NUREG-1145 V.11

ANNUAL REPORT 1994

United States Nuclear Regulatory Commission

June 30, 1995

The President
The White House
Washington, DC 20500

Dear Mr. President:

This Annual Report for 1994 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 1994, with additional treatment of events after that period where circumstances warranted.

Respectfully,

Ivan Selin

Ivan Selin
Chairman

ANNUAL REPORT 1994

United States Nuclear Regulatory Commission

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

NUREG-1145, Vol. 9, *1992 NRC Annual Report,* published July 1993

NUREG-1145, Vol. 10, *1993 NRC Annual Report,* published August 1994

The *1994 NRC Annual Report,* NUREG-1145, Vol. 11, is available from

U.S. Government Printing Office

P.O. Box 37082

Washington, D.C. 20402-9328

Table of Contents

Chapter 1: 1994 Highlights/Licensing and Inspection Summary
(1–7)

Chapter 2: Nuclear Reactor Regulation
(9–56)

Chapter 4: Nuclear Materials Regulation

(87–94)

Chapter 5: Fuel Cycle Safety and Safeguards

(95–110)

Chapter 9: Nuclear Regulatory Research
(163–210)

Chapter 10: Proceedings and Litigation
(211–220)

Chapter 11: Management and Administrative Services
(221–236)

APPENDICES

1994 Highlights: Licensing and Inspection Summary

Chapter 1

This is the 20th annual report of the U.S. Nuclear Regulatory Commission (NRC), covering events and activities occurring during fiscal year 1994 (October 1, 1993 through September 30, 1994), with some treatment of noteworthy events after the end of the fiscal year.

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.

This report covers the major activities, events, decisions, and planning that took place during fiscal year 1994 within the NRC or involving the NRC. The report is issued in compliance with Section 307(c) of the Energy Reorganization Act of 1974, which requires that an annual report be submitted to the President for transmittal to the Congress. This chapter takes note of significant changes in the makeup of the Commission and in agency structure, and provides a summary of licensing and inspection activity treated in detail in subsequent chapters of the report.

Changes in the Commission and in NRC Structure

The term of Commissioner Forrest J. Remick ended June 30, 1994 and, as of the end of calendar year 1994, the vacancy on the Commission had not been filled. A second vacancy created when Commissioner James R. Curtiss' term ended the previous year also had not been filled at that time. Early in calendar year 1995, Chairman Ivan Selin announced his intention of leaving the Commission on July 1, 1995, one year prior to the expiration of his five-year term. On April 6, 1995, the Senate confirmed President Clinton's nomination of Dr. Shirley Jackson as an NRC Commissioner. President Clinton has announced that Dr. Jackson will become Chairman, effective July 1, 1995. She was sworn in as a Commissioner on May 2, 1995.

Thomas E. Murley, Director of the NRC's Office of Nuclear Reactor Regulation (NRR), retired during the report period and was succeeded by William T. Russell, a former Regional Administrator for NRC's Region I (Philadelphia). The Commission took action during the period to consolidate the former Region V (San Francisco) with Region IV (Dallas), designating the former a Field Office of Region IV. The consolidation of Regional Offices was effective as of April 4, 1994. With completion of the construction and occupancy of the second building at NRC Headquarters (see the discussion at the end of this chapter), the NRC Office of Consolidation was subsumed into the Office of Administration in July 1994. The Office of Policy Planning was discontinued upon completion of its work on the NRC Strategic Plan, as described in the 1993 NRC Annual Report, pp. 6 and 7. These mergers and other measures, such as the reorganization of

NRR and the Office for Analysis and Evaluation of Operational Data, are all part of the streamlining taking place throughout the NRC in recent years.

Power Reactor Regulation

Power Reactor Licensing Actions. No new licenses were issued in fiscal year 1994, although about 1,520 licensing actions were completed for this period.

Licensing Actions for Operating Power Reactors. Either routine activity or unexpected events at a nuclear facility can result in a need for the NRC to take licensing actions. Routine licensing 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 fiscal year 1994, NRR completed about 1,520 licensing actions. About 98 percent of these actions were directed at specific plants and licensees. The balance were multi-plant actions deriving from the imposition of NRC requirements. The total inventory of licensing actions under review has increased from about 1,174 to 1,293. (See Chapter 2.)

Implementation Status of Safety Issues. The NRC publishes a document annually giving the status of the implementation and verification of actions involving major safety issues. The 1994 annual report, published in December 1994, includes the status, as of September 30, 1994, of implementation and verification of all safety-issue actions affecting multiple facilities; that is, the TMI Action Plan Requirements, Unresolved Safety Issues (USIs), Generic Safety Issues (GSIs), and all other multi-plant actions (MPA). The 1994 annual report states that more than 99 percent of the TMI Action Plan items, about 94 percent of the USI items, about 98 percent of the GSI items, and about 89 percent of the other MPA items have been implemented at the 109 licensed plants.

Renewal of Operating Licenses. The first operating license of a current active plant will expire in 2000, and the operating licenses of nearly 20 percent of these plants will expire by the end of 2010. Preparation for expected license renewal applications continues to be a high priority. During 1994, the NRC staff developed and published for public comment a proposed revision to the license renewal rule that simplifies the license renewal process.

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 10 CFR Part 52, which includes provisions for design certification, early site permits, and combined licenses. The NRC is preparing proposed standard design certification rules for two evolutionary light water reactor (LWR) designs.

Power Plant Maintenance. During fiscal year 1994, the NRC prepared a draft version of an inspection procedure that will be used to verify licensees' implementation of 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The draft inspection procedure was the subject of a public workshop on March 31, 1994, and was revised to incorporate appropriate comments and suggestions received from the public and industry representatives at the workshop. The NRC will validate this inspection procedure during site visits to nine plants that have volunteered to have their implementation of the rule reviewed prior to the effective date of the rule, July 10, 1996. The site visits were scheduled to be performed during the period from September 1994 through March 1995.

Special Reactor Plant Inspections. During 1994, the NRC headquarters and regional staffs continued to perform special team inspections, involving 4–to–10 inspectors and requiring 1–to–2 weeks of on-site 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.

The staff continued to perform Service Water System Operational Performance Inspections (SWSOPIs) as an area-of-emphasis inspection in accordance with TI 2515/118, Revision 1. The TI requires the staff to conduct SWSOPIs at sites licensed before 1979 and also at sites having problems with service water systems or more general problems with maintenance, engineering, or technical support. At the end of the fiscal year, 24 SWSOPIs had been completed, including the five pilot inspections.

An inspection procedure titled "Licensee Self-Assessments Related to Area-of-Emphasis Inspections" (IP 40501) was issued to allow for reduced NRC inspection activity at facilities which demonstrate good performance. 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. By the end of the fiscal year, licensees had committed to perform 23 SWSOPI self-assessments; fourteen of these were completed.

Thermo-Lag Fire Barrier Systems. Following extensive investigation of a fire at the Browns Ferry (AL) nuclear power plant in 1975, the Commission, in 1981, issued a fire protection rule (10 CFR Part 50.48) which licensees could satisfy by, among other acceptable means, installing fire barriers. In 1981, licensees began installing Thermo-Lag 330-1 fire barriers. By 1991, Thermo-Lag fire barriers were installed in most operating plants.

In 1991, the NRC received information which raised questions as to the adequacy of Thermo-Lag as an effective fire barrier. A Special Review Team, in its final report issued in April 1992, concluded that the fire-resistance ratings and ampacity derating factors (lowering the current-carrying capacity of cables, taking into account the insulating effects of the fire barrier) for Thermo-Lag were indeterminate. The team also found that some evaluations of test results and some procedures for installing Thermo-Lag were inadequate. After the review team issued its report in 1992, fire endurance tests of Thermo-Lag fire barriers conducted by the nuclear industry and the NRC staff demonstrated that certain Thermo-Lag fire barrier configurations did not provide the level of fire-resistance needed to satisfy NRC fire protection requirements. The staff has developed an action plan to ensure that concerns raised during its review of the Thermo-Lag issue, including the adequacy of other fire barriers and the appropriateness of aspects of the NRC fire protection program, are tracked, evaluated, and resolved. The staff has issued two bulletins, two generic letters (one describing test criteria), and numerous information notices to the industry; reviewed industry test programs; and conducted toxicity and combustibility tests. For the short term, licensees have addressed the fire endurance problem by implementing compensatory measures, such as fire watches, in areas where Thermo-Lag material is installed. Long term actions may range from barrier upgrades and repairs to complete replacement of some barriers. Additional plant-specific analyses may also be required to resolve the ampacity derating problem. Regulatory action and coordination with the industry will continue until the technical and programmatic issues in the staff's action plan have been resolved. (See discussion under "Safety Reviews," in Chapter 2.)

In September 1994, the United States Attorney for the District of Maryland and the NRC Inspector General (IG) announced the indictment of Thermal Science, Inc. (TSI) and its president. The indictment alleges that TSI and its president conspired with others to make false statements and conceal material facts within the jurisdiction of the NRC and to defraud the United States by impeding, impairing, obstructing, and defeating the NRC's administration of the Atomic Energy Act. In April 1994, Industrial Testing Laboratory and its president had pleaded guilty in U.S. District Court in Maryland to five counts of aiding and abetting the making of false statements in connection with the case.

Nuclear Materials Regulation

Nuclear materials regulation during fiscal year 1994 comprised:

- Nearly 100 fuel storage and transportation package reviews and 11 route approvals for transporting special nuclear material and spent fuel.

- Fourteen Quality Assurance (QA) Program inspections of transportation packaging and dry spent fuel storage system suppliers.

- Over 5,000 licensing actions on applications for new byproduct materials licenses, amendments to and renewals of existing licenses, and reviews of sealed sources and devices.

- Approximately 2,200 materials licensee inspections.

Materials Licensing and Inspection. The NRC currently administers approximately 6,700 licenses for the possession and use of nuclear materials in medical and industrial applications. This represents a reduction of about 200 licenses over the past year. Table 1 shows the distribution of licenses by Region. The 29 Agreement States administer about 15,000 licenses.

The program is designed to ensure that activities involving such uses of radionuclides do not endanger the public health and safety. NRC regional staff completed 2,193 inspections of materials facilities in fiscal year 1994. The NRC Regional Offices administer almost all materials licensees, with the exception of certain exempted distribution licenses, sealed source and device design reviews, and licenses for companies which extract other metals from ores and slags containing uranium and thorium, which are handled at NRC Headquarters.

The NRC completed 5,002 licensing actions during the fiscal year. Of this total, 348 were new licenses, 3,359 were amendments, 1,110 were license renewals, and 185 were sealed source and device reviews. (See Chapter 4.)

Fuel Cycle Licensing Activities. By the end of fiscal year 1994, the NRC had completed 106 fuel cycle licensing actions.

Fuel Cycle Safety Inspection. As part of the February 7, 1993 reorganization of fuel cycle facility activities within NMSS, several fuel cycle facility inspection activities have been consolidated in NRC Headquarters, in a phased approach. Activities consolidated include chemical process safety and nuclear criticality safety inspections, which were added to the material control and accounting (MC&A) inspections previously conducted by Headquarters. The NMSS staff has also developed and initiated a chemical process safety inspection program. Draft inspection procedures have been framed and are being validated through on-site inspections. During fiscal year 1994, headquarters staff provided technical expertise to address difficult design, integration, and adequacy concerns in the areas of criticality and chemical process safety.

The four Regional Offices and NMSS conducted in excess of 133 safety inspections at 15 fuel cycle facilities that are either decommissioned or undergoing decommissioning during fiscal year 1994. The inspections include resident inspector activities at two of these facilities. The inspections covered the areas of criticality safety, radiation protection, emergency preparedness, environmental safety, chemical safety, and transportation. (See Chapter 5.)

Facilities and Transportation Safeguards

Fuel Cycle Safeguards Licensing. Nine active, licensed nuclear fuel cycle facilities were subject to NRC comprehensive safeguards requirements during fiscal year 1994. Two of the nine facilities contain significant quantities of highly enriched uranium (HEU), requiring extensive physical security and MC&A measures. One of these facilities—NFS, of Erwin, Tenn.—reduced the quantity of 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, this interchange did not lead to any significant activity during 1994. One of the low-enriched fuel fabrication facilities, CE-Windsor, phased out its fuel fabrication work and transferred these operations to the CE-Hematite site.

Fuel Cycle Safeguards Inspection. Headquarters staff conducted 16 comprehensive MC&A inspections, while the regional and resident inspectors continued to perform inspections for physical security at major fuel fabrication facilities. Approximately 14 physical security inspections were performed by Region-based inspectors. Performance-based inspection procedures were followed by both MC&A and physical security inspectors.

Reactor Safeguards Inspection. The four NRC Regional Offices conducted 119 safeguards inspections during the report period at licensed nuclear power reactors. Approximately 210 revisions to licensee security, contingency, and guard training plans were reviewed and found acceptable by both regional and headquarters staff.

After completion of the Regulatory Effectiveness Review Program in May 1991, the NRC staff initiated an Operational Safeguards Response Evaluations (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 U.S. Army personnel. 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/safeguards interface reviews to ensure that safeguards measures do not adversely affect the safe operation of the plant. Ten OSREs were conducted during fiscal year 1994, for a total of 27 to date. The effort resulted in a combined total of 20 significant improvements at nine power reactor sites.

Transportation Safeguards. Safeguards requirements were applied to 20 shipments of irradiated spent reactor fuel made over approved routes during fiscal year 1994. Ten of these shipments were by rail. One of the shipments was a transient shipment passing through the United States.

Six domestic and two export shipments of strategic special nuclear material (SSNM, which is "less than five but more than one kilogram" of HEU) were completed during fiscal year 1994. Four export shipments of five or more kilograms were made during the fiscal year.

NRC regulations require licensees to notify the NRC of international shipments of special nuclear material (SNM) and natural uranium. During fiscal year 1994, the NRC received about 179 such notifications. When appropriate, these were forwarded to the Department of Transportation for notification of international authorities. (See Chapter 5.)

Technical Assessment Capability for Repository Licensing Reviews

The NRC staff continued work on the draft License Application Review Plan (LARP; NUREG-1323), the comprehensive guidance document for the NRC staff's review of a potential DOE license application to construct and operate a high-level waste (HLW) repository. The 97 individual review plans that comprise the LARP cover the NRC requirements in 10 CFR Part 60, for which DOE must show compliance in its license application. The review plan topics are generally consistent with the draft "Format and Content Regulatory Guide for the License Application" (Regulatory Guide DG-3003). Each review plan will have a standard structure with separate sections identifying the applicable 10 CFR Part 60 requirements, and will include the staff's review strategy, review procedures and acceptance criteria, implementation (interfaces and responsibilities), and sample staff evaluation findings.

During the report period, the staff completed the work needed for publication of the draft LARP, Revision 0. Preliminary copies of the draft LARP were also sent to DOE and other parties for their information. The LARP gives guidance to the NRC staff in its review of DOE's license application to construct a mined geologic repository for the disposal of spent nuclear fuel and other HLW at Yucca Mountain. The LARP is intended to ensure the quality and uniformity of the staff reviews, establish the appropriate review priorities, and present a well-defined base from which to evaluate proposed changes in the scope and requirements of staff reviews. Because it is a public document, it will help 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. This draft version represents the staff's initial efforts in developing the LARP. Beginning with this version, the staff currently plans to issue a revision to the draft LARP each year through 2000, culminating with the issuance of a final LARP in 2001. Each revision of the draft LARP will incorporate the work completed by the staff during that particular year. Revision 0 and subsequent revisions of the draft LARP are to be considered preliminary documents and, as such, subject to change. (See Chapter 6.)

NRC License and Annual Fees

The Omnibus Budget Reconciliation Act of 1990 (Public Law 101–508) requires that, in fiscal year 1994, the NRC collect license 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. For fiscal year 1994, the NRC's budget authority was originally $547.7 million. The Commission, in its effort to streamline operations, proposed a $12.7 million rescission to its original appropriation for fiscal year 1994. Congress approved this NRC-proposed reduction. That action resulted in a revised budget authority of $535.0 million. Approximately $22.0 million of the revised budget was appropriated from the Nuclear Waste Fund.

Of the remaining $513 million, approximately 97 percent, or $499.6 million, was collected through license fees and annual charges. Therefore, the net amount appropriated to the NRC in fiscal year 1994, including appropriations from the Nuclear Waste Fund, was $35.4 million. Table 1 shows the amounts collected by category in fiscal year 1994. A detailed account of NRC financial management, with an audited financial report, is given in the NRC Financial Statement for FY 1994 (NUREG-1470, Vol. 4).

Table 1. License and Annual Fee Collections—FY 1994

Fees	Facilities Program	Materials Program	Total
10 CFR Part 170	$102.9 million	$15.4 million	$118.3 million
10 CFR Part 171	$330.3 million	$51.0 million	$381.3 million
TOTAL FEES	$433.2 million	$66.4 million	$499.6 million

The Energy Policy Act of 1992 (EPA-92) directed the NRC to review its policy for assessment of annual charges under OBRA-90, solicit public comment on the need for changes to this policy, and recommend to the Congress any changes needed in existing law to prevent placing an unfair burden on NRC licensees. Consistent with these requirements, the NRC requested public comment on its fee policy in a *Federal Register* notice published on April 19, 1993. Although EPA-92 required only public comments on the annual fees assessed by the NRC under 10 CFR Part 171, the NRC also requested comments on 10 CFR Part 170 fee policies because of the interrelationship of 10 CFR Parts 170 and 171 fees. After review and evaluation of more than 500 public comments, the Commission submitted its report to Congress in February 1994. The report recommended certain legislative changes to OBRA-90 and the Atomic Energy Act to improve the fairness and equity of the fees.

NRC Consolidation a Reality

After more than a decade of planning, surveying, persuading, negotiating, purchasing, leasing, constructing, and transporting, the location of NRC Headquarters at a single venue was finally achieved in fiscal year 1994. The two-building complex at One White Flint North (OWFN) and

Two White Flint North (TWFN), in North Bethesda, Md., contains offices for about 2,400 NRC staff personnel, representing the entire headquarters complement. About 1,000 staff personnel occupy OWFN, first occupied by the NRC in late 1987, and about 1,400 are in the newly constructed TWFN, with occupancy taking place over the spring and summer of 1994. The facility incorporates a new Operations Center for emergency response (see Chapter 3), an underground garage accommodating more than 1,000 vehicles, a fullservice cafeteria, multi-purpose auditorium, staff training facility, credit union, day-care center, fitness center, and other resources. The White Flint complex is located about 12 miles northwest of downtown Washington, D.C.

The NRC two-building complex facing Rockville Pike in North Bethesda, Maryland.

Nuclear Reactor Regulation

Chapter 2

The Office of Nuclear Reactor Regulation (NRR) of the Nuclear Regulatory Commission (NRC) is responsible for developing and issuing regulations for the safe operation of the nation's operating nuclear power and research reactors and for assessing applications to construct and operate new reactors and issuing permits and licenses to do so. The operating and proposed new reactors include both nuclear power reactors operated by electric utilities and non-power reactors, such as those operated by various universities. The NRC does not regulate reactors operated by the Department of Energy (DOE) for furnishing fissionable materials for use in nuclear weapons. More specific NRR responsibilities include the approval and oversight of reactor siting, design, construction, operation, maintenance and decommissioning. NRR's review responsibilities encompass the safety, safeguards, environmental and antitrust considerations related to reactor facilities. NRR also directs and oversees the NRC Regional Offices in their conduct of reactor licensing and inspection activity.

The licensing activity of NRR begins with the extensive review of applications for construction permits and operating licenses for new reactors, and the complex procedures—including inspections from the outset of plant construction and throughout a facility's operating lifetime—leading to issuance of permits or licenses, and licensing actions taken thereafter. In recent years, a steady increase in the number of licensed operating reactors and a decrease in the number of plants still under construction have brought about a substantial shift in NRC activity. NRC staff focuses on the safety regulation of the 109 nuclear power plants licensed for operation in the United States. (See Appendix 7 for listing of and data on all NRC-licensed power plants.) At the same time, the NRC is increasing attention to the development of criteria and procedures for conducting safety reviews of the advanced reactor designs proposed for nuclear plants of the future.

NDE contractor Marty Mingus running the "SAFT scanner" on a feedwater pipe at FitzPatrick.

Status of Licensing

Reactor Engineer Intern Program

The Reactor Engineer Intern Program was established in 1988 to train new personnel in anticipation of the agency's future work force requirements. The program seeks out 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 so that they may acquire a broad grasp of the various concerns, roles and tasks of the agency. Upon completion of the rigorous two-year program, interns are given permanent technical professional assignments based on their educational

LICENSING THE NUCLEAR POWER PLANT

The nuclear power plant licensing process begins when a utility files an application for a construction permit with the NRC. The application usually follows considerable consultation between the utility and the NRC staff and comprises many volumes of data, covering both safety and environmental aspects of the intended operation, in accord with NRC requirements and guidance. The NRC staff completes the second phase by reviewing various safety, environmental, safeguards (from theft or sabotage), and antitrust issues. Thereafter, as required by law, the independent Advisory Committee on Reactor Safeguards (ACRS) assesses the proposed project and the results of the earlier reviews and makes its recommendations. The fourth phase is a mandatory public hearing on the matter conducted by a three-member Atomic Safety and Licensing Board (ASLB) which makes an initial decision as to whether a construction permit should be granted. This decision is subject to appeal by any person or group with standing in the proceeding to the Commissioners for a final NRC decision. Appeal beyond the NRC decision is available by recourse to the Federal courts.

When the NRC staff accepts ("dockets") the initial application of a utility, 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 and to a local public document room established by the NRC near the proposed plant site, and to the NRC public document room in Washington, D.C. At the same time, the NRC 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 ASLB appointed to the case, with rights of appeal by the petitioner to the Commission.

With guidance of the standard format (Regulatory Guide 1.70), the applicant for a construction permit describes the proposed nuclear plant design in a preliminary safety analysis report. Upon finding this report sufficiently complete to warrant review, the NRC staff dockets the application and begins the safety, environmental, safeguards, and antitrust reviews in parallel. Even before receiving a safety report, NRC staff will conduct a substantive review and inspection of the design and procurement activities in the applicant's quality assurance program. The safety review is performed in accordance with the Standard Review Plan for Light-Water-Cooled Reactors, initially published in 1975 and periodically revised since then. The plan sets 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; it also describes the procedures to be used in performing the safety review.

The NRC staff examines the applicant's PSAR to determine whether the plant design is safe and consistent with NRC rules and regulations, whether valid methods of calculation were used, and whether the applicant has conducted its analysis and evaluation in sufficient depth and breadth to ensure adequate safety. Upon verifying that the applicant's preliminary report meets the acceptance criteria of the Standard Review Plan, the staff prepares a Safety Evaluation Report describing the expected effect of the construction and operation of the proposed facility on public health and safety.

Following publication of the Safety Evaluation Report, the 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 issues a supplement to the Safety Evaluation Report which incorporates 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.

Where appropriate, the NRC may grant a Limited Work Authorization to an applicant in advance of a final decision on 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 the ASLB has conducted a hearing on environmental impact and site suitability and has reached a favorable finding. To realize the desired saving in construction time, the applicant must submit the environmental portion of the application early in the process.

The environmental review begins with an assessment of the acceptability of the applicant's Environmental Report. If that report is judged sufficiently complete to warrant review, the staff dockets the report and begins an analysis of the consequences to the environment from the construction and operation of the proposed facility. Upon completion of the analysis, a Draft Environmental Statement is published and distributed 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 in the preparation of a Final Environmental Statement. Both the draft and the final statements are made available to the public at the time of their publication. During this same period, the NRC staff conducts analyses and prepares a report on the site suitability concerns of the proposed licensing action. After these efforts, a public hearing, presided over by the appointed ASLB, may be held on 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).

The antitrust reviews of license applications 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.

background, personal and career preferences, and on the needs of the agency.

In June 1994, 20 Reactor Engineer Interns were honored at a joint ceremony recognizing the graduates of intern programs established by the NRC's three program offices. Since the inception of the NRR program in 1988, a total of 73 entry-level engineers have successfully completed the Reactor Engineer Intern Program. Currently, 15 headquarters-based interns are pursuing the requirements of the program.

License Applications, Issuances, and Decommissioning

During fiscal year 1994, the NRC staff has been engaged in revising Part 50 regulations to clarify their applicability to decommissioning and to make certain changes in decommissioning policy regarding permanently shut down reactors. This has been a collaborative effort between the Offices of Nuclear Reactor Regulation, Nuclear Regulatory Research, and the General Counsel. Proposed rulemaking is expected to be published in March 1995 for public comment.

On January 25, 1994, Commonwealth Edison Company (ComEd) workers discovered a significant quantity of water in the containment building of Dresden Unit 1 (Ill.), which has been permanently shutdown since 1978. The source of the estimated 55,000 gallons of water was a service water line which had frozen and ruptured within the unheated containment. The water was pumped from the containment building for processing by the site radwaste system. The NRC responded by conducting a Special Team Inspection, which involved Headquarters and Region III staff, to review and evaluate the circumstances and significance of this event. The inspectors identified a pattern of declining management oversight at the facility. Significant inconsistencies were found between the licensee's Decommissioning Plan and actual conditions, equipment configurations, and programs at the facility. On June 13, 1994, the NRC proposed a civil penalty on ComEd for its failure to maintain required systems and to staff Dresden Unit 1 in accordance with the Dresden 1 Decommissioning Plan. On July 13, 1994, ComEd paid the civil penalty and provided a list of corrective actions that ComEd would take to resolve identified deficiencies.

The incident at Dresden Unit 1 prompted the NRC to review the likelihood of similar events at other facilities in the decommissioning process. NRC Bulletin 94-01 was issued on April 14, 1994, to inform licensees of permanently shutdown nuclear power reactors with fuel in the spent fuel pool, of the results of the special NRC inspection at Dresden 1, and to request that they take actions to ensure that adequate cooling and shielding of the fuel in the spent fuel pool are not compromised. The NRC conducted site inspections of all permanently shutdown reactor facilities to verify that the terms of the bulletin were met.

In 1993 the NRC staff issued its safety evaluation and environmental assessment of the proposed decommissioning plan for the Rancho Seco (Cal.) nuclear power plant. However, NRC approval of the decommissioning plan was delayed because of hearing contentions raised by the Environmental and Resources Conservation Organization (ECO). During 1994, ECO reached a settlement with the Sacramento Municipal Utility District, the licensee for Rancho Seco, and on August 1, 1994, withdrew from the proceeding. The staff is currently reviewing and updating its previous safety evaluation and preparing the order which will authorize decommissioning of Rancho Seco.

On March 31, 1994, the Citizens Awareness Network (CAN), an activist group based in the Rowe, Mass., community, filed a complaint in the Massachusetts District Federal Court claiming the NRC did not follow the National Environmental Protection Act (NEPA) in its review of the Yankee Atomic early component removal program conducted in 1993. (This program was discussed in the 1993 NRC Annual Report.) The court denied the complaint on jurisdictional grounds, but CAN has appealed to the First Court of Appeals in Boston. Litigation is ongoing and oral arguments are scheduled to be conducted in January 1995.

During 1994, the licensee for the Trojan (Ore.) nuclear power plant, Portland General Electric, proposed to undertake a large component removal (LCR) project which would include the removal and shipment of the Trojan steam generators and pressurizer to the U.S. Ecology low-level waste repository at Hanford, Wash. The NRC staff provided State-requested support to the Oregon Department of Energy to facilitate a "rulemaking" process that culminated in the State approving the LCR project November 17, 1994. The licensee commenced the LCR project in late November 1994.

Special Cases

South Texas Project. The South Texas Project (STP) nuclear power plant is a two-unit Westinghouse pressurized water reactor facility located in Matagorda County, Tex. The licensees for the facility are Houston Lighting and Power Company, City Public Service Board of San Antonio, Central Power and Light Company, and the City of Austin, Texas. The operator of the South Texas Project is Houston Lighting and Power Company. Each unit is rated at 3,800 megawatts (thermal).

Both units were shut down for an extended period in February 1993 because of various managerial and technical (hardware) issues. The problems with the facility were grouped into three broad areas—material condition and housekeeping, human performance, and managerial and organization performance. The facility was placed on the NRC Watch List in 1993.

During this time, the NRC staff oversight of the facility increased significantly. For example, the units were placed under a confirmatory action letter (CAL), as supplemented; a diagnostic evaluation team review was initiated in April 1993; a restart panel composed of regional and headquarters personnel was formed in accordance with NRC Inspection Manual Chapter 0350 "Staff Guidelines for Restart Approval;" and inspections by operational readiness assessment teams and other NRC staff teams were conducted. These efforts were implemented by a combination of NRC personnel from the Office of Nuclear Reactor Regulation, the Office for Analysis and Evaluation of Operational Data, and Region IV. The licensee initiated various corrective actions, including the generation of a comprehensive operational readiness plan and business plan to track and correct identified deficiencies.

After being assured that the units could be operated safely, the NRC lifted the supplemented CAL and allowed the units to restart. STP Unit 1 restarted on February 18, 1994, and STP Unit 2 restarted on May 22, 1994. Each unit has operated relatively uneventfully since restart. As a result, NRC concern decreased during 1994.

Commonwealth Edison Company. The Commonwealth Edison Company (ComEd) owns and operates 12 nuclear power plants at six sites in the State of Illinois. The sites are Braidwood, Byron, Dresden, LaSalle, Quad Cities, and Zion, and they range in time of operation from seven years for Braidwood to 24 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 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 determined the following probable root causes for the utility's difficulties: (1) insufficient management attention and resources committed to the operating sites during the construction of new facilities, (2) limited effectiveness of corporate level oversight of nuclear operations, (3) slow recognition of situations requiring increased management attention, (4) weak engineering support to the operating units, and (5) inability to substantially benefit from experiences of other utilities or from experience at its own sites.

ComEd developed and began to implement an Integrated Management Action Plan to improve organizational and management effectiveness, business planning, and management of issues. In 1993, ComEd reorganized the corporate office and management structure at each site to establish a standard organization for each. ComEd transferred corporate engineers to the sites and created a site vice president position at each site to be accountable for developing and implementing the technical and business plans. Quality assurance organizations at each site were also reorganized to increase staffing and improve communication with the site organizations.

In 1994, ComEd continued to change the senior level organization and personnel by creating positions for the Vice President of Pressurized Water Reactor (PWR) Operations and a comparable position for Boiling Water Reactor (BWR) Operations. This position was an additional level of management oversight between the Chief Nuclear Officer and the Site Vice Presidents. New positions were also established for an Engineering Vice President and a Nuclear Support Vice President. All four appointments for these positions were made from outside the company. ComEd also made management changes at the BWRs and is implementing comprehensive improvement plans at each of its BWRs. The licensee has improved efforts to find deficiencies by implementing an integrated problem identification program at all ComEd sites.

The NRC monitored and evaluated operations at ComEd plants under the Systematic Assessment of Licensee Performance (SALP) program and found that activities at the Byron plant exhibited generally excellent performance and that Braidwood demonstrated performance from good to excellent. Performance at Zion was generally good but inconsistent. While performance at Quad Cities and LaSalle was acceptable, they exhibited indications of declining performance. Dresden performed adequately and continued improving slowly.

In September 1993, a diagnostic evaluation team (DET) inspected Quad Cities, finding management weaknesses and deficiencies in plant performance. The team found particular problems with poor plant material condition, ineffective self-assessment, and a failure to complete past improvement plans. In January 1994 and June 1994, the NRC issued letters to ComEd expressing concerns about adverse performance trends. In the second letter, the NRC noted progress but stated that it would need more time to clearly assess the effectiveness of the licensee's actions. The NRC is continuing to monitor the licensee's performance and its corrective actions.

The NRC also expressed concern in 1994 regarding adverse performance trends at the LaSalle (Ill.) nuclear power plant. The major issues were poor radiological work practices, declining plant material conditions, and inconsistent performance. The licensee did a major assessment of its organization and programs and developed an integrated improvement plan. NRC personnel from Region III and Headquarters have closely monitored the corrective actions at the LaSalle site by doing more inspections and overseeing progress. Although the improvement efforts appeared to be arresting the adverse trends near the end of the year, the NRC will continue to evaluate their effectiveness.

During the past year, the NRC has closely monitored performance at the Dresden site. Resident and regional inspectors did more inspections and found that, while performance improved in some areas, overall progress has been very slow. Both units completed extensive outages to correct several long-standing material problems. Since June 1994, Dresden has undergone substantial changes in the plant's management and organization alignment. The licensee developed an overall improvement plan and undertook other initiatives to improve quickly. While these changes have started to show some positive results, the NRC determined that continued close monitoring is warranted until the licensee sustains the improved performance at Dresden.

Fermi. On December 23, 1993, while the plant was at 93 percent reactor power, a catastrophic failure of the Fermi Unit 2 (Mich.) turbine generator occurred when blade number 9 of the eighth stage of low-pressure turbine number 3 failed at the root and severed the four adjacent blades, also at the root. One blade penetrated the exhaust hood, and the failed blades caused a severe imbalance of the turbine. The resulting extreme vibration significantly damaged the turbine, generator and exciter. A fire at the generator-exciter end and adjacent areas occurred as a result of hydrogen leakage, detonation and burn. Damage to lube oil and service water cooling lines and activation of the fire deluge systems caused approximately one million gallons of water and oil to drain and flood the turbine and radwaste building basements. No one was injured during the event.

On December 28, 1993, the Region III Administrator issued a confirmatory action letter (CAL) to document actions required of the licensee before restart. These actions were the quarantining of equipment until an NRC augmented inspection team (AIT) arrived on site and the submittal of a licensee root cause analysis and recovery action plans to the NRC for review. The AIT issued its inspection report on February 7, 1994, and concluded that plant personnel had effectively responded to the event and ensured safe reactor shutdown and suppression of the resultant fire.

The licensee determined that a single root cause could not be precisely established. Most likely a number of contributing root causes led to the blade failure that initiated the event, including moisture accumulation or induction in the steam path, unique characteristics of the failed blade, and torsional resonance of the turbine generator rotors, which all added stresses to the blade that failed. The root causes were documented in the licensee's initial response to the CAL on August 24, 1994.

As part of the recovery actions, the licensee was required to discharge approximately 1.5 million gallons of treated low-level activity water to Lake Erie. This action resulted in heightened public and Congressional interest. The licensee has nearly completed corrective and recovery actions. The low-pressure and high-pressure turbines have been repaired, the low-pressure turbine rotors have been straightened and balanced, the generator has been repaired, and the exciter has been replaced. The licensee planned to start up the plant in late 1994. The unit will be operated derated by about 230 MW. The seventh and eighth stage blades have been removed from all three low-pressure turbines and pressure plates have been installed. During the next refueling outage in the spring of 1996, all three low-pressure turbines will be replaced.

The Region III Administrator, with the concurrence of the Office of Nuclear Reactor Regulation (NRR), formed a restart panel, in accordance with NRC Inspection Manual Chapter 0350, to evaluate and track the licensee's investigative and recovery actions before restart. The panel established a formal restart action plan with 33 separate action items requiring resolution prior to restart. The panel has nearly completed its review of the licensee's actions. The Regional Administrator, with the concurrence of the Director of NRR, will authorize restart after the restart action plan items have been completed.

Palisades. 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 (Mich.) nuclear power plant. During fiscal year 1994, a number of issues were raised regarding dry-cask storage at Palisades.

During 1993 and early 1994, questions were raised about the possible effects of earthquakes and erosion at the Palisades site on the safe storage of spent fuel in the VSC-24 casks. On the basis of these concerns, the NRC initiated an independent assessment, in March 1994, to more closely examine the behavior of the storage pad at Palisades with respect to seismic and other natural hazards. On May 23, 1994, the staff held a public meeting with CPCo to discuss CPCo's examination of the dry-cask storage pad and the staff's independent assessment of that examination. After the meeting, the staff continued to address comments and questions received from the public regarding dry-cask storage at Palisades. On September 20, 1994, the staff issued a final safety assessment, in which it concluded that the location of the storage pad at the Palisades site was acceptable to support the concrete storage cask against all effects of the design-basis earthquake and against other such postulated natural hazards as high winds, floods, shifting sand dunes, and soil liquefaction.

In June 1994, the Office of Nuclear Material Safety and Safeguards (NMSS) performed an inspection of the VSC-24 vendor (Sierra Nuclear Corporation, SNC) and its contractors. NMSS identified numerous quality assurance (QA) violations indicating a serious lack of management commitment in the implementation of SNC's QA program. CPCo subsequently halted loading of spent fuel into the storage casks and any further cask fabrication at SNC. After it completed a detailed evaluation of each of the QA deficiencies and its applicability to each cask, CPCo resumed cask loading in September 1994. Resumption of cask fabrication at SNC is awaiting completion of root cause and corrective action analyses and is scheduled for early fiscal year 1995.

On July 28, 1994, a CPCo inspector, while reviewing radiographs, found two crack-like indications (approximately 3/16 inch in depth) in the vertical weld of multi-assembly sealed basket (MSB) No. 4 at the Palisades site. MSB No. 4 is a component of VSC-24 Cask No. CVCC-24-004 which was previously loaded with spent fuel on July 16, 1994. Although CPCo determined that the remaining wall thickness was sufficient to support the safe storage function of the MSB, it informed the staff of its intent to offload MSB No. 4. CPCo is currently enhancing its existing unloading procedure, and offload of MSB No. 4 is scheduled to take place in 1995.

Besides dealing with the issues discussed above, the staff continues to field numerous questions from the public regarding the issue of dry-cask storage at Palisades as well as other nuclear power plant sites.

Cooper Nuclear Power Plant. The Cooper (Neb.) nuclear power plant is a single unit, 778-megawatt (electric) General Electric boiling water reactor facility, located in Nemaha County, Neb. The Cooper plant is owned and operated by the Nebraska Public Power District (the licensee). The recent declining level of licensee performance has resulted in significantly increased NRC oversight of the facility, including placing the facility under Confirmatory Action Letters, as supplemented, and initiating a special evaluation based on Diagnostic Evaluation Team principles.

In the previous two NRC Systematic Assessment of Licensee Performance (SALP) reports—for the periods ending in January 1992 and April 1993, respectively—declining performance was noted in the functional areas of Operations, Radiological Controls, Maintenance/Surveillance, Engineering/Technical Support, Emergency Planning, and Safety Assessment/Quality Verification. In January and June of 1994, the NRC sent letters identifying these negative trends to senior licensee management, requesting that appropriate remedial actions be taken.

The plant entered a forced, unplanned outage in May 1994, which continued through the end of the report period. The plant was shut down because of concerns regarding the capability of the emergency diesel generators to supply emergency electrical loads in a post accident condition. Following the plant shutdown, an NRC inspection identified serious deficiencies in the control room emergency filter system that had existed since 1989. In addition, during design basis reconstitution efforts, the licensee discovered significant containment deficiencies that had not been identified since plant operation commenced in 1974. The root cause of the problems identified in these engineered safety feature systems was inadequate testing. Confirmatory Action Letters (CALs) have been issued to address the specific hardware concerns associated with the emergency diesel generators and associated electrical distribution system, the control room envelope, and the containment penetrations. The CALs also required the licensee to evaluate its operational experience review and testing programs.

In July 1994, the licensee initiated an independent self-assessment of station performance by a team of industry peers. This Diagnostic Self Assessment (DSA) concluded that significant performance deficiencies existed that required resolution by licensee management. Major findings of the DSA included these: (1) corporate and plant management did not foster high standards of performance; (2) weaknesses existed in the licensee's long-range planning efforts; (3) management and quality assurance oversight were not effective; and (4) testing, configuration control, and corrective action programs were deficient.

Subsequent to the DSA, the NRC conducted a Special Evaluation (based on Diagnostic Evaluation Team principles) to assess the independence and rigor of the DSA process, as well as its findings, and to independently evaluate the licensee's performance. The special evaluation found that the DSA was an effective and comprehensive assessment, which reached substantive conclusions that were supported by the NRC's independent assessment. The special evaluation's findings, which closely paralleled the DSA's findings, included these: (1) management did not provide the leadership and direction necessary to maintain corporatewide standards of performance; (2) major programs and processes were poorly defined, and did not ensure the consistent and effective accomplishment of program goals and objectives; and (3) independent oversight and self-assessment were not effective in monitoring ongoing activities for detecting deficiencies or for ensuring that identified deficiencies were resolved. As a result of the DSA and the NRC's special evaluation, the licensee senior management recognized that problems and future challenges exist at the Cooper nuclear plant.

Since July 1994, the licensee has implemented significant organizational and management changes. At the close of the report period, the new management team has initiated a comprehensive three-phase performance improvement plan to identify and address the actions needed to prepare for plant restart, the short-term period following restart (2-to-3 months) and long term plant operation. The plan is intended to correct the historic fundamental weaknesses and to provide a basis for sustained improved performance at the Cooper facility.

The NRC will continue its enhanced oversight of licensee activities for the duration of the current outage. The NRC staff has established a formal Restart Panel, in accordance with NRC Inspection Manual Chapter 0350, to identify specific restart issues and to coordinate the inspection efforts necessary to verify that the licensee has satisfactorily addressed those issues before NRC approves plant restart.

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. By that time, TVA had already placed the Browns Ferry (Ala.) and Sequoyah (Tenn.) nuclear plants in a cold shutdown status and had made commitments to the NRC to implement comprehensive corrective actions. TVA had confirmed that these plants would not be restarted without NRC concurrence. The number and complexity of relevant issues were not limited to the operating reactors, since questionable construction practices had also been identified at the TVA's Watts Bar (Tenn.) project.

On December 12, 1994, Craven Crowell, Chairman of the TVA Board of Directors, announced that TVA by itself will not complete the two unfinished units at Bellefonte (Ala.), and the second unit at Watts Bar. TVA estimated that it had invested \$4.6 billion in the two units at Bellefonte, which are 88 percent and 57 percent complete, respectively, and \$1.7 billion in Watts Bar Unit 2, which is 61 percent complete. TVA estimated that it would cost as much as \$8.8 billion to complete the three units. TVA indicated that the primary reason for the cancellation was an attempt to limit increases in TVA's debt to a level below the \$30 billion limit set by Congress. TVA will maintain the three units until it completes an Integrated Resource Plan, in late 1995. At that time, TVA will consider alternatives, including converting the units to another fuel source or applying the same corrective action plans and criteria used for the Unit 2 restart. The NRC staff will review any changes proposed by TVA.

Browns Ferry. Unit 2 was shut down in September of 1984 for a planned refueling outage. Units 1 and 3 were shut down in early 1985 because of equipment problems and operational incidents. In March of 1985, TVA volunteered to maintain all three units in a shutdown condition until corrective actions could be implemented to resolve serious NRC concerns regarding TVA's ability to safely operate and manage the Browns Ferry facility.

Browns Ferry Unit 2 was restarted on May 24, 1991, following extensive NRC review and inspection of TVA's corrective action programs. TVA had focused its efforts at Browns Ferry exclusively on Unit 2 to develop and implement necessary corrective actions; restoration of Unit 3 and then of Unit 1 were to follow.

In August of 1991, Unit 2 returned to normal full power commercial operation, having successfully undergone a Power Ascension Test program. In a letter of June 30, 1992, the NRC notified TVA that Unit 2 had demonstrated excellent 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 continue to remain in the close monitoring category and would require explicit NRC authorization to be operated.

On January 29, 1993, Browns Ferry Unit 2 was shut down for its first refueling outage following restart from the extended recovery outage. This outage was the milestone for completing numerous post-restart commitments. The large plant modifications included installation of the hardened wetwell vent, completion of the control room design upgrade, and installation of a new plant process computer, including full-function safety parameter display systems. The plant was restarted on schedule in late May 1993 and has operated well since that time.

TVA plans to load fuel in Browns Ferry Unit 3 in October 1995 and to take this reactor critical in December 1995. In general, TVA is applying the same corrective action plans and criteria used for the Unit 2 restart. The NRC staff will review any changes proposed by TVA.

A decision on whether to pursue recovery of Browns Ferry Unit 1 is part of TVA's Integrated Resource Plan. To restart Unit 1, TVA expects that extension of the license to "recover" a portion of the extended shutdown time in the current license, or license extension will be required.

Sequoyah. Sequoyah Units 1 and 2 were voluntarily shut down in 1985 for the licensee to address environmental qualification issues, performance weaknesses, and management problems. Both units were restarted in 1988. From October 1986 to May 1989, Sequoyah was on the NRC's list of plants requiring close monitoring because of regulatory concerns about declining performance.

Performance improved into 1991, but then declined. In 1992, an increase in the number of plant events, and also escalated enforcement actions caused by poor procedure adherence, lack of attention to detail, and configuration control problems, caused increased NRC staff concern. The concern was mainly related to a lack of leadership and an inability to effectively communicate expectations within the organization, especially in operations, maintenance and engineering.

These problems were exacerbated by three dual-unit events that occurred in 1992 and 1993. The first was an inadvertent water-injection into the control air system; the second was a simultaneous trip of both units during breaker-testing in the switchyard; and the third was an unanticipated steam-leak in the secondary system. The water-injection event was caused by a failure to adequately maintain air system components, and caused one unit to trip and the other unit to automatically reduce power. The breaker-testing event caused both units to trip. When Unit 2 tripped in 1993 because of a steam-leak in the secondary system, TVA found a significant deficiency in the process to monitor and predict weakening of steam line piping, caused by steam impingement on the inside surface of the piping (i.e., the erosion/corrosion program). Since these program weaknesses were evident in both units, TVA voluntarily shut down Unit 1, and TVA management agreed that neither unit would be restarted until various issues were addressed and the NRC determined that TVA identified and corrected the root cause of the problems. TVA determined that the root cause was the failure of management to clearly assign responsibilities and provide appropriate oversight and direction for monitoring and maintaining the balance-of-plant piping.

While the plant was shut down, TVA performed evaluations that revealed problems in hardware and other areas. The problems were grouped into six focus areas—Balance of Plant; Operations; Backlogs; Programs; People, Organization and Culture; and Corporate/Site Interface.

TVA identified ineffective resource management and ineffective personnel and management performance as the underlying causes of the problems in these areas. TVA adopted a comprehensive performance improvement plan, including a Restart Plan and a Post-Restart Site Improvement Plan. As a result, many site technical programs have been restructured and reorganized to more clearly assign responsibilities. Management focused on creating an atmosphere conducive to improved performance, and personnel changes occurred. And, responsibility for a number of programs has been shifted from the corporate organization to the site.

The NRC established a Restart Panel to monitor activities at the plant. The NRC also conducted an Operational Readiness Assessment Team inspection to confirm the overall effectiveness of plant programs to correct the deficiencies and to conduct power operation. In general, the results of this inspection were favorable. TVA management and the NRC will continue to closely monitor the effectiveness of these changes.

On October 18, 1993, the NRC concluded that the plant had completed all items necessary for restart of Unit 2. TVA restarted Unit 2 on October 19, 1993. Unit 1 was restarted on April 13, 1994, following completion of refueling activities.

Watts Bar. Having restarted Sequoyah and Browns Ferry Unit 2, TVA stepped up activities on Watts Bar Unit 1 and established a fuel-loading date, currently set for March 1995.

Although construction of Unit 1 was complete in 1985, extensive corrective programs were required to resolve deficiencies identified from allegations, employee concerns, inspections and audits. The staff reviewed and approved all 28 corrective action programs. Details of the staff's review may be found in the latest supplement to the Watts Bar Safety Evaluation Report (NUREG-0847). TVA must implement all corrective actions programs before the NRC will issue an operating license.

The NRC staff is implementing an extensive inspection program at Watts Bar to ensure that the plant has been built in accordance with applicable NRC requirements.

On December 12, 1994, Craven Crowell, Chairman of the TVA Board of Directors, announced that TVA by itself will not complete the second unit at Watts Bar. TVA estimated that it had invested $1.7 billion in Watts Bar Unit 2 which is 61 percent complete.

Bellefonte. In July 1988, TVA informed the NRC that the TVA Board of Directors had decided to defer construction of Bellefonte Units 1 and 2 (Ala.) because of lower-than-expected load forecast for the near future, cost-cutting efforts to improve the TVA's financial position, and the TVA's effort to hold electric rates constant for a specific period of time. TVA continued activities at the plant during the deferral period, and the NRC staff continues performing periodic inspections at the site.

On November 8, 1990, TVA met with the NRC staff and presented a plan to resume construction of the Bellefonte plant. TVA evaluated three options for completing Bellefonte: (1) completing the plant as a nuclear facility, (2) converting the plant to a combined-cycle gas facility, or (3) converting the plant to a pulverized coal facility. Following this evaluation, TVA decided to complete the two Bellefonte units as nuclear units.

On March 23, 1993, TVA notified the NRC that it planned to complete Bellefonte Units 1 and 2. TVA's plans called for loading fuel in Unit 1 by 1998 and in Unit 2 by 2002. Following receipt of TVA's letter, the staff prepared an inspection plan and conducted a special reactivation inspection. The staff concluded that TVA's knowledge of Bellefonte structures, systems and components was adequate for reactivation of Bellefonte.

On December 12, 1994, Craven Crowell, Chairman of the TVA Board of Directors, announced that TVA by itself will not complete the two units at Bellefonte. TVA estimated that it had invested $4.6 billion in the two units at Bellefonte which are 88 percent and 57 percent complete, respectively.

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 preparations for license renewal applications. 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 before the license expires to plan for replacement power alternatives and capital acquisition.

The prospect of 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 permits the NRC staff to renew operating licenses but does not lay out a process to be followed.

In December 1991, the NRC established a process for the renewal of nuclear power plant operating licenses (10 CFR Part 54). Since publishing the rule, pre-implementation activities associated with lead plant reviews and further interaction with the industry identified a number of policy issues needing resolution before the license renewal process could continue. As a result, the NRC undertook to amend the license renewal rule to address these policy issues, which included establishing greater credit for existing programs in the license renewal process, resolving ambiguities between the statements of consideration and the rule, and to establish a more efficient, stable, and predicable license renewal process. The proposed amendment to the license renewal rule was published for public comment on September 9, 1994. Publication of the final amendment is expected in July 1995.

Rulemaking

The NRC published the proposed license renewal rule (10 CFR Part 54) in the *Federal Register*, July 17, 1990; the final rule was published in December 1991. Although no license renewal applications have been received since publishing the final rule, the staff has been conducting various activities for implementing the license renewal rule. As a result of these activities and interaction with industry, the NRC found a number of significant policy issues needing resolution before the license renewal process could continue.

At the close of the 1993 report period, the staff was preparing recommendations for the Commission on how to resolve the policy issues. In a staff requirements memorandum (SRM) dated February 3, 1994, the Commission endorsed the staff's recommendations and directed that the license renewal rule be revised. During 1994 the NRC staff developed and published for public comment a proposed revision to the license renewal rule that simplifies the license renewal process. At the end of the report period, the public comment period was still in progress. The revised rule is scheduled for final publication in July 1995.

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. The staff conducted three public workshops in February 1994 in an effort to openly discuss the commenters' concerns and to formulate resolution of these policy issues. The staff published a proposed supplement to the proposed rule on July 25, 1994, which contained the staff's proposal to resolve the policy issues. The staff is reviewing the public comments on this proposal and expects to complete the environmental protection rulemaking in mid-1995.

Regulatory Guidance Development

Activities regarding development of a draft regulatory guide and a draft Standard Review Plan (SRP) for License Renewal to aid in implementing the license renewal rule have been delayed pending the outcome of the rule revision.

The staff expects to complete the final regulatory guide and Environmental Standard Review Plan for license renewal about six months after issuing the final 10 CFR Part 51 rule and the GEIS.

Industry Technical Report Reviews

NUMARC, now part of the Nuclear Energy Institute, prepared 11 industry reports and requested NRC review and approval of them, so that each can be referenced in a license renewal application, obviating any need for an entirely plant-specific evaluation. The industry reports addressed aging for PWRs and BWRs on the reactor vessel and its internals, the reactor coolant system, the containment, and Class I structures and cables in harsh environments. A screening methodology report was also provided. In response to an SRM of June 28, 1993, the staff is incorporating appropriate technical information from the industry reports into a working draft of the SRP for license renewal. This approach is expected to result in a single document that will include industry report insights and establish the staff's review acceptance criteria.

Industry Activities

Industry Owner's Groups have continued activities in anticipation of a simplified license renewal process at the completion of the license renewal rule revision. Their primary activity has been to support the Nuclear Energy Institute in commenting on the proposed license renewal rule.

The staff received and reviewed screening methodology reports in 1993 from the Babcock & Wilcox (B&W) Owner's Group and from Baltimore Gas and Electric Company (owner of the Calvert Cliffs (Md.) nuclear power plant), which the staff has reviewed.

In 1994 the staff issued safety evaluations on both of these license renewal screening methodology submittals.

Other owner groups, representing Westinghouse and General Electric plants, have indicated that they also will become actively involved with license renewal.

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 the agency's existing regulations, and to eliminate unnecessary and unproductive requirements. Since the NRC already had several initiatives under way to identify and eliminate requirements that were considered to provide only marginal safety benefits, it consolidated them all within the "Continuing Program for Regulatory Improvement," 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; and (3) The Cost Beneficial Licensing Action (CBLA) Program.

In 1994, the Office of Nuclear Reactor Regulation created an organization called the RRG/CBLA Program Group. This independent group, headed by a Director reporting directly to senior office management, is dedicated to oversee and facilitate the implementation of the Continuing Program for Regulatory Improvement.

Marginal to Safety Program

Through the Marginal to Safety Program, the NRC is continuing to eliminate or modify regulations that are considered to provide incrementally small safety benefits but impose a substantial regulatory burden on licensees. The main focus of the Marginal to Safety Program is 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 recognized 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 facilitate processing of petitions for rulemaking, the NRC is currently preparing a change to 10 CFR Part 2.802, "Petition for Rulemaking," to allow an expedited process to be used for petitions that include a comprehensive regulatory analysis of the basis for the petitioned rule change.

Regulatory Review Group Implementation Plan

The NRC's Continuing Program for Regulatory Improvement also incorporates the staff's Regulatory Review Group Implementation Plan. In 1993, the staff's Regulatory Review Group (RRG), a group of senior-level NRC staff, conducted a review 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 leading to burden reduction with little or no adverse safety impact. The staff's action plan for implementing the RRG's recommendations was approved by the Commission in January 1994. The RRG developed more than 60 recommendations covering a wide spectrum of issues and topics. In its September 16, 1994, report to the Commission, the staff identified 10 recommendations that have been implemented.

Within the RRG program, substantial effort is under way to reduce regulatory burden in areas related to plant security, quality assurance, fire protection, fitness for duty, and procurement, and also to reduce reporting requirements. The RRG program also includes regulatory burden reduction through the use of probabilistic risk assessment. The NRC staff has developed an overall policy on the use of probabilistic risk assessment (PRA) in nuclear regulatory activities so that the many potential applications of PRA technology can be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency and enhances safety. Through the use of PRA the staff and licensees will be able to allocate staff and financial resources to items in a manner corresponding to their safety significance.

Another RRG identified item was the development of guidance for managing the commitments industry makes to the NRC. The NRC staff is reviewing guidance being prepared by industry that will provide licensees with the flexibility to modify or delete commitments of little or no safety significance without NRC staff involvement. Industry estimates indicate that licensees currently track and maintain between 5,000 and 10,000 commitments made to the NRC for each plant. A significant number of these commitments were for actions that go beyond what is required by the regulations and can be modified or deleted without affecting plant safety. Currently, industry is conducting a pilot program, with NRC staff oversight, to observe how the guidance is being implemented.

Cost Beneficial Licensing Actions

The NRC's Continuing Program for Regulatory Improvement incorporates the Cost Beneficial Licensing Action (CBLA) program, an agency initiative that began as a pilot program in mid-1993 and was expanded to become available to all licensees in 1994. The CBLA program was created to increase the staff's receptiveness to requests from licensees that would result in reducing or eliminating license requirements that have an incrementally small effect on safety but carry a heavy economic burden. This would be different than in the past, when licensees' requests for approval of license amendments that might be considered to be marginally safety significant but might result in large cost savings were given the lowest priority by the NRC for staff review.

The RRG/CBLA Program Group trends NRC responsiveness related to CBLA activities, and serves as a focal point for the NRC staff, industry, and public on issues and initiatives associated with CBLAs. The RRG/CBLA group does not replace the normal process for reviewing and approving licensee requests. The RRG/CBLA group provides general CBLA policy guidance to NRC and licensee staff, will track and trend CBLA submittal and approval data, and will work with the staff and industry to find CBLAs with generic implications. The CBLA group will also focus management attention on implementing the CBLA process within the staff.

Through December 1994, the staff has received 141 CBLA submittals. The staff has approved 49 submittals thus far, resulting in an estimated lifetime savings (based on industry estimates) of approximately $277.2 million. The CBLA group will monitor the CBLA submittal and approval trends and, if backlogs warrant, will review the program and make adjustments as necessary. An Administrative Letter informing licensees of the CBLA program is being prepared and is expected to be issued in January 1995.

Standardization of Reactor Design

The Commission strongly endorses regulatory policies that encourage 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. In this regard, the NRC plans to achieve the benefits of standardization with the design certification process, which along with early site permits and combined licenses, constitutes the major provisions of the new licensing process in 10 CFR Part 52. The NRC is preparing proposed standard design certification rules for two light water reactor (LWR) designs.

Next-Generation Reactor Designs

The staff is reviewing five applications for design certification under Subpart B of 10 CFR Part 52. Two of the applications are for evolutionary LWR designs (advanced boiling water reactor (ABWR) and System 80+), two are for passive LWR designs (AP600 and simplified boiling water reactor (SBWR)), and one is for a heavy water reactor design (CANDU 3). The status of each of these reviews, including that of the Electric Power Research Institute (EPRI) Advanced LWR Program, is as follows.

ABWR. The staff issued the final design approval on July 13, 1994, after it issued its final safety evaluation report in July 1994 (NUREG-1503). The Commission will issue a notice of proposed rulemaking for design certification of the ABWR when the design control document (DCD) for the ABWR is complete. The purpose of the DCD is to provide, in a single document, design-related information to be incorporated by reference in the design certification rule for the ABWR standard design. This document will contain information from the design certification application, design-related information that complies with staff positions reflected in the final safety evaluation report, and any Commission directives stipulated during the rulemaking process. All applicants referencing the certified ABWR standard design must conform with the information in the DCD.

System 80+. The staff issued the final safety evaluation report (NUREG-1462) and final design approval in July 1994. The Commission will issue a notice of proposed rulemaking for design certification of the System 80+ when the DCD for the System 80+ design is complete.

AP600. Westinghouse Electric Corporation submitted an application for final design approval and design certification of its AP600 design in June 1992. The AP600 is a 600-megawatt-electric (MWe) pressurized-water reactor plant incorporating passive safety systems and features into its design. On November 29, 1994, the staff issued a draft safety evaluation report (DSER) containing 1,136 open items, 62 confirmatory items and 172 combined operating license action items. To date, the staff has issued approximately 2,200 requests for additional information and 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 a test program for the AP600 that includes separate-effects (SE) experiments on the passive approach and two integral systems test (IST) programs (see "Testing for Passive Designs," later in this chapter). The staff expects to issue a DSER supplement containing the results of its review of the testing program in October 1995.

SBWR. GE Nuclear Energy submitted an application for final design approval and design certification of its SBWR design on August 27, 1992, and furnished supplements to it 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 about the SBWR testing program led GE to request a realignment of the SBWR design certification program and to reassess its testing and analysis program. All review activities not related to testing and analysis have been suspended, with resolution of staff concerns and completion of required testing by January 1996. The staff and GE will establish a modified design certification schedule at that time.

EPRI Advanced Light-Water Reactor (ALWR) Program. EPRI prepared a compendium of technical requirements for ALWRs, referred to as the ALWR Utility Requirements Document (URD). These requirements are intended to apply to the design of future evolutionary and passive ALWR power plants. Volume I of the URD, "ALWR Policy and Summary of Top-Tier Requirements," is a management-level synopsis of the URD, covering design objectives and philosophy, the overall physical configuration and features of a future commercial nuclear power plant design, and the steps needed to apply the proposed ALWR design criteria to a functioning power plant. Volume II contains the utility design requirements for an evolutionary nuclear power plant (with a power rating of approximately 1,350 MWe). Volume III contains the utility design requirements for nuclear power plants (with a power rating of approximately 600 MWe) in which passive safety features and systems will be used for the ultimate safety protection of the plant. The URD also proposes the resolution of certain unresolved safety issues and generic safety issues and delineates ways of complying with 10 CFR Part 52.

The NRC staff issued the final safety evaluation report (FSER) on Volumes I and II (NUREG-1242) of the EPRI ALWR URD in August 1992. The staff issued the FSER on Volume III (NUREG-1242) in August 1994.

Pre-application Reviews

During fiscal year 1994, the staff continued to work on completing the pre-application reviews of four advanced reactor designs (MHTGR, PRISM, CANDU 3, and PIUS) in response to 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. The PRISM final pre-application safety evaluation report (PSER; NUREG-1368) was issued in February 1994. Pre-application review activities for CANDU 3 and PIUS were closed out in fiscal year 1994, and an application for design certification for the CANDU 3 was submitted on September 30, 1994. The MHTGR final PSER will be completed in fiscal year 1995. The following discussion deals with each of these pre-application reviews.

PRISM. The Department of Energy (DOE) submitted the Power Reactor Innovative Small Module (PRISM) design. The design is a small, modular, pod-type, liquid-sodium-cooled fast reactor with a ternary metal-alloy fueled core. The proposed plant would integrate nine reactor modules, producing 471 megawatts-thermal (MWt) each, with three steam turbine generator sets to produce a total plant output of 1,395 MWe. Plant design and performance would be highly automated, with little reliance on operators and reliance on passive systems to respond to off-normal events and transients; consequently, power excursions would be kept small and would be promptly shut down, and decay heat removal would be assured with high reliability.

On November 4, 1993, the Advisory Committee on Reactor Safeguards (ACRS) reviewed the PSER and concluded that no obvious impediments to licensing the PRISM design had been identified. The NRC issued its final PSER (NUREG-1368) on the PRISM design in February 1994. The staff identified key safety issues for the design, gave DOE guidance on applicable licensing criteria, and assessed the adequacy of the pre-applicant's research and development programs.

CANDU 3. The CANDU 3 is a 450-MWe, natural uranium-fueled, heavy-water-moderated and -cooled, pressure tube reactor developed by Atomic Energy of Canada, Ltd. (AECL). The design has evolved from previous CANDU reactors, most notably the CANDU 6, a 600-MWe design. There are 25 CANDU reactors in operation and 19 under construction around the world. CANDU experience to date amounts to over 175 effective fullpower years. In December 1988, a U.S. company, AECL Technologies (AECLT), the U.S. representative of AECL in Canada, was created as the pre-applicant for the CANDU 3 licensing effort in this country. In a letter to the NRC dated April 12, 1994, AECLT informed the NRC of its intent to submit an application for design certification of the CANDU 3 design under the provisions of 10 CFR Part 52. In its letter of September 30, 1994, AECLT applied for design certification under 10 CFR Part 52 and submitted the safety analysis report for the CANDU 3 design. This brought to closure the previously planned preapplication review, identified in SECY-91-161, "Schedules for the Advanced Reactor Reviews and Regulatory

Guidance Revisions," that had been conducted since 1989.

A number of major policy and technical issues that were being considered by the staff during the pre-application phase remain under evaluation during the design certification process, including those involving reactivity feedback and control, reactor shutdown reliability, and online refueling. Another issue related to the CANDU 3 design philosophy for compliance with 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," is under consideration. Although not previously identified as a key issue, the staff believes that compliance with Appendix B is crucial to the design certification application and that early involvement in this issue is important. Noncompliance with Appendix B could have serious implications in the evaluation of the design certification application. The staff has completed the design certification acceptance review of the CANDU 3 design and notified AECLT of the results of that review on December 15, 1994.

PIUS. In October 1989, ABB/Combustion Engineering, U.S. representative for ABB Atom (Sweden), submitted the Process Inherent Ultimate Safety (PIUS) design. The design is a pressurized-water reactor which uses physical phenomena to accomplish reactor control and safety functions that are usually performed by mechanical means. The reactor module is submerged in a large pool of highly borated water, intended both for core cooling and for reactor shutdown. The module will be open at the bottom and at the high point of the hot leg of the reactor coolant loop. At these two openings, density locks will prevent mixing of the coolant and pool water under normal operating conditions. The density locks will not include a physical flow barrier, but the difference in density between the coolant and pool water will maintain a stationary interface. During certain transient conditions, the density difference would be overcome, and the pool water would flow into the core and shut down the reactor.

In May 1993, the Commission directed the staff to document its evaluation of the preapplication review of the PIUS design, and to end all other activities until a design certification application is submitted by ABB/Combustion Engineering. SECY-94-110, dated April 22, 1994, closed out the PIUS pre-application review.

MHTGR. DOE submitted the Modular High Temperature Gas-cooled Reactor (MHTGR) design to the NRC in 1986. The design is a helium-cooled, graphite-moderated thermal reactor with multi-coated fuel particles. One objective of the design is to meet the Protective Action Guidelines (PAGs) of the Environmental Protection Agency (EPA) at the exclusion area boundary during any accident, with reliance on active safety systems and operator actions. The proposed reduced need for a conventional LWR low-leakage containment is based on a high reliance on the individual fuel particles, which will be coated microspheres embedded in small organic cylindrical compacts placed in large graphite fuel blocks. The MHTGR fuel and core is similar to that used in Fort St. Vrain. The proposed plant would integrate four reactor modules, producing 350 MWt each, and two turbine generator sets to produce a total plant output of 560 MWe, a thermal efficiency of nearly 40 percent.

The NRC issued a draft PSER for the MHTGR, NUREG-1338, in March 1989. Since then, the NRC has conducted meetings with DOE and issued requests for more information (RAIs) on the design from DOE, and DOE responded to the RAIs and submitted three amendments to the Preliminary Safety Information Document for the MHTGR. The final PSER will be completed in fiscal year 1995.

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 safety feature of the design has been confirmed through analysis, testing, experience, or some combination thereof, and that sufficient data exist on the safety features 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 by 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 test program for the AP600 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). Two integral systems test (IST) programs have also been conducted. A low-pressure IST facility was constructed at Oregon State University to study the behavior and interactions of the safety and important non-safety systems at low pressures corresponding to the later stages of several accident sequences. A high-pressure, full-height IST facility was built at the Societa' 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 the operation of the gravity-driven cooling system have been run in the GIST facility at GE's San Jose site, and an integral systems test (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 at SIET in a new facility, PANTHERS, and a new integral test facility, PANDA, is under construction at the Paul Scherrer Institute (PSI) in Wuerenlingen, Switzerland. The staff has identified several other tests which must be included in the GE test program. In response to the staff's concerns, GE performed a reassessment of the SBWR testing and analysis program, the results of which were provided to the staff on August 10, 1994. The staff is currently evaluating GE's revised program.

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 passive ALWRs' safety systems. (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. PUMA, a reduced-height, low-pressure integral systems SBWR loop, is under construction 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 1994, the NRC continued upgrading its capabilities for managing and conducting environmental and site-licensing reviews, and for accessing and analyzing requisite geographical and land use information. The NRC continues to monitor the progress of the Department of Energy demonstration program, which is looking to identify an initial applicant for an early site permit.

Technical Specifications Improvements

In December 1993, the first license amendment to implement the improved standard technical specifications (STS) was issued for the Crystal River, Unit 3 plant in Florida, the lead plant for the Babcock & Wilcox design. In December 1994, the second license amendment to implement the improved STS was issued for the Clinton plant in Illinois. License amendment applications to implement the improved STS are under review for eleven other units, and will be completed over the next two years. About 38 percent of the commercial nuclear units are converting or plan to convert to the improved STS. Of the remaining units, about 9 percent are undecided and about 53 percent are not currently planning to adopt the improved STS. However, if the process required to complete a conversion to the improved STS can be demonstrated to be efficient, more licensees may decide to convert their technical specifications to the improved STS in the future.

In July 1994, the NRC proposed to amend regulations pertaining to the content of technical specifications for nuclear power reactors through a rule change to 10 CFR Part 50.36, Technical Specifications. The purpose of the rule was to codify the criteria for determining the content of technical specifications, as described in the Commission's final policy statement on technical specifications improvements, issued in July 1993. 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 and to relocate other requirements to appropriate licensee-controlled documents. Under this rule change, licensees may voluntarily use the criteria as a basis to propose the relocation of existing technical specifications that do not meet the criteria, from the facility license to licensee-controlled documents, such as the final safety analysis report. Voluntary licensee conversion of current technical specifications in this manner is expected to produce an improvement in the safety of nuclear power plants through more efficient use of NRC and industry resources.

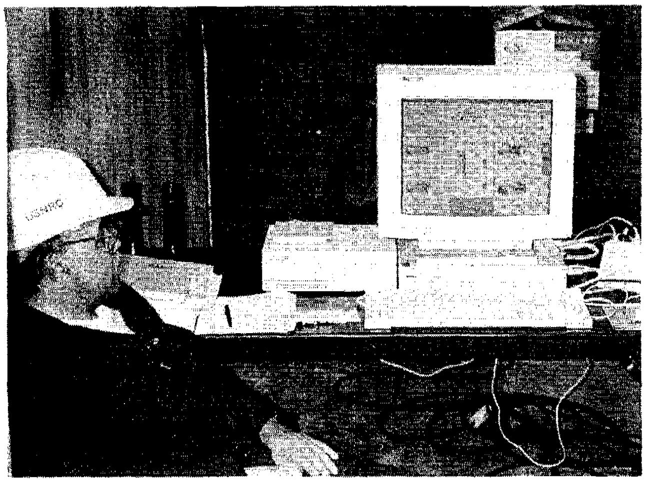
While the Commission places the highest priority on license amendment applications to convert to the improved STS, the NRC is also continuing to place a high priority on improvements to existing technical specifications through "line item" generic STS applications, and improvements to the license amendment practices to ensure more consistent and efficient handling of license amendment applications. Licensees may voluntarily request license amendments to selectively adopt the improvements to the STS as "line item" changes to their existing license. In October 1994, the Nuclear Energy Institute established a standing task force to coordinate industry initiatives for improvements to technical specifications and related license amendment practices. That task group has begun the development of guidance for the preparation of license amendments to convert to the improved STS.

Inspection Programs

NRR is responsible for developing, maintaining and assessing the effectiveness of the reactor inspection program, which encompasses 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, 1994), with added coverage of the seven facilities with construction permits. Responsibility for developing, maintaining, and assessing the effectiveness of the reactor inspection program is shared among the NRR staff.

In 1994, the NRC began development of a trial process to improve the periodic long term integration of objective information (e.g., inspection reports, licensee self-assessment, SALP, etc.) to arrive at conclusions regarding licensee performance and provide site specific recommendations for future inspection activities. This process—the Integrated Performance Assessment Process (IPAP)—was piloted at five plants. Following final development and Commission approval, the staff plans to begin implementation of IPAP in late 1995. IPAP will supplement existing processes that provide ongoing integration and will provide direct feedback on the effectiveness and implementation of the inspection program.

SAFT Ultrasonic System Scanner at Washington Nuclear 1.



Inspector watching the results of ultrasonic testing at Washington Nuclear 1

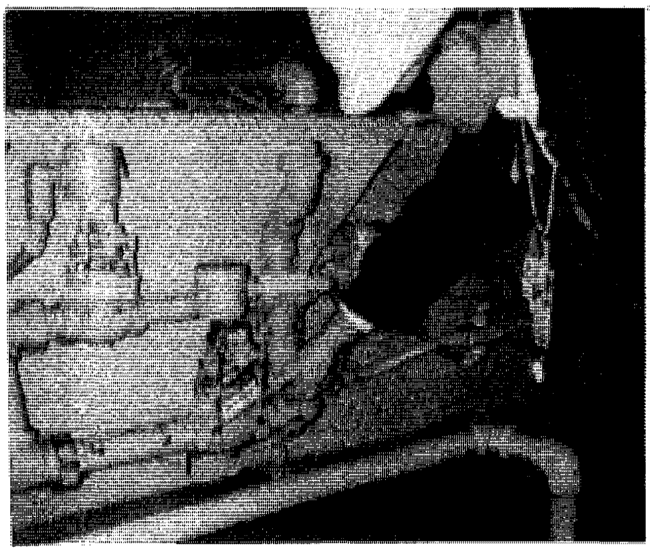
NRR continued to improve the operating reactor program throughout fiscal year 1994 on the basis of its field experience in implementing the current program. The objectives of the inspection program are (1) to ensure that an adequate level of inspection is conducted at every plant, (2) to integrate headquarters and regional inspection programs, (3) to provide more flexibility for Regional Administrators to allocate resources on the basis of plant performance, and (4) to explicitly allocate resources in response to safety issues and regulatory concerns. The inspection staff seeks to obtain sufficient information through direct observation and verification of licensee activity to ascertain whether the facility is being operated safely, whether the licensee's management-control program is effective, and whether regulatory requirements are being satisfied. The inspection staff also gathers information for SALP evaluations (see "Performance Evaluation," below). In the "initiatives" phase of the inspection program, Regional Offices may redirect certain of their inspection resources from plants exhibiting a high level of performance to those showing a lower level of performance.

A basic element in the NRC reactor regulation program is the inspection of licensed reactor facilities to assure reactor safety by confirming that the operations comply with the provisions of the license and to look for other conditions that have safety implications serious enough to warrant corrective action. 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. Regional Administrators report to the NRC Deputy Executive Director for Nuclear Reactor Regulation, Regional Operations and Research.

The NRC conducts a program of regular inspections for reactor, fuel cycle facility, and materials licensees. The NRC is also committed to dealing aggressively with unsafe or potentially unsafe events or conditions occurring at individual plant sites, or other facilities involving licensed operations, through "reactive" inspections. The NRC conducts reactive inspections to determine the root cause of such an event or condition; evaluates the licensee management's response to it, including action to prevent recurrence; and decides whether a similar problem could occur at other facilities.

Reactor Inspection Program

The operating reactor inspection program is implemented by headquarters and region-based inspectors. Headquarters inspectors conduct, or support the Regional Office in conducting, inspections under the Team Inspection Program. The Regional Offices conduct most of the required program inspections by both region-based and resident inspectors. Most region-based inspectors are specialists, and resident inspectors are generalists. The resident inspectors provide the major on-site NRC presence for direct observation and verification of licensee activity. This effort includes in-depth inspections of control room operations; inspections of 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 inspector is the primary on-site evaluator in the NRC inspection effort with respect to licensee event reports, events and incidents, and other general inspections of licensee activity. The resident inspector is also the NRC contact with local officials, the press and the public. 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.



NRC's Samuel Hansell, Jr., inspects emergency diesel generator solenoid valves at a nuclear power plant.

The inspection program allows headquarters and regional inspections to focus on those plant operations that contribute most to ensuring reactor safety and on the identification of safety problems. The NRC continued to improve the program in fiscal year 1994, based on knowledge gained from experience with the current program.

The inspection program comprises the following three elements:

(1) Core Inspections. The regular inspections conducted at every plant. They provide a balanced look at a cross-section of plant activities considered important to maintaining safety.

(2) Area-of-Emphasis Inspections. This program element consists of two parts:

  (a) *Generic Area Team Inspections* addressing a subject area in which an emerging safety concern was found, or in which increased attention is needed because of a history of longstanding or recurring problems. Inspections of this kind are scheduled for all sites. In fiscal year 1994, the NRC conducted generic area team inspections of service water systems. The staff will continue with these inspections during fiscal year 1995.

  (b) *Safety Issues Inspections* are one-time inspections to address a specific safety concern. The staff institutes these inspections by a temporary instruction (TI). A TI may be issued to ensure inspection follow-up of safety issues addressed in a bulletin or Generic Letter, or any other specific safety issue that calls for a one-time confirmatory inspection. During fiscal year 1994, the staff conducted five TIs for such issues as Mark I Hardened Vent Modifications, evaluation of Rosemount pressure transmitters, seismic adequacy of mechanical and electrical equipment, and evaluation of on-line maintenance.

(3) Initiative Inspections. Inspections instituted by the Regional Administrator to follow up on problems identified in licensee performance during other inspections and to address areas where the greatest safety benefit can be obtained. This category also includes those reactive inspections that are conducted unannounced, at the discretion of the Regional Administrator, in response to various plant events or conditions of concern.

The Regional Offices also implement the construction inspection program (CIP) to confirm that the requirements of construction permits for nuclear plants are being met, and that the plants are being built in accordance with their approved designs and applicable codes and standards. In 1994, the staff conducted construction inspection activities at Watts Bar Nuclear facility.

The staff is developing a new CIP to guide the conduct of inspections at construction sites for advanced reactors licensed under 10 CFR Part 52. The new program will be structured to ensure that inspections are systematically planned, performed and documented, and to ensure that the "Inspections, Tests, Analyses, and Acceptance Criteria" required by 10 CFR Part 52 are satisfied.

Special Team Inspections

During fiscal year 1994, NRC headquarters and regional staffs continued to perform special team inspections. A special team inspection usually involves a team of 4-to-10 individuals, with several engineering disciplines represented, and requires 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 systems selected. 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 develops the method for each new type of team inspection, tests it 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 lead a team inspection in some circumstances. Examples of headquarters-led special team inspections during 1994 were the Operational Safety Team Inspection at Cooper, the Station Blackout Inspection at Palo Verde, the Engineering Inspection at Millstone, the Configuration Management Inspection at WNP-2, and the Customized Inspection Planning Process assessment at Salem. Headquarters led an Operational Readiness Assessment Team (ORAT) inspection at the South Texas nuclear plant. 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 the following areas: 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.

New Initiatives. In 1991, the staff began preparing for two new types of team inspections in areas of concern to the NRC: Service Water System Operational Performance Inspection (SWSOPI) and Shutdown Risk and Outage Management (SROM) inspection. The staff conducted pilot inspections of both types 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 an "area-of-emphasis" inspection, at sites licensed before 1979 and at other sites having service water system problems, or more general maintenance, engineering or technical support problems. At the end of fiscal year 1994, 24 SWSOPIs had been completed, including the pilot inspections. The NRC has established an electronic data base of SWSOPI findings, similar to that noted above for EDSFI findings. In addition, IN 94-03 discusses deficiencies and weaknesses identified during the initial seven SWSOPIs. The staff has not planned additional SROM inspections.

The staff issued an inspection procedure, "Licensee Self-Assessments Related to Area-of-Emphasis Inspections" (IP 40501), to allow reduced NRC inspection at those facilities which demonstrate good performance over time. Under the 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 and significant areas not covered. The goal of this approach is to more effectively apportion NRC inspection resources and to reduce the impact on licensee operations of NRC inspection activities, e.g., licensees are required to respond to a smaller NRC team. At the end of the fiscal year, licensees had committed to perform 23 SWSOPI self-assessments. Fourteen self-assessments had been completed. NRC experience has been that reduced-scope SWSOPIs utilize about 50 percent of the direct inspection effort of a full-scope SWSOPI.

Vendor Inspection Program

The Vendor Inspection Program is centered in NRC Headquarters and 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. The program determines and assigns priorities to actions, in order to identify and resolve issues according to their safety significance and generic applicability.

Inspections during fiscal year 1994 addressed reports from industrial organizations and allegations from members of the public concerning potentially defective and sometimes misrepresented parts, components and materials. Licensees and vendors are required to report problems and defects in safety-related equipment, materials and services to the NRC by the provisions of 10 CFR Part 21 as appropriate. In fiscal year 1994, the Vendor Inspection Branch had the responsibility for screening, tracking and ensuring the closeout of the 10 CFR Part 21 notifications. The NRC determined the validity, extent and safety significance of each reported and alleged deficiency and assured that licensees were apprised of potential problems so that appropriate action could be taken to prevent the use of defective components in nuclear plant safety systems. Three hundred and sixty-nine 10 CFR Part 21 notifications were submitted to the NRC in fiscal year 1994, and three hundred and ten were evaluated and closed. The NRC vendor inspection staff also frequently corresponded with vendors and licensees, both written and orally, explaining the NRC's position on specific interpretations and applications of 10 CFR Part 21 and other Federal regulations.

In fiscal year 1994, the NRC vendor inspection staff conducted twenty-two vendor inspections. These inspections covered vendors who manufacture or supply relays, switchgear and distribution equipment, motor control centers, detectors, transmitters, chart recorders, switches, forgings and piping systems, valves, or provide commercial grade dedication or equipment qualification services. The vendor inspection staff also performed inspections to review the GE Nuclear Energy Advanced Boiling Water Reactor quality assurance program and the ABB-Combustion Engineering System 80+ quality assurance program, participated in several inspections at licensees, and provided technical support to the NRC Office of Investigations. The vendor inspection staff also assisted the NRC Office of Investigations and various U.S. Attorneys in criminal cases.

As a result of inspection findings and other information in the vendor program area, the NRC issued twenty-three information notices informing the nuclear industry of problems. These information notices dealt with inadequate vendor quality assurance programs; concerns involving circuit breakers including sub-component relays, close-latch springs, failure to latch closed, inadequate testing and misapplication, and misadjustments between circuit breakers and associated cubicles; capacitor failures; overload relay ambient compensation concerns; potential malfunctions of relays and contractors; valve yoke failures; reactor coolant pump bolt stress corrosion; potential failure of fire hose nozzles; Thermo-Lag derating concerns; power operated relief valves concerns; corrosion of gate valve disc holders; and problems with motor-operated gate valves.

The vendor inspection staff continued to supply information to and participate in the Federal Interagency Working Group on Problem Parts and Suppliers, an activity that NRC helped to sponsor and get under way in 1988 and 1989. An interagency data base for the interchange of information on counterfeit/misrepresented parts is under development.

The vendor inspection staff completed Inspection Procedure (IP) #38703, "Commercial Dedication," which was issued November 8, 1993. The procedure incorporated a more performance-based and results-oriented inspection approach to the dedication of commercial grade items and encompassed the significant feedback received from pilot inspections, licensee and industry meetings, and the NRC public workshop, held in April of 1993, where the NRC staff discussed the issue with nuclear industry representatives and solicited comments on the NRC's draft inspection guidance related to those activities.

INSPECTING THE NUCLEAR POWER PLANT

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

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

The NRC inspection program is designed, through selective examinations, to ensure that the licensee is meeting its responsibility. The NRC inspection program is audit-oriented to verify, through scrutiny of carefully selected samples, that relevant activities are being properly conducted and equipment properly maintained so as to ensure safe operations. The staff determines the items to sample, sample size, and the frequencies of inspection based on the importance of the activity or system to overall safety and on available resources. The inspection program is preventive in nature and is intended to anticipate and preclude significant events and problems by identifying underlying safety problems. The inspection process monitors the licensee's activity and gives feedback to licensee's management for appropriate corrective action. However, the NRC inspection program does not supplant the licensee's programs or attenuate its responsibilities. The inspection program 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 inspections conducted by special teams made up of personnel from both NRC Headquarters and Regional Offices.

Inspections are a vital part of the NRC's review of applications for licenses, and also of 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 program. Inspections cover quality assurance activity related to design, procurement, and planning for fabrication and construction of the facility.

During construction, samples taken across the spectrum of licensee activity are examined to confirm that the requirements of the construction permit issued by the NRC are being followed 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 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 (1) reviewing overall test procedures, (2) examining selected test procedures for technical adequacy, and (3) witnessing and assessing selected tests to verify that test objectives have been met and to confirm the consistency of planned and actual tests. Inspectors also review the qualifications of operating personnel and verify that operating procedures and quality assurance plans are properly developed and implemented.

About six 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 inspection emphasis is given to test procedures and results. The licensee's management system for startup testing is appraised, test procedures are analyzed, tests are witnessed, and licensee evaluations of test results are reviewed. Thereafter, the NRC continues its inspection program for the rest 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 described above 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 ensure verification of satisfactory completion by licensees of the inspections, tests, analyses and acceptance criteria (ITAAC) included in a combined license and required by 10 CFR Part 52.

The NRC verifies that the licensee is operating safely through selective inspections. An on-site 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 reactor plants. 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; "area-of-emphasis" inspections—special inspections to focus on a specific issue; and regional initiative inspections—those required to resolve safety issues brought to light by other inspections or from plant operational experience. The program is structured to ensure that the resources available for inspection are used efficiently and effectively, with particular attention accorded 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.

Performance Evaluation

The performance evaluation process is intended to enhance the NRC's ability to evaluate the effectiveness of licensee performance at nuclear power plants. It involves the integration of information from a variety of the NRC's continuing activities—such as the SALP program, enforcement actions, performance indicator tracking, trend analysis, event evaluation, operator examinations, and inspection findings. The process culminates in a semi-annual meeting of NRC senior managers for discussions and appraisals of operating plant performance. On that occasion, the NRC managers agree upon the plants of greatest concern to the agency and plan a coordinated course of action, including recommendations for special inspections and intensified management attention. The staff presents the results of each such meeting to the Commission and informs each identified licensee of NRC senior management's characterization of its overall performance.

Systematic Assessment of Licensee Performance

The SALP program is a principal and regular method for judging licensee performance. Under the 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, special results review, 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 and is providing needed resources 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 resources to, those areas that can most closely affect nuclear safety and that need improvement.

The SALP includes a review of the previous year's reported events, inspection findings, enforcement history, and licensing issues. 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 the conduct of a SALP assessment, which consists of performance evaluations in specific functional areas.

Human-Systems Interface

Human factors constitutes one of the crucial areas affected by proposed advanced reactor designs, mainly because the control rooms being proposed for those advanced designs differ significantly from more traditional control rooms in current operating plants. New control room designs incorporate compact workstations with computerized display and control functions, as well as some conventional hardwired controls. The staff developed a Human Factors Engineering (HFE) program review model and acceptance criteria for reviewing the advanced control room design process proposed by the applicants for certification of advanced reactor designs under 10 CFR Part 52. The model comprises ten elements, each of which contains general design acceptance criteria derived from accepted HFE practices. The model was published as NUREG-0711, "Human Factors Engineering Program Review Model," in July 1994.

During fiscal year 1994, the staff published final safety evaluations related to design certification reviews for the human-systems interface portion of the GE ABWR and the CE System 80+, and a draft safety evaluation for the human-systems interface portion of the Westinghouse AP600 advanced reactor design. The staff also continued the exchange process with foreign utilities, researchers, and regulatory organizations to share information about efforts to design and evaluate advanced control rooms.

The staff also continued to review human factors/performance issues at operating plants and increased its efforts to conduct follow-up investigations of events involving human performance issues. The staff participated in three Augmented Inspection Teams (AITs), one Operational Readiness Assessment Team (ORAT), one Configuration Management

Inspection, and 12 special inspections to help determine the root causes of events and to identify and analyze those conditions that contribute to human errors. Investigations are conducted using the Human Performance Investigation Process (HPIP) developed by the NRC specifically for considering issues related to human performance; the design of human-systems interfaces, plant procedures, training, and communications; and the effects of supervision, management and organization on human performance. Details on the HPIP process were published in NUREG/CR-5455, "Development of the NRC's Human Performance Investigation Process (HPIP)," in October 1993.

Training

The staff conducts inspections of licensee training programs whenever indications of problems in training at a particular nuclear power plant warrant staff evaluation. During fiscal year 1994, the staff inspected training programs at four sites. The staff also developed and implemented a systematic process for determining when declining human performance indicated that training inspections should be conducted. The staff also continued to evaluate implementation of the Institute of Nuclear Power Operations (INPO) training accreditation program, in order to ensure that the industry's voluntary efforts are maintaining effective training programs for nuclear power plant workers. NRC personnel observed the INPO managed National Nuclear Accrediting Board meetings during which utility training programs are evaluated for reaccreditation. NRC staff members also observed some INPO accreditation team site visits. The above efforts constitute the staff's training oversight program and provide the needed information to ensure training effectiveness at nuclear power plants.

The staff has 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.

Human Factors Information System

The staff developed the Human Factors Information System (HFIS) to help evaluate, track, trends and manage various types of information on human performance at nuclear power plants. This information is used to determine the need for, and focus of, inspections and other reviews, both plant specific and generic, related to human performance. HFIS comprises a data base of seven modules for storing and analyzing data on human performance. The Human Factors Status module contains plant-specific information on procedures, human-systems interface, event analysis, training, and staffing/management issues for each nuclear power plant. The Regulatory Programs module contains information on the compliance status of human factors regulatory programs for each licensee. The Licensee Event Report (LER) Data module contains human error information taken from individual plant LERs. The Emergency Operating Procedure (EOP) Data module contains information related to plant-specific EOP inspections including dates of inspections and inspector comments. The Training Data module contains information related to training program accreditation and training program inspections, including dates of inspections and program accreditation. The Inspection Report Module, added in fiscal year 1994, contains significant information on human performance taken from NRC inspection reports. The Human Performance Investigation Process (HPIP) module, also added in fiscal year 1994, contains plant-specific information on human performance taken from events investigated by the staff using the HPIP.

I&C System Upgrades

The age-related degradation of some earlier analog-to-digital-instrumentation and control (I&C) systems and the difficulties in obtaining qualified replacement components for those systems, as well as a desire for enhanced features such as automatic self-test and diagnostics, greater flexibility, and increased data availability, have prompted some operating reactor licensees to replace existing analog systems with digital systems. After reviewing a number of these digital system replacements and digital equipment failures in both nuclear and non-nuclear applications, the staff has identified potentially safety-significant concerns pertaining to digital systems in nuclear power plants. The concerns of the staff stem from the design characteristics specific to the digital electronics that could result in failure modes and system malfunctions that either were not considered during the initial plant design or that may not have been evaluated in sufficient detail in the safety analysis report. Among these concerns are potential common mode failures attributable to (1) the use of common software in redundant channels, (2) increased sensitivity to the effects of electromagnetic interference, (3) the improper use and control of equipment used to control and modify software and hardware configurations, (4) the effect that some digital designs have on diverse trip functions, (5) improper system integration, and (6) inappropriate commercial dedication of digital electronics. However, the staff believes that, when properly implemented, modern digital systems offer the potential for greater system reliability and such enhanced features as automatic self-test and diagnostics, as well as greater flexibility, increased data availability, and ease of modification.

On August 14, 1992, the staff issued a draft generic letter for public comment in the *Federal Register* wherein a position was established that essentially all safety-related digital replacements result in an unreviewed safety question as defined in 10 CFR Part 50.59 because of the possibility of the creation of a different type of malfunction from those evaluated previously in the safety analysis report; therefore, all safety-related digital modifications had to be approved by the NRC staff before they could be implemented. A number of licensees, as well as industry groups such as the Nuclear Energy Institute (NEI) formerly Nuclear Management and Resources Council (NUMARC) and the Electric Power Research Institute (EPRI), disagreed with this draft position based on their position that it is a licensee not NRC staff responsibility to make the unreviewed safety question determination. The staff reviewed these comments and withdrew the original generic letter. NEI and EPRI took the initiative in the development of guidance for making digital system modifications by writing a topical report to address the issue of which upgrades can be performed under 10 CFR Part 50.59 without prior NRC staff approval. The staff commented on this report while it was in draft form, and the resulting final report, NEI/EPRI Topical Report TR-102348, "Guideline on Licensing Digital Upgrades" dated December 1993 reflects a coordinated effort between industry and the staff.

Report TR-102348 contains guidance that will assist licensees in implementing and licensing digital upgrades in such a manner as to minimize the potential concerns indicated above. It describes actions to be taken in the design and implementation process to ensure that the digital upgrade licensing and safety issues are addressed, and ways to consider these issues when performing the 10 CFR Part 50.59 evaluation. The report does not predispose the outcome of the 10 CFR Part 50.59 process for identification of an unreviewed safety question, but rather provides a 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 staff reviewed the final report and determined that with certain clarifications it can be used as guidance by licensees in both properly designing analog-to-digital replacements and making proper unreviewed safety question determinations under 10 CFR Part 50.59. The staff issued a new draft generic letter for public comment in the *Federal Register* on October 18, 1994, endorsing the EPRI topical report with clarification. The staff will consider all comments in the final evaluation of the proposed generic letter and plans to issue the final generic letter in 1995. The staff believes this generic letter will provide an appropriate basis for use by licensees when implementing digital I&C system upgrades in accordance with the requirements of 10 CFR Part 50.59.

Maintenance

On July 10, 1991, the Commission published in the *Federal Register* (56 FR 31306) a new maintenance rule (the rule), 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." This rule 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 failures and events caused by the lack of effective maintenance. This rule takes effect on July 10, 1996. In June 1993, the NRC issued NRC Regulatory Guide 1.160 which endorsed NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," dated May 1993, as an acceptable method for implementing the maintenance rule.

During fiscal year 1994, the NRC staff prepared a draft version of an inspection procedure that will be used to verify licensees' implementation of 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The draft inspection procedure was the subject of a public workshop on March 31, 1994, and was revised to incorporate appropriate comments and suggestions received from the public and industry representatives at the workshop. The NRC will validate this inspection procedure during site visits to nine plants that have volunteered to have their implementation of the rule reviewed prior to the effective date of the rule, July 10, 1996. The first of these site visits was performed in September 1994, and the remaining eight site visits will be performed during October 1994 through March 1995. After all the site visits have been completed, the inspection procedure will be revised to incorporate lessons learned during these site visits. The results of these site visits will be summarized in a NUREG and will be discussed at a public workshop to be held in June 1995.

Strengthening the Agency's Allegation Program

The Staff Requirements Memorandum (SRM) for SECY-94-089, "Response to the Report of the Review Team for Reassessment of the NRC's Program for Protecting Allegers Against Retaliation," dated June 2, 1994, directed staff to implement recommendations of NUREG-1499, "Review Team for Reassessment of the NRC's Program for Protecting Allegers Against Retaliation."

The review team report proposed 47 recommendations to improve the environment for employees to raise concerns within the regulated community. In general, recommendations include strengthening the NRC allegation program (19 recommendations), modifying enforcement policy for more effective deterrents against violations (11 recommendations), issuing Commission policy statements to encourage licensing action (6 recommendations), setting priorities among and supporting investigations to minimize the impact of retaliation (6 recommendations), and increasing NRC investigations and involvement in the DOL process (5 recommendations).

The recommendations to strengthen the allegation program, as described below, are in various stages of implementation by the Office of Nuclear Reactor Regulation (NRR). Noteworthy actions include:

Protecting the identity of allegers and confidential sources where appropriate and possible, including informing allegers by letter of limitations on the NRC's protection of their identity.

Assisting allegers, including (1) informing harassment and intimidation (H&I) allegers about remedies through the Department of Labor (DOL); (2) providing allegers an industry brochure that provides the NRC's policies and procedures on handling allegations, including limitations on the NRC protection of alleger identity; (3) soliciting alleger feedback on the NRC's handling of their allegations; and (4) making toll free numbers available to allegers for making allegations.

Responding to credible reports of retaliation including responding to credible reports of reasonable fears of retaliation against an individual engaged in protected activities (even though H&I has not yet occurred). If credible, this involves responding to senior licensee management by letter or meeting, notifying licensees of potential enforcement action, monitoring licensee actions towards the alleger, and informing the alleger of DOL remedies.

Providing feedback to allegers on NRC actions. Criteria and time frames have been identified for NRC responses to allegers, e.g., acknowledging receipt and allegation specifics within 15 days; advising allegers within 30 days of the completion of NRC action; and informing allegers every six months of the status of their concerns.

Self assessment, training and interface of staff, including (1) establishing an Agency Allegation Advisor position; (2) conducting annual audits of the allegation program in regional and program offices by the allegation advisor; (3) placing emphasis on the periodic training of appropriate staff; (4) developing performance standards for allegation follow-up in the appraisals of appropriate staff and managers; and (5) conducting Office Allegation Coordinator counterpart meetings.

Tracking, trending and monitoring allegations from receipt to completion of agency action, including introducing new fields for tracking and trending of allegations, new software, and increased retrieval functions and data base capacity.

Most of the staff actions are being addressed in the revision of NRC Management Directive (MD) 8.8, "Management of Allegations," expected to be published in 1995.

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 non-power reactor facilities. The responsibility for administering the examinations at power reactors rests with the four NRC Regional Offices, while the Operator Licensing Branch at NRC Headquarters has responsibility for managing the program and administering the examinations at non-power 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. License applicants must pass the GFE before they can take the 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. The licensing examinations at non-power reactors are similar to those at power reactors, with two major exceptions: 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 fiscal year 1994, the NRC administered approximately 550 site-specific initial licensing examinations to RO and SRO applicants at power and nonpower reactor facilities and approximately 310 GFEs to prospective license applicants at power reactor facilities.

During fiscal year 1994, the NRC also evaluated the licensed operator requalification programs at 50 power reactor facilities to ensure the continued competency of individual licensed operators and to assess the quality of the facility licensees' programs. Seven of the programs were evaluated by conducting the requalification examinations in accordance with the procedures in NUREG–1021, "Operator Licensing Examiner Standards," and 43 programs were evaluated using a newly developed inspection process that is described below. The NRC also examined approximately 125 licensed operators for purposes of requalification; nine of those requalification examinations were administered at three non-power reactor facilities.

On August 14, 1991, the NRC amended 10 CFR Part 55 to make the facility licensee's fitness-for-duty requirements a condition of each operator's license. Through September 1994, the NRC received 36 reports of licensed individuals exceeding their facility licensee's cutoff levels for drugs or alcohol.

The NRC is continuing to monitor the performance of the utilities' certified and approved simulation facilities to ensure that they remain acceptable for the conduct of operating tests in accordance with 10 CFR Part 55. As of September 1994, the staff's observations during the conduct of NRC licensing examinations and requalification inspections and its evaluations of the facility licensees' quadrennial simulator performance test reports have not identified any deficiencies that would prevent the conduct of valid operating tests.

The NRC is continuing its efforts to improve the operator licensing program. The NRC staff has implemented or is considering a number of initiatives that will enhance the initial licensing and requalification examination processes. The following improvements were either accomplished during fiscal year 1994 or are in progress:

(1) In February 1994, the NRC published a *Federal Register* notice that eliminated the 10 CFR Part 55 requirement for each licensed operator to pass a comprehensive requalification written examination and an operating test conducted by the NRC during the term of the operator's six-year license. The NRC will now conduct requalification program inspections and only conduct requalification examinations where operator performance indicates the need for an NRC exam. Eliminating that requirement has enabled the NRC to more efficiently oversee the facility licensees' requalification programs by implementation of the traditional NRC inspection function which permits the staff to apportion its resources based upon the program's performance rather than the number of individuals licensed to operate the facility.

(2) In March 1994, the staff issued Inspection Procedure (IP) 71001, "Licensed Operator Requalification Program Evaluation," for use in assessing the effectiveness of licensed operator requalification programs at power reactor facilities. The IP incorporates the lessons learned while implementing Temporary Instruction (TI) 2515/117 (same title as IP 71001), which was developed to assess the viability of the new requalification inspection process. The NRC will use the IP to evaluate each licensed operator requalification program once-per-SALP (Systematic Assessment of Licensee Performance) cycle. The NRC conducts requalification examinations in accordance with the procedures in NUREG-1021 only when the staff has lost confidence in the facility licensee's ability to conduct its own examinations or when the staff believes that the inspection process will not provide the needed insight.

(3) In June 1994, the staff published a supplement to Revision 7 of NUREG-1021, "Operator Licensing Examiner Standards," which brings the requalification examination procedures into conformance with the February 1994 amendment to 10 CFR Part 55 and implements several minor enhancements and clarifications in the examination procedures.

(4) The staff continued to review and update the "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors" (NUREG-1122) and the "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors" (NUREG-1123) that were originally published in 1985 and 1986. The revised catalogs, which will incorporate evolutionary changes in licensed operators' tasks and the operator licensing program, are expected to be published early in 1995.

(5) Although a 1993 study of examination consistency concluded that the NRC's licensing examinations are sufficiently consistent to ensure that appropriate licensing decisions are being made, the staff is considering a number of improvements to mitigate the effect that individual differences among examiners might have on examination variability. The program improvements fall into four general areas: enhanced examiner training, increased inter-office rotations and communications, expanded regional oversight, and better examiner guidance, particularly with regard to the level of examination difficulty.

Emergency Preparedness

The staff continued to assess emergency preparedness (EP) at nuclear power facilities through on-site inspections of licensee EP programs and the annual exercises conducted at the more than 70 nuclear reactor sites throughout the United States. The staff also reviewed changes in licensee emergency plans and implementing procedures to determine compliance with current regulations. The overall quality of the EP programs at these facilities remained high during fiscal year 1994. Oversight of research and test reactors involved selected on-site inspections and staff review of changes to emergency plans submitted by licensees.

The staff continued to work closely with the Federal Emergency Management Agency (FEMA) to address issues related to off-site emergency preparedness. One area of cooperative effort involved the handling of deficiencies identified by FEMA in the performance of State and local organizations in full-participation EP exercises. In accordance with the new Memorandum of Understanding between FEMA and the NRC, FEMA Headquarters promptly notified the NRC of the occurrence of a deficiency in an exercise. The NRC then requested licensees to support off-site authorities in the resolution of the FEMA-identified deficiency. In fiscal year 1994, all deficiencies identified by FEMA in off-site exercise performance were corrected, or are scheduled to be corrected, with no need to take further regulatory action.

The staff also worked closely with FEMA in fiscal year 1994 in the continued development of emergency planning guidance for (1) applicants filing for early site permits under 10 CFR Part 52, and (2) licensees recommending protective actions to protect the public in the event of a severe reactor accident. A joint NRC/FEMA working group was also formed to develop guidance on inspections, tests, and acceptance and analyses criteria (ITAAC) for applicants and off-site organizations for emergency plans submitted in support of a combined operating license under 10 CFR Part 52.

NRC continued to rely on FEMA's assistance in addressing off-site emergency preparedness concerns at operating nuclear power plants. These concerns included allegations regarding various emergency planning issues at Pilgrim (Mass.), issues related to the relocation of a reception center at Seabrook (N.H.), and a petition, under 10 CFR Part 2.206, to take action against GPU Nuclear because of alleged deficiencies in the State and local emergency plans for the Three Mile Island plant. Regarding the petition, the staff determined, based upon information provided by FEMA, that enforcement action was not justified under the Commission's rules, and the petition was denied. FEMA and the NRC worked closely with the State of Pennsylvania and the licensee to resolve each of the issues identified in the petition.

The staff completed its review of the EP portions of the Advanced Boiling Water Reactor and Combustion Engineering System 80+ designs during fiscal year 1994. In response to a Commission Staff Requirements Memorandum, the staff is working closely with the Office of Nuclear Regulatory Research to develop recommendations on possible simplification of EP requirements for reactor designs with greater safety margins. A study has been funded to re-evaluate the technical bases for EP given in NUREG-0396 using the insights from NUREG-1150, the new source term information from NUREG-1465, and available plant design and probabilistic risk assessment information for passive and evolutionary reactor designs.

The staff continued to review industry implementation of the guidance in NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels." Sixteen proposed emergency classification schemes based upon the NUMARC/NESP-007 guidance were reviewed by the staff.

The staff supported emergency planning rulemaking activities during fiscal year 1994. In March 1994, a final rule was issued which simplified and clarified the requirements for exercise participation by State and local governments who have off-site planning responsibility for more than one nuclear plant. The final rule also changed the interval for State participation in an ingestion exposure pathway exercise from five years to six years and eliminated the requirement that all States within the plume exposure pathway emergency planning zone for a site fully participate in an exercise at that site at least once every seven years. Another significant rulemaking activity included the continued development of a proposed rule to change the frequency for the conduct of licensee emergency preparedness exercises from annual to biennial. The proposed rule is expected to be published in the *Federal Register* in the near future, following Commission approval.

The staff participated on two working groups involved in the development of industrial standards related to EP for nuclear power plants. One new standard, ANSI/ANS-3.8.5, "Criteria for Emergency Radiological Field Monitoring," was issued in 1994. Five existing standards were reviewed for reaffirmation. These were in the areas of licensee emergency response functions, characteristics of emergency response facilities, emergency plans and implementing procedures, maintenance of emergency response capability, and on-site medical facilities and care. There are four other standards under development.

Safety Reviews

Probabilistic Risk Assessment Implementation Plan

The 1979 nuclear accident at the Three Mile Island (TMI) nuclear power plant substantially changed the character of the analysis of severe accidents worldwide. Both major investigations of this accident (the Kemeny and Rogovin studies) recommended that the staff increase its use of probabilistic risk assessments (PRAs) to augment its traditional, non-probabilistic methods of analyzing nuclear plant safety. In NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," the NRC staff took advantage of the technological developments of the 1980s to assess the risk, including containment performance and consequence analyses, associated with five selected plants. The issuance of NUREG-1150 represented a significant turning point in the use of risk-based concepts in the regulatory process. Similarly, since the mid-1970s, the NRC has conducted a number of studies on risk associated with the fuel cycle, including, for example, transportation and high- and low-level waste management. PRA methods have been applied successfully in numerous regulatory activities, proving to be a valuable adjunct to deterministic engineering approaches.

In 1993, the NRC established three high-level review groups (the PRA Working Group, the Regulatory Review Group, and the Regulatory Analysis Steering Group) to assess the staff's use of PRA. In a November 2, 1993, memorandum to the Executive Director for Operations, the directors of the Offices of Nuclear Reactor Regulation (NRR), Nuclear Material Safety and Safeguards (NMSS), Analysis and Evaluation of Operational Data (AEOD), and Nuclear Regulatory Research (RES) collectively focused on the findings and recommendations of these three review groups regarding the status of PRA use and its role in the regulatory process. In the memorandum, the Office Directors concurred in the need to systematically expand the use of PRA within the agency.

In order to establish top-level guidance on the use of PRA in nuclear regulatory activities and aid in development of a detailed PRA Implementation Plan, the staff proposed a policy statement regarding the use of PRA in regulatory activities. On August 18 and August 19, 1994, the staff forwarded SECY-94-218, "Proposed Policy Statement on the Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities," and SECY-94-219, "Proposed Agency-Wide Implementation Plan for Probabilistic Risk Assessment," respectively, to the Commission. In those Commission papers, the staff proposed an overall policy on the use of PRA in nuclear regulatory activities and proposed a PRA Implementation Plan to ensure that the increased use of PRA methods and technology in nuclear regulatory activities would be implemented in a consistent and predictable manner that promotes regulatory stability and efficiency. The increased use of PRA methods and technology described in the plan is not intended to supplant the defense-in-depth based regulations, but to complement the existing deterministic methods used in regulatory activities. On August 30, 1994, the staff briefed the Commission on the PRA Policy Statement and Implementation Plan. Commissioners' comments were provided during the briefing and in a Staff Requirements Memorandum dated September 13, 1994. The proposed PRA Policy Statement was published in the *Federal Register* dated December 8, 1994, for public comment. On December 2, 1994, the staff conducted a public workshop to inform the public of NRC activities related to the implementation plan and to receive public comments. Over two hundred people from the nuclear industry, the NRC staff, and the general public attended the workshop, which proved to be an excellent forum for communication on this important subject.

Reactor Vessel Materials

Reactor pressure vessel (RPV) integrity is essential to assuring 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 Section 50.60(a) of Title 10 of the Code of Federal Regulations (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 reactor vessel materials that are subject to neutron irradiation. These requirements are set forth in Appendices G and H to 10 CFR Part 50. Appendix G requires that reactor vessels have a minimum USE value of 50 ft.-lb or that the licensee demonstrate, by performing an "equivalent margins" analysis, that safety margins against failure equivalent to those required by Appendix G of the ASME Code are maintained. 10 CFR Part 50.61 sets limits on the reference temperature for pressurized thermal shock, RT_{PTS}, which is related to increase in brittle-to-ductile transition temperature.

The NRC issued Generic Letter (GL) 92-01, Revision 1, on March 6, 1992, to obtain information needed to assess compliance with requirements and commitments regarding reactor vessel integrity in view of certain concerns raised in the NRC staff's review of reactor vessel integrity for the Yankee-Rowe (Mass.) nuclear power plant. The NRC staff has reviewed the responses to GL 92-01 and other docketed information. The NRC staff has prepared a NUREG report that documents the results of the staff's review of licensee responses to GL 92-01 and its evaluations of RT_{PTS} and USE values for all domestic commercial nuclear power plants.

With regard to pressurized thermal shock, the staff has concluded that the RPVs in all except two plants will be below the pressurized thermal shock (PTS) screening limits at the end of their current operating licenses. On the basis of the currently docketed information, Beaver Valley Unit 1 (Pa.) and Palisades (Mich.) are the only plants projected to potentially exceed the PTS screening limits before their licenses expire unless mitigative actions are taken. Beaver Valley Unit 1 and Palisades are projected to exceed the PTS screening limits in 2012 and 2004, respectively, before the end of their operating licenses in 2016 and 2007. The staff has concluded that all RPVs should have adequate upper-shelf toughness throughout their current licensed operating life. It is important to note that these results are based on the information currently reported by the licensees and are subject to change. The dates when the plants are projected to reach the screening criteria may change as a result of new fuel management programs, new surveillance data, and additional analyses.

It is expected that additional information and analyses and licensee programs to reduce neutron flux will result in changes in 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 data base (RVID). This data base, developed by the NRC, 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 data come from licensee responses to GL 92-01 and staff requests for more information, documents referenced in the GL 92-01 submittals, PTS submittals, and surveillance capsule reports. The data have been verified by the licensees. It is anticipated that the RVID will be made available for public access in early 1995. It will also be updated periodically on the basis of NRC assessments of new information from the industry and licensees.

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 design bases, verifying MOV switch settings initially and periodically, testing MOVs under design basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and trending MOV problems. The staff requested that licensees complete the GL 89-10 program within approximately three refueling outages or five years from the issuance of the generic letter. Since 1989, Supplements 1 through 5 to GL 89-10 were issued to provide supplemental information and clarify requirements.

On March 8, 1994, the staff issued Supplement 6, requesting that licensees submit justification for any extension of their schedules for completing MOV tests to verify design-basis capability as part of GL 89–10, and to clarify the staff position on grouping of MOVs to establish valve setup conditions. The staff also discussed the safety significance of the potential for pressure locking and thermal binding of gate valves and responded to questions posed at a public workshop on February 25, 1993. The staff is preparing a proposed supplement to GL 89–10 to discuss the need for licensees of pressurized-water reactor nuclear plants to address the inadvertent mispositioning of MOVs as part of their GL 89–10 programs. The staff is also preparing a proposed Generic Letter to address potential pressure locking and thermal binding of all safety-related power-operated gate valves (beyond motor-operated valves).

Several 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. Most licensees are currently scheduled to complete MOV design-basis capability verification under GL 89–10 by the end of 1995.

The staff continues to monitor the industry's efforts toward resolving the concerns about the performance of MOVs at nuclear plants. The staff is conducting inspections of the implementation of GL 89–10 programs at nuclear plants. The staff provides information to licensees on MOV issues through NRC-sponsored public meetings, participation at industry meetings, and issuance of NRC information notices. The staff is also working with industry organizations regarding methodologies to predict MOV performance and with the American Society of Mechanical Engineers (ASME) to revise ASME code requirements to include long term provisions for monitoring and maintaining the capability of MOVs to perform their design-basis safety functions.

Evaluation of Shutdown and Low-Power Risk Issues

As discussed in the 1991, 1992 and 1993 NRC Annual Reports, an evaluation of shutdown and low-power issues was initiated following the NRC staff investigation of the loss during shutdown of all vital a.c. power, on March 20, 1990, at the Vogtle (Ga.) nuclear power plant. The evaluation sought a broad assessment of risk during shutdown, refueling, and startup, addressing issues raised in regard to the Vogtle event and a number of other shutdown-related issues identified by foreign regulatory organizations, as well as by the NRC.

In February 1992, the staff issued a draft report entitled, "Shutdown and Low-Power Operations at Nuclear Power Plants in the United States," (NUREG–1449) for comment by the public. NUREG–1449 documents the staff's technical findings deriving from the evaluation of shutdown and low-power operations. The comment period on NUREG–1449 ended on April 30, 1992, and a large number of comments were received from utilities and industry organizations. The comments have been addressed in the final report (NUREG–1449) issued in September 1993.

The staff has conducted a formal regulatory analysis of potential requirements in the area of shutdown and low-power operations. The results of the draft regulatory analysis support the staff's preliminary findings, in NUREG–1449, that public health and safety have been adequately protected while plants have been in a shutdown condition, but that safety levels could be substantially improved and that such improvement is warranted. The staff has identified the following areas for potential improvements in shutdown operations: (1) outage planning and control, (2) fire protection, (3) technical specifications or technical specifications administrative controls, and (4) instrumentation.

The preliminary findings of the staff's draft regulatory analysis are documented in SECY–93–190, "Regulatory Approach to Shutdown and Low-Power Operations," dated July 1993.

The staff's proposed resolution of concerns regarding shutdown and low-power operations by rulemaking would require that licensees (1) provide reasonable assurance that uncontrolled changes in reactivity, reactor coolant inventory, and loss of subcooled state in the reactor coolant system when subcooled conditions are normally being maintained, will not occur when the plant is in either a shutdown or low power condition; (2) assure that containment integrity is maintained or can be re-established in a timely manner as needed to prevent releases in excess of the guidelines of 10 CFR Part 100 when the plant is in either a shutdown or low power condition; (3) establish controls in technical specifications limiting conditions for operation and surveillance requirements in accordance with the requirements of 10 CFR Parts 50.36(c)(2) and (3), or technical specifications administrative controls pursuant to 10 CFR Part 50.36(c)(5) for equipment which the licensee identifies as necessary to perform their safety function when the plant is in a shutdown or low power condition; (4) evaluate realistically the effect of fires stemming from activities conducted during cold shutdown or refueling conditions, determine whether such fires could realistically prevent accomplishment of the normal decay heat removal capability, and if so, either provide measures to prevent loss of normal decay heat removal or establish a contingency plan that will ensure an alternate decay heat removal capability exists; and (5) for licensees of PWRs only, provide instrumentation for monitoring water level in the reactor coolant system during mid-loop operation.

The rulemaking package consisting of a draft regulatory analysis, a *Federal Register* notice with a statement of considerations, and a regulatory guide was approved by the Commission on September 12, 1994. The proposed rulemaking package was published in the *Federal Register* (59 FR 53707–52714) on October 19, 1994, for public comment. The public comment period ends on February 3, 1995. After addressing all comments received by the public, the staff will develop a final rule for the consideration of the Commission.

The staff is in the process of revising the regulatory analysis to address the comments received from the Advisory Committee on Reactor Safeguards (ACRS), Committee to Review Generic Requirements (CRGR), Commission, Nuclear Energy Institute (NEI), and Combustion Engineering Owners Group (CEOG). The staff will also consider the insights gained from the recent NRC PRAs for shutdown and low-power operations at Surry (Va.) and Grand Gulf (Miss.), and industry improvement made in conducting outages.

Steam Generator Issues

Steam generator tube integrity continues to be a significant issue for the nuclear industry. Degradation of Inconel 600 steam generator tubing continues to result in the need for improved inspection technology, alternate tube repair criteria, and improved primary-to-secondary leak rate monitoring programs.

An increasing number of plants have reported the occurrence of circumferential cracking at the expansion-transition location. This type of cracking has been reported at several Combustion Engineering designed plants and at several Westinghouse plants to date. Depending on the plant, this cracking has either initiated from the inside diameter or outside diameter of the tube; however, in one instance, the cracking has been reported to be occurring from both the primary side (inside diameter) and secondary side (outside diameter) of the steam generator tubing. The staff has issued several information notices (Information Notices 90–49 and 92–80) stressing the importance of using appropriate probe types, such as pancake type coils, when inspecting locations which are potentially subject to circumferential cracking. More recently, the staff issued an information notice detailing the lessons learned at one plant with respect to the reliable detection of circumferential cracking when using the appropriate types of probes (Information Notice 94–88).

In addition to circumferential cracking at the expansion-transition locations, cracking of tubes which have had sleeves installed in them has also occurred. Tube sleeving is a process which is used as an alternative to tube plugging since tube plugging removes the tube from service whereas sleeving does not. In the sleeving process, the sleeve is positioned inside the steam generator tube so that it bridges the defect. The sleeve is then joined to the parent tube on both sides of the defect forming a joint between the tube and the sleeve. As a result of this process, the sleeve becomes the new primary coolant boundary thereby allowing the tube to be returned to service. Recently, degradation of the parent tubing has been observed at the sleeve joint. Specifically, degradation of the parent tube associated with Babcock & Wilcox (B&W) kinetically welded sleeves and Westinghouse hybrid expansion joint sleeves has been observed. The staff issued Information Notice 94-05 in January 1994, documenting the failure of a B&W kinetically welded sleeve at one plant. The cracking associated with the sleeve joints has primarily been circumferential in nature.

The staff is continuing its review of the Steam Generator Degradation Specific Management Program, which was proposed by the industry in August 1993, to address inspection methods and repair criteria for specific types of degradation. This program is described in the *1993 NRC Annual Report.*

In support of the flaw-specific tube repair criteria proposed by the industry for axially oriented outside diameter stress corrosion cracking (ODSCC) confined to within the thickness of the tube support plate, the staff issued a draft Generic Letter, "Voltage-Based Repair Criteria for the Repair of Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking," for public comment in August 1994. The methodology described in this draft generic letter is intended to ensure adequate structural and leakage integrity of the steam generator tubing throughout the operating cycle. Currently, seven nuclear power plants have implemented, on an interim basis pending finalization of the draft generic letter, voltage-based limits for ODSCC at the tube support plates. The staff is currently reviewing public comments received on this draft generic letter and expects to issue the final generic letter in early 1995.

To more broadly address steam generator tube integrity issues, an advanced notice for proposed rulemaking was issued in August 1994. The objective of the proposed rule would be to maintain steam generator tube integrity so that there is an extremely low probability of steam generator tube leakage which could result in core damage or exceeding allowable off-site doses while allowing a reasonable approach to steam generator surveillance and maintenance activities (i.e., degradation-specific management). Incorporation of an integrated approach such as this considers the overall factors of safety and risk, including systems and radiological assessments.

Primary Water Stress Corrosion Cracking

Primary water stress corrosion cracking (PWSCC) was identified to the Commission as an emerging issue in 1989 after leakage was reported from an Alloy 600 pressurizer heater sleeve penetration at Calvert Cliffs Unit 2 (Md.). Other leaks have been occurring since 1986 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.

At meetings in 1992 with the owners groups, the NRC staff discussed the significance of the CRDM leak at Bugey-3 for domestic plants. Evaluations of CRDM nozzles in U.S. reactor vessels showed that they are not inherently less susceptible than European CRDM nozzles to PWSCC. Subsequently, considering the generic implications of the cracking, the Nuclear Energy Institute (NEI), formerly the Nuclear Management and Resources Council (NUMARC), coordinated the efforts of the PWR owners groups. The owners groups submitted safety analyses for their vessels supplied by Westinghouse, Babcock and Wilcox, and Combustion Engineering. Upon reviewing them, the NRC concluded that the cracking was not safety significant. The basis for this conclusion was that the cracks, with perhaps one exception, 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 creviced area was predicted to occur very slowly, and so an event such as ejection of a CRDM would be unlikely. Reduction of radiation exposure of personnel performing inspections and repairs was also desirable. Field experience in foreign countries has showed that occupational radiation exposures could be greatly reduced in a well-planned examination program, which would include the use of remotely controlled or automatic equipment.

To address PWSCC of CRDMs at U.S. plants, the industry responded by developing a comprehensive inspection, repair, and mitigation program. The industry submitted flaw acceptance criteria which the NRC found acceptable for axial cracks, but not circumferential ones because field experience and finite element stress analyses results predict any cracking that might occur to be predominately axial. Circumferential cracking will be addressed on a plant specific basis.

In 1993 the industry developed remotely operated inservice inspection equipment and repair tools that reduced radiation exposure. Techniques and procedures developed by two vendors were successfully demonstrated in a blind Qualification Protocol developed and administered by EPRI NDE Center. Results of the qualification testing demonstrated that the vendors' inspection procedures and personnel would be highly likely to find any PWSCC in the CRDM nozzles.

In 1994 the first pilot inspections were performed. The licensee for Point Beach (Wis.), the first plant inspected, did not find any cracking. Subsequent inspections were performed at Oconee (S.C.) and Cook (Mich.). Minor axial cracks were found at these plants. Results were consistent with those from prior evaluations, and the NRC's view of the safety significance remains unchanged. However, the fact that cracking was found in two of three U.S. vessels indicates the problem is generic. PWSCC of CRDMs remains an open issue.

The NRC staff is continuing to interact with industry on this issue. Industry is continuing its proactive approach to this problem, developing an integrated 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 staff to potential problems developing in radiation safety, ranging from major repair problems involving highly radioactive components inside the facility to contamination from the cleanup of small leaks of liquid and gaseous materials. These initial reports are followed up by discussions with regional NRC representatives and eventual follow through on any health physics problems in subsequent reactive regional inspections. Further involvement of Headquarters staff in regional and licensee problems may come about as the result of the staff participation in routine environmental and radiological inspections, as well as participation in special regional team inspections of significant licensee problems.

During fiscal year 1994, 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 advanced reactors. This work continued for the Westinghouse AP600 and the General Electric (GE) Simplified Boiling Water Reactor (SBWR) and was essentially completed for the GE Advanced Boiling Water Reactor (ABWR) and the Asea Brown Boveri-Combustion Engineering (ABB–CE) System 80+. An initial acceptance technical review was completed for the CANDU reactor. Such support included detailed evaluations of occupational radiation protection design features, systems, equipment, and public dose controls and projections for normal operations. The licensing support activities for operating plants included reviews of spent fuel pool re–racking activities at both boiling water reactors (BWR) and pressurized water reactors (PWR) and main steam line radiation monitors at the BWRs. Additional PWR licensing support activities included reviews for applying the steam generator interim tube plugging criteria. Licensing action support during the period also included reviews of the radiation protection operating histories at several plants in support of requests for operating license extensions beyond 40 years.

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 on-site 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 the report period, an Information Notice was issued to warn licensees of a material problem with the mask for specific self-contained breathing apparatus used for firefighting and in other hazardous environments.

The staff continued to closely monitor the implementation of the major revision to 10 CFR Part 20. Besides providing technical support to the Office of Nuclear Regulatory Research (RES) on two regulatory guides, the staff published NUREG/CR-6204, "Questions and Answers Based on Revised 10 CFR Part 20," and NUREG/CR-5569, Rev.1, "Health Physics Positions Data Base." These NUREGs provided regional inspection guidance and answered the licensees' implementation questions on the revised rule. These two data bases will be available on the publicly accessible NRC Electronic Bulletin Board starting in early 1995.

To ensure consistent regional implementation and inspection of the revised rule, the staff developed a Temporary Instruction (TI) 2512/123, "Implementation of the Revised 10 CFR Part 20," effective for two years. This TI focuses the inspections on the major aspects of the new rule and provides specific inspection guidance for each area. Finally, the staff has reviewed and provided the Regions comments and approval on significant draft proposed enforcement actions as a result of inspector findings.

Environmental Radioactivity Near Nuclear Power Plants

All licensed U.S. nuclear power plants are required under Federal regulations 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, based on a measurement of plant effluents and the analytical modeling of the environmental exposure pathways. 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 weekly and monthly monitoring is required for each plant by its Radiological Effluent Technical Specifications (RETS) or by effluent control procedures in licensee-controlled documents which have the overall level of effluent management and control required by the Technical Specifications. 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 radio-iodine 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 at locations in each sector for each calendar quarter.

Results of all licensee measurements in their radiological environmental monitoring program 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 3 for listing).

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

NRR also sponsors, through the four Regional Offices, contracts with 27 States for them to carry out environmental monitoring. The purpose of the State contracts is to establish policies and procedures under which the States independently monitor the environs of the NRC licensed facilities. The States collect samples or make radioactivity measurements in the environs of licensed facilities. These measurements duplicate, as closely as possible, certain parts of the licensee's environmental monitoring efforts, but they are executed independently of the licensee. The results of State monitoring are used to confirm the results of licensee monitoring programs.

Occupational Exposure Data and Dose Reduction Studies

The NRC staff has been collating the annual occupational doses at light water reactors (LWRs) since 1969. 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 one of increasing annual dose averages. Annual plant dose averages peaked in the early 1980s. These high doses were primarily the result of NRC-mandated plant upgrades imposed on all LWRs shortly after the 1979 accident at Three Mile Island (Pa). Since 1983, the annual average doses for both PWRs and BWRs have been steadily declining.

The 1993 dose compilation includes data from 73 PWRs and 37 BWRs, for a total of 110 LWRs. Plants which have not been in commercial operation for a full year are not included in this compilation. One new PWR, Comanche Peak Unit 2 (Tex.), has been added to the plant dose compilation for 1993 and Trojan (Ore.), a PWR, has been dropped from the 1993 annual listing since Trojan has been permanently shut down. Other plants which are no longer included in the dose compilation are Dresden Unit 1 (Ill.), Fort St. Vrain (Colo.), Humboldt Bay (Cal.), Indian Point Unit 1 (N.Y.), LaCrosse (Wis.), Rancho Seco (Cal.), Three Mile Island Unit 1 (Pa.), and Yankee-Rowe (Mass.).

In 1993, the average dose-per-unit for all LWRs was 240 person-rem. This is 10 percent lower than the 1992 average of 266 person-rems and is the lowest LWR average dose since 1969 (when there were only seven operating LWRs).

In 1993, the average dose-per-unit for PWRs was 194 person-rems, down 11 percent from the average dose-per-unit of 219 person-rems in 1992. The activities which most frequently contributed to PWR doses in 1993 were steam generator-related work, refueling, in-service inspection, health physics surveys and inspections, valve maintenance and repair, and installation and removal of temporary scaffolding and shielding.

In 1993, the average dose-per-unit for BWRs was 330 person-rems. This is down 8 percent from the average dose-per-unit for BWRs of 360 person-rems in 1992. Major contributors to BWR doses in 1993 included valve maintenance and replacement, inservice inspections, health physics support, refueling activities, decontamination work, and installation and removal of temporary shielding.

The NRC has 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 the periodical *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 also is involved in the compilation, on a regular basis, of an ongoing annotated bibliography of selected readings in radiation protection and ALARA. Other BNL studies for the NRC include a study of the impact of reduced dose limits, and a study of hot particle production, mitigation, and dosimetry.

Implementation Status of TMI and Other Safety Measures

The NRC publishes a document annually giving the status of the implementation and verification of licensing actions related to major safety issues. The most current report includes the status, as of September 30, 1992, of implementation and verification of all safety-issue actions affecting multiple facilities: TMI (Three Mile Island) Action Plan Requirements, Unresolved Safety Issues (USI), Generic Safety Issues (GSI), and, for the first time, all other multi-plant actions. As noted in the report published in December 1992, more than 99 percent of the TMI Action Plan items have been implemented at the 109 licensed plants; approximately 88 percent of the USI items have been implemented; approximately 90 percent of the GSI items have been implemented; and approximately 84 percent of other multi-plant action items have been implemented.

Thermo-Lag Fire Barrier Systems

Following a fire at the Browns Ferry nuclear power plant (Al.) in 1975, a Special Review Group (SRG) was established to identify lessons learned and to make recommendations for corrective actions. The SRG concluded that improvements in fire protection programs were needed, and, in 1981, the Commission issued 10 CFR Part 50.48 and Appendix R to 10 CFR Part 50 to require the added protection. The regulations were to apply to nuclear power plants licensed to operate before January 1979; three sections in Appendix R were considered important enough, however, to be made applicable to all plants. These three sections deal with the protection of safe shutdown capability, emergency lighting, and the reactor coolant pump oil collection system. Section III G.1.a, "Fire Protection of Safe Shutdown Capability," specifically addresses requirements involving the protection of safe shutdown systems. It requires that one train of systems necessary to achieve and maintain hot shutdown conditions, from either the control room or emergency control stations, be free from fire damage. Licensees can satisfy this requirement by separating redundant safe shutdown trains located within the same fire area outside primary containment, achieving the separation by providing one of the following: (1) a horizontal distance of at least 20 feet, with no intervening combustibles plus installed fire detectors and an automatic suppression system; (2) a three-hour rated fire barrier; or (3) a 1-hour rated fire barrier, with fire detectors and automatic suppression.

In 1981, licensees began installing Thermo-Lag 330-1 fire barriers, manufactured by Thermal Science, Inc. (TSI), of St. Louis (Mo.), to satisfy the new fire protection requirements. TSI manufactures Thermo-Lag in thicknesses that are intended to provide either 1-hour or 3-hour fire endurance. When Thermo-Lag is heated by a fire, the solid material sublimes; the subliming gases are decomposed by the fire; and the virgin Thermo-Lag material is replaced by a char layer. The sublimation process and the insulating effects of the resulting char layer protect the equipment located within the confines of the fire barrier from the effects of the fire.

Thermo-Lag fire barriers are installed in about 70 operating plants to meet NRC requirements for the fire protection of the safe shutdown capability. Thermo-Lag is mainly used to separate redundant cable raceways, by surrounding one of the raceways within a Thermo-Lag enclosure. Some licensees have also used Thermo-Lag to construct walls, ceilings and vaults.

Between 1982 and 1991, the NRC received sporadic reports of problems associated with the use of Thermo-Lag. By June 1991, the NRC had information about problems at the River Bend (La.) nuclear power plant which substantiated previous questions regarding the adequacy of Thermo-Lag as an effective fire barrier. The NRC established a Special Review Team to review the issues and make recommendations for their resolution. A final report was issued in April 1992. The team concluded that (1) the fire resistance ratings and the ampacity derating factors for the Thermo-Lag 330-1 fire barrier system were indeterminate, (2) some licensees had not adequately evaluated fire endurance test results and ampacity derating factors (actual cable temperatures may exceed the expected temperatures, accelerating aging of the cable insulation) to confirm the validity of the tests and their applicability to their plants, (3) some licensees had not adequately reviewed installed fire barriers to assure conformance with NRC requirements, and (4) some licensees had used inadequate or incomplete installation procedures.

Subsequent fire tests conducted by the nuclear industry and the NRC demonstrated that certain Thermo-Lag fire barrier configurations did not provide the level of fire resistive protection needed to satisfy NRC requirements. In addition, some Thermo-Lag barriers used by some licensees, as in walls and ceilings, have not been qualified as fire barriers by test.

The staff incorporated these and other issues into an action plan to assure that the issues were tracked, evaluated, and resolved. There has been a high level of Congressional, media and intervenor interest in the matter. The NRC staff has responded to several petitions submitted pursuant to 10 CFR Part 2.206 requesting that all nuclear plants that use Thermo-Lag be shut down until the operability of Thermo-Lag barriers can be effectively demonstrated. The Commissioners testified before the Subcommittee on Oversight and Investigation of the Committee on Energy and Commerce, in the House of Representatives, in March 1993, on fire safety at nuclear power plants, particularly focusing on the Thermo-Lag issues. The staff has completed a reassessment of the NRC reactor fire protection program, and issues raised in its reviews are being addressed by the staff and tracked in a separate action plan. The staff is also evaluating fire barrier materials other than Thermo-Lag and has conducted small-scale tests at NIST. Besides the special review team report, the staff has issued a bulletin and a bulletin supplement, a generic letter about Thermo-Lag fire barriers, a generic letter supplement that clarified fire endurance test criteria, and seven information notices to the industry; reviewed various industry full-scale test programs; and conducted toxicity and combustibility tests.

The staff continues to work with individual licensees to review and monitor industry fire tests, ampacity derating tests, and other industry initiatives. Licensees are implementing compensatory measures, such as fire watches, where Thermo-Lag is installed until long term corrective actions can be implemented. These actions will be based, in part, on the results of a test program developed by NEI for the nuclear industry. The program includes construction and testing of baseline and upgraded Thermo-Lag fire barriers representative of in-plant configurations, and an application guide for licensees to apply the test results to specific in-plant configurations and to determine whether the installed fire barriers meet NRC fire protection requirements and guidelines. For in-plant configurations which fall outside of the industry test program, the licensees for these plants may need to implement alternative plans such as additional testing and analyses. When installed barriers do not meet the requirements, the licensees may choose to repair, upgrade, or replace the existing barriers, or to relocate equipment. More plant-specific analyses may also be required to resolve the ampacity derating problem. Regulatory action and coordination with the industry will continue until the technical and programmatic issues in the staff's action plan have been resolved.

In September 1994, the United States Attorney for the District of Maryland and the NRC Inspector General (IG) announced the indictment of TSI and its president. The indictment alleges that TSI and its president conspired with others to make false statements and conceal material facts within the jurisdiction of the NRC and to defraud the United States by impeding, impairing, obstructing, and defeating the NRC's administration of the Atomic Energy Act. The NRC technical staff supported and assisted the IG throughout its investigation. In April 1994, Industrial Testing Laboratory, St. Louis, Missouri, and its president, pleaded guilty in U.S. District Court in Maryland to five counts of aiding and abetting the making of false statements in connection with the case. The indictment does not alter the plant-specific compensatory measures that are in effect to ensure the public health and safety. The compensatory measures taken by the licensees who use Thermo-Lag fire barriers together with the other features of their fire protection programs will continue to protect the public health and safety until long term solutions are fully implemented.

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 regarding the differences in EQ requirements for older and newer plants; (2) concerns raised by some research tests which indicate that qualification of some electric cables may have been non-conservative; and (3) concerns that programmatic problems identified in the staff Fire Protection Reassessment Report might also exist in the NRC EQ Program. Background for the staff's concerns with EQ is covered in the *1993 NRC Annual Report*. The EQ Task Action Plan is intended to resolve these concerns and includes meetings with industry, a program review of EQ, data collection and analysis, a risk assessment, and research on aging and condition monitoring.

The staff has met several times with the Nuclear Energy Institute, the Nuclear Utility Group on Equipment Qualification, and licensees to discuss activities under the EQ Task Action Plan. As part of its activities to support the EQ Task Action Plan, the Office of Nuclear Regulatory Research held a public workshop in November 1993 and used the information received at the workshop to develop a Research Program Plan.

The program review of EQ involves a look back at the basis for the different requirements, as well as a review of the adequacy of the requirements and their implementation. The staff has conducted surveys, met with industry representatives, conducted an extensive document research effort, and documented its findings. The staff has issued internal reports on the following topics: license renewal background information, the Fire Protection Reassessment Report, the survey of NRC and industry EQ experts, and licensee implementation practices. The results of the program review will be used to focus further research.

Data collection and analysis activities are continuing. The staff reviewed operating experience to determine whether there are significant problems with EQ in the industry and to focus research on those problems. The staff completed four site visits to gather information on licensee EQ activities. The staff issued reports on equipment replacement experience and operating experience data. The staff is reviewing EQ test and research literature, the results of which will be used to evaluate the validity of existing qualification models and serve as the basis for an EQ data base. In addition, to gain an international perspective on EQ practices and requirements, the staff met with EQ experts in Sweden and the United Kingdom, and participated in a technical committee meeting at the International Atomic Energy Agency in the fall of 1994.

The Office of Nuclear Regulatory Research issued its EQ Research Program Plan in August 1994. This plan provides for a cable condition monitoring program, a cable testing program, and an EQ data base in support of the EQ Task Action Plan. Brookhaven National Laboratory is developing cable testing and cable acquisition programs and has found several sources of naturally aged cable for the program. The cable test plan includes testing of new, naturally aged, and artificially aged cables and evaluations of condition monitoring techniques that could give insights into methods for determining how equipment is actually aging and performing in plants. The plan includes testing of some cables under design-basis-event conditions.

Upon completion of the program review and data collection, the staff will determine what further research is necessary 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 for 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 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. On July 28, 1992, at the Barseback 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. In January and March of 1993, the ECCS strainers at Perry Unit 1 (Ohio) were clogged with particulates and fibrous material.

The NRC staff has issued information notices regarding the Barseback event (IN 92-71) and the Perry events (IN 93-34). The staff also 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, take prompt action to remove any such material, and take any immediate compensatory measures which may be required to assure the functional capability of the ECCS. The responses to NRC Bulletin 93-02 indicate that all licensees do not need, or have already performed, necessary corrective actions. The staff also initiated, in June 1993, a program to systematically evaluate the larger implications of the Barseback and Perry experience.

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, and to 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.

The staff has worked with the BWR owners group (BWROG) throughout 1994 to quantify the contributing factors to the phenomenon and to evaluate potential remedies. Possible solutions to this problem will be a combination of reducing the volume of fibrous and particulate material in containment, increased strainer areas, devices to remove material from the strainers, enhanced diagnostic aids, and procedures for accident management. The current schedule for resolving this issue calls for issuance of a final generic communication by the summer of 1995.

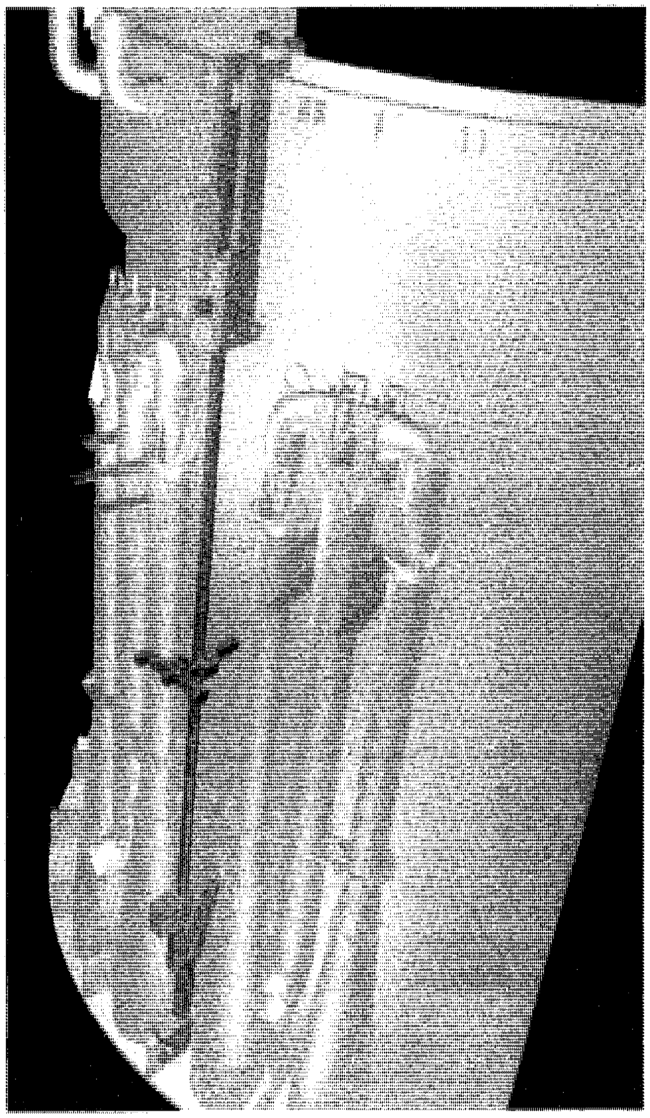
BWR Core Shroud

Cracking of BWR core shrouds has been the most significant of BWR internals cracking reported in 1993 and 1994. Many boiling water reactor (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 NRC Annual Report*. Also provided in that report was a summary of the significant circumferential cracking of the core shroud welds at the Brunswick Unit 1 (S.C.) plant which led to the issuance of Information Notice (IN) 93-79 in September 1993.

In January 1994, the staff identified BWR internals cracking as an emerging technical issue for the agency. Following the additional discovery of significant core shroud cracks at Dresden Unit 3 (Ill.) and Quad Cities Unit 1 (Ill.) in May/June 1994, the NRC issued IN 94-42, IN 94-42, Supplement 1 and Generic Letter (GL) 94-03. During this time-frame the BWR Owners Group formed the BWR Vessels and Internals Project (VIP) to facilitate the industry response to core shroud and internals cracking issues. GL 94-03 requested that BWR licensees inspect their core shrouds at the next refueling outage and perform a safety analysis supporting continued operation of their facilities until the inspections are conducted. Licensee responses to GL 94-03 were initially received during August/September 1994, with several BWR licensees entering outages beginning in September 1994. The review of the responses is ongoing.

Criteria have been established to determine the relative IGSCC susceptibility for all of the BWRs. The criteria include operational time, reactor water chemistry, carbon content of the stainless steel, fabrication methods and residual stresses. The plants have been grouped into three categories: C—highly susceptible; B—moderately susceptible; and A—low susceptibility. Through the fall 1994 outages, 13 of 22 category C plants have been either inspected or repaired. All of the BWRs will complete either inspections or repairs by spring of 1996. The most recent repairs which have been approved by the NRC involve the use of tie rods which are designed to structurally replace the shroud circumferential welds. Repairs of this type have been implemented at Hatch Unit 1 (Ga.) and Oyster Creek (N.J.) during the fall 1994 outages. Licensees have considered the implementation of the tie rod repairs on a preemptive basis since, in some cases, the cost of the detailed inspection required compares closely with the cost of the repair.

The staff has evaluated the basis for continued operation for four of the higher susceptibility plants that are planning to operate for several months prior to either performing a preemptive repair or inspecting their core shrouds. Based on a review of the information provided to date, the staff believes that these four plants can continue



BWR internals shroud showing GE design repair.

to operate safely until their next scheduled outages. The bases are: (1) there has been no 360°, through-wall core shroud cracking observed to date in any U.S. BWR that has performed a shroud inspection; (2) all analyses performed by the licensees for the higher susceptibility plants show that even if cracking did exist in their shrouds, ligaments would remain such that structural integrity would be assured; (3) none of these plants exhibited any of the symptoms (power to flow ratio mismatch) caused by leakage through a 360°, through-wall shroud crack; (4) there is a low probability of occurrence for either steam line or recirculation line breaks; and (5) there is only a short duration of operation until inspections are performed or repairs are implemented. Other factors include, for example, that some plants have recently replaced recirculation line piping, and have been operating with hydrogen water chemistry, substantially lowering the likelihood for a postulated pipe break accident and somewhat mitigating the potential for IGSCC in the core shroud.

The staff will complete the evaluation of the GL 94–03 responses by early 1995 and is continuing to review the examination results from plants which have completed inspections. Licensee inspection plans will be reviewed prior to the upcoming spring 1995 outages for adherence to the required scope of the examination based on the plant categorization. Core shroud repair proposals from licensees will be reviewed and approved individually. A NUREG report providing details of shroud inspection, analysis and repair experience will be issued in 1995. The staff is continuing to work with the BWROG and BWRVIP on a comprehensive action plan addressing cracking in all BWR internals.

Operational Safety Assessment

The NRC headquarters staff participates with the regional staff in the review and follow-up of events at operating nuclear reactor facilities, identifying items of generic significance and determining whether an ordered derating or shutdown of a plant is indicated. These reviews involve evaluating events against existing safety analyses, appraising plant and operator performance during events, reviewing licensee analyses, and deciding if there is any need for corrective action.

In fiscal year 1994, the NRC assigned augmented inspection teams, part of the formal program for the assessment of major incidents, to determine the facts regarding the following operating reactor events:

- Multiple fuel handling problems during refueling at Susquehanna Unit 1 (Pa.) in October 1993.
- Emergency diesel generator load sequencer failures at Beaver Valley Unit 2 (Pa.) in October 1993.
- Unexpected control rod motion at Fort Calhoun (Neb.) in November 1993.

- Fuel fabrication and core physics deficiencies at H.B. Robinson Unit 2 (S.C.) in November 1993.
- Turbine generator failure at Fermi Unit 2 (Ohio) in December 1993.
- Loss of off-site power at McGuire Unit 2 (N.C.) in December 1993.
- Stuck control rod at Braidwood Unit 2 (Ill.) in April 1994.
- Reactor trip with complications at Salem Unit 1 (N.J.) in April 1994.
- Medical misadministration at William W. Bacchus Hospital (Conn.) in June 1994.
- Safety limit in uranium recovery exceeded at Babcock & Wilcox Company (Va.) in June 1994.
- Reactor scram with complications at River Bend Unit 1 (La.) in September 1994.

When generic problems are identified in the course of staff reviews of reported events and problems, a number of actions may be taken by the NRC. If warranted, Information Notices are issued, notifying utilities of conditions or problems that could affect their plants. Utilities are expected to review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Bulletins and Generic Letters have a similar function but may request that specific actions be taken by utilities and require written confirmation when actions have been completed. In fiscal year 1994, the staff issued 113 Information Notices, including two revisions and 14 supplements; two Bulletins, including one supplement; ten Generic Letters, including two supplements; and 15 Administrative Letters. Of these generic communications, the Office of Nuclear Material Safety and Safeguards was involved in the preparation of 18 Information Notices and two Bulletins, some of which affected reactor licensees.

Cleanup at Three Mile Island

During 1994, the damaged reactor from the Three Mile Island Unit 2 (Pa.) nuclear power plant was placed in post-defueling monitored storage (PDMS), a passive, monitored state similar to the SAFSTOR decommissioning alternative. The licensee plans to maintain Unit 2 in PDMS until TMI, Unit 1, permanently ceases operation; then both units will be decommissioned simultaneously.

Loss of Spent Fuel Pool Cooling Function

The staff has continued its evaluation of a 10 CFR Part 21 report, which was filed on November 27, 1992, contending that the design of a certain reactor facility 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 loss of coolant accident (LOCA). The report provided a series of detailed technical and regulatory arguments to support the assertion. The *1993 NRC Annual Report* provides background regarding the postulated event sequence and early NRC review activities.

The staff completed an assessment of safety with regard to a loss of spent fuel pool cooling and determined that the concerns were of low safety significance for the reactor facility described in the 10 CFR Part 21 report. The assessment included an engineering evaluation of the capability to recover from or mitigate a loss of spent fuel pool cooling and a quantitative estimation of the frequency of a sustained loss of spent fuel pool cooling based on the findings of the engineering evaluation. The assessment is documented in a draft safety evaluation report, which was released for comment. Prior to issuing a final safety evaluation report, the staff will evaluate comments from the authors of the 10 CFR Part 21 report, the licensee for the reactor facility described in the 10 CFR Part 21 report, and the Advisory Committee for Reactor Safeguards. In addition to the final safety evaluation report, the staff will issue an Information Notice to inform the nuclear industry of the staff's conclusions.

The staff also developed and began implementing a plan to address on a generic basis the concerns identified in the 10 CFR Part 21 report and 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: (1) a search and analysis of information regarding spent fuel storage pool issues, (2) an assessment of spent fuel storage pool operation and design at selected reactor facilities, (3) an evaluation of the assessment findings for safety concerns, and (4) selection and execution of an appropriate course of action based on the safety significance of the findings.

The basic premise of the final rule is that, for age-related degradation unique to the period of extended operation, the regulatory process ensures that the licensing bases of all currently operating plants provide and maintain an acceptable level of safety. The final rule also states that each plant's current licensing basis must be maintained during the renewal term, in part through a program to manage age-related degradation for systems, structures, and components that are important to license renewal.

Since publishing the final rule, the staff has been conducting various activities for implementing the license renewal rule. These actions have included revision of the regulatory guide and Standard Review Plan (SRP), interaction with the lead plant licensees, and reviews of industry technical reports sponsored by the Nuclear Energy Institute (NEI). Over the past year, the NRC found a number of significant policy issues.

Antitrust Activities

As required by law since December 1970, the staff has conducted pre-licensing antitrust reviews of all construction permit and operating license applications for nuclear power plants and certain commercial nuclear facilities. (See "Procedures for Meeting NRC Antitrust Responsibilities," NUREG-970, May 1985.) Applications to amend construction permits or operating licenses resulting from a proposed transfer of ownership interest or operating responsibility in a nuclear facility are also subject to antitrust review. Over the past several years, the staff's antitrust activities have been concentrated 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 fiscal year 1994, the staff initiated or conducted the following activities associated with the NRC's antitrust review responsibility: (1) completed a review in conjunction with an ownership transfer between Seabrook (N.H.) owners; (2) initiated a review of a proposed merger involving a Palo Verde (Ariz.) owner; (3) completed a review pursuant to a change in ownership in the Davis Besse (Ohio) and Perry (Ohio) facilities resulting from a merger of two licensees; and (4) conducted competitive reviews of three corporate reorganizations.

In early fiscal year 1994, the staff completed its analysis of the request by North Atlantic Energy Service Corporation, acting for the joint owners of the Seabrook (N.Y.) nuclear power plant, to transfer Vermont Electric Generation and Transmission Cooperative, Inc.'s (VEG&T) ownership share in Seabrook to the North Atlantic Energy Corporation (NAEC). The staff determined that the previous antitrust reviews of NAEC and VEG&T, both Seabrook owners, adequately addressed any potential competitive concerns that may arise from the increase in NAEC's ownership share in Seabrook as a result of the transfer of VEG&T's ownership in Seabrook to NAEC.

Centerior Energy Corporation filed a request with the staff to merge Toledo Edison Company (TE) into Cleveland Electric Illuminating Company (CEI), both owners of the Perry and Davis Besse nuclear facilities, into a new corporation. Both TE and CEI underwent previous antitrust reviews by the staff at the construction permit and operating license stages of review and both were bound by extensive antitrust license conditions. The new owner-operator which resulted from the TE/CEI merger agreed to be bound by the existing antitrust license conditions and as a result, the staff determined that there would be no need to conduct an additional review of the proposed merger.

The staff received an amendment request early in the second quarter of fiscal year 1994 from Arizona Public Service Company, acting as agent for the owners of the Palo Verde (Ariz.) nuclear power plant, to approve the transfer of the ownership share held by El Paso Electric Company (EPE) in Palo Verde to the Central and South West Corporation (CSW). The transfer would occur as a result of a proposed merger between EPE and CSW. To date, the staff has reviewed extensive comments received from the public as well as testimony in a parallel merger proceeding at the Federal Energy Regulatory Commission. A decision on the competitive effects of the proposed merger is still pending.

Throughout fiscal year 1994, the staff conducted restructuring or reorganization reviews involving Pennsylvania Power & Light Company (Susquehanna), Commonwealth Edison Company (Braidwood, Byron and La Salle) and Illinois Power Company (Clinton). In each of these reviews, the staff determined that the change in ownership or control resulting from the restructuring or reorganization did not enable the new owner to exert undue market control over the relevant bulk power services market and consequently did not represent a significant change since the previous antitrust review of the facility in question.

Indemnity, Financial Protection, and Property Insurance

1994 Insurance Premium Refunds

The two private nuclear energy liability insurance pools—American Nuclear Insurers and the Mutual Atomic Energy Liability Underwriters—paid policyholders a 28th 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 1994 totaled $16,637,903, which is approximately 46.8 percent of all premiums paid on the nuclear liability insurance policies issued in 1984 and covers the period 1984-1994. The refunds represent about 74.5 percent of the premiums placed in reserve in 1984.

Property Insurance

The 12th annual property insurance reports submitted by power reactor licensees indicated that, of the 74 sites insured, 60 are covered for at least the $1.06 billion required in the revised property/accident recovery insurance rule, published on April 2, 1990. The remaining five sites have sought or have been granted exemptions from the full amount of required coverage, because of their small size or their operating status. Thirty one sites carry the maximum $2.75 billion currently available.

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, each application for a construction permit or an operating license for power reactors, 10 CFR Part 52 license applications, and applications for licenses to construct or operate certain test reactor facilities.

With respect to reactors that are already licensed to operate, the committee is also involved in the review and evaluation of any substantive licensing changes and corrective actions resulting from operating events and incidents and the resolution of generic safety issues associated with the operation of these plants.

Consistent with the statutory charter of the committee and the Federal Advisory Committee Act, ACRS reports, except for classified reports, 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 attendance at and participation in committee meetings. The ACRS membership necessary to conduct a balanced review is drawn from scientific and engineering disciplines and includes individuals experienced in conducting safety-related reviews of nuclear plant design, construction and operation.

During fiscal year 1994, the ACRS completed its annual report to Congress on the overall NRC Safety Research Program and other closely related matters. It also reported to the Commission on the following project related matters:

- SECY-93-289, "Issuance of the Draft Preapplication Safety Evaluation Report (PSER) for the Power Reactor Innovative Small Module (PRISM) Liquid-Metal Reactor."
- Computers in nuclear power plant operations.
- NRC confirmatory test program in support of the AP600 Design Certification.
- ACRS Review of the Advanced Boiling Water Reactor Final Safety Evaluation Report.
- Diversity in the method of measuring reactor pressure vessel water level in the Advanced and Simplified Boiling Water Reactor Designs.
- Individual Plant Examination Program.
- Electric Power Research Institute Advanced Light Water Reactor Utility.
- Requirements Document—Volume III Passive Plants.
- Use of the Design Acceptance Criteria process in the certification of the General Electric Nuclear Energy Advanced Boiling Water Reactor Design.
- Three issues relating to the 10 CFR Part 52 design certification process for Advanced Light Water Reactors.
- Safety aspects of the General Electric Nuclear Energy application for certification of the Advanced Boiling Water Reactor Design.
- Safety aspects of the ASEA Brown Boveri-Combustion Engineering application for certification of the System 80+ Standard Plant Design.
- Some areas for potential staff consideration for operating nuclear power plants and the review of future plant designs resulting from the ACRS review of the evolutionary light water reactors.

The committee also provided special topical reports to the NRC and others on a variety of issues, including:

- Draft final report of the PRA Working Group.
- Thermo-Lag fire barriers.
- Diversity.

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

- Proposed Final Amendments to 10 CFR Part 55 on renewal of licenses and requalification requirements for licensed operators.
- Proposed Rule and Draft Regulatory Guide to address resolution of Generic Issue 23, "Reactor Coolant Pump Seal Failure."
- Draft Commission Paper, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs."

- Trigger values.
- Draft Final Rulemaking Package dealing with emergency planning regulations.
- SECY-93-270, "Proposed Amendments to 10 CFR Part 73 to Protect Against Malevolent Use of Vehicles at Nuclear Power Plants."
- Draft Commission Paper on source-term related technical and licensing issues pertaining to evolutionary and passive light water reactor designs.
- Need for review of rationale for regulation.
- Draft Policy Statement on the use of probabilistic risk assessment methods in reactor regulatory activities.
- Proposed Rule for shutdown and low-power operations.
- Proposal for modifying the NRC rulemaking process.
- Emergency planning zones, protective action guidelines, and the new source terms.
- Proposed resolution of Generic Safety Issue 15, "Radiation Effects on Reactor Pressure Vessel Supports."
- Proposed National Academy of Sciences/ National Research Council study and workshop on digital instrumentation and control systems.
- Proposed Generic Letter 94-XX, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes."
- Proposed Generic Letter on the use of NUMARC/EPRI Report TR-102348, "Guideline on Licensing Digital Upgrades."
- Revised Regulatory Analysis Guidelines.
- Proposed revisions to Appendix J to 10 CFR Part 50, "Primary Reactor Containment Leakage Testing for Water-cooled Power Reactors."
- Proposed final version of NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants."

In performing the reviews and preparing the reports cited above, the ACRS holds subcommittee meetings as needed, and monthly full committee meetings required during the year.

Operational Information and Investigations and Enforcement Actions

Chapter 3

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

Since its formation in 1979, one of the primary missions of the U.S. Nuclear Regulatory Commission's (NRC's) AEOD has been to provide a strong, independent capability for the analysis of operational data. The office serves as the focal point for the independent assessment of operational events through the review, analysis, and evaluation of the safety performance of both reactor and nuclear material facilities. To accomplish this mission, AEOD (1) collects, analyzes, and disseminates operational data; (2) assesses trends in performance from these data; (3) evaluates operating experience to provide insights into, and to improve the understanding of, the risk-significance of events; (4) conducts reliability studies of risk-important systems; (5) analyzes human performance in operating events; and (6) produces periodic Performance Indicator, Abnormal Occurrence, and Accident Sequence Precursor Reports. Other elements that contribute to this mission are diagnostic evaluations conducted under the Diagnostic Evaluation Program and incident investigations conducted under the Incident Investigation Program. AEOD is also responsible for the NRC's Incident Response Program and the Technical Training Center. In addition, AEOD provides administrative and technical support for the Committee To Review Generic Requirements (CRGR).

The AEOD programs, taken as a whole, constitute the essential independent review and assessment of safety performance, which complements the regional and the Offices of Nuclear Reactor Regulation (NRR) and Nuclear Material Safety and Safeguards (NMSS) reviews of operating events, and provides a quality verification function through a system of checks and balances 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.

Analysis of Reactor Operational Experience

Data Sources

The AEOD staff analyze and evaluate operating experience and publish studies on a variety of subjects. To do this, the staff reviews a broad variety of operating data. These data include reports submitted by licensees to the NRC in compliance with 10 CFR 50.72 ("Immediate notification requirements for operating nuclear power reactors") and 10 CFR 50.73 ("Licensee event report system"), 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 experience includes 10 CFR Part 21 reports ("Reporting of Defects and Noncompliance"), NRC regional inspection reports, preliminary notifications (PNs) of events or unusual occurrences issued by the NRC, and allegations. AEOD also examines plant operating profiles and shutdown data found in licensees' Monthly Operating Reports to generate a context for event analysis.

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 these domestic data. The NRC continues to assess foreign operational experience for its applicability to nuclear power plants in the United States.

During fiscal year 1994, the AEOD staff and contractors reviewed about 70 reports on 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 fiscal year 1994 AEOD submitted 17 reports to the NEA/IRS (see Chapter 8, "International Cooperation").

Experience Feedback

Based on the review and analysis of these sources of operational data, several reports were written and broadly distributed both within the NRC and to the regulated industry. The reports are publicly available. Table 1 provides a list of 1994 reports.

Table 1. AEOD Reports Issued During FY 1994

Case and Special Studies

Designation	*Title*	*Issued*
S93–06	Potter & Brumfield Model MDR Rotary Relay Failures	12/93
S94–02	Turbine-Generator Overspeed Protection Systems at U.S. Light-Water Reactors	09/94

Engineering Evaluations

Designation	*Subject*	*Issued*
E93–03	Electrical Inverter Operating Experience 1985 to 1992	12/93

Technical Review Reports

Designation	*Subject*	*Issued*
T93–03	Loss of Annunciator and Computer System Events	12/93
T93–04	U.S. Nuclear Regulatory Commission Review of Operating Experience	12/93
T94–01	The Electrical Transient Which Followed the Los Angeles Earthquake—January 17, 1994	03/94
T94–02	Review of Mispositioned Equipment Events	05/94
T94–03	Computer-Based Digital System Failures	07/94

Potter & Brumfield Model MDR Rotary Relay Failures (Special Study AEOD/S93-06). This report described failure mechanisms in some of the 3,000 Potter & Brumfield model MDR series rotary relays installed in 35 nuclear power plant units, in both safety-related and non-safety-related applications. Many MDR relays were constructed of the same materials, making each subject to the same failure mechanisms. About one-third of the failures occurred in 10 events involving multiple relays. Five events involved simultaneous failures of redundant components. Failures were often not detected until relay operation was tested or demanded and some MDR relays failed after testing.

Root cause analysis revealed material and misapplication problems. Potter & Brumfield undertook a series of design and manufacturing modifications since 1985 to eliminate a number of these failure mechanisms. The study suggested that an increase in reliability and a reduction in challenges to safety-related systems could be effected by replacing safety-related MDR relays that were subject to the identified common-cause failure mechanisms.

Turbine-Generator Overspeed Protection Systems at U.S. Light-Water Reactors (Special Study AEOD/S94-02). On November 9, 1991, the Salem Unit 2 (DE) nuclear power plant experienced a destructive turbine overspeed. This was a direct result of simultaneous common-mode failures of three solenoid-operated valves in the turbine's overspeed protection system. Extensive reviews were conducted of the event, its causes, and the corrective actions taken at Salem and at other nuclear plants, and actions taken by major turbine manufacturers and by the NRC. In addition, a comprehensive review and evaluation of turbine-generator overspeed protection systems at U.S. light-water reactors was performed. Many precursors to the Salem overspeed event were found. However, before the Salem event, a destructive overspeed event was considered highly unlikely because of the diverse and redundant turbine overspeed protection systems.

The NRC's concern for turbine hazards has historically focused upon large, high-energy missiles that could damage safety equipment. This study established that the greater hazard of turbine overspeed and other turbine failures is mechanical damage that can result in discharges of flammable, explosive fluids, and collateral flooding, although U.S. events have not directly affected safety. In-depth examinations of common-mode equipment failures and deficiencies in operating, maintaining and testing turbine overspeed control systems were performed. The root causes of many turbine overspeed protection system malfunctions were common-mode hardware, testing and maintenance deficiencies. Turbine overspeed events are preventable. A companion study of consequences of all types of turbine failures is underway that will include the overspeed-initiated failures.

Electrical Inverter Operating Experience 1985-to-1992 (Engineering Evaluation AEOD/E93-03). Electrical inverter failures have caused engineered safety feature actuations, reactor trips, and turbine runbacks. Such failures were examined to determine the trend in failure data and the root causes. The total number of documented electrical inverter failures-per-year decreased during the 7-1/2 year period studied. This was due primarily to three factors: (1) better inverter cooling, (2) more preventive maintenance, and (3) more inverter replacements. Component failure was the dominant root cause, followed by human error.

Comparison of maintenance recommendations from vendors and failure data showed that further improvements in inverter performance can be achieved by following manufacturer maintenance recommendations.

Loss of Annunciator and Computer System Events (Technical Review AEOD/T93-03). Industry experience with losses of annunciators and computer system failures was assessed. These problems raised two issues: (1) the adequacy of the remaining instrumentation to provide information by which to assess the status of plant systems, and (2) the impact of losing information that may be required to assess the level of the emergency. On the first issue, several Augmented Inspection Teams (AITs) concluded that the loss of annunciators was not safety significant. Analyses using probabilistic risk assessment (PRA) techniques determined that the loss of annunciators did not pose a serious risk to plant safety. Operating experience showed that annunciator systems are reliable, and that the likelihood of an accident or transient coincident with the loss of annunciators is very small. On the second issue, it was concluded that sufficient guidance has been given to the licensees for the development of the emergency action level procedures.

NRC Review of Operating Experience (Technical Review T93-04). This technical review report was written in response to a request by the International Atomic Energy Agency (IAEA) for a summary of practices in the operational safety feedback domain in the United States. The report provides an overview of how the NRC reviews operating experience, and how it transmits its findings to the nuclear community. The paper addresses the dissemination, review, analysis and feedback of operating data obtained from licensees, vendors, and NRC inspectors, as well as experience at foreign facilities.

The Electrical Transient Which Followed the Los Angeles Earthquake—January 17, 1994 (Technical Review T94-01). The January 17, 1994, earthquake which struck southern California affected off-site power to nuclear plants in California, Arizona, and Washington. This report describes how the grid protective scheme separated the western States into north and south islands. About 45 transmission lines were reported to have tripped, 40 generating units tripped or ran back, and loads were lost throughout the western United States and Canada. The Diablo Canyon (Cal.) plant and Washington Nuclear Unit 2 were in the north island. Operating nuclear plants in the south island were San Onofre (Cal.) and Palo Verde (Ariz.).

The report concludes that the performance of the Western Systems Coordinating Council grid was within the emergency operating criteria and that the estimated frequency for a loss of power caused by grid frequency swings as a result of an earthquake is comparable to that of a loss caused by severe weather, such as a hurricane. As of the date of the report (March 16, 1994), off-site power to a nuclear plant had not been lost because of grid frequency swings, although the potential for such an event existed..

Review of Mispositioned Equipment Events (Technical Review AEOD/T94-02). The AEOD staff examined over 190 mispositioned equipment events for the period 1990-to1993. Most of the events concerned mispositioned valves, and about 15 percent of them involved multiple components. The personnel errors associated with these situations varied widely from improvisation in the absence of adequate procedures to apparent false sign-off on check lists. About one-third of the events were identified as violations, and fines from $25,000 to $150,000 were levied.

Regulatory Guide 1.47 addresses automatic status indication for safety systems, and Three Mile Island (TMI) Action Plan Item I.C.6 addresses independent verification of alignment when returning a system from maintenance or testing. A rough analysis of the human error probabilities and the potential system unavailabilities associated with the data indicates that the safety impact is below what was previously estimated in probabilistic risk assessments.

Computer-Based Digital System Failures (Technical Review AEOD/T94-03). Licensees are replacing analog instrumentation and control systems with digital systems, as the analog systems become obsolete. This study focused on the current operating experience of these systems in the U.S. nuclear industry as reported to the NRC. Licensee event reports were searched for digital system failures between 1990 and 1993. In addition, safety evaluation reports for a General Electric plant and a Westinghouse plant were reviewed for analog-to-digital upgrades.

This report presents computer-based digital system failures and staff evaluations of the NRC's review of analog-to-digital conversions. The study produced two major findings. First, electromagnetic interference, human-machine interface problems, and software errors caused a significant fraction of the digital system failures during the period. Few failures were caused by random component failures. Second, NRC reviews adequately address the issues revealed by operating experience.

Analysis of Nuclear Materials Experience

One of the activities of AEOD is the review and evaluation of the operating 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 death.

As part of operational experience feedback, the AEOD staff prepared a videotape entitled "Take Control: Safety Procedures for Industrial Radiography," which was distributed in April 1994. The video demonstrates "lessons learned" through re-enactment of radiography overexposures reported to the NRC.

The AEOD Annual Report (NUREG-1272, Vol. 8, No. 2) includes a review of 1993 nuclear materials events reported by NRC licensees and Agreement States.

Nuclear Materials Events Data Base

From 1981 through 1992, nuclear material event data were coded and maintained in two data bases, one containing records of medical misadministration events and the other containing records of other reported nuclear material events. In 1993, AEOD developed a new data base called the Nuclear Material Events Data Base (NMED). In developing the data base structure, AEOD solicited and received substantial input from the NRC Headquarters Offices of Nuclear Material Safety and Safeguards (NMSS) and Nuclear Regulatory Research (RES), the regional offices, and the Agreement States.

The NMED contains about 11,000 detailed records of reported events, including voluntary reports, as well as reference information for identifying associated reports, such as inspection reports. (Agreement State data are available only from 1991 on.) The NMED contains records of material events for all categories of material licensees, including non-power reactors. Radiation overexposures for commercial power reactors are also maintained in the NMED. The NMED is expected to be operational and accessible to NRC program offices and Agreement States by the end of calendar year 1995.

In 1993, 714 events involving materials licensees and non-power reactors were reported to the NRC—416 by NRC licensees and 298 by Agreement States.

Medical Misadministrations

The NRC regulates approximately 2,000 licensees in 21 States, the District of Columbia, and the U.S. territories that use radioisotopes in radiation therapy and nuclear medicine applications. These facilities submitted reports of 28 misadministrations that occurred in 1993. The 29 Agreement States regulate about 5,000 medical institutions, which include hospitals, clinics, and physicians in private practice. Agreement States submitted 19 reports of misadministrations that occurred in 1993. Of these 47 events, 34 involved therapeutic misadministrations and 13 involved sodium iodide misadministrations.

The primary factors contributing to therapeutic misadministrations in 1993 included patient intervention resulting in dislodgement of sources, errors in computer treatment planning, equipment malfunctions, and errors in calculating the prescribed dose. Sodium iodide misadministrations in 1993 most often resulted in overdoses rather than underdoses. The primary causes of the misadministrations were failure to (1) verify the type of administered radiopharmaceutical, (2) verify the administered dosage, (3) calibrate the prescribed dosage, (4) verify patient identification, and (5) follow physician's orders. To prevent recurrence, the NRC and Agreement State licensees took similar corrective actions, including implementation of procedures to ensure correct identification of the patient, verification of the dose calculation, verification of the treatment planning program, verification of the prescribed dose/dosage and procedure, and verification of the prescribed treatment site.

Radiation Overexposures

For 1993, NRC licensees reported 11 events that resulted in overexposures to 15 people, and Agreement State licensees reported 22 events that resulted in overexposures to 24 people. Eighty-five percent (33/39) of the overexposures involved whole body exposures, whereas about 15 percent (6/39) involved extremity exposures. The overexposure events reported by NRC licensees were about evenly distributed among medical/academic, research/commercial, and industrial radiography licensees. On the other hand, over 86 percent of the overexposures reported by Agreement States involved industrial radiography.

The primary causes of the medical/academic and research/commercial overexposures were failure to adequately monitor quarterly exposures and failure to wear adequate protective clothing. In most of the events involving industrial radiography for which a cause was provided, the overexposure was attributed to either a personnel error or an equipment problem.

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 facility events, and test, research and training reactor events. For 1993, there were a total of 377 such events reported by NRC licensees and 257 reported by Agreement States. While there were no reported overexposures or significant contaminations as a result of these reported events, several of them had the potential to affect the public health and safety and three of them met the criteria for abnormal occurrence reporting to the Congress.

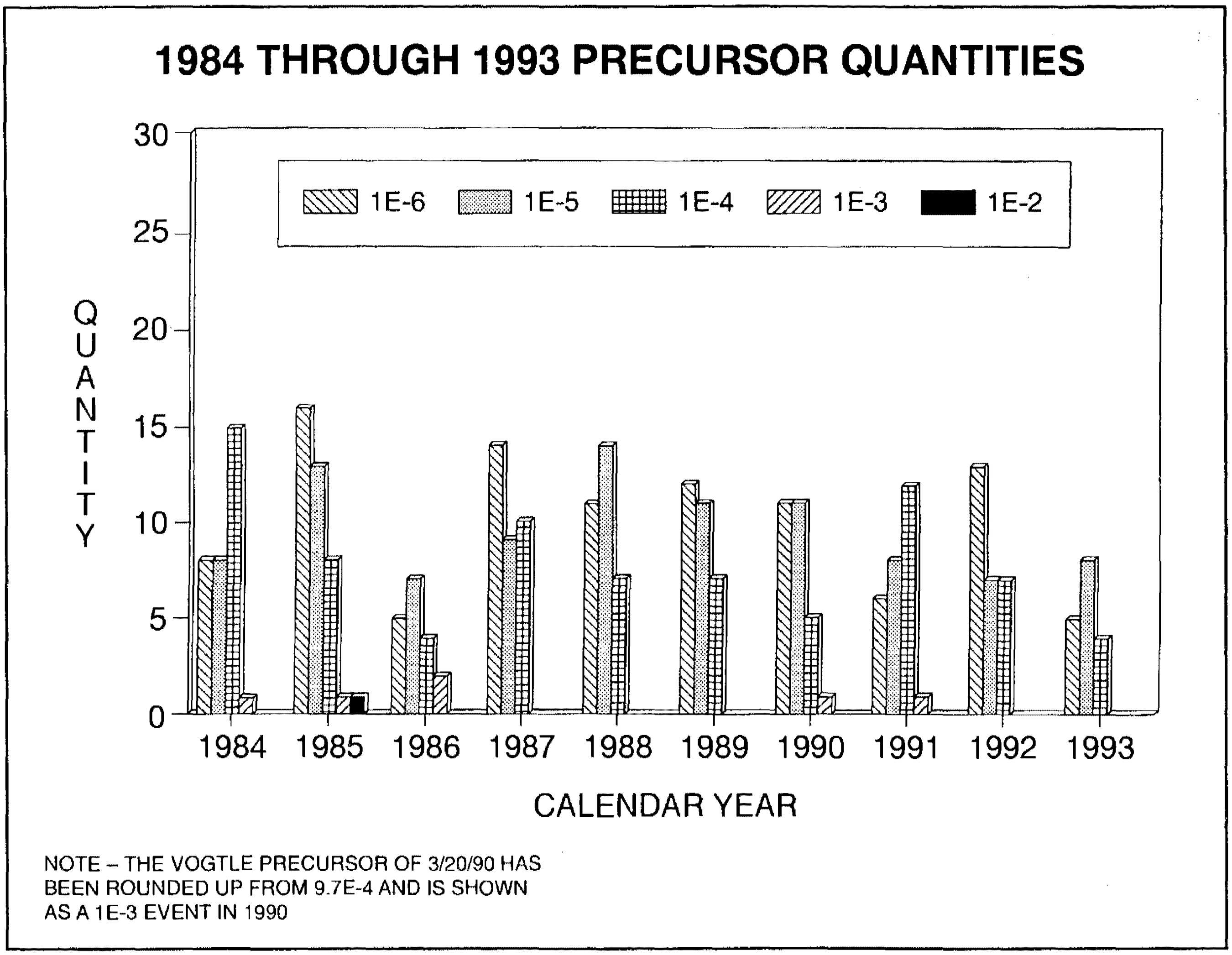
Risk and Reliability Analysis

Accident Sequence Precursor Program

The Accident Sequence Precursor (ASP) Program, conducted by the Nuclear Operations Analysis Center of the Oak Ridge National Laboratory, quantitatively evaluates operational experience. It serves as one of several tools to ensure that important operating lessons are not overlooked. ASP is a formal program in which nuclear power plant events or conditions and the reliability of standby safety equipment are analyzed using probabilistic risk assessment (PRA) techniques to evaluate the conditional core damage probabilities associated with the events. Results of the ASP Program are peer-reviewed by outside consultants, other NRC offices, and the affected licensees. They are used in NRC initiatives such as the Senior Management Meeting process. The purpose of the program is to provide a structured and systematic means of quantitatively evaluating the safety significance of nuclear plant operating experience. The principal objectives of the program are to identify and rank the risk significance of operating reactor events, to evaluate their generic implications, and to document and disseminate the evaluations for feedback to plant operators.

An ASP is an operational event or plant condition that is an important element of a postulated core-damaging accident sequence. Accident sequences considered in the ASP Program are those associated with inadequate core cooling, which would be expected to result in core damage. Precursors can be infrequent initiating events or equipment failures that, when coupled with one or more postulated events, could result in a plant condition involving inadequate core cooling. The ASP method couples and evaluates seemingly disparate elements of operational experience with random failures assumed for other parts of the models being evaluated. These evaluations account for all actual or potential concurrent failures, degradations or outages of safety systems. The evaluations also include estimates of the likelihood of equipment failures and human errors, and of the probability of recovery should problems occur. Events with conditional core damage probabilities (CCDPs) greater than 10^{-6} are considered accident sequence precursors.

The ASP Program began in 1979. Since then over 400 precursor events from reported experience for the years 1969 through 1992, excepting 1982 and 1983, have been evaluated and documented. Over the years, the ASP Program has evolved to the point where the methodology and results are now used routinely by the NRC. The methodology continues to be improved to better account for plant design and operational differences, human reliability, and changes in equipment, and to provide user-friendly analytical tools. Other planned improvements include incorporation of modeling and data uncertainty in each event analysis, a more complete set of accident sequences, and better containment response and consequence evaluation. An analysis of the uncertainty in the trends that may be inferred from ASP results is also in progress.



Under the ASP Program, licensee event reports (LERs) of plant problems, equipment failures, or other operational incidents are reviewed. Operational occurrences that involve portions of postulated core damage sequences are identified. Plant equipment and human responses that could affect the course of an accident are evaluated, including failures that have actually occurred and also the probabilities for failures that could occur.

The results of the ASP analyses are useful indicators 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 furnish a unique data base of historical system failures, multiple losses of redundancy, and infrequent core damage initiators. Several of the recorded precursor events have involved equipment failure caused by factors, conditions or phenomena that affected the ability of safety equipment to perform its function. These mechanistic failures are essentially different from "random" failures or unavailabilities of equipment.

The operation of commercial nuclear power reactors in the United States now represents a combined total of over 1,800 years of experience. The ASP Program uses information gained from this experience to provide an ongoing assessment of nuclear plant operation. This assessment helps to identify how well plant designs and capabilities can cope with actual operational events.

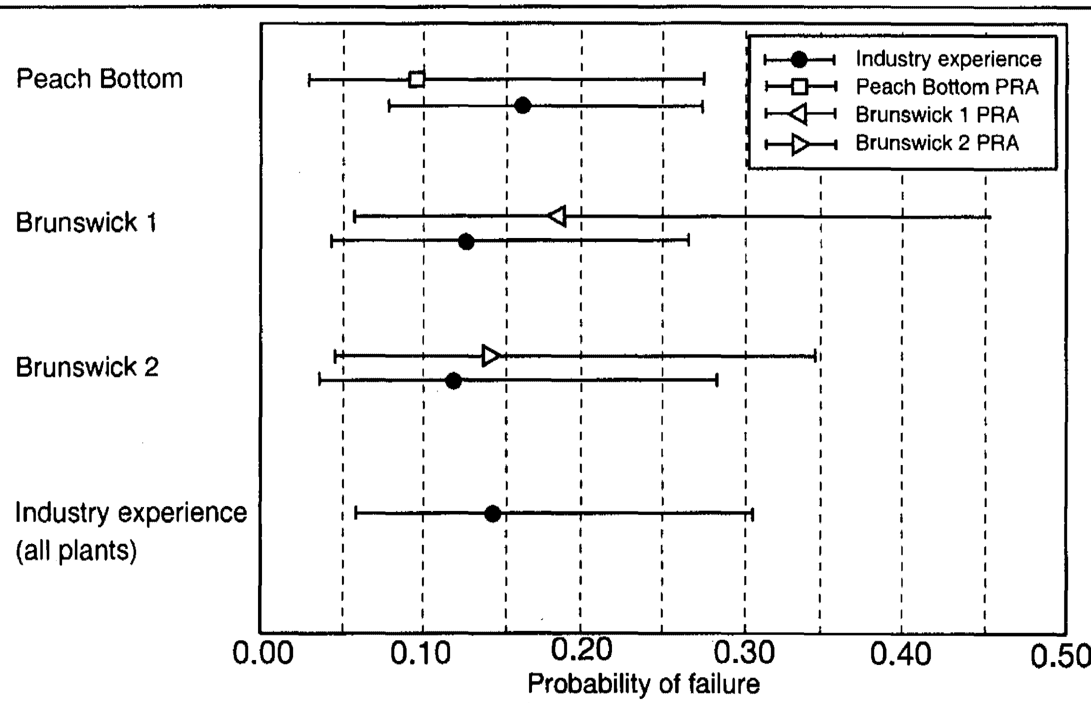
Results of the analysis of 1993 ASP events are given in Table 2. There were 15 precursors affecting 16 different units. Details of the analyses of these events may be found in "Precursors to Potential Core Damage Accidents"

(NUREG/CR-4674), Volumes 19 and 20, published in September 1994. Previous issues of NUREG/CR-4674, Volumes 1 through 18, give additional information and detailed analyses of the accident sequence precursors identified through 1992.

System Reliability Studies

AEOD has begun a program to use risk insights from past probabilistic risk assessments (PRAs), NUREG-1150 studies, Individual Plant Examinations, and other relevant sources to determine which systems and components should be trended. For those identified as risk-important, reliability analyses of system performance are being performed through a disciplined, systematic process for analyzing operating experience data. The pressurized-water reactor (PWR) systems reviewed included auxiliary feedwater, high-pressure safety injection, low-pressure safety injection, and primary pressure relief. The BWR systems reviewed included high-pressure coolant injection (HPCI), high-pressure core spray, isolation condenser, reactor core isolation cooling, primary pressure relief, and residual heat removal. The reactor protection system and risk-significant support systems (e.g., emergency ac power, dc power, and service water) are included for both PWRs and boiling-water reactors (BWRs). Each study contains a brief system description, description of data collection and analysis methods, simple qualitative and numerical data summaries, estimates of the probabilities that contribute to operational unreliability, and comparisons with values used in PRAs and Individual Plant Examinations (IPEs) to identify significant failures and industry-wide trends. The initial set of studies covered operating experience from 1987 through 1992. These studies are undergoing peer review. The BWR HPCI study has been completed and peer reviewed.

High-Pressure Coolant Injection (HPCI) System Reliability Study. There were over 200 licensee event report (LER) events from 1987 through 1993 in which the HPCI system was inoperable, as defined by plant Technical Specifications. Over half of these problems were associated with the HPCI pump steam turbine, which is independent of an ac electric power system. Problems such as turbine steam supply motor-operated valves



HPCI Comparison Between PRA Models and Industry Experience

Table 2. 1993 Accident Sequence Precursor Events

Plant	LER No.	Date	CCDP	Description
Precursors Involving an Initiator				
LaSalle 1	373/93–015	09/14/93	1.3E–04	Scram and LOOP (loss of offsite power)
Perry	440/93–010, 440/93–011	03/26/93	1.2E–04	SWS (service water system) line rupture and clogged RHR (residual heat removal) strainers
McGuire 2	370/93–006	12/27/93	9.3E–05	LOOP and MSIV (main steam isolation valve) failure to close
Beaver Valley	1334/93–013	10/12/93	5.5E–05	Dual unit LOOP (Unit 2 defueled)
Palo Verde 2	529/93–001	03/14/93	4.7E–05	Steam generator tube rupture
Pilgrim	293/93–004	03/13/93	4.6E–06	Weather-induced LOOP; vessel P/T (pressure/temperature) limits violated
Cook 2	316/93–007	08/02/93	2.4E–06	Scram with degraded AFW (auxiliary feedwater)
North Anna 2	339/93–002	04/16/93	1.1E–06	AFW disabled after scram due to operator error
Precursors Involving Equipment Unavailabilities				
Catawba 1, 2	413/93–002	02/25/93	1.5E–04	ESW (essential service water) potentially unavailable
Haddam Neck	213/93–006, 213/93–007	06/27/93	6.5E–05	Degradation of MCC-5, pressurizer PORV (pressure-operated relief valve), and both EDGs (emergency diesel generators)
Quad Cities 2	265/93–010, 265/93–012	04/22/93	6.0E–05	Degradation of both EDGs
Arkansas 1	313/93–002	09/30/93	5.1E–05	Both trains of ECCS (emergency core cooling system) recirculation inoperable for 14 hours
South Texas 1	498/93–005, 498/93–007	12/29/92 01/22/93	1.2E–05	Unavailability of one EDG and TDAFW (turbine-driven auxiliary feedwater) pump
TMI 1	289/93–002	01/26/93	3.1E–06	Both RHR heat exchangers unavailable
Beaver Valley	2412/93–012	11/04/93 11/06/93	2.1E–06	Failed EDG load sequencers

Note: The number following a plant name denotes a particular unit at the site. Where a precursor affects more than one unit, there will be multiple numbers following the name. For example, Turkey Pt 3, 4 is a precursor affecting both Unit 3 and Unit 4.

Table 3. HPCI Model Comparison Results

Model	5th	Mean	95th
Peach Bottom PRA	0.021	0.095	0.265
Brunswick 1 PRA	0.053	0.181	0.45
Brunswick 2 PRA	0.042	0.139	0.344
Analysis of Industry Experience (without recovery)	0.058	0.14	0.31

(MOVs), turbine governor and speed control, and HPCI injection MOVs accounted for over 70 percent of system inoperabilities. Instrumentation and control problems accounted for a smaller portion of failures and were dominated by spurious actuation of the steam leak detection system which causes isolation of the turbine steam supply. When adjusted for the number of plants operating in any given year, statistically significant differences in industry-wide HPCI unreliability estimates between years could not be detected. Operational unreliability was estimated by combining Bayesian distributions for the various system failure modes. A comparison of the results of this study with plant PRAs is shown in Table 3. The figure shows the values used in each PRA along with an empirical Bayesian update of that plant's experience from 1987–1993. The figure also shows the overall industry value for the 1987–1993 period. The PRAs and the historical experience analyzed in this report are in general agreement. For this comparison the models did not include any system failure recovery actions. Without recovery, the mean HPCI failure probability of the model based on industry experience is 0.14. With recovery, the mean HPCI failure probability of the model based on industry experience is 5.6E–2.

Safety Performance Trends

AEOD collects, analyzes and disseminates a wide range of operational data. A subset of this information is used in the NRC Performance Indicator (PI) Program. Selected industry trends are developed by analysis of industry average operational experience data. The values shown in the report for the current year are projections based upon nine months of data and are subject to change when the final data are available. The industry averages over the last three years for five of the specific types of events that AEOD monitors as indicators of plant performance have decreased (shown improvement). Those indicators are (1) automatic scrams while critical, (2) safety system actuations, (3) significant events, (4) safety system failures, and (5) collective radiation exposure. The annual industry average for forced outage rate has increased over the past three years and equipment-forced-outages-per-1,000 critical hours has remained essentially constant. In calculating the industry averages, data for certain periods were excluded for plants that either have ceased commercial operation or were in extended shutdowns requiring Commission approval before startup or operation above low power.

Reactor Scrams. As an essential element of basic reactor safety systems, a reactor shutdown or "scram" can result from initiating events that range from relatively minor incidents to events that are precursors of accidents. The 1993 industry average data shown in the 1993 NRC Annual Report, pp. 60 and 61, were derived from a projection based upon nine months of data. The actual year-end value for 1993 was slightly lower. The 1994 average scram rate, projected from nine months of data, is the same as the final 1993 value, although the total number of automatic scrams decreased slightly.

In 1994, equipment failure remained the leading cause of scrams, causing over three times as many scrams as the next leading cause, personnel error. Of the scrams occurring at operating plants during 1994, the systems initiating the most scrams, in descending order, were the feedwater system and turbine (tied), and the reactor protection and electrical systems (tied).

Safety System Actuations. AEOD monitors a subset of engineered safety feature (ESF) actuations for the PI Program safety system actuation (SSA) indicator. This subset consists of (1) actuations of certain emergency core cooling systems and (2) actuations of the emergency a.c. electrical system caused by loss of power to an emergency bus. Plant systems designated as ESFs vary considerably among nuclear plants, as do the plant conditions which actuate those systems. The SSAs focus on two key ESFs found at all plants, in order to provide a fairly standardized measure of challenges to ESF systems.

The annual industry average data for 1990 through 1993, and the projected data for 1994, show a slow decline in the number of SSAs.

Significant Events. Significant events are events that the NRC staff identifies through the application of certain criteria. The identification process includes a daily review and discussion of selected operating reactor events. Significant events are normally identified according to one or more of the following criteria: (1) the degradation of important safety equipment; (2) an unexpected plant response to a transient, or a major transient itself; (3) a 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 plant Technical Specifications (TS) or regulations; (6) operation outside the limits of TS; and (7) other events or aspects of an event considered significant.

The annual industry average number of significant events decreased in 1991 then remained constant through 1993. Based upon the projected data, significant events have decreased again in 1994.

Safety System Failures. AEOD monitors safety system failures (SSFs), which include any event or condition that could prevent the fulfillment of the safety function of 26 safety systems, subsystems, or components. Unsatisfactory conditions in these areas are generally found during testing, special inspections, and engineering design reviews, rather than upon demands to operate. For a system that consists of multiple redundant subsystems or trains, inoperability of all trains constitutes an SSF. SSFs can have implications for a plant's readiness to respond to anticipated events and postulated accidents.

From 1990 through 1993, the industry average number of SSFs fluctuated about an essentially constant value. The projected data for 1994 show a decrease in this average number.

Forced Outage Rate. The forced outage rate indicator is the number of forced outage hours in a period divided by the sum of the unit service hours (i.e., generator online hours) and the forced outage hours. For performance monitoring purposes, forced outages are defined as those outages required to be initiated by the end of the weekend following the discovery of an off-normal condition. The trend in forced outage rate can provide a useful perspective on overall plant operating performance.

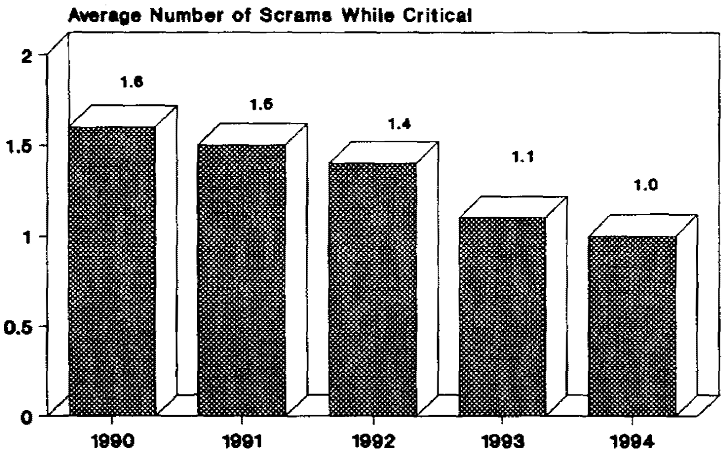
The annual industry average forced outage rate has increased from 7.6 percent to 9.3 percent over the past three years.

Equipment Forced Outages-per-Thousand Commercial Critical Hours. The equipment forced outage (EFO) indicator is a measure of the number of forced outages caused by equipment failures-per-1,000 hours of commercial operation while the reactor is critical. 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 that can provide perspective on the effects of equipment problems on overall plant performance.

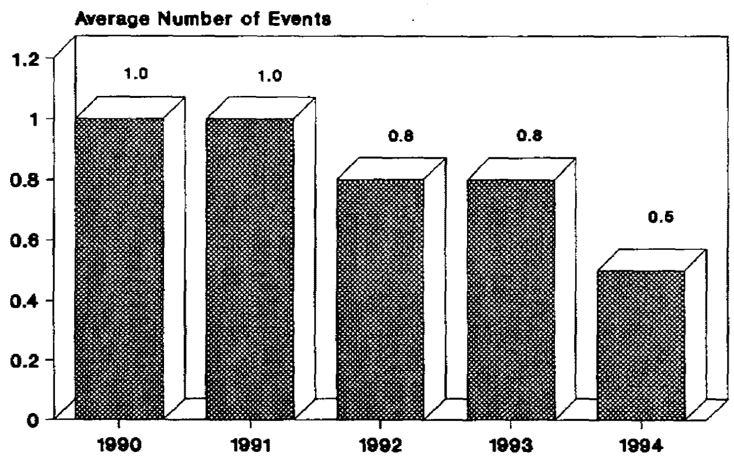
The annual industry average EFO rate has remained between 0.2 and 0.3 for the past three years.

Collective Radiation Exposure. Although the NRC receives radiation exposure data on an annual basis, INPO routinely receives radiation exposure data from the plants on a quarterly basis. AEOD uses the INPO data to disseminate information, without duplicating their effort. The industry's collective radiation exposure declined from 1990 through 1993. The projected value for 1994 shows a continued decline.

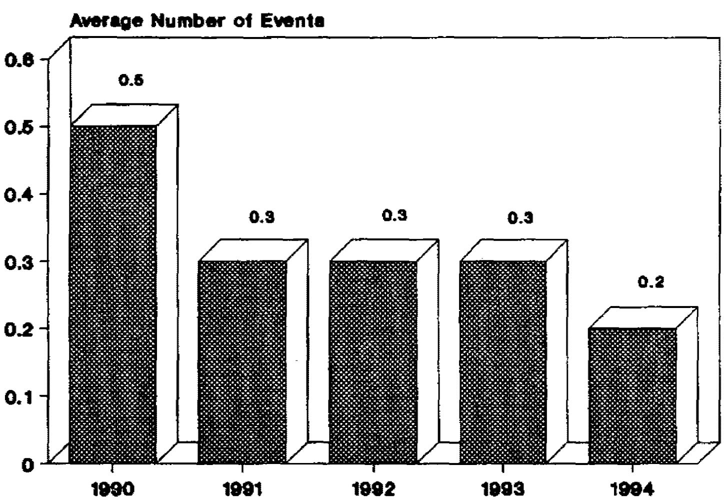
Average Number of Reactor Scrams While Critical



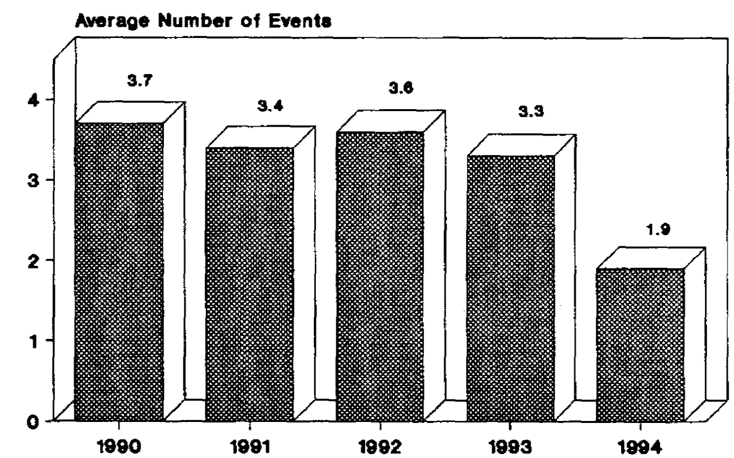
Average Number of Safety System Actuations



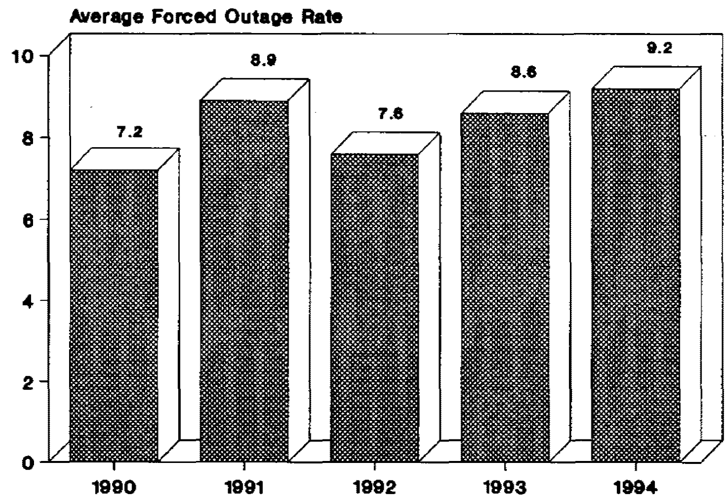
Average Number of Significant Events



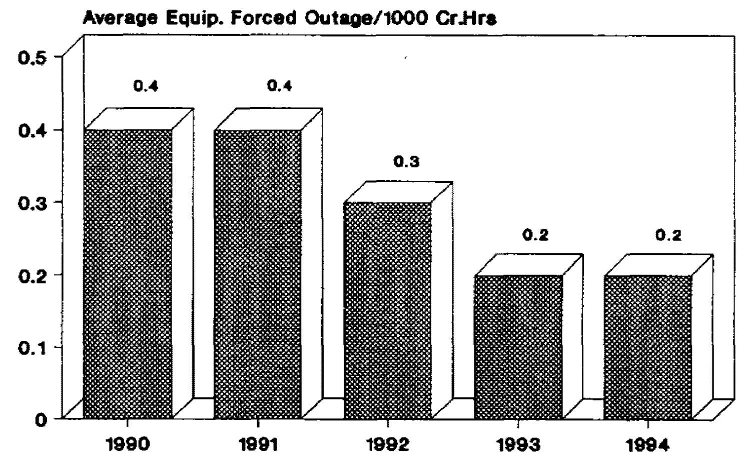
Average Number of Safety System Failures



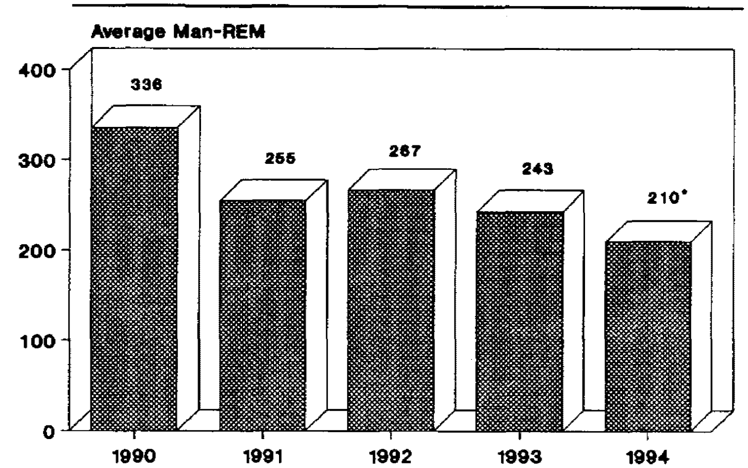
Average Forced Outage Rate



Average Equipment Forced Outage Rate Per 1000 Critical Hours



Average Collective Radiation Exposure (Man-REM)



*Projected from 8 months of data

The graphs on these two pages display five-year trends (1990 through 1994) for Performance Indicators (PIs) 1-to-7 (the eighth indicator, "Cause Codes," is not subject to industry-wide calculation), beginning top-left and top-right for PI-1 and PI-2 and proceeding to PI-7. The averages shown do not include data for a period when a plant(1) was in an extended shutdown that required Commission approval before either a startup or operation above low power, or (2) was no longer in commercial operation.

Radiation Exposures From Reactor and Nonreactors

People are regularly exposed to naturally occurring radiation and to radiation from man-made applications of radioactive materials—including medical diagnosis and therapy, industrial and commercial activities, nuclear production of electricity, environmental radiation other than naturally occurring sources, and consumer products. According to the National Council on Radiation Protection and Measurements, the total average effective dose equivalent to a person in the United States from all sources is approximately 3.6 milliSieverts (mSv) (360 millirems (mrem)) per year. The average person in the United States receives an effective dose equivalent of about 0.5 mSv (50 mrem) per year from medical applications. The whole fuel cycle, including operation of reactors, contributes less than 0.01 mSv (one mrem) per year. All other sources combined of radiation under human control add up to an effective dose equivalent of approximately 0.06 mSv (six mrem) per year.

Almost all of the radiation dose from nuclear power plants is occupational dose, i.e., the dose to the employees and contractors who work at the plant. Because the economics of operating a plant creates a strong impetus to lower exposures and achieve ALARA ("As Low As Reasonably Achievable") objectives, 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 average annual dose-per-worker exposed to radiation at nuclear power plants has declined from 9.4 mSv (940 mrem) in 1973 to 2.7 mSv (270 mrem) in 1993. The reduction is believed to be mainly the result of the licensees' extensive dose-reduction efforts, which are reflected in the reduced collective radiation exposure per plant. Some measures that reduce collective exposures are the licensees' efforts to have 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.

The NRC regulates both reactor and nonreactor applications of nuclear materials. All NRC licensees are required to provide appropriate personnel monitoring equipment to each individual who has the potential to receive a dose in any calendar quarter in excess of 25 percent of the allowable limits specified in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 20), "Standards for Protection Against Radiation." Certain licensees (reactor operators and those involved with industrial radiography, the manufacturing and distribution of radioactive materials, fuel fabrication, low-level radioactive waste disposal, and independent spent fuel storage and processing) are required to provide annual summaries of exposure data for individuals for whom personnel monitoring has been required.

Exposure data for 1993 show that of the six categories of licensees that are required to report collective exposures for monitored individuals, the licensees of the 114 reactors that reported (109 operating), by virtue of their large number of employees, had the highest collective exposure (26,365 centiSieverts (cSv), or 26,365 rems, to 189,537 people), followed by radiographers (1,627 cSv, or 1,627 rems, to 4,720 people), manufacturers and distributors (680 cSv, or 680 rems, to 4,913 people), and fuel fabrication licensees (339 cSv, or 339 rems, to 9,649 people). Low-level waste disposal (21 cSv, or 21 rems, to 432 people) and independent spent-fuel storage (14 cSv, or 14 rems, to 135 people) licensees had relatively low collective doses. Of the categories that report collective radiation exposures for monitored individuals, industrial radiography has the highest average measurable dose-per-worker. For each category of licensee, including industrial radiography, the average measurable dose-per-worker is far below the allowable limits established in 10 CFR Part 20.

In addition to relatively low worker occupational exposures, few overexposures occur. Between 1989 and 1993 inclusive, licensees reported seven events at nuclear power plants involving seven individuals who received exposures that exceeded the quarterly limits specified in 10 CFR Part 20. During this same period, the number of overexposure events and the number of individuals overexposed in nuclear materials applications licensed by the NRC (43 overexposures to 53 people) exceeded those overexposed at nuclear power plants.

Tabulation of Abnormal Occurrence Reports to Congress

The NRC prepares a quarterly Report to Congress on Abnormal Occurrences, the NUREG-0090 series, which also serves to promulgate significant event information to licensees, other government agencies, and the public. (These reports may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082, Washington, D.C. 20402-9328, or the National Technical Information Service, 5285 Port Royal Road, Springfield, Va., 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 (LPDRs) throughout the country (see Appendix 3 for list of LPDRs)).

Four abnormal occurrence (AO) reports were issued during fiscal year 1994: NUREG-0090, Vol. 16, No. 3 (July-September 1993); Vol. 16, No. 4 (October-December 1993); Vol. 17, No. 1 (January-March 1994); and Vol. 17, No. 2 (April-June 1994). The four reports describe one AO at a nuclear power plant, 22 AOs at other NRC licensees (industrial radiographers, medical institutions, industrial users, etc.; there were no AOs reported at fuel cycle facilities), and 17 AOs reported by the Agreement States (see Table 4). Two of the NRC-licensee events (AOs 94-08, and 94-14) resulted in civil penalties being proposed by the NRC. (See Appendix 6 for a list of all civil penalties proposed by the Office of Enforcement, with capsule descriptions of the reasons therefor). The four reports also provide updated coverage of certain AOs previously reported.

Table 4. Abnormal Occurrences Reported During 1994

NRC LICENSEES:

93-9	I-131 Diagnostic Misadministration	07/27/93	Tulsa Regional Medical Center, Tulsa, OK	Technologist failed to verify patient identification with written directive
93-10	Fatal Radiation Overdose	07/27/81	Northern Oklahoma	Radiographer suspected of stealing a source died from exposure to radiation
93-11	Brachytherapy Misadministration	01/07/93 02/26/93	Washington University Medical School, St. Louis, MO	A malfunction in an afterloader caused unprogrammed ejection of a source resulting in unplanned exposure to the skin of the patient
93-12	Brachytherapy Misadministration	04/23/93	Mercy Hospital Scranton, PA	Wrong catheter length entered in high-dose-rate after loader treatment computer
93-13	Brachytherapy Misadministration	07/01/93	Mountainside Hospital, Montclair, NJ	Short catheter connected to dose-rate afterloader
93-14	Exposure to a Nursing Infant	12/02/91	Queen's Hospital, Honolulu, HI	A nursing mother was given I-131 for a diagnostic scan resulting in exposure to the infant's thyroid

93–15	Brachytherapy Misadministration	11/10/93	Good Samaritan Medical Center, Zanesville, OH	An Ir–192 ribbon was incorrectly inserted in catheter, resulting in an unplanned exposure to the patient's larynx
93–16	Brachytherapy Misadministration	11/17/93	Marquette General Hospital, Marquette, MI	Short catheter resulted in exposure to wrong site
94–01	Inoperable Main Steam Line	March 93	Perry Nuclear Power Plant, Painesville, OH	Inoperability of main steam line isolation valves caused a major degradation of essential safety-related equipment
94–02	Brachytherapy Misadministration	12/11/93	Hospital Metropolitano, Ro Piedras, PR	Patient intervention resulted in exposure to a wrong treatment site
94–03	Teletherapy Misadministration	12/20/93	Triangle Radiation Oncology Associates, Pittsburgh, PA	Two patients were misadministered therapeutic doses at the same facility
94–04	Lost Sources	1993	Brooks Air Force Base, San Antonio, TX	Four Sr–90 sources were lost; suspected to have been inadvertently discarded and transported to landfill
94–05	Brachytherapy Misadministration	01/07/94	University of Cincinnati, Cincinnati, OH	I–125 seed was damaged by a surgical staple during implant, resulting in exposure to wrong site
94–06	Brachytherapy Misadministration	01/13/94	Keesler Medical Center, Keeslerrate Air Force Base, Biloxi, MS	Failure of a high-dose afterloader source to retract resulted in an overdose to patient
94–07	Brachytherapy Misadministration	01/27/94	Alexandria Hospital, Alexandria, CA	Program error during setup of high-dose-rate afterloader resulted in an exposure of a nontreatment site
94–08	Brachytherapy Misadministrations	09/11/93	Deaconess Medical Center, Billings, MT	Multiple misadministrations due to similar errors in treatment plans
94–09	Brachytherapy Misadministration	04/13/92	Memorial Hospital, South Bend, IN	Source fell out of applicator during insertion and remained on patient's bed for 7.5 hours, resulting in exposure to nontreatment site
94–10	Teletherapy Misadministration	04/22/94	Jewish Hospital, Washington Univ. Medical Center, St. Louis, MO	Verbal change to a written directive resulted in unintended dose to the left eye
94–11	Brachytherapy Misadministration	05/02/94	The Queen's Medical Center, Honolulu, HI	Sr–90 treatment of the eye resulted in higher than prescribed therapeutic dose to the eye

94–12	Sodium Iodide Misadministration	05/17/94	Stamford Hospital, Stamford, CT	An incorrect diagnostic study was performed, resulting in excess thyroid exposure
94–13	Brachytherapy Misadministration	06/14/94	Blodgett Memorial Hospital, East Grand Rapids, MI	Overdose during a Sr–90 therapeutic treatment of the eye
94–14	Brachytherapy Misadministration	06/21/94	The William W. Backus Hospital, Norwich, CT	112 I–125 seeds with excessive activity were implanted and required mitigating surgery

AGREEMENT STATE LICENSEES:

93–05	Teletherapy Misadministration	12/04/87	Alta Bates Medical Center, Berkeley, CA	Incorrect calculations in radiation therapy treatment plan resulted in lethal dose to 9-year old patient
93–06	Overexposure	05/22/93	X-Cel Group, Corpus Christi, TX	Malfunction of a radiography camera resulted in a source disconnect and an overexposure to the radiographer's hand
93–07	P–32 Radiopharmaceutical Misadministration	10/05/92	Unspecified Licensee, Albany, NY	Patient was administered a therapeutic dose of P–32 in excess of the prescribed dose
93–08	I–131 Misadministration	12/14/92	Inland Imaging, Spokane, WA	Patient prescribed a diagnostic dose of I–131 erroneously received a therapeutic dose
93–09	Teletherapy Misadministration	07/11/92	Unspecified Licensee, New York, NY	Five treatments intended for right axial were erroneously administered to left axial
93–10	Theft of Radioactive Material	02/03/93	Maryland Heights, MO, and rural Madison and Macoupin Counties, IL	Diversion of nuclear medicine generators during transportation to reclaim lead shielding for selling as scrap metal
93–11	Found Source	03/24/93	Scrap Metal Facility, Magnolia, AK	General license 4-curie source found in scrap yard
93–12	Teletherapy Misadministration	06/08/93	Rocky Mountain Gamma Knife Center, Denver, CO	The anterior/posterior angiogram was reversed during optical scanning into the dose-planning system, resulting in unintended exposure to the brainstem
93–13	Lost or Stolen Radiation source	09/02/93	BPB Instruments, Midland, TX	15–curie Am/Be source was stolen
93–14	Brachytherapy Misadministration	10/06/93	Michael Reese Medical Center, Chicago, IL	Patient was overdosed due to an error in reading treatment plan, resulting in excess exposure to the treatment site

93–15	Brachytherapy Misadministration	12/03/93	Mt. Sinai Medical Center, Miami Beach, FL	Eight patients were overdosed during booster therapy treatments due to the wrong transfer tube being used
93–16	Brachytherapy Misadministration	09/24/92	Richland Memorial Hospital, Columbia, SC	Cs–137 source fell out of applicator during installation, causing an exposure to the patient's thigh, resulting in ulceration of the skin
94–01	Therapeutic Radiopharmaceutical Misadministration	06/17/93	North Carolina Baptist Hospital, Winston Salem, NC	Technologist inadvertently administered two doses incorrectly, resulting in unintended exposures to each patient
94–02	Brachytherapy Misadministration	08/04/94	Memorial Medical Center, Lufkin, TX	Patient intervention resulted in unintended exposure to a wrong site
94–03	Overexposure	02/23/94	Blazer Inspection, Texas City, TX	Equipment malfunction resulted in an overexposure to a radiographer
94–04	Lost Source	04/19/94	Tucker Wireline Service, Corpus Christi, TX	Failure to secure source material during transport resulted in a lost source
94–05	Multiple Brachytherapy Misadministration	05/17/94	Cedars Medical Center, Miami, FL	Calculation errors in therapeutic treatments resulted in overexposures

Incident Response

Events Analysis

The NRC maintains a 24-hour-a-day, 365-day-a-year Operations Center in Rockville, Md., which provides a focal point for NRC communications with licensees, State agencies, and other Federal agencies regarding events involving NRC-licensed activity. During the year, the Operations Center was employed to monitor several events, including a UF_6 release from the Westinghouse Fuels Facility (January 1994), a potentially uncontrolled radioactive source in Cleveland, Ohio (March 1994), and a reactor trip following the loss of circulating water at the Salem (N.J.) nuclear power plant (April 1994). The center was also used for three "shakedown" drills, and three full-participation and one limited-participation exercises. The shakedown drills were part of the integrated testing program used to verify the functionality of the new Operations Center and to confirm the capabilities of the agency's response personnel. The plants for which exercises were conducted included North Anna (Va.), Prairie Island (Minn.), Washington Nuclear Power (Wash. and Ore.), and Perry (Ohio). Computer-generated accident simulations were also conducted in all Regional Offices.

New Operations Center

The NRC commenced operation from its new Operations Center at Two White Flint North in Rockville, Md., on May 31, 1994. This milestone event was the culmination of a multi-year effort that started with the development of functional

Executive Team
The NRC has the lead Federal Government role in response to incidents at NRC-licensed facilities. That response is managed by the Executive Team, shown here in the Operations Center during an emergency plan exercise.

Protective Measures Team
In this exercise, as they would during an actual event at a nuclear power plant, the Protective Measures Team evaluates potential hazards and makes recommendations to ensure public health and safety.

specifications and the establishment of a conceptual design. The state-of-the-art Operations Center Information Management System (OCIMS) includes integrated voice, video and data subsystems, providing timely and effective information flow during NRC response to an incident involving an NRC licensee.

Before the inauguration of operations at the new center, the NRC conducted extensive acceptance testing of the center with the OCIMS contractor. This was followed by three "shakedown" drills using a nuclear plant analyzer to familiarize NRC response personnel with the new systems and to identify potential deficiencies in the design or implementation of the center that were not discovered during the acceptance testing period.

Coordination with Other Federal Agencies

The NRC participated in the development of the revised Federal Radiological Emergency Response Plan (FRERP)—a plan cooperatively developed by 17 Federal agencies to coordinate the Federal response to radiological emergencies—and on a Federal Response Plan (FRP) Task Force, chartered to clarify the roles and responsibilities of the interagency groups supporting the FRP. These plans are mutually supportive and describe the manner by which the Federal Government would respond to significant natural or technological events. NRC staff also served as members of the Annex Planning Leaders and Catastrophic Disaster Response Group and participated on the Federal Emergency Management Agency (FEMA)-chaired Federal Radiological Preparedness Coordinating Committee (FRPCC) and six subcommittees.

State Outreach

During the year, the NRC continued its State Outreach program, designed to increase and improve the NRC's interaction with States during exercises and events. The program emphasizes increased frequency of exercise participation, attempting to exercise with each State on a three-year cycle. The NRC is also working through the Office of State Programs to expand participation in meetings, workshops and other vehicles that help describe the available NRC assessment tools, response capabilities, and accident assessment training courses. During 1994, at the headquarters and regional levels, the NRC coordinated and conducted 10 exercises with States to demonstrate NRC interfaces and capabilities. The NRC also worked with 15 other States to explain the NRC Headquarters interface and capabilities during an accident; State Outreach briefings were given at the National Radiological Emergency Plan, Conference of Radiation Control Program Directors, and FEMA Region IV REP Conferences.

International Nuclear Event Scale

The International Nuclear Event Scale (INES) is a ranking system used to promptly and consistently communicate to the public the safety significance of reported events at nuclear installations world-wide. It was designed by an international group of experts convened jointly by the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA). The international scale is currently in use throughout the world.

In fiscal year 1993, the NRC became a limited participant in the INES program. Events classified at the Alert level or higher, according to the U.S. emergency classification system, are reported within the INES. In addition, only events at commercial nuclear power facilities are considered for INES reporting. Reporting under the INES is made after careful consideration of the facts and circumstances surrounding the event. This step helps to avoid confusion with the existing four-level emergency response scale used in the United States. In fiscal year 1994, the NRC submitted four INES reports. A summary of the events along with their INES rating is provided in Table 5.

International Support Activities

The NRC participated in the development of the NEA-sponsored Short Term Countermeasures Workshop, which included presentations on recent research on protective actions and current

Table 5. FY 1994 INES Reports

Plant	Event Description	Date	Rating*
Fermi 2	Catastrophic Turbine Failure at Power	12/25/93	1
Waterford 3	Toxic Chemical Release from Nearby Chemical Plant	3/19/94	Out of Scale
Salem 1	Loss of Circulating Water Pumps with Reactor Trip	4/7/93	1
Robinson 2	Emergency Diesel Exhaust Manifold Fire	6/6/94	Out of Scale

* Events are classified on the scale at 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".

country policies. Representatives from AEOD and the NRC Office of International Programs (IP) reviewed the U.S./Canada relationship and, as a part of the U.S. delegation, participated on the U.S./Canada working group for nuclear emergency planning. The Environmental Protection Agency (EPA) leads this initiative.

AEOD was also actively involved with the Russian Republic and the Ukrainian Federation in the development of Emergency Response Centers for these two countries. These initiatives are being pursued under the auspices of the Lisbon Initiative, with expected completion dates of 1996.

Incident Investigation Program

The Incident Investigation Program (IIP) ensures that the NRC's investigations of significant events are timely, thorough, well coordinated, and formally administered. The scope of the IIP includes investigations of significant operational events involving reactor and nuclear materials licensees licensed by the NRC. For an event of potentially major significance, an Incident Investigation Team (IIT) is established by the NRC's Executive Director for Operations (EDO). For an event of less safety significance, the cognizant Regional Administrator may establish an Augmented Inspection Team (AIT). AEOD has responsibility for overall administration of the IIP, while NRR is responsible for maintaining the procedures for an AIT response.

Of the reportable events which occurred during fiscal year 1994, none was judged to have a sufficiently high level of safety significance to warrant an IIT response.

Accident Review Groups

On October 29, 1993, AEOD issued Management Directive (MD) and Handbook 8.9, "Accident Investigation." MD 8.9 provides NRC policy guidance for the investigation of operational events of extraordinary safety significance at reactor or non-reactor facilities licensed by the NRC that pose a significant hazard to public health and safety, or the environment, or involve high public, media, congressional, or executive branch interest. As specified in MD 8.9, the Accident Investigation Program provides for a response by an Accident Review Group (ARG) at the discretion of the Commission.

The Commission has the responsibility for approving the investigation of an event by an ARG and also approves the follow-up actions assigned as a result of the investigation. Normally, an individual outside the NRC would be expected to lead the ARG. An ARG would be composed of NRC staff experts and experts from outside the NRC and would report directly to the Commission; ARG activities would be independent of regional and headquarters office management.

Diagnostic Evaluation Program

The Diagnostic Evaluation Program (DEP) provides an independent assessment of licensee performance at selected reactor facilities. The DEP evaluates the involvement of licensee management and staff in ensuring safe plant operations, the effectiveness of their actions, and the root causes of safety-related performance problems. The DEP supplements the licensee assessment information provided by the NRC's Systematic Assessment of Licensee Performance (SALP) Program, Performance Indicator (PI) Program, and the routine and special inspections performed by NRC Headquarters and the Regional Offices. The DEP provides in-depth and detailed information for the decision-making of senior NRC management in their oversight of nuclear plant safety.

The NRC's Executive Director for Operations makes the decision to conduct a diagnostic evaluation of a specific facility and establishes a Diagnostic Evaluation Team (DET). The DET is composed of technical staff members from the NRC's Headquarters and Regional Offices, resident inspectors and contractors, as appropriate. Team members who are selected for a DET would not have previous significant involvement in recent inspections or reviews of the facility, so as to provide an unbiased and independent assessment of plant performance. A DET provides the broad-based assessment of licensee safety performance at the plant selected for the evaluation. Within the overall broad scope of the review, emphasis and focus of the DET is dependent on areas of special interest to NRC management. The evaluation process involves observations of plant activities, in-depth technical reviews, licensee employee interviews, equipment "walkdowns," and programmatic reviews in a number of functional areas important to safety, such as maintenance, surveillance and testing, management involvement, engineering and technical support, conduct of operations, safeguards and security, plant modifications and design changes, radiation protection, quality assurance, and corrective action.

Diagnostic Evaluation of the Palisades Nuclear Power Plant. In January 1994, the EDO directed that a diagnostic evaluation of the Palisades (Mich.) nuclear power plant be undertaken. The decision to conduct the evaluation was based on an apparent decline in the performance of plant operations, engineering, maintenance and plant support. A 16-member team spent approximately three weeks evaluating activities at the Palisades site. The evaluation was performed in March and April of 1994. Some DET members visited the licensee's headquarters in Jackson, Mich. The areas evaluated included operations and training, maintenance and testing, engineering and technical support, and management and organization. The findings and conclusions of the DET were discussed with the licensee at a public meeting on May 31, 1994. The team's evaluation report was issued in June 1994.

The team identified performance and programmatic deficiencies and found that weaknesses in management of Palisades significantly contributed to these deficiencies. The significant findings of the DET included omissions and deficiencies in safety-related pump and valve testing that resulted in indeterminate operability of certain equipment; the failure of plant management to address and correct human performance problems; ineffective and untimely engineering evaluations of degraded components and systems; a high threshold for identifying deficiencies, coupled with ineffective or untimely evaluations; and ineffective independent quality oversight by the Nuclear Performance Assessment Department. The team found that a significant contributor to the weaknesses at the plant was the failure to clearly define and communicate to the staff the organizational roles and responsibilities between the Nuclear Engineering and Construction Organization and the Systems Engineering Department.

The DET found the root causes of Palisades' performance to be management's (1) acceptance of low standards of performance, (2) failure to integrate processes and clarify and communicate roles and responsibilities, (3) failure to ensure effective self-assessment and quality oversight, and (4) failure to develop and implement an effective corrective action process.

Special Evaluation of the Cooper Nuclear Power Plant. In June 1994, the EDO directed that a diagnostic evaluation of the Cooper (Neb.) nuclear power plant be conducted, based on an apparent decline in the performance of plant operations, engineering, maintenance, and plant support. A subsequent decision was made by the EDO to perform a special evaluation, based on the licensee's plans to conduct its own broad-based independent Diagnostic Self-Assessment (DSA) of operations at the Cooper plant. The NRC special evaluation team (SET) consisted of eight technical members and a manager who spent approximately two weeks evaluating activities at the Cooper site, and also visited the licensee's headquarters in Columbus, Neb. The evaluation was performed in September and October of 1994. Safety performance was evaluated in the areas of operations, maintenance, engineering, and management and organization; it included an evaluation of findings made by the licensee's DSA, conducted in July and August 1994. The findings and conclusions of the SET were discussed with the licensee at a public meeting on November 17, 1994. The team's evaluation report was issued in November 1994.

The Diagnostic Self-Assessment Team (DSAT) found deficiencies in the areas of design control, configuration control, engineering experience, testing, quality of maintenance, long-term equipment reliability, procedural adequacy and compliance, industrial safety, conservative operating philosophy, training programs, human resource development, planning, management systems, self-assessment, and system functionality. The DSAT attributed these deficiencies to weak management, poorly defined programs, and ineffective self-assessment. The SET confirmed that the findings of the DSAT accurately characterized the plant's performance deficiencies and their causes.

The SET also identified numerous significant equipment problems, which led to the determination that operability could not be assured for several safety-related systems, including the residual heat removal, standby liquid control, core spray and service water systems. The licensee's staff was unaware of these deficiencies until they were identified by the SET.

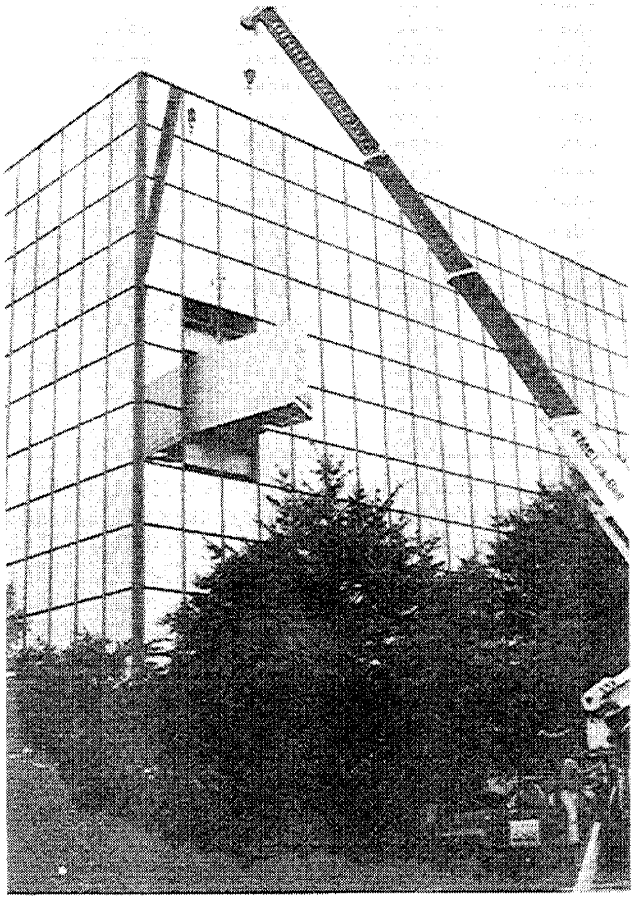
The conclusions of the SET were similar to and consistent with the root causes identified by the DSAT. Specifically, the SET found that (1) management did not provide the leadership and the direction necessary to maintain appropriate corporate-wide standards of performance; (2) major programs and processes were poorly defined and, as implemented, did not assure the consistent and effective accomplishment of program goals and objectives; and (3) independent oversight and self-assessment were not effective in monitoring ongoing activities, detecting deficiencies, or assuring that identified deficiencies were resolved.

Technical Training Program

AEOD manages and conducts the NRC technical training program at the Technical Training Center (TTC) in Chattanooga, Tenn. AEOD coordinates with NRC Headquarters 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. The AEOD staff provide technical assistance in areas of expertise and provide advice and limited technical training assistance to foreign regulatory counterparts.

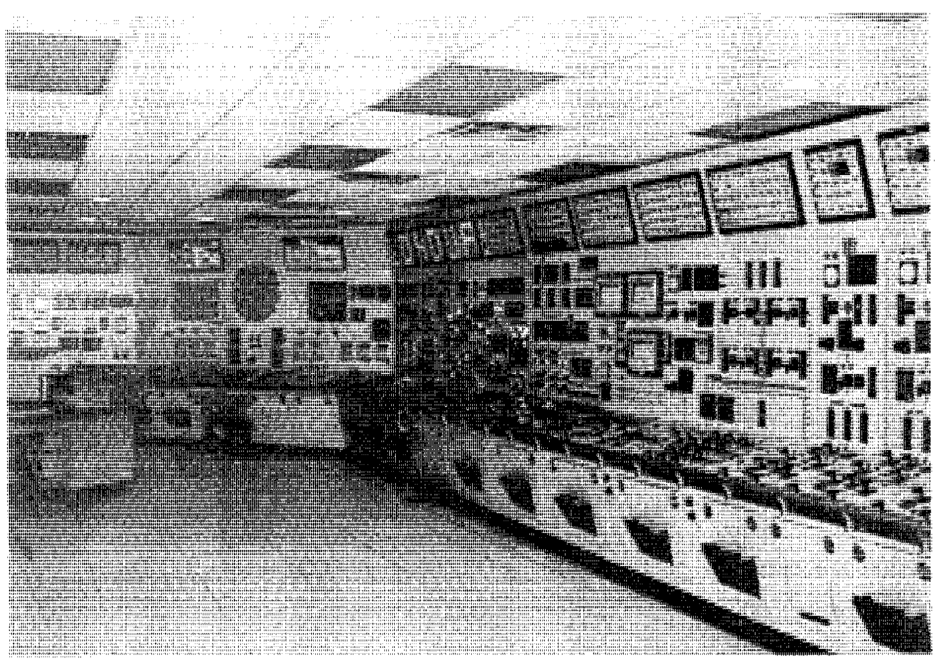
Reactor technology courses are provided for each of the reactor vendor designs: General Electric (GE), Westinghouse, Combustion Engineering (CE), and Babcock and Wilcox (B&W). These courses include classroom instruction and simulator training on full-scope reactor training simulators for each vendor design.

Specialized technical training courses are provided in probabilistic risk assessment (PRA), 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.



One of the BWR/4 full-scope simulator panels being rigged into the fourth floor of the Technical Training Center.

The main control board of the new BWR/4 full-scope simulator located at the Technical Training Center.



During fiscal year 1994, AEOD provided 79 courses in reactor technology and 101 in specialized technical training areas, requiring 67,544 instructional hours. Most of this technical training was provided in support of qualification programs for NRC technical staff.

In October 1993, the EDO's organizational review team recommended the transfer of PRA training from the Office of Personnel (OP) to AEOD. The PRA Technology Training Program became the official responsibility of AEOD in January 1994. The curriculum was expanded to include follow-up workshops for the regions, which evolved into the PRA Insights Into [individual plant examinations] IPEs course, and a second PRA software course, Advanced [integrated reliability and risk analysis system] IRRAS.

AEOD staff, supported by personnel from NRR, NMSS and the Office of State Programs (OSP), provided the second round of training on the new 10 CFR Part 20. Workshop sessions were held in headquarters and Regions I, III, IV and V. AEOD staff also conducted another 10 sessions for resident inspectors and other government organizations.

A major new training initiative began in the area of fuel cycle technology. NRC staff targeted for this training include fuel facility inspectors, license reviewers, headquarters staff, and other personnel who have regulatory oversight over fuel cycle facilities. Nine training courses are being developed.

It was known following the August 1993 Training Advisory Group (TAG) meeting that new agency technical training needs were evolving and that a comprehensive needs survey would be required. The resulting technical training needs survey was sent to Office Directors and Regional Administrators in September 1993. The survey asked for identification of needs that were not being addressed. The results showed nearly the same overall needs for existing courses but also turned up numerous new course proposals. Each of the new course proposals was reviewed by the TAG in an April 1994 meeting. After consideration of the proposals, the TAG reached consensus on the disposition of the proposals.

Transition of responsibility for providing training to Agreement State personnel from OSP to AEOD began in early fiscal year 1994. In accordance with an Agreement State Training Transition Plan signed by the AEOD and OSP office directors, AEOD assumed responsibility for training of Agreement State Personnel. According to the plan, AEOD will manage and fund contracted courses, schedule courses, handle logistics, and provide instruction (where applicable). OSP will continue to fund Agreement State travel and per diem, give input on matters affecting Agreement State training, and provide Agreement State special topics workshops.

During fiscal year 1994, AEOD and OSP continued to share slots in the Safety Aspects of Industrial Radiography and Transportation of Radioactive Materials Courses and jointly sponsored presentations of the Inspection Procedures Course and the Materials Licensing Course. Merging of training requirements for NRC and Agreement State personnel is planned for 1995. The desire is to have a unified training program that will provide timely and consistently high quality training to NRC and Agreement State personnel.

The need to provide training for inspectors and other technical staff in the area of digital instrumentation and control was identified both at TAG meetings and in the technical training needs survey. A Digital Instrumentation and Controls Working Group was established to address staff training needs in this area. The group met twice during the year and is developing a recommended curriculum for NRC personnel to obtain the necessary skills to conduct effective inspections in the digital instrumentation and control area. The working group reviewed the technical positions that might need training and concluded that training is most urgently needed for region-based inspectors responsible for addressing instrumentation and control issues and that a short seminar for resident inspector personnel will be necessary to acquaint them with digital instrumentation and control issues.

Active pursuit of Lisbon Initiative technical assistance projects continued. AEOD is assisting Gosatomnadzor of Russia (GAN RF) in the establishment of a comprehensive system for training and qualification of technical personnel and a functional training center for personnel in the Don Region. AEOD is assisting the State Committee for Nuclear and Radiation Safety

(SCNRS) of the Ukraine in the establishment of a comprehensive system for training and qualification of SCNRS technical personnel.

Committee To Review Generic Requirements

Generic requirements and positions proposed by the NRC staff for one or more classes of reactors are reviewed by the Committee To Review Generic Requirements (CRGR). The Committee is made up of senior NRC managers who review such proposals and advise the Executive Director for Operations (EDO) as to whether or not the requirement or position should be issued.

The members of the CRGR, as of the end of fiscal year 1994, are as follows:

Edward L. Jordan (Chairman), Director
Office for Analysis and Evaluation of Operational Data

Guy A. Arlotto, Deputy Director
Office of Nuclear Material Safety and Safeguards

William F. Kane, Deputy Administrator
Region I

Frank J. Miraglia, Jr., Deputy Director
Office of Nuclear Reactor Regulation

Joseph Rutberg,
Deputy Assistant General Counsel
for Materials, Anti-trust and Special Proceedings
Office of the General Counsel

Joseph A. Murphy, Deputy Director
Division of Systems Research
Office of Nuclear Regulatory Research

In making its evaluations of proposed requirements, the CRGR seeks assurance that a proposed requirement (1) is necessary for the public health and safety, (2) is needed for compliance with existing requirements or written licensee commitments, or (3) is likely to provide a substantial improvement in public safety or security and to have a cost impact on the public, industry and government which is consistent with and justified by the improvement to be realized.

Since its inception in November 1981, through September 1994, the CRGR has held 263 meetings and taken up a total of 447 separate issues. In fiscal year 1994, the CRGR held 14 meetings and considered 22 issues, including seven generic backfits in the form of three rules, two bulletins, one generic letter and one branch technical position. A listing of the 22 issues considered by CRGR at its 14 meetings follows:

- Final rule amendment to reduce the required frequency of random drug testing by licensees.
- Response to licensee comments on an information notice regarding on-site electric power systems.
- Final rule amendment to delete a requirement for NRC administered operator requalification examinations.
- Generic letter supplement to remove certain motor-operated valves from the scope of testing for boiling-water reactors.
- Safety evaluation report on NUHOMS concrete cask for dry storage of spent reactor fuel at reactor sites.
- Generic letter requesting information on Thermo-lag fire barriers.
- Supplement to generic letter on fire endurance testing for fire barriers.
- Urgent bulletin on plugging of emergency core cooling system strainers.
- Supplement to guidance on the criteria for protective actions following severe accidents.
- Proposed rule on the reliability of reactor coolant pump seals during off-normal conditions.
- Proposed rule on planning and precautions for periods of plant shutdown and low power operation.
- Final rule amendment on protection against malevolent use of vehicles at nuclear power plants.

- Urgent bulletin on spent fuel pool draindown.
- Generic letter supplement to remove certain motor-operated valves from the scope of testing for pressurized-water reactors.
- Proposed rule amendment to eliminate the requirement for certain annual emergency response exercises.
- Advance notice of proposed rulemaking on acceptance criteria for steam generator tubes in pressurized-water reactors.
- Generic letter on the replacement of analog protection systems with digital systems.
- Generic letter to approve the use of steam generator tube plugging criteria based on the voltage of eddy current test signals.
- Expedited generic letter on core shroud cracking in boiling-water reactors.
- Revised guidelines for regulatory analyses.
- Proposed rule amendment on leakage testing for primary reactor containments.
- Revised guidance on concentration averaging and encapsulation for land burial of low-level radioactive waste.

Office of Investigations

The Office of Investigations (OI) conducts investigations of alleged wrongdoing by individuals or organizations other than employees of the NRC or NRC contractors. (Allegations involving NRC employees or NRC contractors come under the purview of the NRC Office of the Inspector General (OIG); see Chapter 11). Thus, OI is concerned with the activities of NRC licensees, applicants for licenses, licensee contractors and vendors.

In fiscal year 1994, 250 investigations were opened and 256 investigations were closed. These investigations resulted in NRC enforcement action and in civil penalties totalling approximately $1 million dollars (see Appendix 6).

In fiscal year 1994, continued support was provided to the Department of Justice (DOJ) and other Federal agencies in prosecuting criminal violations that were substantiated during OI investigations. Of the 256 investigations closed in fiscal year 1994, 23 cases were referred to the DOJ for prosecutorial review. During fiscal year 1994, OI supported 11 Federal grand juries. OI investigations resulted in three indictments, three convictions, and six guilty pleas in Federal courts.

The following sections give examples of significant OI investigations on which action was taken by DOJ or the Office of Enforcement during fiscal year 1994.

Department of Justice Actions

As an example of the continuing close working relationship developed with other Federal agencies, on December 9, 1993, OI, with the assistance of the U.S. Marshals Service and support from the NRC Region I technical staff, executed a Federal search warrant on the premises of Power Inspection, Inc., Power Inspection possessed an NRC materials license and conducted radiography and other testing activities at nuclear power plants. Power Inspection and its president were the subject of a previous investigation and subsequent criminal prosecution in the Western District of Pennsylvania in 1988. The current investigation is ongoing.

An extensive investigation into the falsification of NRC-required training records by The American Inspection Company, Inc. (AMSPEC), the results of which were initially reported in fiscal year 1993, culminated in the additional sentencing and guilty pleas of the corporation and of the president and vice president of AMSPEC. Larry Ladner, an AMSPEC employee, was sentenced to two years' probation and 100 hours of community service, and was fined $1,200 for conspiring to violate the Atomic Energy Act. On March 15, 1994, AMSPEC pleaded guilty to conspiracy to violate the Atomic Energy Act and mail fraud. The corporation was sentenced to five years' probation, $100,000 in fines, $218,000 in restitution to the U.S. Government and a $200 special assessment. On March 15, 1994, Daniel McCool, president of AMSPEC, pleaded guilty to conspiracy to violate the Atomic Energy Act and providing false information to the NRC. He was sentenced to 10 months' imprisonment, one year's probation, fined $20,000, and given a $100 special assessment. Lezlie McCool also pleaded guilty to mail fraud and conspiracy to defraud the United States and was sentenced on March 15, 1994, to 10 months' imprisonment, three years' probation, a $10,000 fine, and a $100 special assessment.

An investigation involving Allied Signal, Inc., a uranium conversion facility, determined that a Mr. Richard Gardecki, employed as a health physics specialist, had deliberately falsified his educational background on his employment application, by falsely asserting that he had a required degree in physics. Further, during the conduct of the investigation, Mr. Gardecki provided false sworn testimony. On April 7, 1994, Mr. Gardecki entered a guilty plea to a three-count indictment. On June 14, 1994, he was sentenced in U.S. District Court to five years' probation on each count and 250 hours of community service.

An investigation conducted jointly by OI and OIG involving Thermal Science, Inc. (TSI) determined that Alan M. Siegel, president of Industrial Testing Laboratories, Inc. (ITL), aided and abetted in making material false statements within the jurisdiction of the NRC. ITL was the testing facility at which TSI conducted qualification testing on Thermo-Lag, a fire barrier product utilized throughout the nuclear industry to meet NRC requirements. Mr. Siegel entered a guilty plea to a five-count information filed in U.S. District Court, Baltimore, Md., and his sentencing is pending. ITL also entered a guilty plea to an information and was fined $150,000.

As a result of an extensive investigation into conspiracy to defraud the United States, making false statements, and falsifying documents regarding the transport of radioactive materials, on February 7, 1994, Gordon Finlay, president of Finlay Testing Laboratories, Limited (FTL), was sentenced to 21 months' imprisonment and fined $50,000 in Federal District Court, District of Hawaii, for conspiracy to carry radioactive material on board commercial passenger aircraft. On the same day, FTL was sentenced to five years' probation and fined $380,000.

Enforcement Actions

An investigation involving Northeast Nuclear Energy Company and its Millstone Unit 1 (Conn.) nuclear power plant disclosed that the plant's engineering manager had engaged in the harassment and discrimination of a senior engineer over the raising of a safety concern involving the feedwater coolant injection system (FWCI). The investigation also disclosed that there was a deliberate delay in declaring the FWCI system inoperable by the licensee's organization, utilizing administrative means and attempts by the engineering manager to avoid the issue of reportability entirely. Based on the OI investigation, on July 13, 1994, the NRC issued a $220,000 civil penalty and a demand for information. The licensee paid the civil penalty.

As a result of investigative efforts, the NRC issued Notices of Violation to and also proposed civil penalties for the Radiation Oncology Center at Marlton (ROCM) and Oncology Services Corporation (OSC) of $80,000 and $280,000, respectively. ROCM and OSC are separately licensed, but affiliated organizations. Both were cited for a breakdown in corporate control of licensed activities. OSC was additionally cited for violations resulting from the death of a patient and significant exposures to members of the public.

As a result of an extensive investigation into falsification of emergency diesel generator test results at the Vogtle (Ga.) nuclear power plant, the NRC issued a Notice of Violation to Georgia Power Company assessing a $200,000 civil penalty.

Two investigations of Entergy Operations, Inc., and its activities at the River Bend (La.) nuclear power plant determined that the River Bend director of security deliberately removed Safeguards Information from a nuclear plant without being authorized to do so; deliberately failed to notify plant management for four days about a "one-hour" safeguards event; failed to protect Safeguards Information; caused safeguards records to be inaccurate; and deliberately ordered installation of a "thumbturn" on the protected area side of the vital island door, in deliberate violation of the plant security plan. He then refused to allow this event to be logged within 24 hours, as required by the NRC. Based on the OI investigations, on April 21, 1994, the NRC issued

Notices of Violation and imposed a civil penalty of $112,500, which the plant licensee paid on May 26, 1994. Several River Bend employees, including the director of security, were subsequently terminated by Entergy.

An investigation involving Jones Inspection Services (JIS) determined that JIS, an Arkansas licensee but not an NRC licensee, deliberately conducted radiography in NRC jurisdiction without NRC authorization. The owner of JIS was the owner of Tumbleweed X-Ray, a former NRC licensee to whom the NRC had issued an Order on September 6, 1991, prohibiting the company from conducting radiography in NRC jurisdiction for three years. Based on this current OI investigation, on July 26, 1994, the NRC issued an Order to Cease and Desist Use and Possession of Regulated Byproduct Material in NRC Jurisdiction to JIS.

Office of Enforcement

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 actions involving all other licensees.

Appendix 6 provides a listing and brief summary of the civil penalties proposed, imposed, and/or paid during fiscal year 1994; and a listing and brief summary of the 36 orders issued during fiscal year 1994. Recognizing that enforcement actions can sometimes span several fiscal years, there were a total of 114 civil penalties acted upon in fiscal year 1994. Of these, 93 cases were proposed for a total of $4,136,875; 16 were imposed for a total of $133,000; and 98 were paid (including the total amount for those civil penalties being paid over time) for a total of $3,890,675. A total of 57 cases were issued as escalated enforcement actions without a civil penalty for reasons unique to each case.

NRC ENFORCEMENT PROGRAM

The NRC's Enforcement Program seeks to protect the public health and safety by ensuring compliance with the Atomic Energy Act, the Energy Reorganization Act, NRC regulations, and license conditions; obtaining prompt correction of violations and conditions adverse to quality; deterring future violations; and encouraging improvement of licensee performance. 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 NRC Enforcement Policy. This policy has been approved by the Commission and is published as Appendix C to 10 CFR Part 2.

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 and formalizes a violation. 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 may modify, suspend, or revoke licenses. Orders may also be issued to individuals who are not themselves licensed if they violate the regulations concerning deliberate misconduct.

The first step in the enforcement process is assessing the severity level of the violation. Severity levels range from Severity Level I for the most significant violations to Severity Level V for those of minor concern. Severity levels may be increased for cases involving a group of violations with the same root cause, repetitive violations, or willful violations.

Enforcement conferences are normally held for violations assessed at Severity Levels I, II, or III, and may be held for violations assessed at Severity Level IV if increased management attention is warranted (e.g., involving repetitive violations). An enforcement conference is a meeting between the NRC and the licensee to (1) discuss the apparent violations, their significance, the reason for their occurrence, including the apparent root cause, and the licensee's corrective actions; (2) determine whether there were any aggravating or mitigating circumstances; and (3) obtain other information that will help the NRC determine the appropriate enforcement action. The decision to hold an enforcement conference does not mean that the NRC has determined that a violation has occurred or that enforcement action will be taken. In fiscal year 1994, the NRC conducted 186 enforcement conferences.

On June 23, 1992, the Commission approved implementation of a two-year trial program to allow certain enforcement conferences to be open for public observation. This was done so that members of the public can have the opportunity to gain a full understanding of the agency's regulatory process. When this trial program ended in July 1994, the Commission extended it pending results of a broad review of the Enforcement Program underway at that time. In fiscal year 1994, 32 enforcement conferences were open.

Civil penalties are normally issued for Severity Level III or higher violations, absent any mitigating factors, and may be issued for violations at Severity Level IV if the violations are repetitive or similar to previous Severity Level IV violations. Civil penalties are normally issued for any willful violation.

The NRC imposes different levels of civil penalties based on a combination of the type of licensed activity, the type of licensee, the severity level of the violation, and certain escalation and mitigation factors. These factors are (1) who identified the violation, (2) was the corrective action prompt and extensive or untimely and only marginally acceptable, (3) was the violation a reflection of prior licensee performance, (4) did the licensee have prior opportunity to identify the violation, (5) were there multiple occurrences of the violation, and (6) how long did the violation or its impact endure.

If a civil penalty is to be proposed, a written Notice of Violation and Proposed Imposition of Civil Penalty is issued and the licensee has 30 days to respond in writing, by either paying the penalty or contesting it. The NRC considers the response and, if the penalty is contested, may either mitigate the penalty or impose it by order. If the civil penalty is to be imposed by order, the order is published in the Federal Register. Thereafter, the licensee may pay the civil penalty or request a hearing.

In addition to civil penalties, orders may be used to modify, suspend, or revoke licenses. Orders that modify a license may require additional corrective actions, such as removing specified individuals from licensed activities or requiring additional controls or outside audits. The NRC issues a press release with a proposed civil penalty or order.

Nuclear Materials Regulation

Chapter 4

The NRC Office of Nuclear Material Safety and Safeguards (NMSS) and the NRC's four Regional Offices administer the regulation of nuclear materials; the regulation of nuclear reactor facilities is handled by other NRC offices, covered in Chapters 2 and 3. The NRC conducts materials regulation under several broad programs: material safety (including the storage and transport of nuclear fuel), discussed in this chapter; fuel facility safety and safeguards, discussed in Chapter 5; and waste management activities, discussed in Chapter 6.

Activities covered in this chapter include licensing, certification, inspection and other regulatory actions concerned with: (1) storage of spent reactor fuel; (2) transportation issues associated with the fuel and radioactive materials, and (3) production and use of reactor-produced radioisotopes (byproduct material).

Nuclear materials regulation during fiscal year 1994 comprised—

- Nearly 100 fuel storage and transportation package reviews and 11 route approvals for transporting special nuclear material and spent fuel.
- Fourteen Quality Assurance (QA) Program inspections of transportation packaging and dry spent fuel storage system suppliers.
- Over 5,000 licensing actions on applications for new byproduct materials licenses, amendments to and renewals of existing licenses, and reviews of sealed sources and devices.
- Approximately 2,200 materials licensee inspections.

Storage and Transportation

Interim Spent Fuel Storage. Under the Nuclear Waste Policy Act of 1982, the licensed utilities are responsible for interim storage of their spent nuclear fuel until a Federal repository or monitored retrievable storage (MRS) facility is available. Because of delays in the MRS program, all utilities have installed, or developed plans to install, high-density racks in their existing spent fuel pools. As their pools approach capacity, many utilities are facing a shortfall. Without additional storage being made available, 20 utilities would lose "full-core" reserve before the year 2000. To avoid this contingency, a number of utilities are constructing Independent Spent Fuel Storage Installations (ISFSIs).

An ISFSI generally consists of a passive storage system, using dry cask technology. Utilities have two options for licensing ISFSIs—site-specific or general license. Five utilities have applied for and received site-specific licenses. As part of its decommissioning process, licensees for the Rancho Seco (Cal.) nuclear power plant has requested a site-specific ISFSI license. That application is under review; the necessary Environmental Assessment was completed in July 1994. Only one utility is currently storing fuel under provisions of the general license, although several others are preparing to do so. The general license, issued to all 10 CFR Part 50 licensees, allows the storage of fuel in systems of a precertified design—a design given an NRC Certificate of Compliance (CoC)—which eliminates the need for extensive administrative actions in the development of an ISFSI. There are currently six system designs holding CoCs, with two applications under review.

Certificate of Compliance. Provisions of the general license allowing the use of a certified storage cask without the need for additional licensing action make general licenses attractive to licensees. Rulemaking regarding the standardized

NUHOMS system, designed by Vectra (formerly Pacific Nuclear), is nearing completion and is expected to receive a CoC early in 1995. Review of the Nuclear Assurance Corporation Storage and Transport Cask (NAC STC) Topical Report was in progress at the close of the fiscal year. Completion of the review is expected in early 1995. The NAC STC will be the first dry cask system to be approved for both storage and transportation uses, making it the first of a generation of true dual-purpose designs. (The NUHOMS system, under review at Rancho Seco, is also a dual-purpose design.) In addition to these new licensing actions, amendments to existing certificates are under review.

Multi-Purpose Canisters. A significant Multi-Purpose Canister (MPC) design has been proposed by the Department of Energy (DOE) for NRC approval. The MPC is the designation for a canister design the DOE is expected to present to the NRC for certification in 1996 as both a storage and transport cask. The MPC concept employs a common spent fuel basket/canister that would act as the primary support and confinement boundary. While in the storage mode, the system would use a storage overpack, meeting the requirements of 10 CFR Part 72. Because of the many different requirements of NRC licensees (fuel size, weight, etc.), several different MPC designs are anticipated. These include a small MPC (for utilities with restricted crane capacity), and a large MPC—both equipped with Pressurized Water Reactor (PWR) and Boiling Water Reactor (BWR) fuel baskets. Also supporting the MPC is the development of a dry cask-to-cask transfer system that would allow the handling of individual fuel bundles without the need for a spent fuel pool.

Dry Transfer Systems. The DOE is participating in the development of a dry cask-to-cask transfer system. The system would allow individual fuel elements to be moved without returning to the spent fuel pool. NRC staff has participated in ongoing discussions with both the DOE and its vendors to help outline the guidelines the staff will use for this review. The DOE anticipates submittal of an application for at least one of the proposed designs early in 1995.

Quality Assurance Inspection Activities. NMSS continued inspection activities in fiscal year 1994 to ensure that transportation packagings and dry spent fuel storage systems, certified and licensed by the NRC, are designed, fabricated, tested, maintained and used in accordance with an NRC-approved Quality Assurance (QA) Program. This year, the program was expanded to include inspections of nine suppliers of transportation packagings and dry storage systems, and also of five users thereof. The suppliers represent a broad spectrum of the industry, including designers, fabricators, and vendors of packagings and dry storage systems; the users were selected on the basis of geographical distribution. The inspection program is structured to provide information as to whether the licensees comply with the QA requirements of 10 CFR Parts 71 and 72.

Monitored Retrievable Storage (MRS). The NRC provided its comments to the DOE on two revisions to the Annotated Outline for the MRS Safety Analysis Report, which will form the basis for the DOE's MRS license application. However, the DOE informed the NRC that it was suspending work on the MRS annotated outline until a suitable site for an MRS was proposed. Meanwhile, nine Indian Tribes have written to the Nuclear Waste Negotiator expressing readiness to enter creditable formal negotiations leading to an agreement for the siting of an MRS.

The NRC also met with DOE to discuss plans and schedules for the DOE's development of an MPC for the storage, transportation and disposal of the nation's nuclear reactor fuel.

Status of Transportation Activities in 1994. The Federal Government regulates safety in the transportation of radioactive materials primarily through the NRC and the Department of Transportation (DOT). The regulatory responsibilities of the two agencies are delineated in a Memorandum of Understanding (MOU). The DOT regulates modal safety, carriers, hazard communication, and packages for smaller quantity of radioactive materials. The NRC regulates larger quantity and fissile radioactive material packages. The DOT is the designated U.S. Competent Authority for the International Atomic Energy Agency (IAEA). During fiscal year 1994, NRC staff worked toward revising 10 CFR Part 71 to make it compatible with the 1985 version of the IAEA's transportation regulations. The NRC plans to publish a final rule in early 1995. DOT plans to simultaneously publish a similar compatibility rulemaking.

In September 1993, NRC staff issued a transportation CoC for the NAC-STC dual-purpose storage and transport spent fuel cask, the first dual-purpose cask to be reviewed and certified by the NRC (see above). The storage review is in progress and is expected to be completed in early 1995.

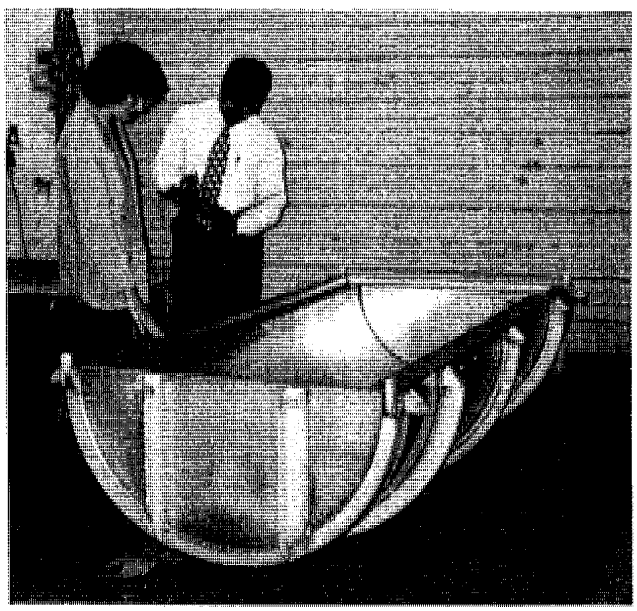


Figure 1. NRC inspectors review a newly fabricated overpack at the Nuclear Containers, Inc., facility in Elizabethton, Tennessee. The overpacks are used for the transport of low-enriched uranium hexafluoride cylinders. On the left is Nancy Osgood conducting the inspecetion; on the right, Dennis Reid records the data.

Materials Licensing and Inspection

The NRC currently administers approximately 6,700 licenses for the possession and use of nuclear materials in medical and industrial applications. This represents a reduction of about 200 licenses over the past year. Table 1 shows the distribution of licenses by Region. The 29 Agreement States administer about 15,000 licenses.

Table 1. Distribution of NRC Nuclear Materials Licenses (as of September 30, 1994)

Region I	2339
Region II	891
Region III	2326
Region IV	901
Headquarters	209
Total:	6666

The program is designed to ensure that activities involving such uses of radionuclides do not endanger the public health and safety. NRC regional staff completed 2,193 inspections of materials facilities in fiscal year 1994. The NRC Regional Offices administer almost all materials licensees, with the exception of certain exempted distribution licenses, sealed source and device design reviews, and licenses for companies which extract other metals from ores and slags containing uranium and thorium. The latter kinds of licenses are handled at NRC Headquarters.

The NRC completed 5,002 licensing actions during the fiscal year. Of this total, 348 were new licenses, 3,359 were amendments, 1,110 were license renewals, and 185 were sealed source and device reviews.

Human Factors. Contractors for "human factors" evaluations related to the use of remote afterloaders in teletherapy and brachytherapy operations submitted draft final reports during fiscal year 1994. Their reports identified some human factors problems—tasks with a high potential for human error that could adversely affect system performance—as well as the factors that contributed to those problems. The problems were assigned priorities in terms of their safety consequences, and alternative means for resolving safety significant problems were identified and evaluated. Staff review of the reports is under way; publication of findings is expected during the second quarter of fiscal year 1995.

An NRC human factors analyst took part in regional inspections related to several medical misadministrations and identified certain factors contributing to the human errors that caused those misadministrations. Licensee responses to the misadministrations were thoroughly reviewed to ensure that root causes were addressed.

Regulatory Impact Survey. In May 1992, NRC staff submitted a plan to the Commission to conduct a regulatory impact survey of fuel facility and materials licensees (SECY 92-166). The plan proposed a three-phased approach, to determine the impact of the NRC's regulatory program on these licensees. The survey would seek 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. Phase I included a pilot series of nine on-site interviews at selected fuel cycle and major materials facilities. Nine interviews were completed between August and October 1992.

The staff submitted a report to the Commission on May 13, 1993 (SECY 93-130), recommending a number of changes in staff practices and proposing a plan for obtaining a broader range of licensee views. The Commission instructed the staff to draw up a plan for obtaining additional information from licensees and for evaluating and incorporating it 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. As fiscal year 1994 ended, the contractor conducting the survey for NRC had mailed approximately 600 questionnaires and had received 372 completed questionnaires from respondents. The staff expects to report its final conclusions and make recommendations to the Commission in the spring of 1995.

Integrated Materials Performance Evaluation Process. In January 1994, staff prepared a draft management directive, SECY 94-011, for use of common performance indicators in the review of Agreement State and NRC regional materials programs. These indicators had been previously presented to the States and Regions for comment. The Commission approved use of five programmatic indicators, as part of a pilot program in 1994. The indicators allowed a team made up of technical staff from NMSS and the Office of State Programs to evaluate a Region or State on the status of its materials inspection program, its technical staffing and training, the technical quality of its licensing and inspection programs, and its response to incidents and allegations. After a one-week, on-site review, the team issued draft reports for regional or State comment and then prepared proposed final reports for approval of a senior-level NRC Management Review Board (MRB).

The same process was used in the review of two Regions and three Agreement States which had volunteered to participate. Separate MRB meetings were held with each Region or State before issuance of final findings. At year's end, the staff was preparing summary findings on the pilot program, in expectation of program implementation in 1995.

Industrial Uses

Industrial Radiography. As described in the *1989 NRC Annual Report* (pp. 74–5), the *1990 NRC Annual Report* (p. 81), the *1991 NRC Annual Report* (p. 95), the *1992 NRC Annual Report* (pp. 102–3), and the *1993 NRC Annual Report* (p. 110), NRC staff has been endeavoring for some time to develop a certification program for industrial radiographers. During the current report period, the NRC staff continued support of the American Society for Nondestructive Testing (ASNT) in implementing ASNT's "Industrial Radiography Radiation Safety Personnel" certification program. The staff also worked toward completing a proposed rule that would mandate radiographer certification. The rule was combined with a rulemaking that would bring about an overall revision of 10 CFR Part 34. This combined rule was published for comment on February 28, 1994. The staff anticipates publishing a final rule in early 1995.

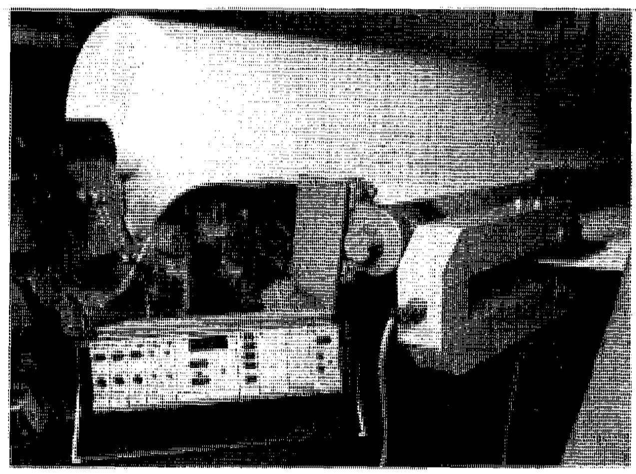
Source/Device Registration. Manufacturers and distributors of radiation sources and devices containing radiation sources are required to submit safety information regarding their products and information about their QA programs to the NRC or an Agreement State. The NRC or Agreement State evaluates the information to ensure that each product is designed to provide adequate protection of the public health and safety and meets all applicable radiation safety requirements, and also that the company's QA program is adequate to ensure that the product meets design specifications. The regulatory authority then issues a certificate of registration to the product vendor. The certificates are used by the NRC or the Agreement State in issuing specific licenses to users of the products.

The NRC maintains a nation-wide registry of sealed source and device designs. The registry includes sources and devices registered by the NRC and by the Agreement States. It also includes sources and devices that are listed in the radioactive materials reference manual of the Food and Drug Administration's Center for Devices and Radiological Health. These sources and devices contain both naturally occurring and accelerator-produced radioactive material. The NRC maintains copies of the registrations and a computerized registry that includes summary information concerning the sources or devices.

Sealed Sources, Devices, and Other Radioactive Material Retrieved by the Department of Energy. 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 DOE provides a disposal facility, or material for which control cannot be ensured because of the licensee's financial or other difficulties. The NRC has negotiated with the DOE to provide assistance with the management of radioactive material in those cases that pose some threat to the public health and safety. On three occasions during the year, the NRC requested the assistance of the DOE to retrieve, control, and/or dispose of material that had become a threat to public health and safety because of a licensee's loss, or potential loss, of control of the material. In each case, the DOE assisted in the management of the material.

The NRC staff has developed procedures for determining when DOE assistance might be appropriate, and for making the request therefor. The NRC and DOE staffs have also been working to formalize a procedure by which DOE assistance is requested by the NRC, and to explore options to resolve the issues that arise with licensees who have limited or no disposal options and for whom control of their material cannot be ensured. Several Agreement States have noted similar problems with their licensees; the NRC is working with these States to determine if DOE assistance is needed for them.

General License Program. 10 CFR Part 31 provides for a general license for the possession and use of certain measuring and gauging devices containing byproduct materials. The generally-licensed device usually consists of radioactive material contained in a sealed source within a shielded device. The device is designed with inherent radiation safety features, so that it can be used by persons with no radiation training or experience.



Portable gauging device used to measure the thickness of paper. Shown is the electronics package which translates the electronic data from the radiation detector located in the top of the "C-Frame" into a measure of paper weight. The sealed source contained with a shielded source housing is attached to the lower part of the "C-Frame."

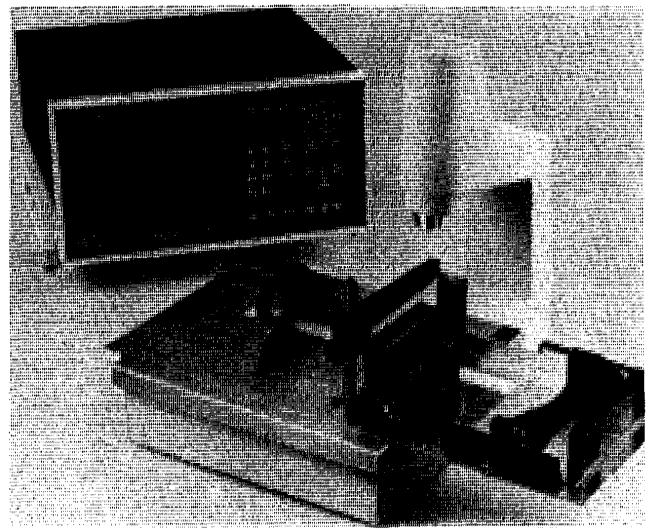
Quality Assurance and Quality Control for Source/Device Vendors. The staff published a draft regulatory guide, "Establishing Quality Assurance Programs for the Manufacture and Distribution of Sealed Sources and Devices Containing Byproduct Material," during the report period. The purpose of the guide is to provide registrants of sealed sources and devices with information on the essential elements needed to develop, establish and maintain a QA program that meets the QA and control requirements of 10 CFR Part 32.

The staff has reviewed the comments received concerning the guide and plans to issue the final version of the guide in early 1995. During 1995, the staff expects to develop a program for ensuring that manufacturers and distributors are implementing QA programs in accordance with the regulatory guide.

Medical Uses

Status of Medical Management Plan. On October 20, 1994, the staff briefed the Commission on the annual report on the medical use regulatory program, titled "Annual Report on the Medical Use Program Including Status Reports on Implementation of the Medical Management Plan (MMP) and Quality Management (QM) Program and Misadministrations Rule" (SECY-94-256; October 13, 1994). The MMP is a five-year plan containing over 90 action items, categorized into nine major program areas. The latter include such areas as licensing and inspection, rulemaking, misadministration policy, enforcement, and research studies. Over one-half of the action items are considered closed, while others are either partially closed or not yet addressed, because their resolution is contingent on the closure of other 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. The annual report also discusses the staff effort to implement the QM rule, since it became effective on January 27, 1992. These efforts include contractor review of licensee-submitted QM plans, development of inspection guidance, resolution of enforcement issues, and staff recommendations on the rule. Subsequent annual reports will provide status reports on the MMP and implementation of the QM rule, until all items have been resolved.

Quality Management Rule Implementation. On January 27, 1992, regulations became effective requiring medical licensees to establish and implement a quality management program (QMP), in compliance with 10 CFR 35.32. This performance-based rule focuses on therapeutic applications of byproduct material, and any patient dosage of sodium iodide-125 or -131 in quantities greater than 30 microcuries. The NRC contracted with Lawrence Livermore National Laboratory (LLNL) to review the QMPs submitted by applicable licensees. The review of the 1,709 submitted QMPs is now complete. Letters outlining the findings of each review were provided to each licensee. A Temporary Instruction (TI) for the inspection of implemented QMPs became effective in August 1994 and will remain in effect for two years. The TI establishes areas of inspection a procedure for determining compliance. Data collected from this TI will be included in the evaluation of the effectiveness of the rule.



This gauging device and electronics are used by physician to measure the mineral content of the bone of a person's arm. The tightly collimated sealed source is located in the base of the unit and the radiation detector is contained in the c-arm.

Medical Visiting Fellows Program. During 1990, the NRC selected a nuclear medicine physician and a radiopharmacist to participate in the Medical Visiting Fellows Program on a full-time basis. The radiopharmacist joined the NRC in December 1991 and completed his fellowship in June 1993. The nuclear medicine physician joined the NRC in October 1991 and will complete his fellowship in December 1995. Shortly after the end of the fiscal year, a notice was published in the *Federal Register* soliciting nominations for a physician who is qualified and experienced in radiation oncology, specifically in the therapeutic uses of radioisotopes in manual and remote afterloading brachytherapy patient procedures. The NRC intends to keep abreast of this technology and future developments in the therapeutic uses of radioisotopes and believes that such a Fellow, with expertise in these uses, can assist NRC staff in meeting this goal. Individuals, other than physicians, having therapeutic radiological physics expertise will also be considered. It is anticipated that the Fellow would join the NRC in late 1995 or early 1996.

Advisory Committee on Medical Uses of Isotopes. The Advisory Committee on Medical Uses of

Isotopes (ACMUI) met in November 1993 and May 1994, and presented its annual briefing to the Commission in October 1994. Topics discussed at these meetings included: dose limits for individual members of the public, 10 CFR 20.1301; impact of fees on medical programs; medical implications associated with calibration of strontium-90 eye applicators and their use in brachytherapy; the term "referring physician," as used in 10 CFR Part 35; Memorandum of Understanding between the NRC and the Food and Drug Administration; brachytherapy issues (pulsed-dose rate afterloading, high-dose rate afterloading, fractionation of doses); implementation of the QM Program and Misadministration rule, "Management of Radioactive Material Programs at Medical Facilities" (NUREG-1516); update of a study by the National Academy of Sciences; inadvertent administration to the wrong patient and patient notification issues; recognition of the American Osteopathic Board of Radiology Certification in 10 CFR 35.930; and bylaws for the ACMUI. Status reports on several rulemakings were provided: "Release of Patients Containing Radiopharmaceuticals or Permanent Implants"; "Preparation, Transfer, and Use of Byproduct Material for Medical Use"; "Administration of Byproduct Material or Radiation from Byproduct Material to Patients Who May Be Pregnant or Nursing"; and revisions to the Abnormal Occurrence Criteria.

As directed by the Commission, ACMUI members serve two-year terms and are limited to three terms. In July 1994, four members: Peter R. Almond, Ph.D; Melvin L. Griem, M.D.; Carol S. Marcus, Ph.D., M.D.; and Joan A. McKeown, completed their terms. Two new members have been appointed: Louis K. Wagner, Ph.D., and John Graham. (Current membership of the Committee is shown in Appendix 2.)

Event Evaluation and Response

The NRC continues to review and analyze operational safety data from nuclear fuel facilities and materials licensees and to maintain its ability to respond to events at these facilities.

Sewer Reconcentration Issues. Sanitary sewer disposal of radioactive material and sewer reconcentration became an issue in the mid-1980's with the discovery of contamination at two sewer treatment facilities in New York and one in Tennessee. In May 1991, the NRC published new regulations dramatically revising 10 CFR Part 20, which, in part, changed the criteria for disposal of radioactive material into sanitary sewer systems. On January 1, 1994, these revisions to the regulations became mandatory for all licensees.

The revisions to the sewer disposal criteria were partially in response to evidence that certain radioactive isotopes were reconcentrating in sewer systems and sewage treatment plants. In particular, about a dozen isotopes—mostly metallic, insoluble materials—were found to be non-dispersible in the sanitary sewer system and were being reconcentrated at the sewer treatment facility into sewage sludge and ash.

Because of 1991 findings of the reconcentration of radioactive materials in some processes to reduce the volume of treated sewer sludge, and in order to determine the adequacy of the present regulations that do not allow dispersible insoluble radioactive waste to enter the sanitary sewer, the NRC initiated a one-year study of the dose pathways associated with the authorized disposal of radioactive materials via sanitary sewer, to clarify the potential for human exposure. This contractor study was designed to analyze current sanitary sewer waste treatment processes to determine how the solubility of material, when it reaches the treatment plant, affects the dose to the public. The study was completed in September 1994, with final publication in late 1994. The report will provide support in the drafting of any proposed rulemaking on this issue.

In conjunction with the contracted study for this fiscal year, the NRC published an Advance Notice of Proposed Rulemaking on February 25, 1994, titled "Disposal of Radioactive Material by Release into Sanitary Sewer Systems," to solicit comments and seek information to determine if the present regulations need to be revised. Specifically, it requested information and comment on these subjects: (1) the form of the material to be disposed of, (2) the total quantity of material permitted to be disposed of, (3) the types of limits that should be applied to disposal; and (4) the exemption of medical patient excreta. The information gathered from comments will assist the agency in evaluating options and alternatives which may be available to provide a better means of regulating sewer disposal.

This issue has elicited Congressional interest. The General Accounting Office (GAO) published a report, "Actions Needed to Control Radioactive Contamination at Sewage Treatment Plants," in May 1994, containing three recommendations to preclude the recurrence of the problem. The agency presented testimony to a Joint Senate/House hearing, responding to the GAO report and its recommendations. The NRC has increased coordination with the Environmental Protection Agency (EPA), including efforts to assist the EPA in its National Sewage Sludge Survey, which will consider evaluation of radionuclides. In addition, the NRC has notified water and radiological officials of all States of the potential for reconcentration of radioisotopes in sanitary sewer systems; State officials can disseminate the information as they deem appropriate.

Incident Involving Contaminated Ferrophosphorus Imported into the United States. On October 19, 1993, the Pennsylvania Department of Environmental Resources notified NRC staff that slightly contaminated, radioactive material had been detected in a shipment of ferrophosphorus alloy at a steel facility in Indiana. Subsequent evaluation confirmed that the ferrophosphorus alloy, a material used in steel production, was contaminated with low levels of cobalt-60. The contaminated alloy had been imported into the United States from Kazakhstan.

NMSS and regional staff appraised the incident and, because the levels of radiation were low and because the ferrophosphorus was diluted in the steel production process, NMSS did not restrict distribution of the material or prevent its use in steel manufacturing. At the time of the incident, the importer had two other shipments of ferrophosphorus from Kazakhstan en route to the United States. The importer contracted with a health physics consulting firm in the United States to survey the shipments on arrival in the United States. The survey results were analyzed by NMSS staff, who authorized the importer to release some of the material that was either not contaminated or only slightly contaminated with cobalt-60 (less than 0.50 microsieverts-per-hour (50 microrems-per-hour) on contact).

The importer's health physics consultant performed surveys of the material in Maryland and on barges on the Mississippi River in Louisiana, and the importer was authorized to release the material below the segregation limit. The remaining 2.2 metric tons of contaminated ferrophosphorus were taken back to the consultant's facility in Pennsylvania. The Commission did not object to the staff's position to allow this remaining material to be used and distributed (April 1994), because the ferrophosphorus presented a minimal risk to public health and safety at the radiation levels detected.

At the time of this incident, NRC staff had already been coordinating efforts with other Federal agencies on a draft Federal Radiological Emergency Response Plan (FRERP). Under the draft FRERP, the EPA would be the lead Federal agency on incidents of this type. In its April 1994 decision, the Commission also did not object to NMSS staff's plan to refer future cases of contaminated imports to EPA for follow-up action.

Fuel Cycle Safety and Safeguards

Chapter 5

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 of the NRC's four Regional Offices. NMSS is responsible for the development, implementation and evaluation of overall agency safety and safeguards policy for 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 (the 1992 Act). The principal licensing, certification, inspection and regulatory activities associated with licensed facilities to ensure adequate safety and safeguards are carried out in NMSS; the office develops and continually evaluates the NRC's "design basis" threats and assesses threats to the domestic environment affecting all NRC-licensed activities, and NMSS directs NRC contingency planning and emergency response operations dealing with accidents, events, incidents, threats, thefts or radiological sabotage related to licensed activities. Technical support is provided to the International Atomic Energy Agency (IAEA) regarding both export/ import requests, and the review of safeguards issues related to the transportation of nuclear material. NMSS coordinates its activities with NRC's Office of Nuclear Reactor Regulation to ensure consistency in the 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 designed to enhance the rigor of the regulatory base for the fuel cycle facility safety program; to improve the timeliness of the license renewal program; and to make the numerous improvements in the program 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 has focused on improvements in the areas of the regulatory base, licensing, inspection, training, and licensee self-assessment.

Among efforts to clarify and upgrade the regulatory base is a major rewriting of 10 CFR Part 70—Domestic Licensing of Special Nuclear Material. The revision will improve the rigor of the regulatory base; develop requirements that are graded according to risk; clarify and refine existing requirements; include, where possible, performance-oriented rather than prescriptive requirements; and reduce unnecessary and burdensome regulatory requirements. This effort will realize many of the improvements to the fuel cycle facility regulatory program recommended in NUREG–1324. A draft proposed rule, with companion documents, is projected for publication by the middle of fiscal year 1995, with a final rule expected during fiscal year 1996.

In support of the rulemaking initiative, the Commission was informed of and approved the staff's high priority efforts to develop a Standard Review Plan (SRP) for staff use in reviewing fuel fabrication license, amendment, and renewal applications, along with detailed guidance to assist licensees in performing the required Integrated Safety Analyses (ISA). The SRP will be useful not only to the NRC staff in reviewing the applications and amendments, but also to licensees in understanding the intent of the new performance-oriented requirements. Public meetings with fuel cycle facility licensees have been held to obtain input regarding the development of the ISA, SRP, and the Standard Format and Content Guide (SF&CG). With respect to the review of pending license renewal applications, the Commission was advised that the licensing staff intends to continue ongoing reviews while concurrently contributing to the development of the SRP. In the interim, until the revision to 10 CFR Part 70 becomes effective, the developing SRP will be used in reviewing license renewal and amendment applications.

Upgrading of the inspection program will continue, primarily through staffing of the Headquarters Inspection Section, providing for an increased focus on inspection activities and 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.

The Commission was advised that improvements in the training and licensee selfassessment programs are under way. An enhanced training program is being developed for the NRC licensing and inspection staffs. Regarding licensee self-assessment, the staff has proposed allowing industry to take the lead in proposing a program for NRC consideration. The Nuclear Energy Institute put forward a draft concept for a selfassessment program in a September 1994 letter to the NRC staff.

Fuel Cycle Licensing Activities

By the end of fiscal year 1994, the NRC had completed 106 fuel cycle licensing actions. Table 1 shows these licensing actions by category.

Fuel Cycle Safety

Fuel Cycle Safety Licensing

Combustion Engineering, Inc. (CE) Hematite License Renewal. On July 28, 1994, License SNM-33 for the CE Hematite Nuclear Fuel Manufacturing Facility, Hematite, Mo., was renewed for a 10-year term. This action followed preparation of an Environmental Assessment (EA) in March 1994, and publication of a "Finding of No Significant Impact" in the *Federal Register* on March 28, 1994. The license authorizes CE to fabricate enriched uranium into fuel elements for light-water reactors.

West Valley Demonstration Project Oversight. Throughout fiscal year 1994, the NRC staff continued safety oversight at the Department of Energy's (DOE) West Valley Demonstration Project (WVDP), near Buffalo, N.Y. The purpose of the WVDP is to demonstrate the solidification and preparation of high-level waste from spent nuclear fuel reprocessing for disposal in a Federal repository. The majority of the high-level waste on-site is stored in two separate tanks, one containing Plutonium/Uranium Recovery Extraction (PUREX) waste and the other containing Thorium Recovery Extraction (THOREX) waste. Removal of dissolved cesium from the supernatant (liquid) portion of the PUREX waste was completed in November 1990. The cesium will be combined with the solid portion of the high-level waste remaining in the PUREX tank, which contains most of the other radionuclides. During fiscal year 1994, the solid portion of the PUREX tank was processed through two "sludge washes" to remove salts. In fiscal year 1995, the contents of the THOREX tank will be added to the PUREX tank, and the resulting contents will be "washed" a final time. Beginning in 1996, the combined wastes will be solidified (vitrified) in borosilicate glass.

The NRC staff monitors public health and safety aspects of the WVDP through inspections at the West Valley site and 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), giving the NRC's conclusions regarding the public health and safety implications of that process segment. In fiscal year 1994, the DOE submitted a draft SAR for vitrification operations. The final SAR is expected to be submitted in January 1995. The NRC staff will issue its corresponding SER by April 1995.

In fiscal year 1994, the staff monitored the ongoing construction and installation of equipment for the vitrification process building. The staff also continued to assess data from

Table 1. Fuel Cycle Licensing Actions (Safety/Safeguards) Completed in FY 1994

Category	No. of Actions
Fuel Fabrication and Conversion	51
Critical Mass Materials	12
Fuel Research, Development, Pilot, & Fresh Fuel Storage	15
Other Source Materials	5
Material Control and Accounting	13
Physical Security	8
West Valley Demonstration	2

cement produced through the completion of the first two "sludge washes," and began evaluating the transfer of THOREX waste into the PUREX tank for the final "wash." As an agency cooperating in the preparation of an Environmental Impact Statement (EIS) for site decommissioning, the NRC continued discussions with the DOE to develop decommissioning criteria to be addressed by the DOE for various aspects of the WVDP which are under NRC oversight. A draft EIS is expected to be published by the DOE and the State of New York in 1995.

Shieldalloy Metallurgical Corporation (SMC). Since 1955, SMC has operated a manufacturing facility located in Newfield, N.J., where it has manufactured specialty steel and super alloy additives, including aluminum master alloys, metal carbides, powdered metals, and optical surfacing products. 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, the radioactive materials are concentrated in high-temperature slag and in baghouse dust.

SMC notified the NRC in early September 1993 that it had filed for bankruptcy protection under Chapter 11 of the U.S. Bankruptcy Code. Disposal of waste at the Newfield facility is one of SMC's largest and undefined liabilities, and must be resolved as part of the company's restructuring activities under Chapter 11. SMC's regulatory counsel informed the NRC staff that the company may file for liquidation under Chapter 7 of the U.S. Bankruptcy Code if waste disposal costs exceed the licensee's financial resources. The staff anticipates that the only alternative the licensee can reasonably afford, given its financial condition, is in-situ disposal. In October 1993, the staff began development of an EIS to evaluate the proposal for in-situ disposal, and held public scoping meetings near Newfield, N.J., during the month of December. An EIS scoping report was issued in July 1994 and delivered to all entities that participated in the scoping process. A draft EIS is expected to be available for public review in late 1995.

SMC's license has been in timely renewal since July 1985. The Newfield facility continues to operate and to generate a source of revenue for the corporation. During fiscal year 1994, the staff continued to gather and evaluate data for preparation of an Environmental Assessment in support of the renewal review. The license renewal evaluation is expected to be completed in mid-1995. (See also Chapter 6, *Waste Management.*)

Nuclear Fuel Services. An interim decommissioning plan was prepared by the licensee for phased remediation of portions of the Nuclear Fuel Services (NFS) facility in Erwin, Tenn. The plan was submitted for NRC review and approval in December 1993. The NRC found the plan to be acceptable and issued a Confirmatory Order in June 1994 permitting NFS to commence decontamination and decommissioning activities, including the removal of the sources of radiation from a previously-authorized burial area. Additional NRC approval will be required for final decontamination and decommissioning of the Erwin site, before it can be released for unrestricted use, following termination of plant operations.

NFS is currently in the process of separating buried contaminated debris from the soil, using special segregation equipment. A new ground water treatment system, set up to decontaminate the ground water pumped from this area, as well as the water generated during soil washing, is being used.

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

Transfer of License Responsibility for Battelle Memorial Institute. On October 5, 1993, the Battelle Memorial Institute's (BMI) Materials License, SNM-7, was amended to lower authorized possession of special nuclear material (SNM) to a maximum total of less than 350 grams; the license was also revised to reflect the limited operations then being conducted at the facility. Because of the reduced SNM possession limits, the license's oversight responsibility associated with BMI's License SNM-7 was transferred from NMSS/FCSS to the NRC's Region III Office.

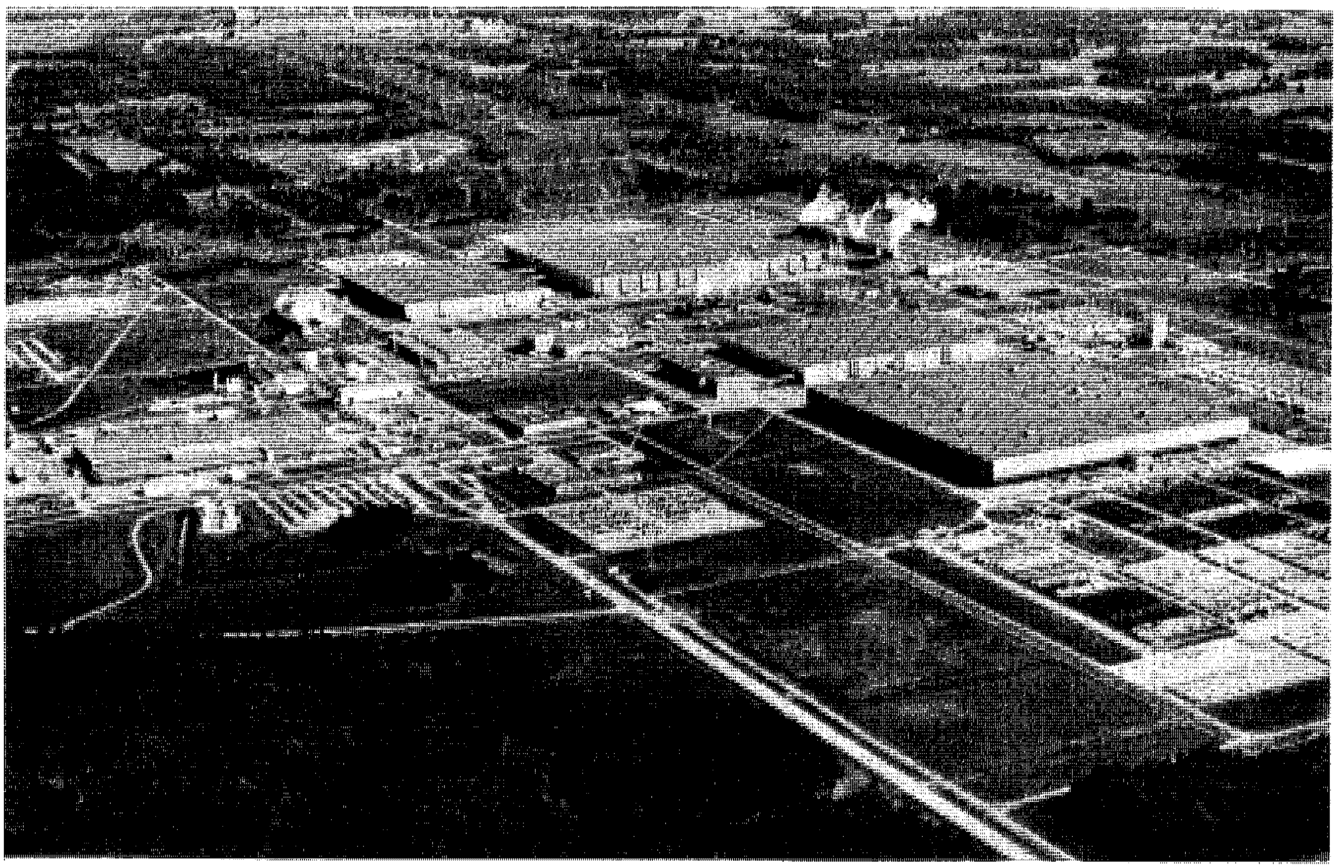
Since the early 1950's, BMI has conducted SNM-related research and development activities at both its Columbus, Ohio, and West Jefferson, Ohio, sites. Currently, BMI's SNM research facilities are being maintained in a surveillance and maintenance mode, with continuing decontamination and decommissioning efforts, under a DOE contract and with BMI funding for these NRC-licensed activities. BMI plans to continue to conduct non-SNM-related R&D activities, primarily involving byproduct materials.

Gaseous Diffusion Uranium Enrichment. In October 1992, Congress enacted the 1992 Act, which created the United States Enrichment Corporation (USEC) and directed the DOE to lease the two gaseous diffusion plants located in Portsmouth, Ohio, and Paducah, Ky., to the USEC. The USEC is to operate the plants and 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 1992 Act provides that the NRC shall regulate safety and safeguards at the gaseous diffusion plants operated by the USEC. In consultation with the Environmental Protection Agency and the DOE, the NRC is to report to Congress at least once each year on the status of health, safety, and environmental conditions at the plants. The report is to include a determination of whether the plants are in compliance with applicable NRC regulations. The NRC is to establish a certification process to ensure that the USEC complies with the regulations, and the USEC is to apply to the NRC annually for a certificate of compliance with the NRC standards; the certification process is to be in lieu of any requirement for a license. The 1992 Act makes provision for the DOE to prepare a plan for bringing the plants into compliance with any unsatisfied provisions of NRC regulations. The plan would be submitted to the NRC at the time of the USEC's initial application for certification.

A new rule (10 CFR Part 76) to govern the regulation of the enrichment plants was issued in proposed form in February 1994 and in final form in September 1994. The regulation establishes standards for adequate protection of public health and safety and the environment, as well as for safeguarding nuclear materials in the interest of national security. The rule applies only to the gaseous diffusion plants operated by the USEC.

Receipt of the USEC application for certification is expected in April 1995. Aided by a technical support contractor, NRC staff is carrying out a pre-application evaluation of various safety and safeguards issues that must be considered in the certification process. These include fire protection, accident analysis, plume modeling, criticality prevention, potential seismic and high wind damage, radiation protection and others. Evaluation of the application will take place between April and October 1995. Issuance of the



Paducah Gaseous Diffusion Plant (aerial photo).

initial certificate of compliance is expected shortly after conclusion of the evaluation. Until the initial certificate is issued, the DOE will continue to oversee regulation of safety and safeguards at the sites.

An important part of the certification process will be the NRC verification that the plants are equipped and organized to comply with regulations in Part 76 and to carry out the commitments made in the USEC's application. Some of the verification will be done by the NRC's Region III Office, which currently has two resident inspectors at each site. The remainder of the verification will be done by NMSS, commencing in October 1994 and likely continuing until certification is complete.

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 Atomic Energy Act 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, Limited Partnership (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). It will be located in Claiborne Parish near Homer, La., and have a capacity of 1.5 million kilograms of "separative work units-per-year," about 15 percent of the annual requirement of all U.S. nuclear utilities for enrichment services. A draft EIS was published for comment in November 1993. Over 500 letters were received commenting on the draft EIS. The final EIS was issued in August 1994 (NUREG-1484), and the SER was issued in January 1994 (NUREG-1491). The NRC staff has concluded that the CEC can be constructed and operated with small and acceptable impacts on the environment, and that the facility does not pose undue risk to the public health and safety. The NRC staff documents support issuance of a combined construction/operating license for the facility.

An organization called Citizens Against Nuclear Trash (CANT) opposes facility licensing. A formal adjudicatory hearing by the NRC's Atomic Safety and Licensing Board Panel (ASLBP) is being held in two phases. Phase 1 covered the safety issues and Phase 2 will cover the environmental issues. The first phase of the hearing was held in Shreveport, La., in July 1994. The second phase of the hearing will be held in March 1995 in Shreveport, La. Issues likely to be treated include: completeness of the license application, decommissioning cost estimates, 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 are the participants in the hearing. The ASLBP will issue its decision when the hearing is completed.

Fuel Cycle Safety Inspection

Headquarters-Based Inspection Activities. As part of the February 7, 1993 reorganization of fuel cycle facility activities within NMSS, several fuel cycle facility inspection activities have been consolidated in NRC Headquarters, in a phased approach. Activities consolidated include chemical process safety and nuclear criticality safety inspections, which were added to the MC&A inspections previously conducted by Headquarters. At present, a chemical process safety inspection program has been developed and initiated. Draft inspection procedures have been framed and are being validated through on-site inspections. During fiscal year 1994, headquarters staff provided technical expertise to address difficult design, integration, and adequacy concerns in the areas of criticality and chemical process safety.

Region-Based Inspection Activities. The four Regional Offices and NMSS conducted in excess of 133 safety inspections at 15 operating and decommissioning fuel cycle facilities during fiscal year 1994. The inspections include resident inspector activities at two of these facilities. The inspections covered the areas of criticality safety, radiation protection, emergency preparedness, environmental safety, chemical safety (NMSS), and transportation.

Facilities and Transportation Safeguards

Fuel Cycle Safeguards Licensing

A total of nine active, licensed nuclear fuel cycle facilities were subject to the NRC comprehensive safeguards requirements during fiscal year 1994. Two of the nine facilities contain significant quantities of HEU, requiring extensive physical security and MC&A measures. One of these facilities—NFS, of Erwin, Tenn—reduced the quantity of 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, this interchange did not lead to any significant activity during 1994. One of the low-enriched fuel fabrication facilities, CE-Windsor, phased out its fuel fabrication work and transferred these operations to the CE-Hematite site.

The fully implemented physical protection requirements provide for performance testing through the use of mandated tactical drills and exercises. Category I facilities continue to increase performance and provide more effective implementation of physical protection measures as a result of lessons learned during performance testing. Both Category I licensees developed more complex drill scenarios during calendar year 1994, to further test their physical protection programs.

Fitness-for-Duty at Fuel Cycle Facilities

Category I fuel cycle facilities are required to implement a fitness-for-duty program, under the provisions of 10 CFR Part 26. Calendar year 1994 was the first year that this program was applied at two qualified fuel cycle facilities. At the close of the report period, only one fuel cycle facility qualified for the fitness-for-duty program. As discussed under" Reactor Safeguards" (below), the Commission is considering changes reflecting recent lessons learned. Program performance data provided by fuel cycle licensees indicate a minimal impact, with a low number of positive drug-related test results.

Physical Fitness at Fuel Cycle Facilities

During calendar year 1994, Category I fuel cycle facilities are required to provide a modification to their physical security plan, as the initial response to the physical fitness requirements set forth in 10 CFR 73.46. Currently, this program only applies to one qualified Category I facility.

Physical Protection at Monitored Retrievable Storage Sites

During 1994, the NRC continued to develop regulations, guidance, and certification determination modules for spent fuel storage sites.

Fuel Cycle Safeguards Inspection

Headquarters staff conducted 16 comprehensive MC&A inspections, while the regional and resident inspectors continued to perform inspections for physical security at major fuel fabrication facilities. Approximately 14 physical security inspections were performed by Region-based inspectors. Performance-based inspection procedures were followed by both MC&A and physical security inspectors.

Reactor Safeguards

Reactor Safeguards Inspection and Licensing. Within the four NRC Regional Offices, a total of 119 safeguards inspections were conducted during the report period at licensed nuclear power reactors. Approximately, 210 revisions to licensee security, contingency, and guard training plans were reviewed and found acceptable by both regional and headquarters staff.

Operational Safeguards Response Evaluations at Power Reactors. After completion of the Regulatory Effectiveness Review Program in May 1991, the NRC staff initiated an Operational Safeguards Response Evaluations (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 U.S. Army personnel. 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/safeguards interface reviews to ensure that safeguards measures do not adversely affect the safe operation of the plant. Ten OSREs were conducted during fiscal year 1994, for a total of 27 to date. The effort resulted in a combined total of 20 significant improvements at nine power reactor sites.

Fitness-for-Duty Programs at Power Reactors. Power reactor licensees are also 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 four years of the program. The Commission has sought comments on various approaches for designating persons who should be randomly tested—in particular, employees without direct safety-related duties—to determine if and how the current approach should be revised. Comments received were being evaluated at the close of the report period.

Program performance data provided by licensees have been summarized in "Fitness for Duty in the Nuclear Power Industry: Annual Summary of Program Performance Reports, CY 1993" (NUREG/CR-5758, Volume 4). The report indicates that nearly 243,000 tests for the presence of illegal drugs and alcohol were conducted during calendar year 1993, of which 1,512 were positive. The majority of the positive test results (952) were obtained through pre-access testing (a

1.04 percent positive rate). There were 341 positive tests from random testing (0.23 percent positive rate). The positive rate also varied by worker category. For example, 0.17 percent of random tests of licensee employees were positive; for long term contractors, the positive rate was 0.11 percent; and for short-term contractors, the positive rate was 0.39 percent. And the general trend of the positive rates, with minor exceptions, is downwards. The Commission modified the fitness-for-duty program, effective January 1, 1994, to permit licensees to lower the random testing rate from 100 percent to 50 percent.

Access Authorization Programs at Power Reactors. Power reactor licensees are required to implement access authorization programs under 10 CFR 73.56. The programs, through the use of background investigations, psychological assessments, and behavioral observations, 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.

The results of 16 initial access authorization inspections have been evaluated to determine if changes to the program requirements are needed and if modifications need to be made to the scope and depth of the inspection program. The programs were found to be generally effective. Because of the number of implementation issues identified, the staff has determined that initial inspections should be conducted at all facilities not previously inspected.

The staff is also revising the NRC Core Inspection Program to include the inspection of access authorization programs previously inspected under TI 2515/116. The results of these inspections will be evaluated to determine if further program changes are necessary. Additional program guidance is being developed to address program implementation issues identified during the initial inspections.

Nonpower Reactors. During fiscal year 1994, the NRC completed 18 safeguards inspections of nonpower reactors (NPRs). The program to convert 25 NPRs from HEU fuel to low-enriched uranium (LEU) fuel is continuing, its progress dependent on the availability of DOE funding, the availability of a suitable replacement fuel, and on whether a reactor has some "unique purpose" requiring HEU fuel. As of the end of fiscal year 1994, one license had been terminated; two licensees had received decommissioning orders; one licensee was planning its reactor's decommissioning; and eight licensees had converted to LEU fuel. The remaining 13 reactors are operating with HEU fuel. Eight of these have been funded by DOE for evaluation of the operational effects of the fuel conversion and for preparation of an SAR. (Two commercial reactor licensees will not be funded by DOE for fuel conversion.) The Commission is also reviewing two "unique purpose" applications (there is no suitable replacement fuel for one of these reactors).

Transportation Safeguards

Spent Fuel Shipments. Safeguards requirements were applied to 20 shipments of irradiated spent reactor fuel made over approved routes during fiscal year 1994. Ten of these shipments were by rail. One of the shipments was a transient shipment passing through the United States.

Strategic Special Nuclear Material Shipments. Six domestic and two export shipments of strategic special nuclear material (SSNM, which is"less than five but more than one kilogram" of HEU) were completed during fiscal year 1994. Four export shipments of five or more kilograms were made during the fiscal year.

Tracking International Shipments of Special Nuclear Material. NRC regulations require licensees to notify the NRC of international shipments of special nuclear material (SNM) and natural uranium. During fiscal year 1994, the NRC received about 179 such notifications. When appropriate, these were forwarded to the Department of Transportation for notification of international authorities.

International Activities

International Safeguards

The NRC is responsible for implementation of IAEA safeguards at licensed nuclear facilities in the United States. Although there are currently no NRC–licensed nuclear facilities under IAEA inspection, the United States continues to report to the IAEA all accounting information required by the Protocol to the U.S./IAEA Safeguards Agreement for five fuel fabrication facilities and to report all exports and imports. The NRC ensures that licensed facilities maintain their MC&A systems and conduct their reporting responsibilities to meet the terms of the U.S./IAEA Agreement, as specified in 10 CFR Part 75. During 1994, an NRC staff member began service as Chairman of the Subgroup on IAEA Safeguards in the United States. The Subgroup reports to the Subcommittee on International Safeguards and Monitoring of the IAEA Steering Committee.

In response to concerns regarding nuclear-related activity in Iraq, the IAEA is looking 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. The information is to include (1) early provision of design information on new facilities; (2) early provision of information on major modifications and additions to existing facilities; (3) expanded reporting of exports, imports, and production of nuclear materials; and (4) reporting of the import and export of certain non-nuclear materials and equipment. The NRC took measures to satisfy the request during the report period.

The NRC assisted the IAEA in conducting a Short Notice Random Inspection (SNRI) test at an NRC-licensed facility. The SNRI test was for the shipments and receipts at an LEU fuel fabrication plant. This approach, still under evaluation, is considered to have significant potential in improving the efficiency of IAEA safeguards.

The NRC is responsible for the licensing of exports and imports of nuclear facilities, equipment, material, and related substances, as set forth in the Atomic Energy Act, as amended. Further, under amendments to the Act adopted in the Nuclear NonProliferation Act of 1978, the NRC must be consulted by the Department of State (DOS) regarding new agreements for nuclear cooperation. Also, the NRC must be consulted by the DOE before authorization of subsequent arrangements for the retransfer of U.S.-origin nuclear materials from one country to another, and before providing technological assistance with foreign nuclear energy activities. During 1994, 110 international safeguards technical reviews were performed regarding export applications, agreements for 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 continues to contribute to U.S. Government efforts to strengthen IAEA safeguards and to maintain the effectiveness of implemented safeguards. During 1994, a special study continued with respect to the difficult issues associated with the establishment of internationally acceptable criteria for the termination of IAEA safeguards on nuclear materials contained in high-level waste.

The NRC continues to contribute to the total U.S. support of IAEA safeguards through interagency efforts involving the DOE, the Arms Control and Disarmament Agency, the DOS, the Department of Defense, and the NRC. These interagency activities serve to coordinate U.S. Government technical safeguards support to the IAEA. An NRC employee 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. The focus of recent SAGSI reviews has been on measures to improve the efficiency of IAEA safeguards.

Former Soviet Union Activities

The NRC continues to provide support to the interagency Cooperative Threat Reduction Program. This initiative, originally called the Safe and Secure Dismantlement program, seeks to coordinate support to the republics of the former Soviet Union in dismantling their nuclear arsenals and deterring proliferation of weapons of mass destruction. The NRC's primary role is to supply assistance to these republics in setting up national regulatory systems for MC&A and physical protection.

Russia signed the MC&A Implementing participated in the first Technical Working Group meeting in February 1994, as well as a site survey of the Elektrostal LEU fuel fabrication facility outside Moscow. These steps led to a number of follow-up activities, including a visit by Elektrostal operators and Russian regulatory representatives to the Siemens LEU fuel facility in Richland, Wash., for MC&A training, and a visit to CE in Hematite, Mo., by Russian nuclear regulatory representatives, to observe the NRC inspection of an NRC-licensed fuel fabrication facility.

Kazakhstan authorities signed the MC&A Implementing Agreement in December 1993, and in July 1994, the NRC participated in the first

A delegation of facility operators from the Russian fuel fabrication facility Elektrostal (located near Moscow) visited Siemens Power Corporation, Richland, Washington, in September 1994. The purpose of the visit was to familiarize the Russian facility operators with material control and accounting procedures and equipment at an equivalent NRC-licensed facility in the U.S. The attendees included representatives from the Russian regulatory agency GOSATOMNADZOR (GAN), the Department of Energy, Los Alamos National Laboratory, and the Defense Nuclear Agency.

Kazakhstan. The NRC has also participated in MC&A and physical protection site surveys at the Ulba Nuclear Fuel Pellet Plant in Ust Kamenogorsk, and the Semipalatinsk Research Facility. An NRC representative was also part of an IAEA-sponsored team—consisting of representatives from countries providing safeguards assistance to Kazakhstan—that surveyed the BN-350 Fast Breeder Reactor Complex in Aktau and the Almaty Institute for Nuclear Physics.

Ukraine also signed an MC&A Implementing Agreement in December 1993. The NRC has participated in two Technical Working Group meetings, the first one in Kiev and the second at NRC Headquarters. NRC representatives have also visited the Chernobyl Nuclear Power Plant for a preliminary assessment of the MC&A and physical protection systems and have participated in site-surveys at the South Ukraine Nuclear Power Plant and the Kiev Institute for Nuclear Research.

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. The NRC's role is to ensure that transparency measures in U.S. commercial fuel fabrication facilities are practical. NRC representatives have participated in negotiations in Moscow with the Russian Federation. In June, they escorted a Russian delegation to the General Electric Fuel Fabrication Plant for a familiarization visit. The first shipments of material subject to the Agreement are expected in early 1995.

As part of the NRC's support to Russia and Ukraine under the Lisbon Initiative, programs have been established to assist the regulatory bodies in both countries in establishing regulatory control over, among other things, fuel cycle activities, transportation of nuclear and radioactive materials, and the storage of spent fuel. During fiscal year 1994, this support involved visits by NRC technical staff to both countries, to gain an understanding of the current situation and to brief key Russian and Ukrainian regulatory personnel on NRC approaches to regulation. During those meetings, agreements were reached regarding further training and other assistance to be provided.

Several Ukrainian specialists have visited the United States to improve their familiarity with U.S. regulatory practice, including licensing and inspection procedures, and to obtain training in developing regulations, guides and related documents. Additional training visits by Russian and Ukrainian regulators are scheduled for fiscal year 1995.

International Physical Protection

Bilateral consultations on physical protection of nuclear facilities and materials are scheduled with countries to share technical information and experience concerning the physical protection of civil nuclear activities. During fiscal year 1994, visits were made to Romania, Slovenia, Bulgaria, Peru and Colombia. Similarly, teams from Belgium and the United Kingdom visited the NRC and NRC-licensed facilities.

Substantial increases in reported incidents of smuggling and offers for the sale of alleged weapons-usable nuclear materials have demonstrated the importance of ensuring a high level of physical protection of 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, including materials that originated in the United States and elsewhere. Material is tracked from facility to facility, on a continuing basis, from original refinement to eventual disposal. Export/import

A delegation of Ukrainian nuclear security specialists from the State Committee on Nuclear and Radiation Safety (SCNRS), the Ministry of Internal Affairs (MIA), and the South Ukraine Nuclear Power Plant visited the Waterford Nuclear Power Plant for a workshop on security systems design, procedures, and the licensing process. The trip was sponsored by the Cooperative Threat Reduction Program, under which the U.S. assists former Soviet republics in securing their nuclear materials and instalations.

transactions are also tracked. Selected data, based on NMMSS output, are then furnished to the IAEA, in fulfillment of U.S. international obligations and bilateral agreements. In July 1994, the NRC published a final rule to make licensee submittal of information in computer-readable form mandatory. The final rule, effective in October 1994, streamlines the collection of nuclear material transaction data and increases the accuracy of the reported data.

Safety and Safeguards Event Evaluation and Response

Reporting of Nuclear Criticality Safety Events

In October 1991, the NRC Bulletin 91-01, "Reporting Loss of Criticality Safety Controls," was issued to all the NRC-licensed facilities whose activities include hot cell operations, enriched uranium operations, uranium fuel research and development, and 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. After review of licensees' responses and comments, the NRC issued a supplement, in July 1993, to clarify the immediate and 24-hour reporting criteria for degraded nuclear criticality safety controls. Further discussions with licensees disclosed a need for even further clarification of the reporting requirements. This discovery gave rise to the NRC Information Notice 94-73, "Clarification of Criticality Reporting Criteria," issued in October 1994. The types of information to be reported to the NRC are also clarified in NRC Information Notice 93-60, Supplement 1, to be issued during fiscal year 1995.

Since licensees began reporting "criticality" safety-related events, under Bulletin 91-01, 58 events have been reported. Fourteen of these events were reported during fiscal year 1994. A small number of them resulted in enforcement actions by NRC Regional Offices. The majority of the events were reported within 24 hours and involved less significant degradations of criticality safety controls. The reported events are now maintained in a computer data base by FCSS. The system is used for trends-and-patterns analysis, to better focus NRC inspection resources on areas of greatest 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 the NRC's safeguards incident response plans for responding to actual thefts of nuclear material or to 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 interagency meetings of Federal agencies concerned with, and prepared to deal with, terrorism. Liaison also includes briefings and consultations with the representatives of other governments regarding NRC threat assessment and incident response activities. During fiscal year 1994, the NRC continued its participation in a variety of training sessions for intelligence community threat analysts and others, to augment their understanding of nuclear-related matters. Finally, the NRC continued to work closely with the DOE and other interested agencies on reported attempts to sell alleged nuclear materials. The staff informed the Commission of a number of nuclear smuggling incidents involving actual HEU or plutonium, which occurred between May and August 1994. The joint NRC/DOE Communicated Threat Credibility Assessment Team, a multi-disciplinary assessment team, was called on periodically during fiscal year 1994 to assess attempts to sell alleged nuclear and radioactive materials.

Design Basis Threat. Besides modifying the design basis threat for radiological sabotage to include the malevolent use of vehicles and the use of a vehicle bomb, the staff re-examined several years' worth of worldwide event data. This effort was undertaken to ensure that no trend in adversary characteristics (e.g., group size or weaponry) had gone undetected during the recent years that might require additional changes in the threat statements. The staff completed its re-examination of the threat statements and concluded that no change was warranted at this time. The staff also continued its ongoing review of the threat environment and provided its findings on a semi-annual basis to the Commission and senior NRC management. The staff also gave assistance to Russia, Kazakhstan, and Ukraine in the development of design basis threat methodology for use in those countries.

Incident Response. During the report period, the fuel cycle safeguards incident response plan was reviewed and updated. In May 1994, the Fuel Cycle Safeguards Incident Response Team took part in an incident response exercise in the new NRC Operations Center at Two White Flint North, North Bethesda, Md.

Safeguards Summary Event List

The staff continued to analyze safeguards events related to threats and incidents, in order to identify trends, patterns and anomalies. During fiscal year 1994, the staff published the SSEL, NUREG-0525, Volume 2, Revision 2, 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, 1993. Volume 1—which reformatted and repackaged summarized events that occurred and were reported from pre-NRC through December 31, 1989—was published in July 1992. The SSEL is intended to provide a broad perspective on the nature of safeguards incidents in the licensed nuclear industry, both unusual and routine, and is distributed to the licensed nuclear community, foreign governments, the Congress, and other Federal agencies.

Safety and Safeguards Regulatory Activities and Issues

Proposed Rules

The following rulemaking actions and studies to determine the need for rulemakings were initiated during fiscal year 1994:

- *Security Plan Format Changes.* Work has begun on a rulemaking to amend 10 CFR Parts 50 and 70, to eliminate submittal of physical security plans in two parts for applicants of 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 if the changes do not diminish the effectiveness of the plans.

- *Independent Spent Fuel Storage Installations Vehicle Bomb Study.* A study was initiated to determine whether a potential need exists for a regulation to require the installation of vehicle barriers around Independent Spent Fuel Storage Installations (ISFSIs). 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 Special Nuclear Material 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 concentration of special nuclear material (SNM), instead of "total SNM mass," for very low-specific-activity soil. The staff has determined that this modification is feasible and is planning to initiate a rulemaking to add an exemption based on a concentration limit. The change would facilitate the delivery of very low-activity waste to a disposal site with no additional risk to the public health and safety.

The following rulemaking actions continued during fiscal year 1994:

- *Safety of Fuel Cycle Facilities and Others Licensed for Special Nuclear Material.* Efforts continued on a major rewrite of the rule governing the possession and use of special nuclear material (SNM), 10 CFR Part 70. A major objective is to update and enhance the regulatory basis for the regulation of facilities processing large amounts of SNM. The principal changes are: (1) the use of an Integrated Safety Analysis of plant processes, and of changes to plant processes, to identify potential areas of risk and to elucidate how safety is achieved; (2) more focus on chemical process and fire protection safety; and (3) more specific performance requirements for management control systems for plant safety. In addition, 10 CFR Part 70 is being rewritten to improve its organization and to make it easier for applicants and licensees to distinguish which requirements apply to their activities.

- *Strategic Special Nuclear Material in Transit.* Work is continuing on an initiative to upgrade physical protection of strategic special nuclear material (SSNM) in transit. A potentially cost-effective alternative to rulemaking is under consideration. Because there are currently no licensees that would be affected by a proposed rulemaking, the NRC is considering handling the issue on a case-by-case basis, instead of performing a generic rulemaking. To this end, interim licensing criteria are in development that could be used as guidance for licensing an entity desiring to transport Category I quantities of SSNM.

- *Spent Fuel Storage Safeguards.* Work continued on a proposed rulemaking to amend 10 CFR Parts 60, 72 and 73, to clarify applicable safeguards requirements for all forms of spent fuel storage. The rule would apply to ISFSIs licensed under a specific or general license, the proposed DOE geologic repository and possible monitored retrievable storage sites, and permanently shutdown power reactors still holding an operating license. The rule also entails amending Part 75 to clarify its applicability to the geologic repository.

Final Rules

The following rules became final in fiscal year 1994:

- *Certification of Gaseous Diffusion Plants.* In September 1994, a new final rule, 10 CFR Part 76, was published to establish the requirements for certification and operation of the DOE gaseous diffusion plants. These plants are owned by the DOE and leased to the USEC for the enrichment of uranium. (See discussion earlier in this chapter.) The rule includes procedural requirements; generally-applicable NRC health, safety, and environmental standards; technical safety requirements; and safeguards requirements specific to the gaseous diffusion plants leased by the corporation.

- *Design Basis Threat.* In August 1994, the final rule to amend the physical protection regulations for operating nuclear power reactors was published. The rule change added Section 73.1(a)(1)(i)(E) and 73.1(a)(1)(iii), associated with the design basis threat for radiological sabotage, to include protection against malevolent use of vehicles at nuclear power plants. The rule change also added Sections 73.55(c)(7) through 73.55(c)(10). These sections require licensees and applicants to establish and document vehicle control measures to protect the facility from the use of a land vehicle to gain unauthorized proximity to vital area barriers. The changes also require licensees to assess whether the measures taken to protect against vehicle intrusion provide protection against a vehicle bomb, consistent with design goals and criteria specified by the Commission.

- *Physical Fitness Training Requirements.* In July 1994, a final rule to amend 10 CFR Part 73 was published requiring Tactical Response Team (TRT) members, guards, and other armed response personnel at Category I fuel cycle facilities to participate in a continuing physical fitness training program and to pass an annual criteria-based performance test. As an alternative, licensees are permitted to develop a content-based, site-specific test, to be administered quarterly, and to confirm that this test duplicates the response duties that are expected of TRT members, guards, and other armed response personnel in the event of a strenuous tactical engagement.

- *Licensee Submittal of Data in Computer-Readable Form.* In July 1994, a final rule to amend 10 CFR Parts 40, 72, 74, 75, and 150 was published requiring certain licensees to submit data to the NRC in computer-readable format. This rule streamlines the collection of nuclear material transaction data and increases the accuracy of the reported information. The final rule will save money for both the NRC and licensees in the data collection process. To facilitate licensee submittal in computer- readable form, the NRC will provide licensees with a diskette containing user prompts to assist them in preparing the data in the required format.

Guidance Documents

- *Integrated Safety Analysis of Fuel Cycle Facilities.* The NRC is preparing a document giving guidance to industry on acceptable ways of performing an Integrated Safety Analysis (ISA). As part of this effort, the NRC held a publicly-attended workshop in August 1993, at which an outline of the proposed guidance document was discussed. In September 1994, the NRC held another public workshop to discuss the draft ISA guidance document previously provided to licensees, license applicants, and other interested parties. The NRC staff presented a summary of the ISA guidance document and explicated the staff's response to comments received concerning the document. A draft will be provided with the proposed rulemaking package of modifications to 10 CFR Part 70, noted above.

- *Physical Security Guidance Documents.* A new guidance document, "Review Criteria for the

Physical Fitness Training Requirements in 10 CFR Part 73" (NUREG-1504), was published in September 1994. It provides the review criteria that will be used by the licensing staff in reviewing and approving the changes to licensees' physical security plans that respond to the new physical fitness requirements of 10 CFR Part 73.

- ***Standard Review Plan for the Review of a License Application for a Uranium Fuel Processing and/or Fabrication Facility.*** Work is continuing on the development of an SRP to provide guidance to the NRC staff for the review and evaluation of the health and safety, safeguards, and environmental aspects of applications for licenses to possess and use SNM to produce nuclear fuel. This guidance is also applicable to the review and evaluation of proposed amendments and license renewal applications. The guidance contained in this document will also be useful to licensees in understanding the intent of new performance-oriented requirements in the proposed rewrite of 10 CFR Part 70. A draft of the SRP will also be provided with the proposed modifications to 10 CFR Part 70.

- ***Standard Format and Content Guide.*** A Standard Format and Content Guide (SF&CG) is being developed for use by applicants for licenses, license amendments, and license renewal applications, as described above in connection with the SRP guidance document. The SF&CG will describe the scope and type of information applicants should submit with their applications for review by the NRC staff. A draft SF&CG will also be published with the proposed rulemaking package for 10 CFR Part 70. Work also continued during fiscal year 1994 to update a number of existing physical security guidance documents. These documents are used by the staff, licensees, and members of the public, and have proved particularly useful in providing guidance to foreign countries as to how the NRC implements many of its programs. Updated documents issued in fiscal year 1994 include guidance on the use of fiber optics in physical protection and a revised, simplified format for Category I facility physical protection plans.

Waste Management

Chapter 6

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

High-Level Waste Program

Regulatory Development Activities

During the fiscal year, 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. As part of this effort, the NRC staff undertook a rulemaking on siting and performance requirements for the Department of Energy's (DOE's) proposed geologic repository. The proposed rule, entitled "Clarification of Assessment Requirements for the Siting Criteria and Performance Objectives," would revise 10 CFR Part 60 only for the purpose of clarifying that the DOE's investigations and evaluations will be judged as to adequacy in terms of their conformance with post-closure performance objectives. In addition, the provisions of the rule concerning presentation of information in DOE's license application would be completely separated from the technical criteria of 10 CFR 60.122 and moved to 10 CFR 60.21, the section of the law that defines the required contents of the license application. The proposed rule was published in the *Federal Register* on July 9, 1993. Action on the final rule was expected during fiscal year 1994; however, work on the rulemaking has been postponed until the NRC staff reviews DOE's proposed program approach (PPA), introduced during the report period, and identifies its impact on the rulemaking.

The NRC staff also analyzed 10 CFR Part 60 to ascertain whether all of the repository functions dealing with the issue of preclosure radiological health and safety were covered in sufficient depth. As a result of this analysis, the staff developed a draft proposed rulemaking, "Design Basis Events for the Geologic Repository Operations Area," to clarify the relationship of 10 CFR Part 60 requirements to potential accident conditions, and to provide consistency among NRC regulations governing similar activities by including a "controlled-use area" and by revising the definition of "important to safety." The draft proposed rulemaking would also address an April 19, 1990 petition for rulemaking (PRM–60–3) by DOE, requesting that 10 CFR Part 60 be amended to include quantitative dose criteria for a design basis accident. The staff submitted a notation vote paper, SECY–92–408, to the Commission, concerning the proposed amendments to Part 60. During the report period, the Commission issued a staff requirements memorandum (SRM) disapproving publication of the proposed amendments. Consistent with Commission guidance in the SRM, the staff made substantive changes to the proposed amendments and, on September 13, 1994, submitted a revised notation vote paper to the Commission—"Proposed Amendments to Part 60 on Disposal of High-Level Radioactive Wastes in Geologic Repositories—Design Basis Events for the Geologic Repository Operations Area" (SECY–94–239).

In the Energy Policy Act of 1992 (the 1992 Act), the Environmental Protection Agency (EPA) is directed to promulgate health-based standards for protection of the public from releases of radioactive materials from a high level waste repository at Yucca Mountain in Nevada.

Pursuant to the mandate of the 1992 Act, the EPA has contracted with the National Academy of Sciences (NAS) to conduct a study and provide recommendations to the EPA on the appropriate technical bases for such standards. Although the NAS may consider a range of issues, its recommendations must address: (1) whether a standard based on doses to individuals is reasonable, (2) whether post-closure oversight and active institutional controls can effectively ensure that exposures of individuals will be maintained within acceptable limits, and (3) whether scientifically supportable probability estimates of human intrusion into a repository over 10,000 years can be made.

After the EPA promulgates its standard under the 1992 Act—which must be consistent with the findings and recommendations of the NAS—the NRC will have to modify the technical criteria in 10 CFR Part 60 to conform to the new standard. At the request of the committee conducting the NAS review, the NRC presented its views on the issues to the committee and provided documentation of the history of and bases for NRC regulations, as well as current NRC staff and contractor work in repository performance assessment (PA). Two NAS Committee meetings were held in fiscal year 1994. The committee was expected to issue formal, peer-reviewed recommendations by late 1994 or early 1995.

Regulatory Guidance Activities

During this fiscal year, the staff issued one final Staff Technical Position (STP), entitled "Consideration of Fault Displacement Hazards in Geologic Repository Design." STPs provide guidance to DOE on selected topics, setting out the criteria to be met for methods to be acceptable to the NRC staff, i.e., in compliance with the requirements of 10 CFR Part 60. This STP (NUREG-1294) addresses the subject of how geologic faults of regulatory concern should be dealt with. Specifically, the STP recognizes the acceptability of designing the geologic repository to take into account the effects associated with faults of regulatory concern (e.g., displacement) and expresses the staff's views on what is needed from DOE, should DOE choose to locate structures, systems and components important to safety or important to waste isolation in areas that contain "Type I" faults (e.g., faults with Quaternary-age displacement).

Technical Assessment Capability for Repository Licensing Reviews

The NRC staff continued work on the draft License Application Review Plan (LARP; NUREG-1323), the comprehensive guidance document for the NRC staff's review of a potential DOE license application to construct and operate an HLW repository. The 97 individual review plans that comprise the LARP cover the NRC requirements, in 10 CFR Part 60, for which DOE must show compliance in its license application. The review plan topics are generally consistent with the draft "Format and Content Regulatory Guide for the License Application" (Regulatory Guide DG-3003). Each review plan will have a standard structure with separate sections identifying the applicable 10 CFR Part 60 requirements, and will include the staff's review strategy, review procedures and acceptance criteria, implementation (interfaces and responsibilities), and sample staff evaluation findings.

During the report period, the staff completed the work needed for publication of the draft LARP, Revision 0. Preliminary copies of the draft LARP were also sent to DOE and other parties for their information. The LARP gives guidance to the NRC staff in its review of DOE's license application to construct a mined geologic repository for the disposal of spent nuclear fuel and other HLW at Yucca Mountain. The LARP is intended to ensure the quality and uniformity of the staff reviews, establish the appropriate review priorities, and present a well-defined base from which to evaluate proposed changes in the scope and requirements of staff reviews. Because it is a public document, it will help 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. This draft version represents the staff's initial efforts in developing the LARP. Beginning with this version, the staff currently plans to issue a revision to the draft LARP each year through 2000, culminating with the issuance of a final LARP in 2001. Each revision of the draft LARP will incorporate the work completed by the staff during that particular year. Revision 0 and subsequent revisions of the draft LARP are to be considered preliminary documents and, as such, subject to change.

Revision 0 of the LARP contains two completed individual review plans and the first two sections for most of the 95 other individual review plans. In parallel with the publication of LARP Revision 0 in fiscal year 1994, the staff began work toward completion of 13 of the 95 remaining individual review plans. Also in fiscal year 1994, the staff began a critical review of the 60 "Key Technical Uncertainties" that it considers most important to demonstrating compliance with 10 CFR Part 60 performance objectives. Newly completed individual review plans and a revised compilation of Key Technical Uncertainties will be published in the next revision to the LARP.

Further support in preparation of the LARP was the NRC staff's continued progress in developing an independent performance assessment (IPA) capability to review the DOE's PAs for a geologic HLW repository. DOE intends to use PAs in its license application, in order to show compliance with 10 CFR Part 60, including, by reference, the generally applicable environmental standard to be issued by EPA. For its part, the NRC staff's IPA capability will strengthen its ability to review DOE's PAs and other aspects of the DOE's HLW program. In particular, the IPA program will aid in the development of requirements and guidance regarding output and methodologies with respect to analysis of the DOE's PA, besides refining the NRC's review strategy.

During the report period, the "NRC Iterative Performance Assessment Phase 2: Development of Capabilities for Review of a Performance of a High-Level Waste Repository" (NUREG–1464) underwent review by staff of the NRC and of the Center for Nuclear Waste Regulatory Analyses (CNWRA). Copies of the revised draft were sent to DOE, the State of Nevada, and affected units of local government. At the end of the report period, NRC staff was preparing the NUREG for final publication, expected by the end of the calendar year.

Yucca Mountain Site Characterization Reviews and Interactions

The NRC staff continued pre-licensing interaction with DOE and provided guidance on DOE's ongoing site characterization activities. DOE's activities at the Yucca Mountain site continued to expand in fiscal year 1994. Of particular significance was the start of excavation for the exploratory studies facility (ESF), using the tunnel-boring machine.

Along with the increased activity at the site, the NRC staff had numerous interchanges with DOE. Among these were seven meetings, eight technical exchanges, and five site visits. The staff also attended four DOE-sponsored meetings. Throughout the same period, the NRC On-Site Licensing Representatives continued to observe the DOE's ongoing site characterization work and to provide liaison with the DOE, the State of Nevada, and affected units of local government.

In addition to these activities, the NRC staff also continued its pre-licensing review of a variety of DOE's site characterization activities and reports, including DOE semiannual progress reports, topical reports, revisions to its license application annotated outline, and study plans. The staff also continued to make progress in its follow-up activities regarding DOE's resolution of staff concerns identified in its Site Characterization Analysis (SCA), dated August 1989.

The staff's reviews of DOE site characterization study plans continued during fiscal year 1994. Of the 66 new and 29 revised study plans submitted by DOE for the NRC staff's review, the staff has, to date, completed reviews of 67 plans; deferred review of 11 pending receipt of needed revisions from DOE; and concluded that eight of the revised study plans submitted by DOE needed no review, based on the limited scope of the revisions. The remaining nine study plans are under staff review. The staff has identified no reasons to object to start-up of activities related to any reviewed study plan; it has conveyed comments to DOE related to nine of the study plans reviewed.

In 1993, the DOE submitted, for NRC staff review, a topical report entitled, "Evaluation of the Potentially Adverse Condition of Extreme Erosion during the Quaternary Period at Yucca

Mountain, Nevada." The NRC staff conducted an acceptance review of the report and found it to be acceptable for technical review. The staff's acceptance, however, was contingent on receiving additional information, which DOE provided on March 31, 1994. Before completing its technical review, the staff also conducted a site visit, in February 1994. In a letter dated August 22, 1994, the staff concluded that the topical report did not contain sufficient information to demonstrate the absence of the potentially adverse condition. The technical bases for the staff's conclusion are: (1) the topical report does not address the subject of extreme erosion, but focuses on long term average rates of erosion; (2) the suitability of the method used to estimate the ages of past incidents of erosion had not been adequately demonstrated; and (3) the qualification process for the dating process was not acceptable. NRC and DOE staff have been discussing these concerns and DOE's resolution of them, so that the DOE can revise the topical report and resubmit it to the NRC.

The DOE has presented its Proposed Program Approach (PPA) in various meetings with NRC staff and other interested parties and requested comments on its proposed site suitability process. The DOE is undertaking the PPA to streamline the HLW program and to demonstrate measurable progress. On August 4, 1994, DOE published a *Federal Register* notice (FRN) describing how it plans to apply its PPA to the site suitability process. The FRN and a DOE report, which it referenced, provided the NRC staff with some of the first documented details on the PPA. The FRN focused only on site suitability and on DOE's interim technical site suitability decision, which leaves the NRC staff no formal role. However, the NRC staff has indicated its interest in ensuring that DOE's site suitability process, which will lead to a recommendation on the site, is carried out in a way that is not inconsistent with the DOE siting guidelines. The NRC staff has reviewed the available information and believes that the PPA affects the entire repository program, and that decisions made with regard to data collection and analysis for site suitability inevitably impact the site recommendation and licensing processes for which the NRC has responsibilities. The NRC staff will be transmitting its comments on the FRN to the DOE, noting the importance of careful consideration of the impact on the entire repository program of PPA decisions being made now.

Interactions With Affected Governmental Units and Indian Tribes

The State of Nevada, representatives of affected units of local government, and other interested parties continued to participate in technical exchanges and meetings between the NRC and the DOE. These participants also continued to receive regular notification of upcoming NRC/DOE HLW meetings, as well as NRC Advisory Committee on Nuclear Waste meetings. Furthermore, the NRC staff continued its active role in ensuring that these parties receive all correspondence and publicly-available NRC reports on the HLW program.

Quality Assurance Activities

The NRC staff has conducted various activities in the area of quality assurance (QA). The staff continued to review DOE and DOE contractor QA plans and procedures (document reviews), to evaluate DOE's effectiveness in auditing its program to identify and correct problems in program implementation, and to evaluate DOE contractor effectiveness in implementing QA programs. In addition, as part of its evaluation of DOE's effectiveness in auditing and of DOE contractor effectiveness in QA program implementation, the NRC staff observed the DOE audits conducted at all major DOE contractor organizations participating in the site characterization program for the Yucca Mountain Project. Based on findings from DOE QA audits of the DOE Management and Operating Contractor (M&O) performed during this reporting period, the NRC staff has raised concerns that the M&O QA program is not being implemented in a manner that will ensure acceptability of the ESF. In an August 1994 meeting with the DOE, the NRC staff expressed its concern to DOE about the recurrence of problems in the M&O QA program over the past two years. The NRC staff is preparing a letter to the DOE that will give the results of its evaluation of the information obtained during the meeting, explain its concerns, and recommend what DOE action should be taken to resolve its concerns with the M&O QA program.

Center for Nuclear Waste Regulatory Analyses

NRC's contract with the Center for Nuclear Waste Regulatory Analyses (CNWRA) was renewed on October 15, 1993 and the CNWRA completed its seventh year of operation in October 1994. The CNWRA provides a broad range of support to NMSS and to the Office of Nuclear Regulatory Research, with respect to the HLW program. CNWRA staff are located at the Southwest Research Institute in San Antonio, Tex., and at the Washington Technical Support Office in Arlington, Va.

Together with the NRC staff, CNWRA continued to develop and implement a computer-assisted "systems engineering approach," called the Systematic Regulatory Analysis (SRA), for the development of the staff's regulatory documents. The purpose of SRA is to identify and reduce uncertainties, to select strategies and methods for determining compliance with NRC regulatory requirements, and to define issues in licensing a HLW geologic repository. This approach is taken by the NRC 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; the 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 sorption mechanisms; regional hydrology; performance assessment issues; volcanism/seismology; volcanism; and tectonic analysis.

Low-Level Waste Management

The main objective of the NRC's low-level waste (LLW) program is to provide adequate protection of the public health and safety and the environment in the management of LLW, in conformance with the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA).

Regulations and Guidance

Withdrawal of Proposed On-Site Storage Rule. In April 1994, the NRC withdrew a notice of proposed rulemaking, published in February 1993, that would have amended its regulations for reactor, material, fuel cycle, and independent spent fuel storage licensees. The proposed rule would have established a regulatory framework containing the procedures and criteria that would have applied to on-site storage of LLW, after January 1, 1996. After considering the comments submitted on the proposed rule, the NRC determined that there was insufficient connection between the requirements in the rule for documenting that a licensee had exhausted reasonable waste disposal options and the objectives of reducing on-site storage of LLW, or encouraging the development of new LLW disposal capacity. The NRC also determined that it could not state that the rule would have provided a licensee substantially greater incentives over existing requirements to dispose of its LLW at available locations in a timely manner. Therefore, the proposed rule would have been neither a necessary nor significant addition to the protection of the public health and safety. As a result, the Commission decided to withdraw the proposed rule.

The Commission continues to favor disposal of LLW over storage and emphasizes that withdrawal of this proposed rulemaking in no way alters its position. The Commission expects LLW disposal facilities to be sited and developed in a timely manner. The Commission also expects that the major interested parties, including waste generators and States, will continue to take all reasonable steps to ensure that LLW disposal capacity is available soon.

Revisions to LLW Storage Guidance. During fiscal year 1994, the NRC staff updated its guidance on interim storage of LLW, in anticipation of increased storage of LLW by licensees. On June 30, 1994, the Barnwell, S.C., disposal facility closed to all "out-of-compact" LLW generators. As of that date, LLW generators in 31 States plus the District of Columbia and Puerto Rico had no access to a permanent disposal facility, thus forcing them to store LLW at their own facilities. Because interim storage of this LLW will be required for at least several more years before new disposal capacity becomes available, and perhaps longer, the staff is in the process of updating all of its previous guidance for LLW storage to ensure that it appropriately addresses the current situation. Four guidance documents were updated and consolidated into a single document and sent to the Agreement States for review and comment in August 1994. The guidance document addresses storage by nuclear power reactor licensees and by materials and fuel cycle licensees; storage of non-reactor waste (e.g., from universities) at a nuclear power reactor site; and alternative means of managing waste when a disposal facility is not available. After review by the Agreement States, the document will be noticed in the *Federal Register* for public comment, and issued as a final document in fiscal year 1995.

Standard Review Plan. During fiscal year 1994, the NRC staff issued the final version of Revision 3 to the "Standard Review Plan (SRP) for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility" (NUREG-1200). The SRP provides guidance to regulatory personnel performing safety reviews of applications for licenses to construct and operate an LLW disposal facility. Revision 3 covers:

- Licensing Process
- Design Considerations
- Guidance on Soil Cover Systems Placed over Low-Level Radioactive Waste
- Receipt and Inspection of Waste
- Waste Handling and Interim Storage
- Waste Disposal Operations
- Release of Radioactivity—Introduction
- Occupational Radiation Exposures
- Radionuclide Inventories
- Radiation Protection Design Features and Operating Procedures
- Radiation Protection Program.

Revision 3 had been issued as a draft for public comment in 1993, and the staff has considered and resolved public comments in preparing the final version.

Performance Assessment Guidance. The staff is carrying out a program to develop LLW PA guidance and to enhance staff expertise in performance assessment guidance. The Low-Level Waste Performance Assessment (LLWPA) program plan was developed and is being implemented through the combined efforts of staff from several organizations, all members of a Performance Assessment Working Group.

During fiscal year 1994, staff efforts focused on two main activities: (1) developing and publishing for comment by the Agreement States and other Federal agencies a draft branch technical position (BTP) on LLW PA that addresses important issues in PA modeling; and (2) gaining experience with integrated PA modeling through an NRC-developed test case model. These efforts 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 Agreement States on LLWPA issues.

The principal guidance objective of the BTP is to provide the applicant with an acceptable methodology for performing the technical analyses required in 10 CFR 61.13, by which to demonstrate compliance with the 10 CFR 61.41 performance objectives. This includes giving (1) general guidance on an acceptable PA strategy that integrates site characterization and PA modeling, and (2) specific guidance on implementing the NRC's performance assessment methodology (PAM). The objectives of each of the main sections of the BTP are as follows: (1) to define LLWPA in the context of the 10 CFR Part 61 regulatory requirements for LLW facility performance, (2) to describe an overall strategy for conducting PA modeling activities, (3) to address important technical policy issues concerning interpretation and implementation of 10 CFR Part 61 technical requirements, and (4) to provide guidance on acceptable modeling approaches for addressing technical issues regarding processes controlling LLW facility performance.

Topical Report Reviews. The Low-Level Waste Management (LLWM) staff continued to review topical reports that address specific technical issues associated with compliance with the NRC's regulations for disposal of LLW in 10 CFR Part 61, "Licensing Requirements for Land Disposal Of Radioactive Waste." After review and approval by staff, licensees may reference the processes described in the topical reports and incorporate the technology for use in their operations.

In fiscal year 1994, staff continued its review of three topical reports concerning high integrity container technology and accepted for review topical reports on cement solidification and on a waste analysis software code. The staff also received a request to amend an approved topical report on vinyl ester resin solidification. Of the topical reports under review, two have highest priority. The waste analysis software code (called Vance 3R-STAT) has multiple States supporting the review, and many States are interested in the final NRC conclusions; a description of the code and the staff's review is provided below. The second high priority topical report is for a multi-use container/high integrity container, proposed by Chem-Nuclear Inc., to be a fundamental component of the North Carolina LLW disposal facility.

As noted above, in fiscal year 1994, the NRC staff began review of a topical report entitled, "Topical Report—3R-STAT: A Tc-99 and I-129 Release Analysis Computer Code." According to the topical report, the two intended uses of the 3R-STAT computer code are: (1) to analyze past fuel-cycle data from operating plants in order to develop average I-129 and Tc-99 release rates as a basis for projecting future inventories of these two radionuclides, and (2) for use in utilities' waste management programs for reporting actual quantities of I-129 and Tc-99 shipped in their LLW to a disposal facility. The computer modeling approach is meant to lead to more realistic projections of the I-129 and Tc-99 inventories than do current methods. The results of the model are used to determine or to project the inventory of these highly mobile and long-lived radionuclides. In addition, the modeling results could significantly affect the technical analyses used to demonstrate that the LLW disposal facility performance objectives in 10 CFR Part 61 are met. This review by the NRC will provide a mechanism for regulatory review of the applicability and technical capability of the model and code.

Concentration Averaging Guidance. In 10 CFR Part 61, a waste classification system based on the concentration of specific radionuclides contained in the waste is set forth. The regulation states that "[T]he concentration of a radionuclide [in waste] may be averaged over the volume of the waste, or weight of the waste if the units [on the values tabulated in the concentration tables] are expressed as nanocuries-per-gram." Over the last two and one-half years, the NRC has developed two proposed "Concentration Averaging and Encapsulation Technical Positions, Revision in Part," which were sent to NRC licensees, and on which comments were solicited. During fiscal year 1994, the NRC staff received comments from the public on the latest proposal and prepared a final position for internal review, including a review by the NRC's Committee to Review Generic Requirements, late in the year. The staff is resolving two specific concerns regarding the effect of the BTP on existing practices for concentration averaging. After that effort, it is anticipated that a position will be ready for formal documentation.

Technical Assistance to the States

During fiscal year 1994, the LLWM 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:

- Support to OSP in conducting a program review of the Utah Agreement State Program.
- Participation in meetings of the LLW Forum, the Technical Coordination Committee, the

Council for Radiation Control Program Directors E-5 Committee, and groups of State and compact officials that meet to discuss areas of common interest in the policy and technical areas.

- Preparation of responses to specific waste management questions from representatives of the States of Nebraska and the Commonwealth of Pennsylvania.

- Presentation on the NRC's waste acceptance requirements for LLW facilities at a meeting of the Central Midwest Compact Commission task group on this topic.

- Participation in meetings on LLW storage with LLW generators in Michigan, New Jersey, the District of Columbia and the Appalachian Compact.

- Participation in the annual DOE National Low-Level Waste Management Conference in Phoenix, Ariz., and the LLW Decisionmaker's Forum in Amelia Island, Fla., where the staff presented papers on LLW storage (at both conferences) and PA (at the Arizona meeting).

- Meeting with State officials in North Carolina concerning NRC licensing of special nuclear material for the proposed new disposal facility.

Cooperation With Other Federal Agencies

During fiscal year 1994, the NRC continued cooperation with other Federal agencies in resolving issues associated with LLW management, decommissioning of licensed nuclear facilities and formerly used sites, and emissions of radionuclides to the general environment. These efforts have primarily involved the EPA and the DOE, but they have also included other Federal and State regulatory agencies that share interests in the regulation of radioactive materials and in protection of the environment.

Cooperation with the EPA. Cooperation with the EPA has focused on three principal areas over the last year: risk "harmonization" (see below), regulation of air emissions of radionuclides, and development of radiological criteria for decommissioning. The agencies also cooperated in evaluating a range of related activities involving drinking water, groundwater protection, uranium mill tailings, hazardous waste, LLW, and other issues of mutual interest. The cooperative activities are generally governed by the March 1992 General Memorandum of Understanding (MOU) between the agencies on regulation of radionuclides in the environment.

In fiscal year 1994, the NRC and the EPA completed a comparison of risk assessment approaches used in a variety of regulatory programs that address both radiological and non-radiological hazards, with a view to bringing them into "harmony." Based on this comparison, the NRC and the EPA compared risk goals and risk management approaches used in the same programs. The NRC staff completed a draft White Paper on risk harmonization (SECY-94-240) which will provide the foundation for additional cooperative efforts to reconcile risk assessment and management approaches. The staff is currently working with EPA to respond to a Congressional request for more coherent radiation standards.

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. At the present time, 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 has distributed to NRC licensees both the NRC (10 CFR Part 20) and their guidance on Subpart I, in addition to information on NRC inspections under 10 CFR Part 20. An *NMSS Licensee Newsletter* article was sent to NRC materials licensees, and joint EPA/NRC televideo training was conducted for EPA, NRC and State inspectors. The NRC staff has completed an EPA referral form for NRC inspection information regarding licensee projected doses from air effluents. The form is part of Inspection Procedure 87102 and provides air emissions information from NRC licensee sites. NRC material inspectors then forward this form to each pertinent EPA Regional office for their use. The staff is also exploring with the EPA a process to rescind 40 CFR Part 51, Subpart I, including the possible revision of 10 CFR Part 20.

For uranium mill tailings disposal sites, NRC regulations at 10 CFR Part 40, Appendix A, which became effective July 1, 1994, implement revisions to EPA's regulation 40 CFR Part 192, Subpart D, with respect to timely emplacement of the final radon barrier and radon monitoring requirements. In July 1994, in response to these changes in 10 CFR Part 40, the EPA published in the *Federal Register* a final rule rescinding 40 CFR Part 61, Subpart T, for uranium mill tailings disposal sites licensed by the NRC or NRC Agreement States.

NRC and EPA staff met on several occasions to exchange technical information and to discuss the status of EPA's environmental standards for management, storage, and land disposal of LLW.

Also, in fiscal year 1994, the NRC and the EPA continued development of guidance regarding mixed waste, to ensure that testing and storage of commercially generated mixed waste can be accomplished in a manner that is consistent with both agencies' regulatory requirements. The agencies also began exploring, with the steel industry, strategies to resolve the issues associated with the management of emission control dust that is contaminated with radioactive material from the inadvertent melting of licensed sealed sources.

The NRC is conducting an Enhanced Participatory Rulemaking on radiological criteria for decommissioning. In an August 1994 *Federal Register,* the NRC published a proposed rule on radiological criteria for decommissioning. EPA plans to publish a similar proposed cleanup rule in 1995. The NRC and the EPA have been actively cooperating by exchanging information and jointly evaluating technical methods necessary to support and implement the radiological criteria in these two proposed rules. The EPA Science Advisory Board's Radiation Advisory Committee is currently evaluating the technical basis for the proposed EPA cleanup rule.

Cooperation with the DOE. Cooperative efforts between the NRC and the DOE during 1994 continued to focus primarily on resolving issues associated with the management of LLW and environmental restoration programs. Under the LLRWPAA, the DOE is responsible for disposing of so-called "Greater-Than-Class C" wastes in an NRC-licensed disposal facility. The agencies have also cooperated in developing procedures for requesting DOE's assistance in picking up abandoned and other radioactive materials judged by the NRC to pose a health and safety concern if left in the long term possession of certain licensees.

In fiscal year 1994, NRC staff was active in several national PA activities, in association with the DOE, and the U.S. Geologic Survey, and through national meetings. NRC staff participated in the DOE Performance Assessment Task Team (PATT) meetings. The purpose of PATT meetings is to discuss and coordinate LLW PA activities at DOE sites, to identify and resolve technical issues, to alert the DOE to policy issues, and to develop revised guidance for the disposal of DOE LLW.

International Cooperation

The NRC staff participated in an International Atomic Energy Agency training course, "Safety Assessment Methodologies for Near-Surface Radioactive Waste Disposal." The staff also briefed a number of visitors from different countries such as Japan, Ukraine, Slovakia, the Czech Republic and others, on the NRC's regulatory program for LLW disposal.

Uranium Recovery and Mill Tailings

The NRC's uranium recovery and mill tailings program licenses and regulates 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; the development of 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

Louis Carson, a Region IV materials inspector, looks over the evaporation pond at the Homestake Mining Co. uranium mill tailings site in New Mexico.

Linda McLean, a Region IV senior health physicist, poses during a tour of the Green Mountain uranium mine, which adjoins the Green Mountain ion exchange facility in Wyoming.

tailings. In addition, the NRC also 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, five are *in-situ* leach facilities, one is an ion-exchange facility, one is a heap leach facility, and one is a mill tailings waste disposal facility. At the close of the fiscal year, three commercial *in-situ* mining operations were operating, and two were under construction. No conventional uranium mills were in operation, four were in standby, and the remainder were in decommissioning and reclamation. Because of the low market price of uranium, no new conventional mills are expected to be licensed in the near future, 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 the environmental assessment of such activities.

In fiscal year 1993, the Commission decided to close the Uranium Recovery Field Office (URFO), Denver, Colo., and consolidate URFO's licensing activities at Headquarters and inspection activities at Region IV. In fiscal year 1994, the NRC completed the transition and closed URFO in a manner that minimized the impact on ongoing inspection, licensing, and policy development programs. During fiscal year 1994, the NRC staff continued to meet with representatives of the industry and States to review the status of actions associated with the URFO closure/transition. The NRC staff plans to continue holding such meetings several times a year, including a large workshop in the spring.

Regulatory Development and Guidance

During the report period, the NRC continued efforts to develop regulatory guidance to implement standards dealing with groundwater. The use of Alternate 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—along with maximum concentration limits and background levels—for demonstrating compliance with EPA and NRC groundwater protection standards. In March 1994, 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 employ in evaluating ACLs. In September 1994, the NRC and EPA reached agreement on the issue. The agreed risk level will be incorporated into the final technical position, to be issued in fiscal year 1995. The agreement also removes a major impediment to EPA's final formulation of its groundwater regulations, which NRC uses in evaluating DOE actions at UMTRCA Title I sites.

Licensing and Inspection Activities

In 1989, the NRC received an application from Envirocare of Utah, Inc., for a license to dispose of commercial uranium and thorium mill tailings at its existing radioactive waste disposal facility in Clive, Utah. The licensing review for this first-of-its-kind facility progressed over the next several years. The Final Safety Evaluation Report and Final Environmental Impact Statement were published in fiscal year 1993. On November 19, 1993, a license, with several conditions that precluded disposal of waste, was issued. On September 8, 1994, the last condition precluding disposal of waste was closed, and on September 9, 1994, the first trainload of material was sent to the site.

In fiscal year 1994, Region IV (then including URFO, before its closure) performed 28 inspections of uranium recovery facilities. During the fiscal year, the NRC issued one new license (Envirocare) and 59 license amendments. And the NRC reviewed environmental and radiological monitoring reports submitted by licensees.

Remedial Action at Inactive Sites

Under the UMTRCA, 24 abandoned uranium mill tailings sites were designated to receive remedial action by the DOE. UMTRCA requires that the NRC concur with the DOE's selection and performance of remedial action, so that the action meets appropriate standards promulgated by the EPA. The DOE has established the Uranium Mill Tailings Remediation (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 fiscal year 1994, NRC staff completed 55 review actions pursuant to its responsibilities at sites under Title I of UMTRCA. These included 4 Remedial Action Plan (RAP) reviews, 5 inspection plan reviews, 10 RAP modification reviews, 11 other site-specific reviews, 3 Completion/Certification Report reviews, and 6 reviews of generic items. The staff prepared three Technical Evaluation Reports, documenting its review of DOE's remedial action selection for the Naturita (Colo.), Slick Rock (Colo.), and Grand Junction (Colo.) sites, and three Completion Review Reports, documenting its review of DOE's remedial action completion for the Durango (Colo.), Lowman (Idaho), and Burrell (Pa.) sites.

The submittal of a site Long Term Surveillance Plan (LTSP) to the NRC for approval is one of the final actions by the DOE before the site comes under the NRC general license for long term care in 10 CFR 40.27. DOE submitted, and NRC staff completed review of, five LTSPs. Two of these reviews resulted in final acceptance of the LTSPs for the Lowman (Idaho) and the Burrell (Pa.)

sites, making those sites the second and third UMTRA Project sites accepted under the NRC general license for long term care. The Spook (Wyo.) site was the first site subject to the general license in 10 CFR 40.27.

In support of the 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 Gunnison (Colo.), Falls City (Tex.), Mexican Hat/Monument Valley (N.M./Utah), Ambrosia Lake (N.M.), Rifle (Colo.), Tuba City (Ariz.), Shiprock (N.M.), Salt Lake City (Utah), Naturita (Colo.), Slick Rock (Colo.) and Grand Junction (Colo.) sites.

Bob Evans, a Region IV inspector, uses a survey meter to check the location of two disposal pits containing thorium on the Hill Air Force Base reservation in Utah.

The preliminary activities for the groundwater remediation phase of the UMTRA Project continued during fiscal year 1994. As part of the NRC's role as a cooperating agency in the DOE's development of the Programmatic Environmental Impact Statement (PEIS) for this phase of the remedial program, NRC staff participated in a groundwater technical working group established to develop and review programmatic documentation. The NRC also reviewed and prepared comments on the DOE internal draft of the PEIS.

Decommissioning of Nuclear Facilities

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

Materials Decommissioning

Several hundred NRC materials licenses are terminated each year. The majority of NRC-licensed operations result in little or no contamination of buildings or soil, and decommissioning actions leading to the 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 waste 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.

The NRC developed the Site Decommissioning Management Plan (SDMP), in 1990, to focus efforts 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 some policy and regulatory issues affecting site decommissioning. The SDMP is updated annually, most recently in August 1994.

Over the last year, three sites, Old Vic, Inc. (Ohio), AMAX (Wyo.), and Pawling (N.Y.), completed decommissioning and were removed from the SDMP list. The Commission was informed of the staff's decision to release each of these sites for unrestricted use.

Five sites were added to the SDMP during the last year:

- Clevite Corporation (Neighborhood Progress, Inc.) site, located in Cleveland, Ohio.
- Horizons, Inc. (Lamotite) site, located in Cleveland, Ohio.
- Kaiser Aluminum site, located in Tulsa, Okla.
- The former Brooks and Perkins (Fromme Investment Co.) site, located in Detroit, Mich.
- The former Brooks and Perkins (AAR Manufacturing) site, located in Livonia, Mich.

In March 1994, the Cabot Corporation (Pa.) submitted a revised renewal application. The revised application proposes a digestion process which, according to Cabot, will recycle slag to recover metals and acid. Cabot proposes to dispose of the residues from the revised process as LLW, or to sell the residues for uranium content. The staff is reviewing the proposal. Shieldalloy Metallurgical Corporation has continued to operate since filing for bankruptcy under Chapter 11 last year. As part of the bankruptcy proceedings, Shieldalloy is required to quantify the environmental liability of the Newfield (N.J.) and Cambridge (Ohio) facilities. Shieldalloy claims that if any decommissioning alternative other than on-site disposal is required, it will be forced into Chapter 7 liquidation. The NRC is developing an environmental impact statement for each of the Shieldalloy sites to evaluate various alternatives for decommissioning, including on-site disposal. The environmental impact statement process will also include a cost-benefit analysis for each alternative.

In October and November 1993, Chemetron provided a Site Remediation Plan (SRP) for the Bert Avenue site, Harvard Avenue site, and McGean-Rohco complex (all in Ohio). The SRP proposed the construction of an on-site disposal cell, under Option 2 of the 1981 BTP on "Disposal of Onsite Storage of Thorium or Uranium Wastes from Past Operations," at the Bert Avenue site and another at the Harvard Avenue site. On May 11, 1994, NRC staff issued a Notice of Violation and Proposed Civil Penalty of $10,000 for Chemetron's incomplete submittal of the Site Remediation Plan by October 1, 1993, the date specified in the license. On April 4, 1994, Chemetron proposed to expedite the remediation of the McGean-Rohco complex ahead of the schedules proposed in the SRP. This action followed an explosion that took place on December 8, 1993, at the McGean-Rohco complex. The explosion occurred during the testing of a new chemical process that was being evaluated by McGean-Rohco. Region III inspectors arrived on-site on December 8, 1993, and performed radiological surveys of the building and area. No contamination in excess of background was found on the injured workers, emergency personnel and equipment, nor on the surrounding areas outside of Building 20C. On August 9, 1994, the NRC issued an amendment to the Chemetron license authorizing Chemetron to remediate the McGean-Rohco buildings.

Over the last year, the staff continued work on two rulemaking efforts intended to promote more timely and effective decommissioning at SDMP sites and other decommissioning sites, and to ensure the effective decommissioning of future sites. These rulemakings are denominated Radiological Criteria for Decommissioning and Decommissioning Timeliness.

Detailed discussions of the status of these rulemakings were submitted to the Commission in a "Draft Proposed Rule on Radiological Criteria for Decommissioning" (SECY-94-150), on May 31, 1994, and in a "Final Rule on Timeliness in Decommissioning of Materials Facilities" (SECY-94-135), on May 20, 1994.

The staff issued two guidance documents related to the SDMP program in 1994: (1) "Procedures for Preparing *Federal Register* Notices for Site Decommissioning Management Plan Licensing Actions" (NMSS Policy and Procedures Letter 1-46), and (2) "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity" (Policy and Guidance Directive PG-8-08). The procedures for preparing *Federal Register* notices provide NMSS and regional staff with guidance as to when to publish notice of licensing actions at SDMP sites. The intent is to ensure that stakeholders and other interested parties are provided early notice of proposed licensing actions. Policy and Guidance Directive PG-8-08 provides NRC and licensees with three standard exposure scenarios to be considered when performing dose assessments. These should provide NRC with more consistent bases for reviewing dose assessments submitted for SDMP sites.

The staff continued to work on a number of generic issues that involve a number of different SDMP sites. These issues have been discussed in previous updates of the SDMP and include large volumes of thorium-contaminated slag and soil, financial assurance, increasing public involvement and hearing requests, and the involvement of various State agencies.

On June 1, 1994, the NRC hosted a workshop on the SDMP, in Rockville, Md. The workshop focused primarily on the technical aspects of final radiological surveys at decommissioning sites. Attendance exceeded 250, and included representatives from the SDMP sites, private industry, EPA, DOE, Agreement States, and other interested parties. The response to the workshop was positive and the attendees requested additional workshops.

Reactor Decommissioning

NMSS currently has regulatory responsibility for eight former power reactor plants in the process of being decommissioned. These plants are the Shoreham (N.Y.) nuclear power plant, Fort St. Vrain (Colo.), La Crosse (Wis.), Peach Bottom Unit 1 (Pa.), Vallecitos (Cal.), Humboldt Bay Unit 3 (Cal.), and Enrico Fermi Unit 1 (Mich.). NMSS exercises project management oversight over the facilities, and the Regions conduct regularly scheduled inspections of these facilities.

The La Crosse (Wis.), Peach Bottom (Pa.), Vallecitos (Cal.), and Humboldt Bay (Cal.) nuclear power plants—each of boiling water reactor (BWR) design—are currently in long term storage (SAFSTOR decommissioning) prior to facility dismantlement. The Fermi (Mich.) plant, which has a sodium-cooled reactor, also is in SAFSTOR. Only the La Crosse and the Humboldt Bay facilities have spent fuel stored on-site in the spent fuel pool (wet) storage.

Both the Shoreham and the Fort St. Vrain plants are being decommissioned under the DECON procedure, which involved immediate dismantlement and decontamination. At the time of its final shutdown in June 1989, Shoreham had operated the equivalent of only two effective-full-power days. The DECON of Shoreham, a BWR, has been confined primarily to the reactor, radwaste, and turbine buildings. The reactor was segmented, removed from the reactor building, and shipped off-site for disposal. The Long Island Power Authority (LIPA), the Shoreham licensee, has entered into a contract with the Philadelphia Electric Company (PECO) under which PECO will take possession of the slightly irradiated fuel for use in its Limerick Unit 1 (Pa.) reactor; the Shoreham fuel has been transferred. Dismantlement of the Shoreham facility is complete, and primary activities at Shoreham will involve work related to the termination survey. The reactor, radwaste, turbine and control buildings, along with buildings, facilities, and grounds within the secured area fence, are included in the license termination survey. LIPA is expected to request license termination in early 1995.

Fort St. Vrain, which was a high-temperature gas-cooled reactor, operated from January 1974 to August 1989. Spent fuel generated at Fort St. Vrain is stored in dry storage in an on-site independent spent fuel storage installation (ISFSI). The licensee, Public Service Company of Colorado (PSC), has completed approximately 50 percent of the Fort St. Vrain DECON. The 1,320 ton concrete top head has been segmented and removed. PSC has removed and shipped for disposal 1,770 activated graphite components. Further, PSC has shipped, for disposal or volume reduction, approximately 97,000 ft^3 of materials containing approximately 71,000 curies of radioactivity. NMSS staff has initiated review and evaluation of the Fort St. Vrain final survey plan.

In 1995, NRC staff also expects to perform reactor-decommissioning-related activities involving the following reactor plants: Rancho Seco (Cal.), Yankee-Rowe (Mass,), San Onofre Unit 1 (Cal.), Trojan (Ore.), and Big Rock Point (Mich.).

Rancho Seco, a pressurized water reactor (PWR) design, prematurely ceased power operations in mid-1989. The Rancho Seco licensee, the Sacramento Municipal Utility District (SMUD), took this action in response to a non-binding voter referendum. NMSS completed its review of the Rancho Seco decommissioning plan in early 1993, and, in accordance with the Commission Memorandum and Order (CLI-93-03), the staff's environmental assessment and safety evaluation of the Rancho Seco decommissioning plan was issued in mid-1993. In mid-1994, the Environmental and Resource Conservation Organization, which opposed SMUD's decision to decommission the Rancho Seco plant, withdrew from the ongoing proceedings. It is expected that the NRC will issue an order approving the Rancho Seco decommissioning plan in early 1995.

The Yankee-Rowe plant, a PWR design, prematurely ceased power operations in late 1991. The Yankee-Rowe licensee, the Yankee Atomic Electric Company (YAEC), cited economic uncertainties in explaining the early discontinuation of operations. YAEC, under its component removal project, has removed the steam generators, pressurizer, reactor coolant pumps, and a portion of the reactor internals at the plant, and has shipped these components off-site for disposal. Citizen Awareness Network has filed a complaint in Federal court to oppose YAEC decommissioning activities. NMSS has completed its review of the Yankee-Rowe decommissioning plan. An NRC order approving the Yankee-Rowe decommissioning plan was expected in early 1995.

Trojan and San Onofre, both PWR designs, also prematurely ceased operations. The decommissioning plans for these facilities were due to be submitted to NRC in late 1994. NRC staff expects to complete the reviews of both decommissioning plans by mid-to-late 1995.

Big Rock Point, a BWR, is expected to cease power operation upon expiration of the operating license on May 31, 2000. The Big Rock Point licensee, Consumers Power Company (CPCo), requested that the NRC review a plan to decommission the Big Rock Point facility before final cessation of power operation. The NRC has agreed to CPCo's request for early review. The Big Rock Point decommissioning plan is scheduled to be submitted in early 1995. NRC staff expects to complete the review in late 1995.

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 activities and concerns involving nuclear waste disposal facilities, as directed by the Commission. This mission includes activities under 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 committee's 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 which 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 attendance at and participation in committee meetings. The ACNW membership is drawn from scientific and engineering disciplines and includes individuals experienced in geosciences, risk assessment, radioactive waste treatment, environmental engineering, nuclear engineering, and chemistry.

During fiscal year 1994, the ACNW reported to the Commission on a variety of issues, including:

- Review of the high-level radioactive waste performance assessment capability of the NRC staff.
- Review of the low-level radioactive waste performance assessment program.
- Proposed rulemaking on design basis events for the geologic repository operations area.
- High-level radioactive waste research programs on volcanism, natural analogs, and tectonics.
- The impact of the Department of Energy's Proposed Program Approach on the NRC's high-level radioactive waste licensing activities.

Communicating With the Public and the Government

Chapter 7

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 management frequently take part in Congressional Hearings (see table), 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

Commission Meetings

The NRC Commissioners meet in public session at the NRC Headquarters building, One White Flint North, Rockville, Md., to discuss agency business. Members of the public are welcome to attend and observe Commission meetings. A Commission meeting may be closed to members of the public if it is convened to deal with one or more of certain subjects specified in the Sunshine Act, which allows the closing of meetings involving such subjects or items of information as classified documents, internal personnel matters, information that is confidential by statute, trade secrets, personal privacy, investigations or adjudicatory matters. Members of the public are not allowed to participate in public Commission meetings unless specifically requested to do so by the Commission.

The Commission endeavors to provide meaningful public observation and understanding of open meetings. The Commission's Headquarters Conference Room is located at 11555 Rockville Pike, Rockville, Md. It 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 discussed 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 prior to the commencement of the meeting. Transcripts of open meetings and the papers made available to the public at the meeting are also placed in the PDR at the conclusion of the meeting for inspection and copying. Copies of all papers referenced at the meeting are normally released to the public. The public is also permitted to tape record Commission discussions at open meetings. It is the Commission's practice to allow camera and television coverage of open meetings and briefings without prior notification.

Commission meeting in progress.

The Commission attempts in all cases to provide at least one week's advance notice for Commission meetings. Notice of the following four weeks of Commission meetings is published each week in the *Federal Register.* An announcement is also displayed on a TV-monitor in the lobby of NRC Headquarters and is posted in the Public Document Room. 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. Notice of meetings is given to the press through the wire services and by mailings to individuals who have requested copies of such notices. Announcements of Commission meetings are also regularly furnished on a recorded telephone message ((301) 415-1292), providing the schedule for upcoming Commission meetings and/or voting sessions.

Advisory Committees

The Nuclear Regulatory Commission engages the expertise and experience of a wide segment of the public through their service on the NRC'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 community, as well as from State and local governmental organizations, the National Congress of American Indians, and private citizens. Committee members provide advice and recommendations to NRC on a large range of issues affecting NRC policies and programs. Appendix 2 gives a brief statement of the purpose of each of the NRC's standing advisory committees and a listing of the names and affiliations of current members.

The NRC's advisory committees meet, in accordance with the requirements of the Federal Advisory Committee Act, in public sessions, at Headquarters locations and in venues throughout the United States. Notice of advisory committee meetings is published in the *Federal Register,* in NRC press announcements, and by the posting of meeting dates and topics in the NRC Public Document Room, 2120 L Street, N.W., Washington, D.C. Transcripts and/or minutes of meetings are also available for inspection and copying at the NRC Public Document Room.

Persons interested in the activities of a particular committee or in committee meetings may call or write the NRC Advisory Committee Management Officer, Office of the Secretary, Washington, D.C. 20555; telephone (301) 415-1968.

Public Information

The Office of Public Affairs (PA) employs a variety of means to inform the public promptly about important regulatory actions taken or contemplated by the NRC. These include public announcements on significant agency policy decisions, activities, workshops or rulemakings; notification to the public and news media about NRC meetings through public announcements; and interviews, press conferences and special periodic news briefings, including an annual news conference by the Chairman.

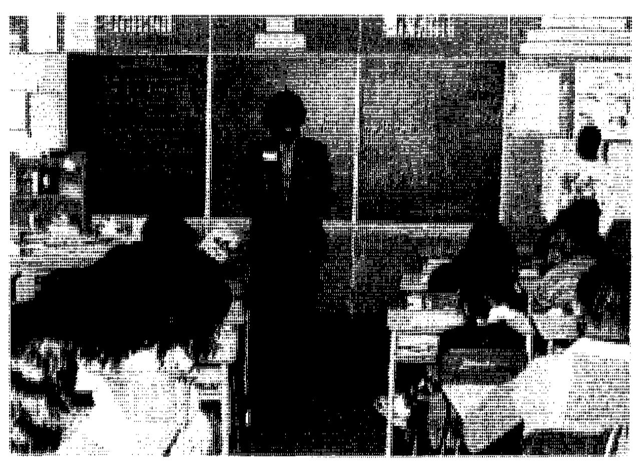
Special periodic news conferences are conducted by each of the NRC's four Regional Administrators about four times a year. This year sessions were held in Charlotte, N.C.; Cleveland, Ohio; the Cooper nuclear power plant in Nebraska; Knoxville, Tenn.; East Hampton, Conn.; Lynchburg, Va.; Monroe, Mich.; Philadelphia, Pa.; the River Bend nuclear power plant in Louisiana; Rochester, N.Y.; San Luis Obispo, Cal.; and San Juan, Puerto Rico. Reporter interest and media coverage focused primarily on the performance of nuclear power plants, the status of cleaning up radioactively contaminated sites, enforcement actions and spent fuel storage.

For responses to general inquiries, PA develops and distributes fact sheets, brochures and pamphlets that cover such topics as the NRC's mission, nuclear waste, licensing of nuclear power plants, radiation protection and plutonium. The most recently published pamphlet describes the process by which the public may petition the NRC for a thorough review of potential health and safety issues.

Enforcement Conferences. The Commission decided to extend a two-year trial period that opened to the news media and the public selected enforcement conferences at which apparent violations of agency regulations are discussed with licensees. Historically such conferences have been closed. The trial period will continue while a broad review is conducted to determine whether most such conferences should be open to the public.

School Volunteers Program. NRC volunteers continued their goal of enriching the quality of education in the classrooms of Washington Metropolitan Area Schools. This year, 130 employees—including chemists, engineers, geologists and attorneys—visited approximately 70 area schools.

James Keith Everly's description of what it's like to work for the NRC's Division of Security satisfies the younger set at one of the nearby elmentary schools in Maryland.



NRC's Brenda Shelton tells students at a nearby school in Maryland about her on-the-job experiences in records management.

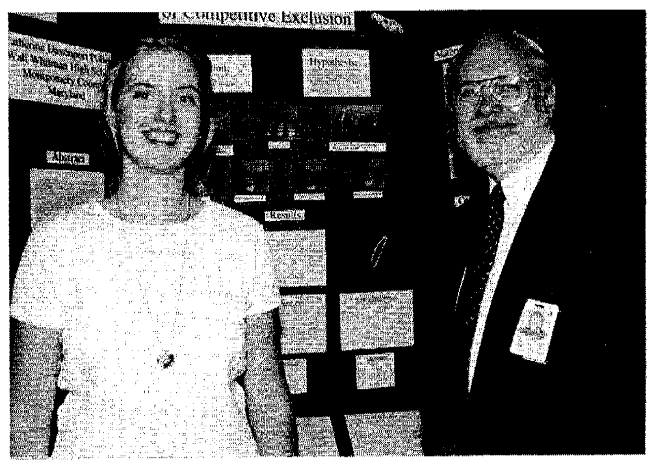
The agency's program gives students an inside look at the many career paths of NRC employees, and involves hands-on science and math demonstrations, mentoring and tutoring, assisting with science projects, and judging at science and math fairs. Coordinated by the Office of Public Affairs, the program provides rewarding experiences for employees and students while informing the public about the NRC's role as a regulator of nuclear safety.

Dr. Sandra Frattali, NRC Office of Nuclear Regulatory Research, judges a student's project at a Chevy Chase, Maryland, elementary school science fair.

To help volunteers save time in developing presentations to students, the NRC worked with a contractor and a teacher to create 10 portable classroom kits with activities appropriate for Grades 1 through 12. The kits cover basic information on radiation (with some actual household items containing minute amounts of radioactive materials), reactor operations, risk assessment, safety considerations in siting and licensing of nuclear waste facilities, and many other science and math topics used by the NRC to carry out its mission.

During the school year, Deputy Executive Director for Operations Hugh Thompson presented NRC Special Awards to seven science students at the annual Montgomery Area Science Fair. The winners were selected because their projects demonstrated scientific excellence in some way related to the NRC's multifaceted mission. It was the fourth time the NRC presented the awards. The students subsequently explained their winning projects to the Commissioners, NRC staff and parents.

NRC's Joseph De Cicco, Office of Nuclear Material Safety & Safeguards, shows a Montgomery County teacher how to assemble a cloud chamber experiment for her students.



One of the seven NRC Special Awards winners, Catherine Davenport Pollock, is congratulated at the annual Montgomery Area Science Fair by Commissioner Kenneth Rogers.

The NRC also hosted and participated in a Science and Technology Program for Educators. For five days, 40 Montgomery County teachers were teamed with scientists and other professionals from area organizations such as Bechtel, TRW, National Institute of Standards and Technology, PEPCO and Bell Atlantic to explore the importance of technology education and its application in the workplace. Subsequently, the teachers incorporated their experience into classroom lesson plans. At the NRC, teachers were welcomed by Commissioner E. Gail de Planque and went on to learn about the basics of radiation through a hands-on demonstration, observe a drill at the Emergency Operations Center, and participate in a problem-solving exercise involving the cleanup of a radioactively contaminated site.

Commissioner E. Gail de Planque addresses Montgomery County teachers at a science and technology workshop for educators.

The NRC has embarked on a Technology and Research Partnership with a high school in Bethesda, Md. This is a one-year program that challenges students to come up with solutions to real-life, technological problems. Volunteers from the NRC have been working with students to identify and explore problems involved in cleaning up an actual, radioactively contaminated site. Throughout the project, the NRC will guide students through a decision-making process that incorporates skills in data analysis, technical report writing, research, quality management and team problem-solving.

Because of the success of the Headquarters program, each Regional Office will begin a pilot school volunteers program this year. Volunteers will visit one or two schools in the vicinity of the Regional Offices and perform many of the activities being done by Headquarters employees.

Headquarters Public Document Room

Serving as a bridge between the agency and the public, the Headquarters Public Document Room (PDR) maintains a comprehensive collection of unrestricted documents related to NRC licensing proceedings and other significant decisions and actions and also documents from the regulatory activities of the former Atomic Energy Commission. The computerized, on-line Bibliographic Retrieval System (BRS) includes extensive indices to the collection and an on-line ordering module for the placement of orders for the reproduction and delivery of specific documents. In 1995, electronic full text or abstracts of selected materials will be added to the BRS, and full text of a number of categories of items will be put into an electronic bulletin board (Fed World). Located at 2120 L Street, N.W., Washington, D.C., the PDR is open Monday through Friday, from 7:45 a.m. to 4:15 p.m., eastern time, except on Federal holidays.

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 in paper, microfiche, or on diskette, for a nominal fee. The PDR also offers a Standing Order Subscription service for automatic receipt of selected serially published documents and reports. Certain items of immediate interest, such as Press Releases and Meetings Notices, are posted in the Reading Room at the facility.

Among the wide variety of agency documents available to the public at the PDR are NRC NUREG Reports and manuals; 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 are related to nuclear power plants—their design, construction and operation—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.

The Headquarters PDR contains nearly two million documents. During a typical month, the PDR serves about 1,300 documented users.

Technical Reference Librarians are available to assist on-site users and those who call or write with information requests. PDR staff make the BRS data base available to the public either on-site, using terminals in the Reading Room, or off-site, via modem. Off-site access (at 1200, 2400, and 9600 baud) is available for searches 24 hours a day, weekends and holidays included. Access to the BRS may be arranged by calling the telephone number given below; utilization of the system may be learned by either an on-line tutorial or on-site, personal instruction.

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

Persons wishing to visit and use the Public Document Room or obtain additional information regarding the PDR may call (202) 634–3273, Monday through Friday, between 8:30 a.m. and 4:15 p.m. (eastern time); fax to (202) 634–3343; transmit to Internet address PDR@NRC.GOV; or write to the U.S. Nuclear Regulatory Commission, Public Document Room, Washington, D.C. 20555.

Patrons at the Headquarters Public Document Room.

Local Public Document Rooms

At the close of fiscal year 1994, the NRC was maintaining 87 Local Public Document Rooms (LPDRs) in academic, public, and State libraries throughout the country. These LPDRs house collections of documents related to nuclear power reactors, the proposed high-level waste disposal facility, certain fuel cycle facilities, and low-level and high-level waste disposal facilities, both operational and prospective. Through the LPDR program, started by the Atomic Energy Commission in the late 1960s and continued and expanded by the NRC since its inception in 1975, 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 the local facility. (See Appendix 3 for a complete listing of LPDRs, by State.)

The 75 power reactor and two high-level waste LPDRs maintain post-1980 records in a microfiche rather than paper format. The conversion to microfiche has significantly increased the document resources available at each of these LPDRs. The collections are no longer limited to records pertaining to the local facility only but contain essentially all records made available to the public by the NRC since 1981.

Forty-four LPDRs currently have on-line access to NRC's computerized document management system, the NUDOCS/AD (Nuclear Documents System/Advanced Design). With this access, librarians and patrons can identify NRC publicly available records, within a data base of approximately two million records. Post-1980 records identified in searches can be viewed and copied from the NRC microfiche at the LPDRs.

Local librarians and their patrons may use a toll-free telephone number to request assistance and information from NRC LPDR staff on collection content, search strategies, and the use of reference tools and indices. Information on computer access at LPDR libraries is also available from the NRC LPDR staff. The telephone number is 800-638-8081.

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.

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 1994, NRC witnesses testified at nine 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 mark-ups.

Cooperation With the States and With 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 (SP). The goal of the office is to ensure that the NRC maintains effective relations and communications with these organizations, and to promote greater awareness and mutual understanding of the policies, activities and concerns of all parties involved, as they relate to radiological safety at NRC and at Agreement State licensed facilities. The office's activities encompass three general areas: the Agreement

States Program; State, Local and Indian Relations; and Federal Liaison. These programs are implemented through Headquarters and the Regional Offices.

Agreement States Program

A total of 29 States have formal agreements with the NRC by which those States have assumed regulatory responsibility over byproduct, source and small quantities of special nuclear material.

At the close of fiscal year 1994, approximately 15,000 radioactive materials licenses were administered by the Agreement States, representing about 70 percent of all the radioactive material licenses issued in the United States. The State of Pennsylvania is negotiating a limited agreement with NRC which will give Pennsylvania regulatory authority over the land disposal of byproduct, source and special nuclear material only. The States of Massachusetts, Ohio and Oklahoma are also negotiating full Agreement State status with NRC.

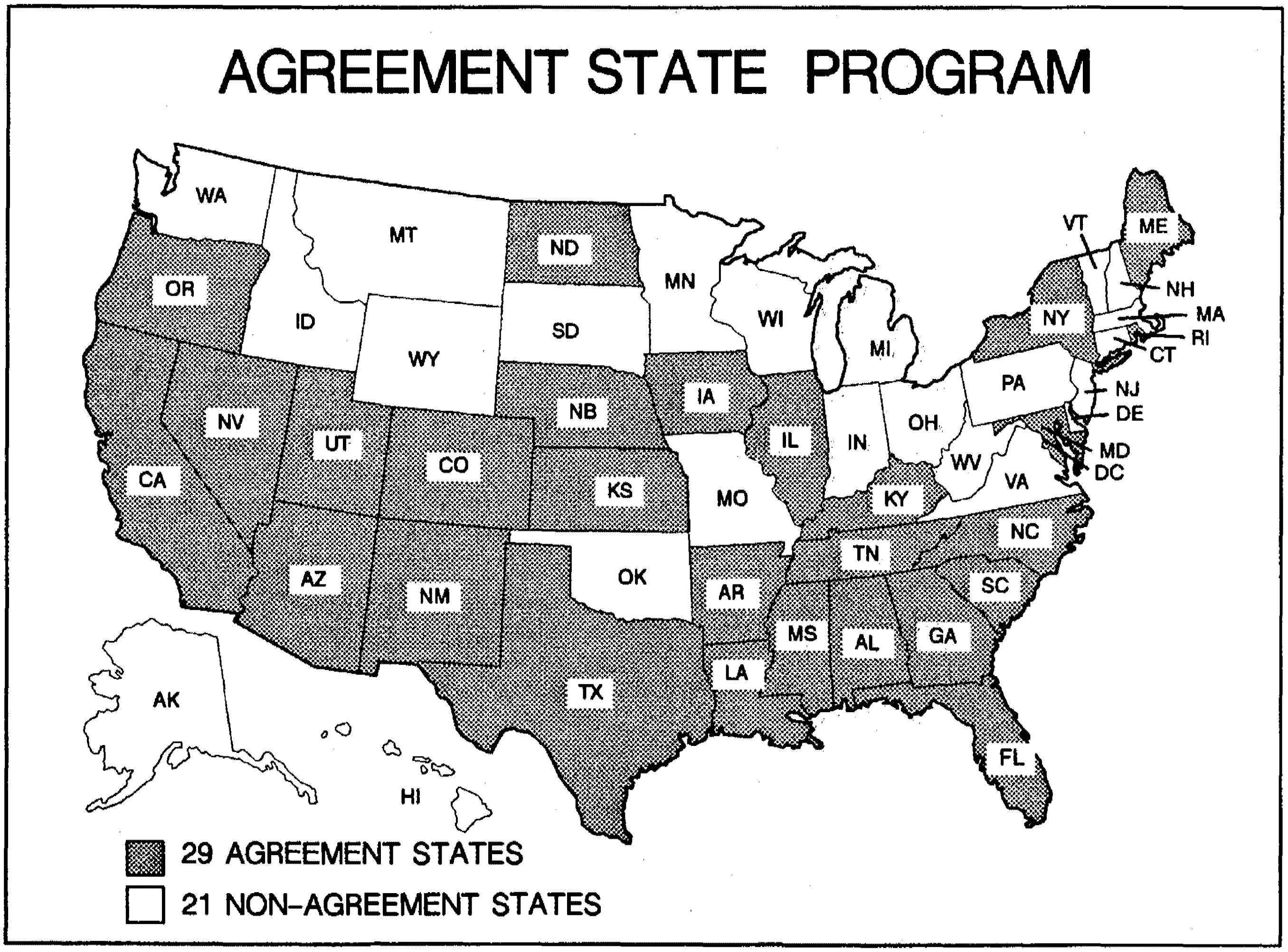


Table 1. Congressional Hearings at Which NRC Witnesses Testified—FY 1994

Date	Committee	Subject
10/28/94	Committee on Energy and Commerce Subcommittee on Energy and Power (House)	Safety of Russian-Designed Nuclear Reactors
10/28/94	Committee on Energy and Natural Resources (Senate)	Nuclear Safety Assistance to Russia, Ukraine, and Eastern Europe
11/08/93	Committee on Science, Space, and Technology Subcommittee on Energy (House)	Dry Cask Storage and Universal Containers
03/08/94	Committee on Natural Resources Subcommittee on Energy and Mineral Resources (House)	Federal Nuclear Facilities Act
03/09/94	Committee on Public Works and Transportation Subcommittee on Investigations (House) and TVA Congressional Caucus (House and Senate)	TVA's Nuclear Oversight Program
03/09/94	Committee on Environment and Public Works Subcommittee on Clean Air and Nuclear Regulation (Senate)	NRC User Fees
03/17/94	Committee on Appropriations Subcommittee on Energy and Water Development (House)	NRC's FY 1995 Appropriations
05/17/94	Committee on Governmental Affairs (Senate)	Bomb Prevention versus Bomb Promotion: Exports in the 1990's
06/21/94	Committee on Governmental Affairs (Senate) Committee on Government Operations Subcommittee on Energy, Environment, and Natural Resources (House)	Radioactive Contamination at Sewage Treatment Plants

Integrated Materials Performance Evaluation Process. In March 1994, the Commission approved the use of the five programmatic indicators outlined in SECY 94-011 as part of a pilot program in 1994. These common performance indicators are used to review NRC Regional Office and the Agreement State materials licensing and inspection programs. The indicators allowed a team made up of technical staff from the Office of State Programs, the Office of Nuclear Materials Safety and Safeguards and Regional Offices to evaluate a Regional Office or Agreement State materials program, based upon the following five common performance indicators: the status of its materials inspection program; its technical staffing and training; the technical quality of its licensing program; the technical quality of its inspection program; and its response to incidents and allegations. The process was used in two regional reviews and in Utah, New Hampshire and Illinois, each of which had volunteered to participate. The new process is to be integrated with the final policy statement on Adequacy and Compatibility for implementation in Agreement State program reviews.

Policy Statement on Agreement State Adequacy to Protect Public Health and Safety and Compatibility with NRC Regulatory Programs. On April 21, 1994, the Commission approved publication of a new proposed policy entitled, "Statement on Agreement State Adequacy to Protect the Public Health and Safety and Compatibility with NRC Regulatory Programs." The proposed policy statement attempts to draw a clear distinction between what is required for the "adequacy" and "compatibility" of an Agreement State program. It also attempts to strike 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 Commission directed staff to hold a public workshop with all interested parties during the comment period. On July 21, 1994 (59 FR 37269), the NRC published the draft policy statement for public comment within 90 days. The comment period was later extended to December 19, 1994, so that interested parties who attended the public workshop on November 15, 1994, had an additional 30 days to comment on the draft policy statement.

Statement of Principles and Policy for Agreement States Program. Following Commission review and approval, the staff published, on August 5, 1994, a proposed new policy statement, entitled "Statement of Principles and Policy for the Agreement States Program," for public comment (59 FR 40058). The draft policy 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 draft document is considered an "umbrella" policy statement, one which will serve as 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 comment period on the policy statement expired on December 19, 1994.

Improving Cooperation With the 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, and this resource has greatly facilitated the expanded involvement in these procedures.

Review of State Regulatory Programs. The Atomic Energy Act of 1954, as amended, requires NRC to review Agreement State radiation control programs periodically. The NRC conducts three kinds of reviews: routine reviews, review visits, and follow-up reviews. Routine reviews are complete examinations of State regulatory programs, normally conducted 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. Follow-up or special reviews are conducted as needed, and they tend to focus on State actions in specific areas.

In fiscal year 1994, NRC performed 12 program reviews, 8 review visits, 3 follow-up reviews, and 6 special sealed source and devices reviews. 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. When appropriate, multi-discipline teams are sent to conduct reviews of Agreement State programs. The teams include NRC Program and Regional Office staff.

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 by assisting in State inspections and reviews of license applications, and by dealing with specialized or unusual radiation applications requiring specialized expertise and knowledge. The NRC provided technical assistance to the

States dealing with sealed source and devices evaluations; uranium milling; regulation changes; and jurisdictional determinations.

Training Offered State Personnel by the NRC. The NRC sponsors certain training courses and workshops intended primarily for State radiation control personnel to help them maintain high quality regulatory programs. Course subjects are diverse, covering health physics, industrial radiography safety, well-logging, radiation protection engineering, transportation of radioactive nuclear materials and low-level waste, nuclear medicine, inspection procedures and materials licensing. In addition, special workshops on specific areas are held as needed.

The NRC sponsored 25 such training courses and workshops attended by 500 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.

Organization of Agreement State Managers' Workshop. A public workshop for managers of the Organization of Agreement States (OAS) was conducted July 12–14, 1994, in Herndon, Va. Topics included an open discussion of Agreement State issues, the status of NRC rulemakings, the new policy statement for NRC Agreement States program, Integrated Materials Performance Evaluation Program (IMPEP), sealed source and devices reviews, Federal Advisory Committee Act update, medical management plan, allegations received against radiation control programs, national data base for events reporting, and an OAS task force report on national events data base.

Annual Agreement States Meeting. The 1994 annual meeting of Agreement State radiation control program directors was held October 24–25, 1994 in Portland, Me. Panel discussions and individual presentations addressed regulations, operational events, medical issues, exchanges of information, the integrated materials performance evaluation program (IMPEP), the policy statement on the Agreement States Program, the overall umbrella policy, and the proposed policy on compatibility.

Operational Events in Agreement States. Information on events in Agreement States 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 events involving industrial radiography, well logging, lost or stolen equipment, and equipment failure, as well as incidents involving the administration of radioactive by-product material to individuals for medical diagnosis and therapy. The events are carefully analyzed for long term trends and any generic implications. 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 goals for SP is to maintain open lines of communication and close liaison with State and local government officials and their organizational representatives, and with Native Americans and organizations representing American Indian Tribes. These relationships are developed in an effort to address the concerns of these sectors of society and to promote increased understanding of issues related to NRC regulation, inspection and oversight activities.

Outreach Activities. The NRC continues cooperative activities with the States and their national organizations. Besides routine interaction with State and local government and Indian Tribe officials, NRC representatives have taken part in a number of special State-related events. For example, NRC continued to participate in the activities of the National Association of Regulatory Utility Commissioners (NARUC), as they related to nuclear issues and spent fuel disposal and storage. NRC staff continued throughout the year to meet with State and local officials, to discuss the results of SALP reviews of nuclear power plants and outreach activities related to emergency response planning. The NRC staff conducted three regional workshops with State officials during the month of February 1994 in Rockville, Md., Rosemont, Ill., and Chicopee, Mass., to discuss options for addressing States' concerns regarding the role of need for electrical generating capacity, alternative energy sources, utility costs and cost-benefit analysis in NRC environmental reviews for nuclear power plant license renewals.

The NRC has continued to follow the activities of other State-related organizations, such as the National Governors' Association (NGA), the Western Governors' Association (WGA), and the National Conference of State Legislatures (NCSL).

Cooperation With States. The NRC staff continues to implement a policy that allows States to observe or participate in NRC inspections at reactors, pursuant to the policy statement on "Cooperation With States at Nuclear Power Plants and Other Nuclear Production or Utilization Facilities" (57 FR 6462). In some cases, States may observe special inspections as well. During the year, the NRC staff continued to negotiate a memorandum of understanding with officials from the State of New Jersey to conduct low-level radioactive waste storage inspections.

State Liaison Officer Program. The NRC policy statement on Cooperation With States identifies the governor-appointed State Liaison Officer (SLO) as the primary State contact for all requests involving observation of NRC inspections of plants or facilities. The SLOs are also the NRC's primary point of contact with the States regarding all relevant NRC decisions and actions. The NRC hosts a National SLO meeting every three years and hosts regional meetings on an "as needed" basis in the off years.

The Conference of Radiation Control Program Directors, Inc. The NRC, through the Office of State Programs, continues to be represented in the Conference of Radiation Control Program Directors (CRCPD) to help ensure that State and Commission programs for protection against the hazards of radiation are coordinated and compatible. The CRCPD was formed in 1968 to provide a forum where Federal, State and local radiation control program officials could address governmental radiation protection issues, mainly through committees and task forces. At any given time there may be 50 or more groups working on specific projects. An example is the group working on Suggested State Regulations, seeking to promote uniformity in radiation protection programs throughout the United States. As many as 11 NRC resource persons are represented on approximately 24 committees and task forces which meet throughout the year. The NRC contributed $110,000 in fiscal year 1994 to the CRCPD.

Low-Level Waste Compacts. Because of the growing concern about low-level waste (LLW) storage, SP participated with other NRC offices in reviewing LLW storage guidance for NRC licensees; volume minimization regulations by the Commonwealth of Massachusetts; and proposed storage regulations by the State of South Carolina.

In addition, SP continued its support of disposal facility licensing activities in host Agreement States. For example, it assisted in coordinating host Agreement State comments on the 3-R State Topical Report for measuring more accurately the critical source term radionuclides of Technetium-99 and Iodine-129, and provided Agreement State comments on NRC staff's draft Branch Technical Position on Performance Assessment for LLW Disposal Facilities. In related areas, SP assisted in the coordination of comments on proposed amendments to the Central Midwest and Midwest Compacts; the proposal for acceptance of LLW mixed waste by the U.S. Department of Energy; and reviewing existing ground water protection standards in host Agreement States and comparing them with proposals by the U.S. Environmental Protection Agency.

Emergency Planning. NRC staff from the Regions and the Office for Analysis and Evaluation of Operational Data met throughout the year with emergency response officials from various States, as part of a continuing "outreach program." The program is intended to brief State officials on the NRC emergency response program, the Federal Radiological Emergency Response Plan, the Emergency Response Data System (ERDS), and NRC/State liaison during an emergency and financial assistance.

ERDS Memoranda of Understanding (MOUs) were negotiated with the States of Arkansas, Kansas, New Hampshire and South Carolina during 1994. ERDS is a "real-time" data system designed to provide direct transmission of selected plant information from licensees' on-site computers to the NRC Operations Center. States can have the capability to receive ERDS data during events at power plants, through an MOU with the NRC.

Liaison With American Indian Tribes. The NRC continues to maintain communications with those

American Indian Tribes, and with their national organizations, potentially affected by, or otherwise interested in, NRC regulatory activities. Tribal interest in nuclear related activities has increased over the years and has provided for a number of government-to-government exchanges of information regarding 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 also participates in EPA-sponsored interagency meetings to exchange information of potential relevance and importance to Federal and Tribal activities. The NRC also 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.

Federal Liaison

The NRC's Federal Liaison is responsible for establishing and maintaining effective communications at the policy level between 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 the contact 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 1994, 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 1995.

Also in 1994, the Federal Liaison was appointed the NRC's Federal Preservation Officer (FPO). The National Historic Preservation Act of 1992, as amended, calls for Federal agencies to designate an FPO. In this capacity, the Federal Liaison maintains communication with officials at the National Park Service and the Historic Preservation Council. In 1994, the Federal Liaison coordinated and drafted the NRC response to the Secretary of the Interior's Annual Report to Congress on Federal Archeological Activities.

The Federal Liaison also serves as the NRC's point of contact with the National Science and Technology Council (NSTC), formerly the Federal Coordinating Council for Science, Engineering and Technology. The NSTC considers issues and developments in science and technology which 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 1994, the Federal Liaison served 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 has developed the NRC's Draft Environmental Justice Implementation Strategy.

International Cooperation

Chapter

8

Recognizing that efforts to assure the peaceful, safe and environmentally acceptable uses of nuclear energy necessarily involve international cooperation, the Nuclear Regulatory Commission has long maintained a wide-ranging program of international cooperative exchanges. Such cooperation is conducted through bilateral relationships, and also through a number of multilateral institutions. As the regulator of the world's largest civil nuclear program, the NRC has broad capabilities to contribute to international programs in nuclear power plant safety, radiation protection, nuclear materials safeguarding and their physical protection, waste management, and the decommissioning of nuclear facilities, while benefitting from the experience of and expertise gained by foreign nuclear operations in these areas.

The NRC's international program, administered through the Office of International Programs (IP), has three broad objectives:

1. **Supporting U.S. foreign policy objectives.**

    - Helping to enhance nuclear power plant safety in countries with Soviet-designed reactors.
    - Helping to establish agreed nuclear safety principles world-wide.
    - Assisting countries with developing nuclear power programs using U.S. nuclear technology, and those countries considering such technology, to build a solid safety/regulatory infrastructure through direct bilateral aid.
    - Expanding consultation and support to Pacific Rim countries, in order to assist in the development of effective regulatory organizations and nuclear safety systems for those embarking on or engaged in developing rapidly expanding nuclear power programs.
    - Supporting efforts by multilateral organizations in the nuclear field—especially the International Atomic Energy Agency (IAEA)—to enhance nuclear safety in countries throughout the world.

2. **Helping to enhance U.S. national security.**

    - Providing the NRC's expertise and perspectives in the formulation and implementation of U.S. nuclear non-proliferation policies.
    - Executing the NRC's export licensing activities in accordance with U.S. laws and policies.
    - Supporting efforts to review and revise U.S. and multilateral export control systems relevant to the NRC's responsibilities.
    - Participating in U.S. Government efforts to assist countries of the former Soviet Union (FSU) in enhancement or establishment of systems for safeguarding nuclear materials.
    - Assisting the Executive Branch to strengthen IAEA safeguards and physical protection, particularly where U.S. nuclear exports are involved.

3. **Improving the safety of NRC-licensed facilities in the United States.**

    - Exchanging information with other countries on the safe operation of nuclear facilities and the safe use of nuclear materials, especially those with advanced nuclear programs and plants similar to those in the United States.

- Participating in international cooperative research programs on high priority safety areas to complement and expand the NRC's research activities.
- Participating in key reactor and materials safety program activities of the Nuclear Energy Agency (NEA) and the IAEA relevant to NRC interests.

Fiscal Year 1994 Activities

During the report period, the NRC's activities in the international sphere continued to expand significantly. Most noteworthy among them were the following:

- Support for meetings of the U.S.-Russia Joint Commission on Technological Cooperation in Energy and Space, in which Vice President Gore and Russian Prime Minister Chernomyrdin signed important agreements on nuclear safety cooperation, including a government-to-government agreement on shutting down the Russian plutonium production reactors at Tomsk and Krasnoyarsk.
- Activity in support of cooperation with the New Independent States of the former Soviet Union and countries of Central and Eastern Europe, including strengthening of their regulatory organizations, training of foreign inspectors and joint work in the areas of operational safety and risk reduction.
- Efforts to help countries of the former Soviet Union, particularly Russia, Ukraine and Kazakhstan, to improve their systems of accounting for and controlling nuclear materials, including improvements to their regulatory programs and enhancement of facility safeguards, within the framework of agreements signed by the United States with these countries in the fall of 1993.
- Raising to a higher priority regulatory cooperation with several Pacific Rim areas (Indonesia, China, Korea and Taiwan), which are embarking on, or are considering, new or expanded nuclear power programs.
- Playing a leading role in the negotiation of the international Convention on Nuclear Safety and in efforts to achieve the widest possible adherence to the Convention which was opened for signature in September 1994.
- Continuation of an active program of cooperative nuclear safety research with other nations, including Japan, Russia and France.

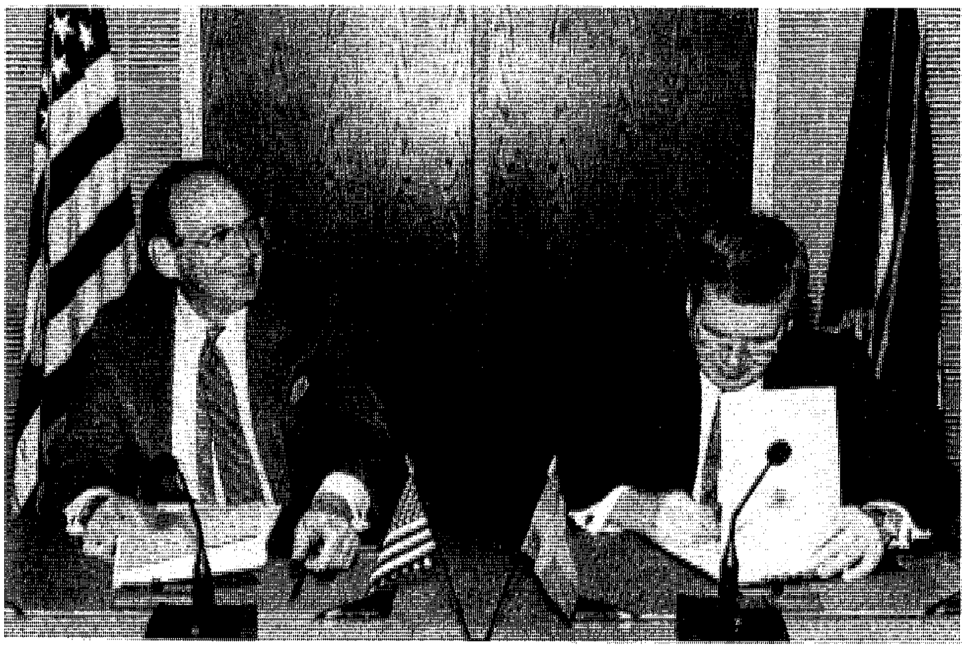
These examples of major NRC international involvement in nuclear safety are described in greater detail below, along with many other activities of note during the report period.

Bilateral Safety Information Exchange

The NRC participates in a wide range of mutually beneficial programs of information exchange and cooperative safety research with counterparts in the international community. This section discusses the NRC's arrangements for exchange of information related to nuclear regulatory and licensing responsibilities.

Safety Cooperation Arrangements

Since 1974, when it formalized the information exchange arrangement program, the NRC has conducted most of its technical regulatory exchanges under the umbrella of the growing number of general safety cooperation arrangements that have been signed and renewed over the years. These arrangements now total 33—with Argentina, Belgium, Brazil, Canada, China, the Czech Republic, Egypt, Finland, France, Germany, Greece, Hungary, Indonesia, Israel, Italy, Japan, Kazakhstan, the Republic of Korea, Lithuania, Mexico, The Netherlands, Russia, the Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Peru, the Philippines, Ukraine, the United Kingdom, and Taiwan.



Chairman Selin and Lars Hoegberg, Director General, Swedish Nuclear Power Inspectorate (SKI), signing the renewal of the NRC–SKI Information Exchange Agreement.

The arrangements provide for communications channels with foreign nuclear regulatory organizations, ensuring prompt reciprocal notification of reactor safety problems that could affect either U.S. or foreign nuclear facilities and assisting in the identification of possible precursor events meriting further investigation. The arrangements also provide a framework for bilateral cooperation on nuclear safety, safeguards, waste management and environmental protection, and serve as the vehicle for NRC assistance to other countries in improving health and safety practices. They are typically of five years' duration, and may be renewed by mutual written agreement of the parties.

During fiscal year 1994, the NRC concluded its first information exchange and cooperation arrangement on nuclear safety matters with South Africa, made possible by South Africa's acceptance of IAEA inspections of all nuclear facilities and the signing of the Nuclear Non-Proliferation Act. Arrangements were signed with Kazakhstan and Lithuania of the FSU, and arrangements with Slovenia and Brazil were renewed during this same period.

As a key part of the NRC's bilateral nuclear safety cooperation program, IP planned and coordinated visits by NRC Commissioners in fiscal year 1994 to Slovenia, France, Austria, Russia, Mexico, Canada, Japan, Korea, Taiwan, Hong Kong, China, Indonesia, Thailand, Australia, India and South Africa. These visits are an important means of encouraging the exchange of information and experience on nuclear safety and allowing the NRC to gain first hand knowledge of specific programs, through selected site visits, and to evaluate the kinds of assistance the NRC might provide. During the year, the NRC also received high-level visitors from Canada, France, Germany, Spain, Italy, Russia, Ukraine, Armenia, Kazakhstan, Slovenia, Hungary, Japan, Korea, Taiwan, China, Indonesia, Egypt, India, the IAEA and the NEA to discuss nuclear safety matters of mutual interest.

Foreign Assignees Working at 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 fiscal year 1994, 11 countries—Australia, China, France, Indonesia, Italy, Japan, Mexico, Romania, Spain, Ukraine, and Taiwan—sent 25 people to

Chairman Selin greeting Dr. A. Gopalakrishnan, Chairman, Indian Atomic Energy Regulatory Board (AERB) on the occasion of the first NRC–AERB nuclear safety dialogue meeting.

participate in the program. The participants completed assignments, ranging from a few months to a year or more, working in the following areas: responsibilities of a project manager; NRC review activities related to plant systems, balance of plant, and waste management; establishment of an incident reporting system; 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; advanced reactors and licensing procedures; emergency preparedness; instrumentation and controls; risk during shutdown of a nuclear plant; inspections; storage and transport of spent fuel and all aspects of the development of a regulatory program.

During their time at 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, helping them and their organizations to understand Western safety practices which may prove useful in their own regulatory programs.

Bilateral Nuclear Safety Cooperation

During fiscal year 1994, NRC carried on active nuclear safety cooperation programs with a large number of countries, with each of the geographical areas involved reflecting somewhat different needs and interests.

Former Soviet Union

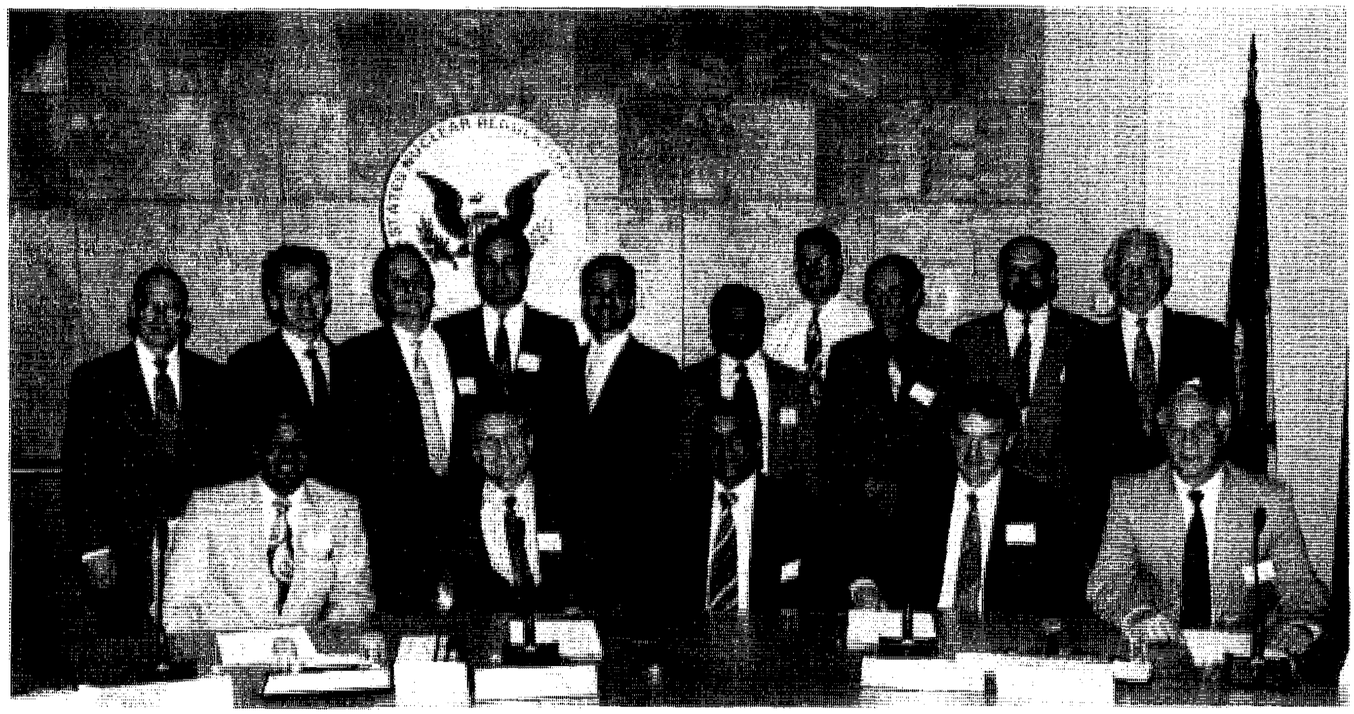
After the Chernobyl reactor accident in 1986, the United States recognized the need to cooperate with the then Soviet Union (now former Soviet Union (FSU)) to improve reactor safety in plants considered less safe than those using Western designs and practices and to help them develop a nuclear safety culture based on a strong, independent regulatory organization. The NRC has played an important role in rendering U.S. assistance to the Soviet Union and, more recently, to the independent countries of the FSU, especially in developing and enhancing their regulatory systems. NRC cooperation with countries of the FSU continued at a brisk pace during fiscal year 1994.

Russia: The Gore-Chernomyrdin Commission. During the report period, there were two meetings of the Joint U.S.-Russia Commission on Technical Cooperation, which is chaired by Vice President Gore and Russian Prime Minister Chernomyrdin, and in which NRC Chairman Ivan Selin also participated. At the second meeting of the Commission in December 1993, important agreements on nuclear safety cooperation and joint principles of nuclear reactor safety were signed. Significant progress was made in resolving a number of other nuclear issues, such as developing a U.S.-Russian Agreement on Radiation Effects Research (which was signed in January 1994) to create a framework for cooperation in the study of health and environmental effects of ionizing radiation. A number of issues of interest to NRC were on the agenda of the Third U.S.–Russian Gore-Chernomyrdin Commission (GCC) meeting held in Washington, June 20–21, 1994. Progress was made on resolving a key nuclear safety issue—liability protection for U.S. companies working in Russia—based on certain assurances of the U.S. Government. This concern had been holding up a portion of the U.S. effort to upgrade Russian nuclear power plant safety systems.

The most important other development at the meeting was the signing of a government-to-government agreement on shutting down Russian plutonium production reactors at Tomsk and Krasnoyarsk by the year 2000. The two sides (represented by DOE Secretary O'Leary and Minister of Atomic Energy Mikhailov) also agreed to a Joint Committee Report on Nuclear Energy to highlight the significant progress that has been made since the Commission began work last year. Key elements of this report outline progress on materials control and accounting (MC&A) and physical protection; nuclear safety assistance; the Joint Energy Alternatives Study; and fissile material storage and disposition, including a commitment to explore measures to enhance bilateral cooperation to improve transparency in the process of weapons dismantlement at U.S. and Russian military facilities. Minister Mikhailov also submitted a list of issues that he believed warranted the attention of the two principals.

NRC Activities With Russia and Ukraine Under the JCCCNRS and the Lisbon Initiative. The Joint Coordinating Committee on Civilian Nuclear Reactor Safety (JCCCNRS), established by a U.S.-USSR Memorandum of Understanding in 1988, provides the framework for cooperation between the United States and the former Soviet Union in nuclear safety. During 1994, 25 scheduled activities with the Russian and Ukrainian regulatory bodies (GAN and SCNRS, respectively) were completed as planned. A major portion of these involved technical training covering all facets of regulation. Activities included regulatory training programs at the NRC Technical Training Center in Chattanooga, Tenn.; training for licensing and inspection of nuclear power plants at the Brookhaven National Laboratories in Upton, N.Y.; and short-term training sessions at NRC Headquarters in areas such as the creation of an emergency response center and the role of the NRC project manager who acts as NRC liaison with an assigned nuclear power plant. This effort involved approximately 55 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 (AID).

In June, Commissioner Rogers and staff travelled to Obninsk, Russia, in response to an invitation to attend the Fifth Annual Scientific and Technical Conference of the Russian Nuclear Society. Commissioner Rogers presented a paper entitled, "Nuclear Safety Regulation in the United States: Trends and Implications." The trip also included visits to Moscow and St. Petersburg, where meetings and discussions were held with the First Deputy Chairman and staff of GAN, the first Vice President and staff of Kurchatov Institute,



Participants in Working Group 12 "Nuclear Power Plant Aging and Life Extension" meeting, conducted as part of the US–Russia Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) activities.

and the Deputy Minister of Atomic Energy, who is also Russian Co-Chairman of the JCCCNRS. Commissioner Rogers then visited Kiev, Ukraine, where he met with the SCNRS Chairman, who is also the Ukrainian Co-Chairman of the JCCCNRS, and the Chairman of Goskomatom, the Ukrainian nuclear power plant operating organization. The visit concluded with a trip to the South Ukraine nuclear power plant, where discussions were held related to plant operating procedures.

Annual Meeting of the Joint Coordinating Committee for Civilian Nuclear Reactor Safety. The sixth annual meeting of the JCCCNRS, which was also the second Joint Meeting of the U.S.-Russia and U.S.-Ukraine committees, was held in Moscow in May. The meeting focused on policy and management issues regarding reactor safety in Russia and Ukraine. Specifically, discussions involved nuclear liability, early regulatory involvement, emergency operating instructions, jurisdictional regulatory authority, providing Ukraine with original design documentation for Soviet-designed reactors, the sharing of operational event information and probabilistic risk assessment. The session concluded with the signing of a Memorandum of Meeting to summarize accomplishments to date and outline plans for future activities for each working group. A significant outgrowth of the relationship between NRC, GAN and SCNRS is the recognition that each of the regulatory bodies must establish a position of authority, as well as independence from, the regulated industry.

Joint Coordinating Committee for Radiation Effects Research. Over the past two years, the NRC has actively participated in U.S. Government efforts to establish a mechanism for cooperating with the government of Russia in researching the health and environmental effects of radiation. The culmination of this effort came in January 1994, when both governments signed the "Agreement Between the Government of the United States of America and the Government of the Russian Federation on Cooperation in Research on Radiation Effects for the Purpose of Minimizing the Consequences of Radioactive Contamination on Health and the Environment." The Joint Coordinating Committee for Radiation Effects

Research (JCCRER) was established to implement this agreement. Commissioner de Planque is the NRC's representative on the JCCRER.

The first meeting of the JCCRER was held in Washington from October 24–26, 1994. At this meeting, the JCCRER established an implementing plan, guidelines for developing and carrying out cooperative research projects, and a first-year research agenda. Initial topical areas will include dose reconstruction, health effects, and risk- estimation on exposed community populations and occupationally exposed workers.

Armenia. In September of 1994, while attending the IAEA General Conference, the Chairman met with Viguen Tchitetchian, the Vice Prime Minister of Armenia. Mr. Tchitetchian is the most senior official in the government of Armenia with responsibilities for restarting its reactors at Medzamor, which are essentially VVER–440/230 designs. While explaining the U.S. opposition to restart of these reactors, because of concerns about their safety, the Chairman indicated that the NRC could provide training in support of the newly formed nuclear regulatory authority. In November the head of the Armenian regulatory organization visited NRC to explain the background, need and current schedule for re-starting the Medzamor reactors. He stressed Armenia's commitment to undertaking the project safely. He was briefed on the philosophy, approach and process for regulating nuclear facilities in the United States and visited the North Anna (Va.) nuclear power plant. In April 1994, Armenian State Minister Steve Tashjian visited the Commission to report on the current status of preparations for the restart of the Medzamor reactors and to request safety assistance, including the training of Armenian engineers. Despite its opposition to restart of the reactors, the United States feels there is a need in Armenia for an independent and competent regulatory authority. The NRC indicated to the State Minister that it is prepared to provide limited regulatory assistance to Armenia to complement the assistance being provided by the IAEA.

Kazakhstan. On February 14, 1994, an agreement for technical cooperation in the nuclear safety area between the NRC and the Kazakh Atomic Energy Agency (AEA) was signed during the visit of Kazakh President Nazarbayev to Washington. The NRC is working with the AEA to develop a program of safety assistance designed to help strengthen nuclear regulation in Kazakhstan.

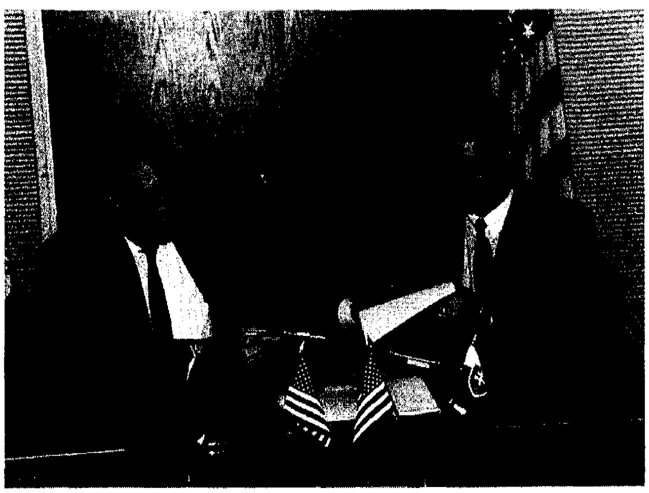
Central and Eastern Europe. The NRC has continued its extensive assistance program to Central and Eastern Europe (CEE) countries in improving safety practices at their Soviet-designed reactors. The objectives of the regulatory assistance program include assistance in the development of an effective regulatory organization; advancing safety culture awareness and practices; strengthening the legal framework and regulatory capability governing nuclear safety; improving analytical capabilities for performing safety analyses (computer codes); strengthening inspectorates through intensive training in NRC regulatory inspection philosophy, procedures, and techniques; preparing training programs for safety evaluations at nuclear power plants; and emphasizing the regional approach by inviting representatives from all CEE countries to attend training courses.

In 1994, CEE countries participated as a group in two key activities: an inspector training program and assistance in the use of specific computer codes. A resident inspector training course was held from September through November for senior plant personnel from Bulgaria, Hungary and the Czech and Slovak Republics. The purpose was to familiarize plant personnel with the inspection techniques and procedures conveyed to the regulatory inspectors the year before, in order to enable both groups to cooperate better with one another. The NRC continues to release the latest versions of the principal NRC computer codes and allows all CEE countries to participate in periodic user-group information exchange meetings. The NRC offers frequent assistance and training in the use of these codes, and all five CEE countries have participated in some of the selected activities related to use of computer codes on Severe Accidents, Thermal Hydraulics, Probabilistic Safety Assessment and Materials Integrity Research.

The NRC also conducted specialized training courses for all countries in several technical areas, including seismic margins evaluations, low-level waste regulation, and others.

An NRC team visited the Slovak Republic, Bulgaria and Hungary in June to follow up on the inspector training they received in the fall of 1993 and to discuss future assistance needs with each of these countries.

Czech Republic. In 1994, the NRC and Idaho National Engineering Laboratory (INEL) worked together to train several senior engineers from the Czech regulatory authority (SONS) in how to evaluate the safety of the Temelin nuclear power plant, which is being backfitted with Westinghouse-provided fuel and updated instrumentation and control systems, in accordance with current NRC regulatory requirements; they are also being shown how to prepare a final reactor Safety Analysis Report. Training thus far has included classroom lectures, hands-on analyses and documentation reviews, and identification of numerous areas and issues on which additional information was required from the vendor to resolve safety questions.



Chairman Selin and Jan Stuller, Chairman, Czech Republic State Office of Nuclear Safety (SONS) signing the NRC–SONS Information Exchange Arrangement.

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 nuclear power plant. The NRC has recommended that the Idaho National Engineering Laboratory serve as the U.S. technical support organization to participate in the review. The NRC does not intend to have direct involvement with the analysis. IP is prepared to assume responsibility for follow-up bilateral assistance and coordination with other donor countries.

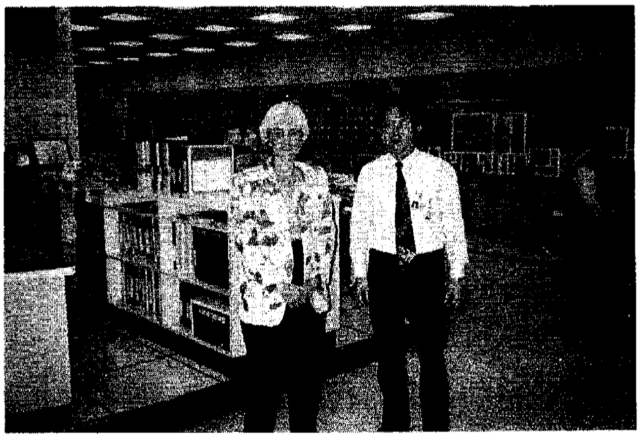
Slovenia. Commissioner Forrest Remick visited Slovenia in December 1993 to sign a new Information Exchange Arrangement with Slovenia as a successor to the former Yugoslavia. The Yugoslavian Arrangement was signed first in 1985 and was to be renewed in early 1991 when it was overtaken by political upheaval, the eventual dissolution of Yugoslavia, and the political reinstatement of Slovenia. The NRC continues to have active cooperation with the Jozef Stefan Institute, which administered the earlier agreement.

Pacific Rim Countries

This region includes a number of countries with well established nuclear power programs (Japan, Korea, Taiwan). It is also the fastest growing market for energy world wide. The energy demand in many of the Pacific Rim countries is expected to triple over the next 30 years, and nuclear power's share of this increase is also expected to rise. The Commission recognizes the importance of this growth and sees some regulatory challenges for its continued safe development.

In response to this growing energy market, the Commission has placed a high priority on safety cooperation with Pacific Rim countries. During the past five years, much of the Commission's effort has been concentrated on the countries of Central and Eastern Europe and the former Soviet Union where serious problems exist in their nuclear power programs. The root cause of many of these problems is the lack of an adequate safety culture. To help avoid a similar situation developing in the countries of the Pacific Rim, the Commission is offering its assistance, drawing from lessons learned in efforts to assist the FSU and CEE in upgrading their technology and safety systems.

During the report period, the Chairman and Commissioners Rogers and de Planque have each visited the region and met with government, industry and utility representatives to discuss the safe expansion of nuclear energy in the Pacific Rim. The importance of international cooperation in nuclear safety has been stressed in speeches to the nuclear and business communities in Taipei, Tokyo, Hong Kong, Beijing and Jakarta. Also, during this time, there have been several key bilateral technical meetings where expanded cooperation has been discussed. The Commission is committed to providing more regulatory information and counsel as these nuclear programs grow.



Commissioner de Planque pictured with the plant manager in the control room of Taiwan's Kuosheng NPP.

China. In November 1993, the Director of China's counterpart regulatory body visited the Commission and made several site visits to nuclear facilities. The meeting provided for an exchange of nuclear safety information in activities related to nuclear power generation and nuclear materials safety. Since China now has three operating power reactors, the NRC's focus is on plant operation, maintenance and inspection.

In April, Commissioner de Planque visited China for a series of in-depth meetings with China's nuclear power and materials program organizations and senior policy officials, as well as tours of nuclear facilities. Her visit complemented earlier visits by the Chairman and Commissioner Remick and helped to identify areas for expanded bilateral cooperation and new technical assistance in the future. As a result of these Commission exchanges with Beijing and Provincial authorities, NRC hosted an assignee from Guangdong Province for training in the area of emergency planning and response.

In July, the Chairman visited China to meet with Embassy, government, and utility officials to discuss China's current and projected nuclear power program, the status of nuclear power and safety in the United States, regional coordination in emergency planning and response, and the vital role played by a strong, independent regulator in maintaining nuclear safety and establishing public credibility.

Japan. Japan relies on nuclear power for nearly 30 percent of its electricity (45 operating reactors) and continues to be one of the NRC's valued bilateral partners in nuclear power safety. In April, Commissioner Rogers visited Japan to attend the 27th Annual Conference of the Japan Atomic Industrial Forum, where he addressed the opening session on "Achieving Effective Regulation Through the Application of Universal Principles." While there, he also visited the Genkai nuclear power plant, the ROSA-IV experiment at the Japan Atomic Energy Research Institute's Tokai Works, and the Japan Nuclear Fuel Limited fuel cycle facilities at Rokkashomura.

In July, the Chairman visited Japan, where he met with government officials and utility and industry representatives to discuss their current and future nuclear power program, including improvements derived from increased adoption of standardization and modularization. He also addressed the American Chamber of Commerce on the topic of international nuclear safety.

Taiwan. The Chairman visited Taiwan for two days in May and met with nuclear safety authorities, legislators, utility and industry representatives, and representatives of the press. He also made a speech to the American Chamber of Commerce on "Building Public Confidence in Nuclear Energy." During discussions with the Chairman of Taiwan's Atomic Energy Council (AEC), he focused on AEC's efforts to strengthen its regulatory function and aspects of nuclear safety cooperation between AEC and the NRC.

Republic of Korea. The ROK's s active nuclear power program includes nine operating reactors with seven more under construction. All are to be joined to the electricity grid by 1999.

Commissioner Remick represented NRC in Seoul in October at the International Symposium on Advanced Nuclear Power Systems—Design, Technology, Safety, and Strategies for Their Deployment, which was co-hosted by the IAEA and the Korea Electric Power Corporation. The Commissioner chaired a session on safety systems for advanced nuclear power systems, participated in a Steering Committee panel discussion, and assisted in the closing session.

The President of the Korea Institute of Nuclear Safety (KINS) visited NRC in May to meet with available Commissioners to discuss current U.S. regulatory issues and the status of the ROK program. He specifically requested training in inspection for personnel from KINS at the Technical Training Center in Chattanooga and in the Regions; a visit to Korea by NRC experts to advise on the NRC position regarding safety during shutdown and low power operations, steam generator replacement and backfitting requirements for older plants. He also requested long term, on-the-job technical training for KINS personnel at NRC Headquarters.

The Korean Vice Minister of Science and Technology also visited NRC in May. He met with the Commissioners for discussion on current issues, continued NRC support for the Korean nuclear safety program and the Korean-proposed text for the renewal of the NRC-Ministry of Science and Technology (MOST) Information Exchange and Cooperation Arrangement.

The Chairman visited Seoul and Taejon in August to meet with officials from MOST, KINS, and the Ministry of Trade, Industry and Energy. Discussions covered Korea's rapidly expanding power reactor program, plans for standardization and waste management, the need for a strong, independent regulator, and the importance of providing an opportunity for significant public participation in the licensing process.

Indonesia. There remains a clear division within the government of Indonesia as to the need for nuclear power. The Ministry of Mines and Energy and PLN, the national utility, see no need to consider it in Indonesia's energy mix before 2010. The Ministry for Research and Technology and the National Atomic Energy Agency (BATAN) continue to plan for Indonesia to place its first orders by 1997, at the latest, with operation to begin in 2003. As part of this plan, a feasibility study is being conducted in Indonesia on introducing nuclear power into its electricity grid by the year 2003. Meanwhile, the NRC's assistance has been requested to provide nuclear safety and regulatory training to some of the personnel who will staff the independent nuclear regulatory authority Indonesia has announced will be created.

In February, NRC placed four Indonesian BATAN staff members in one-year assignments at NRC, three in the Office of Nuclear Reactor Regulation and one in the Office of Nuclar Regulatory Research, where they are learning aspects of regulation through on-the-job interactions with NRC staff and participation in selected training courses at the Technical Training Center in Chattanooga. The group also spent a week at the Idaho National Engineering Laboratory (INEL) to enhance their knowledge of how a U.S. National Laboratory provides technical regulatory support to the NRC. The assignees had briefings and performed reviews in a number of technical areas focussed particularly on review of the Advanced Light Water Reactor designs under 10 CFR Part 52. The NRC has committed to train four BATAN personnel per year for the next two years, depending on final decisions Indonesia makes on whether and how to proceed with its nuclear power program.

In August, the Chairman visited Indonesia where he met with key Embassy, government, and utility representatives to discuss significant regulatory issues, including U.S. nuclear power safety; U.S. support for nuclear energy safety in the Pacific Basin; and the importance of establishing and empowering an independent regulatory authority and establishing a safety culture at an early stage of commitment to a nuclear program. While there, he also made a presentation to the Indonesian governmental community on nuclear safety and energy experience in the Unite States and the world, including programs in the booming Pacific Rim economies.

Dr. Mohammad Ridwan, Secretary General of the Indonesian Academy of Sciences and Technology and a Special Adviser to the Minister of State for Research and Technology, made an extended visit to NRC in September to learn more about the role and responsibilities of an independent regulator. He has been designated by his government to help determine key factors in the establishment of Indonesia's independent regulatory authority (expected to take place in

1995) and then to head preparations for its establishment.

Thailand. Chairman Selin visited Thailand in May to hold a series of discussions with U.S. Embassy Bangkok and Thai Government officials (the Energy Generating Authority of Thailand (EGAT), the Office of Environmental Policy and Planning, the National Energy Policy Office, and the Office of Atomic Energy for Peace). Discussions focused on the energy picture in the country, with specific emphasis on Thailand's then-announced plans to explore the feasibility of adding two 1,000-megawatt nuclear power plants to its energy mix by the year 2006. He also described at all stops safety considerations in adopting the nuclear option, the status of the NRC's design certification program, and the nuclear power and safety program in the United States. On the last day of his visit, EGAT publicly announced that, although it would continue to study the nuclear option, it was abandoning plans to begin a nuclear power program at least in the period 1994–2011. EGAT cited mounting anti-nuclear sentiment, a lack of clear government policy, and increasing investment costs as the primary factors behind its decision.

Australia. Chairman Selin visited Sydney May 1–3 to participate in the 9th Pacific Basin Nuclear Conference. Dr. Selin presented a paper on "U.S. Support for Nuclear Energy Safety and Cooperation in the Pacific Basin" at the plenary session and conducted bilateral meetings on the margins with Australia, Canada, China, France, Germany, Indonesia, Japan, Russia, South Korea, Thailand, and the IAEA.

Commissioner de Planque, a co-founder of the Pacific Nuclear Council, also participated in the conference. She presented welcoming remarks at the opening session, chaired a plenary session, presented a plenary session paper, "The Science and Philosophy of Developing Programs for Radiation Protection," and attended selected bilateral meetings held by Dr. Selin during the conference. Subsequently, she met with representatives of the Western Australia Department of Health in Perth; visited a mineral sands mine in Capel; met with Australian Department of Primary Industries and Energy representatives and visited a hospital nuclear medicine program in Canberra. She also visited the Australian Radiation Laboratory and medical positron emission tomography facility in Melbourne.

Indian Subcontinent

India has developed an ambitious nuclear program (a mix of imported and indigenous technology), even though it does not have access to full range of nuclear commerce because of its non-proliferation policy. However, safety-related events at a variety of Indian nuclear facilities have given rise to two main concerns in the West. First, the absence of detailed information on the causes of, and responses to, these events creates concerns that similar (or worse) accidents could occur, and that this would have a negative impact on all countries currently using nuclear energy. Second, there are concerns that lack of an active safety dialogue with India prevents the United States from learning some useful nuclear safety lessons which might contribute to safety at U.S. facilities. As part of the U.S. Government discussions with India on energy issues, the NRC has begun to explore areas of mutual interest for possible exchanges of information. With a large and varied nuclear program, India should provide an opportunity for cooperative exchanges that would prove beneficial to both India and the United States.

India. In July 1994, Commissioner de Planque and IP Director Carlton Stoiber travelled to India as part of Energy Secretary O'Leary's mission to discuss energy issues. During the trip Commissioner de Planque and Mr. Stoiber visited the Bhabha Atomic Research Centre and consulted with the Department of Atomic Energy (DAE) and the Atomic Energy Regulatory Board (AERB) concerning the possibility of opening an informal, reciprocal nuclear safety dialogue.

At a meeting between Chairman Selin and the Chairmen of DAE and AERB during the September IAEA General Conference in Vienna, the AERB and NRC exchanged letters agreeing to pursue the dialogue, with an initial focus on fire safety, safety analysis of boiling water reactors, severe accidents (management and research), regulatory training, decontamination and decommissioning, and medical applications of radiation and radioisotopes.

In October, a delegation led by Dr. Gopalakrishnan, Chairman, AERB, attended the NRC Water Reactor Safety Conference, held two days of technical discussions at NRC headquarters, and visited the Brunswick nuclear power plant in Wilmington, N.C. Dr. Gopalakrishnan and part of the delegation visited the NRC Technical Training Center in Chattanooga. The remaining delegation went to Brookhaven National Laboratory (BNL) in New York for tours and discussions of BNL's nuclear safety research programs for DOE and the NRC.

Western Europe and Canada

The NRC has maintained traditionally strong ties with countries in this region, many of which have active and advanced nuclear programs. The NRC's relationships with these countries enable the agency to increase its knowledge of important new technical developments, both for operating facilities and advanced designs, and to harmonize regulatory approaches to the extent possible.

France. Because of the importance of their respective programs and activities, NRC and the nuclear establishment of France actively continued their regular cooperative exchange activities. In February, the Director of the French Directorate for the Safety of Nuclear Installations visited the Commission and senior management to discuss assistance activities with Russia and Ukraine and the international Nuclear Safety Convention. He also provided views on the re-start of the Medzamor units in Armenia. He returned in May to attend the NRC's annual regulatory meeting and meet with senior NRC officials.

In March, the Chairman of Electricit de France met with the Chairman and Commissioners to discuss nuclear safety in Central and Eastern Europe and global prospects for nuclear power and waste storage.

In September, Chairman Selin visited senior executives of the Directorate for the Safety of Nuclear Installations, the Atomic Energy Administration, Electricit de France, COGEMA and Framatome to discuss nuclear safety assistance to Russia and Ukraine and the importance of nuclear safety in the future nuclear energy growth in the Pacific Rim countries.

Germany. In December 1993, Dr. Adolph Birkhofer, the General Manager of the Company for Reactor Safety (GRS), visited the NRC to propose close cooperation between NRC, the GRS and the French Institute for Protection and Nuclear Safety (IPSN) to achieve resolution of the technical issues involved in severe nuclear plant accidents.

In January, the Director, Nuclear Safety and Radiation Protection of the Ministry of Environment, Nature Protection and Nuclear Safety (BMU), met with the Commissioners to discuss a number of topics, including U.S. expectations of the G–24 Group, bilateral cooperation with CEE countries, U.S. plutonium policy, and the BMU/NRC bilateral arrangement on nuclear safety cooperation.

In February, NRC staff met with their French and German counterparts in Paris to conduct a detailed review of ongoing activities and future plans regarding nuclear safety assistance to Russia and Ukraine.

Italy. In November 1993, Dr. Giovanni Naschi, Director, DISP, Agency for New Technologies, Energy and Environment (ENEA) visited the NRC to sign the third renewal of the NRC-ENEA/DISP Information Exchange Arrangement on behalf of the Italian Government. Commissioner Remick signed the renewal agreement for NRC. Dr. Naschi also met with staff of various NRC offices to discuss future cooperative exchange activities in the safety review of future passive advanced light water reactor designs; the status of waste management in the United States and Italy; and the Italian Government reorganization initiative which would establish a national agency for environmental protection, of which the ENEA would become a part.

Spain. In October 1993, a Commissioner of the Spanish regulatory body, CSN, met with the Chairman and Commissioners at the NRC to exchange opinions on nuclear safety issues of common interest, economic issues related to the future of nuclear power and waste management, public acceptance problems in Spain and the United States in siting a high-level waste repository, international issues such as change and progress in Central and Eastern Europe, the effectiveness of the Nuclear Energy Agency (NEA), the status of the Convention on Nuclear Safety, and nuclear issues related to European Community standardization.

The United Kingdom. Chairman Selin visited the UK September 12–13 for discussions with nuclear officials from the UK's Department of Trade and Industry, the Atomic Energy Division of the Nuclear Installations Inspectorate (NII); the national nuclear utility, British Nuclear Fuels Limited and the Offices of Environment, Science and Energy. Discussions centered on the UK's nuclear program review, which was undertaken to determine views of various interested parties regarding privatizing the nuclear industry and possibly building another nuclear power plant similar to the one recently completed at Sizewell. Other topics discussed were nuclear safety assistance to Ukraine; the need for a more comprehensive approach to nuclear assistance projects in Russia and Ukraine, emphasizing structural growth in their energy economies and movement toward these countries assuming their indigenous safety and management responsibilities; the importance of the Pacific Rim (especially China) in the future growth of nuclear energy and the consequent need now to begin improving nuclear safety there; and the need for a regional approach to some of Russia's key nuclear safety projects. Dr. Selin also delivered a major speech before a combined meeting of the British Nuclear Energy Society and the Nuclear Industry Forum on the subject: "Nuclear Safety in the New Independent States and in Central and Eastern Europe."

Also, during the report period, two representatives of the British Nuclear Installations Inspectorate (NII) visited NRC Headquarters, Region IV, and the Comanche Peak and South Texas Project nuclear plants to learn about NRC headquarters and regional management philosophy on new plant startups, including controls and precautions taken with equipment taken out of service for testing during the startup; the application of current inspection procedures; and the role of regionally based and resident inspectors during initial plant startup. They also visited the South Texas Project site to observe NRC and licensee preparations for the restart of the unit following an extended outage and to witness licensed operators going through the startup evolutions on the simulator. The visitors expressed appreciation for the knowledge of U.S. experience and practices gained during the visit.

Canada. In October 1993, Commissioner de Planque attended the International Nuclear Congress in Toronto, Canada. She also toured the Darlington Nuclear Generating Station and held safety discussions with AECB personnel.

In March, NRC and Atomic Energy of Canada Limited (AECL) renewed the research agreement related to participation in the Cooperative Severe Accident Research Program and the disposition of irradiated fuel from NRC tests in the National Research Universal (NRU) reactor. Besides defining the terms and conditions of the cooperative research, the agreement spells out the terms and conditions for the permanent disposal of degraded fuel from NRC tests in the NRU reactor. AECL will take title to the fuel, package it, and provide interim storage. AECL will also provide burnup calculations to satisfy the AECL and International Atomic Energy Agency requirements for disposal of the fuel.

In June, the Head of the Medical, Academic and Accelerator License Assessment Office, Radioisotopes and Transportation Division of the Atomic Energy Control Board of Canada, met with NRC management and staff in the NRC Offices of Nuclear Materials Safety and Safeguards, Nuclear Regulatory Research, State Programs, Investigations, Enforcement and the Inspector General to discuss and review the NRC's experience with the development and implementation of regulations pertaining to patient safety in radiation therapy.

Switzerland. In January, the Chairman made an official visit to Switzerland to meet with the Director and staff of the Swiss Federal Nuclear Safety Inspectorate (HSK) and to visit the Beznau nuclear power plant. Discussions with Roland Naegelin, Director, HSK, included periodic safety review practices in Switzerland, bunkered safety systems of the Beznau and Muehleberg power plants, use of plant-specific probabilistic safety assessment insights in licensing decision making and the Beznau plant information system. The tour of the Beznau plant provided an opportunity to view the special emergency residual heat removal system and the plant information system, both of which are recent safety initiatives.

Latin America

The three largest countries of Latin America—Argentina, Brazil, and Mexico—all have long-standing nuclear programs. Initiatives in recent years by Argentina and Brazil in the non-proliferation area have increased opportunities for U.S. nuclear cooperation with them. Active cooperation continues with Mexico.

Argentina. IP Director Stoiber represented the NRC at a Conference on the Peaceful Uses of Nuclear Energy and Non-Proliferation held in Bariloche, Argentina in April. The Conference, hosted by the governments of Argentina and Brazil and the U.S. Department of Energy (DOE), drew officials from throughout Latin America and encouraged a spirit of hemispheric cooperation. Panels and discussions were held on such topics as non-proliferation (the Treaty of Tlatelolco and the 1995 conference on the Nuclear Non-proliferation Treaty), nuclear cooperation (medical, agricultural and industrial uses of nuclear technology), nuclear safety, waste management, safeguards, research reactor technology, and multilateral export control arrangements (the Zangger Committee and Nuclear Suppliers Group). Mr. Stoiber made a presentation entitled, "Nuclear Safety: A New World Perspective," and chaired a panel on nuclear safety issues.

Brazil. The President of the Brazilian Comissao Nacional de Energia Nuclear (CNEN), Jose Mauro Esteves dos Santos, signed a renewal of the NRC-CNEN Information Exchange and Cooperation Arrangement during a brief signing ceremony on September 20 on the margins of the IAEA General Conference.

Mexico. Commissioner Forrest Remick visited Mexico in early March, where he met with senior-level officials at Mexico's National Commission for Nuclear Safety and Safeguards (CNSNS) and at the Secretariat for Energy, Mines and Industrial Paraestatals. He also toured the Laguna Verde nuclear power plant and delivered a paper at the TRAC BI Workshop in Cuernavaca, Mexico.

Later in March Chairman Selin also visited senior energy and nuclear officials in Mexico City and visited the nuclear power plant at Laguna Verde. Discussions were held with the Secretary of Energy, Mines and Industrial Paraestatals, the Director General of the National Commission for Nuclear Safety and Safeguards, the Mexican Institute for Petroleum and the Director General of the Federal Electricity Commission.

In November 1993, Commissioner de Planque addressed the plenary session of the second Regional Congress on Radiation and Nuclear Safety in Zacatecas, Mexico on the subject, "Nuclear Power: Issues in a Changing World."

Africa and Middle East

The NRC has had only modest involvement with countries in these two regions, in particular because of a lack of active nuclear power programs there, and also for broader policy reasons. Recent developments in Southern Africa and elsewhere may warrant an expanded role in regulatory cooperation with certain countries in these regions.

South Africa. In September, during an official visit to South Africa, Chairman Selin signed an arrangement with the NRC's nuclear safety counterpart, the Council for Nuclear Safety. The arrangement is to serve as the framework for future nuclear information exchange and possible cooperation in nuclear research. It is similar in substance to arrangements that the NRC has signed and implemented with counterpart regulatory authorities in other countries. During his visit, the Chairman met with senior officials of the Ministry of Foreign Affairs; the Atomic Energy Corporation; ESCOM, the national electric utility; the Anglo-American Corporation; the African National Congress (ANC) and the President of the World Association of Nuclear Operators. Dr. Selin made a presentation to the annual nuclear safety meeting of ESCOM and toured the Koeberg nuclear power plant. He also visited facilities at the Pelindaba/Valindaba Research Center.

Egypt. In January, Dr. Fawzi Hamad, then President of the Egyptian Atomic Energy Authority (EAEA), visited the Chairman and

Commissioners to discuss the signing of a sister-laboratory arrangement between Los Alamos National Laboratory and the Egyptian Atomic Energy Authority. They also discussed NRC work on inherently safe reactors, waste management and renewal of the USNRC–EAEA Cooperation Arrangement.

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 in Vienna and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD) in Paris. For example, NRC employs data received from other countries through both agencies on events at their nuclear power plants in comparative studies of reactor operational experiences that may produce information applicable to the safety of U.S. reactors. Reports of operational events received from the NEA's Incident Reporting System, from the IAEA and from bilateral exchange programs with over 20 countries are used by the NRC to supplement domestic data, and the NRC provides U.S. incident reports to the international community as well (see Chapter 3).

International Atomic Energy Agency

International Atomic Energy Agency General Conference and Board of Governors Meetings. In September 1994, Chairman Selin attended the 38th regular session of the International Atomic Energy Agency (IAEA) General Conference in Vienna. While there he took part in bilateral discussions with delegations from Japan, Kazakhstan, South Korea, China, Germany, Ukraine, Hungary, the Czech Republic, the Slovak Republic, Slovenia, Russia, Brazil, Argentina, the European Union, Lithuania, Finland, Sweden, Canada, Mexico, South Africa, Armenia and India. He also renewed the NRC's bilateral arrangement with Brazil. The NRC's Executive Director for Operations, James Taylor, also attended the General Conference and participated in a meeting for senior regulators, where he led a session on current issues related to a paper he had prepared on core shroud cracking, steam generator tube inspection, and shutdown and low power risk. Other participants at the meeting included regulators from several newly independent countries who readily responded with their own experience in these areas.

The opening for signature of the Convention on Nuclear Safety (CNS) for civilian nuclear power reactors was the highlight of safety activities at the 1994 General Conference. The United States was the third country to sign the CNS, after Canada and Germany. The IAEA Board of Governors and Director General of the IAEA were also directed to start preparations for a waste management convention. Other resolutions directed the IAEA to intensify activities monitoring nuclear material trafficking, to develop measures to achieve a stronger and more cost-efficient safeguards system, and to restore technical assistance to Israel.

Four meetings of the IAEA Board of Governors were held during the report period, all of which were attended by NRC staff. The December 1993 board focused on a report of the Technical Assistance and Cooperation Committee, a research reactor project in Colombia and safeguards issues. The February 1994 board approved a draft text and authorized the Director General to convene a Diplomatic Conference June 14–17 to negotiate the CNS based on the text developed by an open-ended working group. In addition, the February board decided to restructure and sharpen the focus of future board agenda by having them shaped around a particular topic or theme reflecting a key program priority. While retaining flexibility to address new and continuing items, it was decided that future boards would highlight technical cooperation in December, nuclear safety and waste in March (the old February board), and safeguards and the budget in June. The June 1994 board focused on safeguards issues related to the conduct of safeguards inspections in North Korea and measures to strengthen the effectiveness of the IAEA safeguards system; technical cooperation, nuclear safety issues related to international waste management, liability for nuclear damage, and the agency's program and budget. Finally, the September 1994 board approved the report of the June Diplomatic Conference, which had adopted the Convention on Nuclear Safety for transmission to the General Conference.

Commissioner Remick's Participation in IAEA Meetings. Commissioner Remick participated in a meeting in Vienna in April 1994 to consider actions to alleviate the serious safety problems identified by an IAEA expert safety assessment mission to the Chernobyl site the month before. The meeting concluded that Ukraine would require outside assistance to strengthen the sarcophagus, close the Chernobyl site, complete other reactors under construction and develop alternative energy sources.

Also during the report period, Commissioner Remick agreed to chair four sets of meetings organized by the IAEA as Regulatory Peer Group Discussions. The first meeting, held in November, was on "The Policy Used for Setting and Assessing Regulatory Goals and Objectives." Participants were senior regulators from Argentina, Belgium, Bulgaria, the Czech Republic, the United Kingdom and the United States. Because of his involvement in the development of the NRC's safety goals, he chaired all of the 1994 Peer Group meetings, which were on the same subject as the November meeting but involved different country participants.

IAEA Visitors to NRC. Dr. Morris Rosen, Assistant Director General, visited NRC in April and met with the Chairman, Commissioners Rogers, Remick and de Planque, EDO James Taylor and IP Director Stoiber. His main purpose was to discuss the April 21–22 meeting in Vienna on Chernobyl. Dr. Rosen noted that the deteriorating sarcophagus at the Chernobyl plant posed the greatest threat. Other topics discussed were IAEA's activities pertaining to Armenia, Chernobyl, Ukraine, Kazakhstan, India and Pakistan; implementing the Convention on Nuclear Safety; and funding for radiation protection assistance to the former Soviet Union through the IAEA-United Nations Development Program on Strengthening Radiation and Nuclear Safety Infrastructures in Countries of the former Soviet Union.

Mr. David Waller, Deputy Director General for Administration, visited NRC on April 14 where he met with the Chairman and IP Director Stoiber to discuss the IAEA budget and the impact of changes in the safeguards area.

Dr. Boris Semenov, Deputy Director General for Nuclear Energy and Safety, also visited NRC in April to meet with the Chairman, Commissioner de Planque, EDO James Taylor and IP Director Stoiber. Discussions focused on the Convention on Nuclear Safety, the April 21–22 Chernobyl Conference in Vienna, G–24 safety coordination, Russian technical support, and IAEA activities related to a future convention on the safety of waste management.

IAEA Meeting Participation. During fiscal year 1994, NRC participated in 39 meetings on a wide range of nuclear safety topics. The NRC staff attended meetings in the areas of emergency planning and preparedness; root cause analysis of incidents; the incident reporting system; the International Nuclear Event Scale; computer codes for severe accident management; nuclear power plant equipment qualification; safety of nuclear power plants built to earlier standards; safety margin assessment of major nuclear power plant components; nuclear power plant personnel qualification; motor-operated valve issues; erosion and corrosion of nuclear power plant materials; safety principles for the design of future reactors; long term storage of shutdown nuclear installations; nuclear power plant control and instrumentation systems; research reactor commissioning and accidents; reporting system/data base on accidents caused by radiation sources and devices; exemption principles; international standards for radiation protection; pre-disposal management of medical waste; geo-hydrological transport models for repositories; review of IAEA waste management safety standards; materials transport regulations; safe transport of low specific activity materials; air transport of hazardous materials; OSART Mission highlights; regulations for uranium deposit and development production; liability for nuclear damage; and safeguards.

Third Party Liability. In response to international concern about transboundary damage where insufficient funds are available for compensation, as well as the concern of U.S. firms about their potential liability in nuclear safety upgrade activities for Soviet-designed reactors, the United States has been participating in efforts to develop an effective international nuclear liability system.

The NRC participated in three separate meetings on nuclear liability during fiscal year 1994 to discuss specific proposals to revise the Paris and Vienna Conventions. Progress was made at the final meeting in May where the U.S. delegation tabled a draft transboundary supplemental compensation arrangement which would assure better compensation, permit universal adherence and provide linkage among countries with different nuclear liability systems. To achieve its goals, the draft is designed as an umbrella or bridging mechanism with coverage broad enough to include the Vienna Convention parties, the Paris and Brussels Convention parties, and other major nuclear states, such as Japan, Russia, Ukraine, Canada, and the United States. The proposal received support from a number of major nuclear states, including Russia, Ukraine and Japan. It was scheduled to be considered at the next session of the IAEA Standing Committee on Liability, to be held October 31, 1994.

Convention on Nuclear Safety. The Convention on Nuclear Safety (CNS), the first legal instrument to address directly the safety of nuclear power plants worldwide, was opened for signature on September 20 during the IAEA General Conference. Ministers and high-level governmental delegates from 38 countries, 23 with nuclear power programs, representing all geographical regions, signed the Convention on the first day. The Convention will enter into force on the 90th day after the 22nd instrument of ratification is deposited with the IAEA (the Depositary of the CNS), including the instruments of 17 States with at least one nuclear installation which has achieved criticality in a reactor core.

The CNS applies to land-based civil nuclear power plants and obliges Contracting Parties to establish and maintain proper legislative and regulatory frameworks to govern safety. Parties to the Convention commit themselves to the application of fundamental safety principles for nuclear installations, and agree to participate in periodic peer review meetings to submit national reports on implementation of their obligations.

On December 5–6, Mr. Stoiber attended a meeting in Vienna with representatives from China, the Slovak Republic, Canada, Sweden and the IAEA Secretariat to prepare for meetings of signatories by assisting in the drafting of terms of reference for the preparatory meeting and the meeting of parties when the CNS enters into force.

Nuclear Energy Agency

NEA Steering Committee Meetings. Two Nuclear Energy Agency (NEA) steering committee meetings were held during fiscal year 1994 in Paris. At a meeting in October, the committee welcomed the Republic of Korea (ROK) as its newest member and accepted two ROK cost-free experts to the NEA and a trainee from Taiwan. Exploratory talks among the NEA, Argentina and Brazil were postponed pending new steps taken by these countries in the area of non-proliferation. The revised mandate for the Committee on Radiation Protection and Public Health (CRPPH) was approved. Regarding cooperation with the countries of Central and Eastern Europe and the former Soviet Union, a symposium on the Chernobyl-4 reactor unit was postponed pending the fact-finding mission to Kiev in March.

At a meeting in April, the committee welcomed an observer delegation from Mexico and noted that it looked forward to Mexico becoming the 25th member of the NEA upon its accession to the OECD. The committee reviewed the 1995–1996 Program of Work for the agency. The U.S. delegation voiced concern regarding three new general activities (economic and technical assessments, nuclear science, and public information) associated with FSU/CEE countries and requested that only specific activities be included in the program of work on a case-by-case basis. The committee also endorsed the draft statement by the Committee on Nuclear Regulatory Activities on Licensing Aspects of Nuclear Power Plant Siting, and recommended its wide distribution.

The steering committee reviewed the progress made by Argentina and Brazil with respect to non-proliferation commitments, in particular the entering into force of the Quadripartite Safeguards Agreement. Argentina's adherence to the Treaty of Tlatelolco was noted. Concerning the outstanding joint request by Argentina and Brazil to explore possible cooperation with the NEA, the committee requested the Secretariat to transmit a letter to the two countries welcoming recent steps taken by them and encouraging Brazil to follow the lead of Argentina on further non-proliferation commitments.

Considerable discussion took place on the proposed comprehensive review of the agency's long term objectives and the Director General's strategy for utilizing small groups of experts, which would include non-government participants, to harmonize proposals. The committee authorized a review and decided to hold, no later than October 1995, a special session to discuss the results of the review. The committee endorsed the proposal to convene an Ad Hoc Group of Experts in the summer of 1994 on the agency's information and publications program.

NEA Senior Regulators Meeting. NRC Chairman Ivan Selin attended meetings of the NEA Senior Regulators in Paris, September 16. The agenda covered the CNS and its implementation; the safety of VVER and RBMK reactors and the effectiveness of the assistance programs provided by OECD countries; and safety and licensing aspects of new reactors. Regarding the CNS, participants agreed that an early meeting of signatories and a small meeting of principal experts would be useful to set forth proposed formats for national reports, which will be the basis for the peer review process fundamental to ensuring compliance with the Convention. Regarding the safety of RBMK and older VVER reactors, they agreed that strengthening the regulatory bodies in Ukraine and Russia is fundamental to progress; that coordination among regulatory bodies is fairly good and that there should be mutual respect for one another's approaches to such assistance; that the Nuclear Safety Account of the EBRD should continue to work on the riskiest reactors; and that a final solution is needed to the liability question. On the question of advanced reactors, the regulators agreed that establishing quantitative risk goals more stringent than those generally employed today would be of limited benefit; nevertheless, efforts should continue to design away uncertainties. Operational issues and human factors are considered the best place to make progress in reducing accident risk. They also agreed that work on harmonizing plant life extension rules would be valuable and that, for new plants, regulatory emphasis should be placed on severe accident sequences, mitigation of consequences and emergency planning.

U.S.–EURATOM Negotiations. The agreement between the government of the United States and the European Atomic Energy Community (EURATOM) Concerning Peaceful Uses of Atomic Energy provides the legal basis for NRC to authorize exports of nuclear fuel and major nuclear reactor components to the EURATOM member states, including Belgium, France, Germany, Italy, the Netherlands, Spain and the United Kingdom. The agreement expires in 1995 and is currently being renegotiated. The Department of State has the lead role for the United States in these negotiations, while DOE and other U.S. agencies, including the NRC, provide technical and policy support to the Department.

During the report period, the United States continued negotiations with EURATOM on the agreement. As required by the Nuclear Non-proliferation Act of 1978 (NNPA), as amended, the United States has been seeking consent rights on a case-by-case basis for reprocessing in the European Union of U.S.-supplied or produced nuclear material. The European Commission has been unwilling to give those rights to the United States and has urged the United States to seek from Congress a waiver of the consent right requirements of the NNPA. Negotiation sessions in October and December seemed to bring the parties closer to resolution of the consent right issue. The next negotiating round is scheduled in January 1995.

G–7 Nuclear Safety Working Group. During preparations for the July 1992 Munich Summit of Western industrial democracies, representatives of the group of seven (G–7) nations decided to establish a Nuclear Safety Working Group (NSWG) to develop a program to address safety problems with reactors of Soviet design. Another initiative launched by the G–7 NSWG was establishment of a special multilateral fund for nuclear safety assistance, to be administered through the European Bank for Reconstruction and Development (EBRD). The G–7 also requested that the Group of 24, or G–24, (a group of nations joined together to coordinate economic assistance to Central and Eastern Europe (CEE)) form a special group, the G–24 Nuclear Safety Working Group (NSWG), to coordinate bilateral nuclear safety assistance to the CEE and the FSU.

During fiscal year 1994, NRC participated actively in U.S. Government efforts, together with those of other G–7 nations, to develop a G–7 Action Plan to provide financial and other assistance to Ukraine that will enable the Chernobyl nuclear power plant to be closed as soon as possible. This action plan was formally announced at the G–7 Summit in Naples, Italy in July. Approximately $200 million was pledged by the G–7 countries towards initial implementation of this effort. In addition, the Nuclear Safety Account (NSA), which is administered by the European Bank for Reconstruction and Development, is expected to play a key role in assisting in implementing the G–7 action plan.

European Bank for Reconstruction and Development. During Chairman Selin's September visit to the UK, he also met with U.S. representatives to the European Bank for Reconstruction and Development (EBRD) and officials of the EBRD and the Nuclear Safety Account. Among these were former Congressman James Scheuer, now U.S. Director for the EBRD, his deputy, Alternate Director Lee Jackson and EBRD President Larosiere. Discussions centered on U.S. support for EBRD's project to fund safety upgrades to the Mochovce nuclear power plant in the Slovak Republic. Dr. Selin reassured officials that U.S. support for Mochovce was firm, noting that completion of safety upgrades to Mochovce was very important to the U.S. Government but, along with that support, came the requirement that all the bank's discussions on the project be made public—the more information released about safety and least cost analysis of this project the better. The Chairman also noted that Western assistance to date to Russia and Ukraine can only cover short-term risk reduction activities and that in the future these countries are going to have to accumulate enough money so they can invest in their own energy infrastructures. Alternate Director Jackson spoke at length on the improved management of the EBRD under the new president.

G–24 Nuclear Safety Assistance Coordination Activities. The organizational structure of the G–24 NSWG includes a Plenary, a Steering Committee, and Technical Working Groups which meet periodically to discuss coordination of various safety assistance efforts. A Nuclear Safety Assistance Coordination Center in Brussels, Belgium, houses a data base of information related to nuclear safety assistance activities which is used to develop recommendations to minimize the likelihood of duplication of efforts and to identify any potential assistance gaps. The NRC, as part of U.S. Government efforts to support the G–24 coordination process, participates actively in G–24 NSWG meetings and activities.

The NRC participated in the G–24 NSWG Steering and Plenary Committee meetings held in Brussels, Belgium, in March, June, and September to discuss coordination of safety assistance programs worldwide for the countries of the former Soviet Union and Central and Eastern Europe. The NRC also participated in the second and third meetings of an Ad-Hoc Regulatory Assistance Coordinating Body, a meeting that was held in conjunction with the March and September G–24 NSWG Steering and Plenary Committee meetings. Meetings of this group are held periodically under the auspices of the G–24 to provide regulatory authorities a forum in which to exchange information on ongoing regulatory assistance projects for the FSU and CEE, as well as to identify the need and mechanism for any future regulatory assistance coordination activities. In addition to the NRC, the regulatory authorities of Germany, France, Spain, Belgium, Finland, Sweden, Canada, Italy, and the UK were represented. Representatives of the European Union's safety assistance programs also attended.

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: Severe Accident Research; Thermal/Hydraulic Code Maintenance and Assessment; and Piping Integrity and Material Research. Over fifty 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 produce confirmatory safety data of mutual benefit in a timely and cost effective manner.

Examples of activities conducted in fiscal year 1994 under the NRC's international nuclear safety research program (see also Chapter 9) are the following:

- Using the ROSA Large-Scale Test Facility in Japan to do confirmatory safety system testing to help provide technical bases for NRC licensing decisions on the AP 600 advanced reactor design.

- Cooperating internationally to develop practical advanced analytic methods to improve predictions of pressure vessel fracture and assess integrity of pressure vessels 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 pressure vessel (PV) embrittlement and thermal annealing of the vessel to mitigate embrittlement effects.

- Irradiating various stainless steel samples in the Halden reactor in Norway as part of an investigation of irradiation-assisted stress corrosion cracking of reactor core internal components, which becomes greater as reactors age and core materials absorb greater neutron flux.

- Working to unite the fragmented technical activities of various institutions and organizations in the former Soviet Union within the framework of the Joint Coordinating Committee on Civilian Nuclear Reactor Safety.

Export and Import Licensing

NRC Export/Import Role. Under the Atomic Energy Act of 1954, as amended, the NRC is responsible for licensing the export and import of nuclear-related materials and equipment to ensure these items are used only for peaceful purposes. This authority extends to production and utilization facilities, to special nuclear and source material, to byproduct materials, to certain nuclear-related components, and to 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 also is 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 DOE. The NRC is also consulted by the Department of State (DOS) regarding agreements for nuclear cooperation between the United States and other countries. In fiscal year 1994, 110 technical international safeguards reviews were performed regarding export applications, agreements for nuclear cooperation, subsequent arrangements, and technology transfers.

NRC Export Licensing Summary. In fiscal year 1994, the NRC completed 129 export licensing actions. Of these, 47 involved exports to EURATOM, Japan and Mexico of routine reload fuel for power reactors using low-enriched uranium (LEU); six involved initial core fuel loading for power reactors in the Czech Republic, Japan and Taiwan; and two licenses authorized the export of low-enriched uranium for use in foreign research and test reactors. One license was approved for the export to France of 280 kilograms of high-enriched uranium (HEU), in the form of unirradiated fuel elements from a decommissioned reactor, for recovery of the HEU and downblending to LEU for use in research reactors in EURATOM. Thirty of the completed actions were applications returned without action to the applicant when anticipated orders were not received.

Export of Low-Enriched Uranium to the Czech Republic. On March 17, the Natural Resources Defense Council, Friends of the Earth, Hnuti Duha, and Global 2000 filed a petition for intervention and a request for a hearing on an application by Westinghouse for a license to export an initial core and four reloads of low-enriched uranium fuel to the Czech Republic for Temelin Units 1 and 2. The petitioners challenged the health, safety, and environmental impact of fuel exports for the Temelin reactors. On June 10, after the Commission denied the request for a public hearing, NRC staff issued a license authorizing the export of this low-enriched uranium fuel to the Czech Republic.

Nuclear Suppliers Group. The NRC continued to support U.S. efforts to enhance multilateral export controls of the international Nuclear Suppliers Group. The NRC published a final rule on September 26, 1994, to conform its export controls to the Nuclear Suppliers Group Guidelines for the export of nuclear-related dual-use commodities. The 1994 Plenary Meeting of the Nuclear Suppliers Group (NSG) took place in Madrid, Spain in April. Representatives of 29 Member States participated in the meeting, including a representative from NRC. The group adopted several changes in the guidelines for nuclear transfers, including a strengthening of the re-transfer provisions and emphasis on the importance of members satisfying themselves that their transfers will not contribute to proliferation of nuclear weapons. The Group also encouraged the continuation of work to clarify and expand the list of nuclear goods and technology in the areas of uranium enrichment, uranium conversion and reactor coolant pumps. A new technical working group was created to review the companion list of dual-use items. The Group also reviewed progress made on information-sharing arrangements among members and affirmed the principle of transparency.

Subgroup on Nuclear Export Coordination. The NRC continued to participate in the Subgroup on Nuclear Export Coordination (SNEC), an inter-agency body which meets regularly to reach consensus on export license applications which may raise nuclear proliferation concerns. SNEC serves as a forum for exchanging and coordinating views among member Federal agencies on nuclear export licensing activities of the Department of Commerce, nuclear technology transfers authorized by the Department of Energy, and exports licensed by the Nuclear Regulatory Commission. Cases are referred to SNEC because of country destination, concern about end user/commodity, precedent setting nature of the proposed export, and agency request. In 1994, 143 export cases were reviewed by SNEC with most of these being dual-use exports. The number of cases reviewed in 1994 dropped substantially from earlier years as a result of revisions to Department of Commerce licensing controls over computer exports.

Department of Energy Technology Transfers. The NRC worked with DOE by using the new expedited procedures to process safety-related transfers of nuclear technology (training, advice, licenses, and other assistance separate from exports of nuclear materials and equipment) for Russia and the Ukraine. The NRC also concurred in DOE's proposal to remove Argentina, Brazil and Chile from the Part 810.8 list of restricted countries because of significant changes in their non-proliferation policies. Other technology transfer cases involved assistance to South Africa, Russia and the Ukraine. The NRC was also consulted by DOE on subsequent arrangements involving previously-exported U.S. nuclear materials in Switzerland, Taiwan, the United Kingdom, and France.

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. non-proliferation laws, which are intended to ensure that U.S. exports will be protected and safe-guarded 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 Nuclear Threat Reduction Act of 1991 (P.L. 102–228) 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 other non-proliferation-related activities. Under the legislation, a Safe and Secure Dismantlement (SSD) Group (now known as the Cooperative Threat Reduction (CTR) Program) was established to focus on giving assistance to the former Soviet Union (FSU) in dismantling nuclear weapons, including enhancement of national systems for nuclear materials control and accounting (MC&A) and physical protection.

The NRC is committed to the U.S. effort to provide denuclearization support to the republics which inherited the Soviet Union's strategic nuclear arsenal. The NRC and DOE are co-leading the U.S. effort in MC&A and physical protection, including the implementation of a U.S.-Russia MC&A Agreement signed on September 2, 1993. Similar agreements with Kazakhstan and Ukraine were signed by the United States in December 1993. The objective of these agreements is to assist the FSU republics in improving their regulatory programs and facility safeguards capabilities to protect nuclear material and facilities effectively. This effort will enhance the national safeguards regulatory program and includes the installation of model safeguards systems at selected nuclear sites for demonstrating systems capability and for training.

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 making information exchange trips for the purpose of discussing national physical protection programs. During fiscal year 1994, visits were made to Romania, Slovenia, Bulgaria, Peru and Colombia. Similarly, teams from Belgium and the United Kingdom visited the NRC and NRC-licensed facilities.

Nuclear Non-Proliferation Activities

U.S. Non-Proliferation Policy. The United States continues to provide strong support for the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), for the International Atomic Energy Agency (IAEA) and its safeguards role, and for multilateral export controls.

Nuclear Non-Proliferation Treaty Extension. The Nuclear Non-Proliferation Treaty, with more than 160 parties, is the cornerstone of the international nuclear non-proliferation regime and supports fundamental U.S. national security and foreign policy objectives. In April 1995, a conference of the parties will be held to decide whether to extend the treaty indefinitely, or for one or more fixed periods.

During the fiscal year, two Preparatory Committee meetings for the NPT Extension Conference were held. Nearly 120 of the more than 160 parties to the NPT attended the second session of the Preparatory Committee in January 1994. The PrepCom focused principally on three outstanding issues, and important progress was made toward establishing the organizational and procedural framework for the 1995 conference. On the method of decision-making at the PrepCom, the parties agreed that the Committee will make every effort to adopt decisions by consensus. On whether or not observers would be allowed to attend PrepCom meetings, it was agreed that representatives of states which are non-parties shall be allowed upon request to attend as observers, and that representatives of non-governmental organizations shall be allowed, upon request, to attend the open meetings and be seated in the gallery. The nature of the background documentation to be prepared to support the parties at the PrepComs, which for many developing country delegations provides the basis for their own substantive preparation, was also agreed upon.

Approximately 90 countries participated in the September 1994 PrepCom, with progress evident on several procedural issues. The parties held two plenary sessions devoted to an "exchange of views," considered a number of background papers prepared by the U.N. Secretariat and the IAEA, and convened a Working Group to review the conference rules of procedure. The PrepCom failed to reach agreement on the agenda for the 1995 conference, although progress toward this end was made. It is expected that the rules and the agenda will be finalized at the fourth PrepCom in January 1995.

Nuclear Regulatory Research

Chapter 9

Activities of the NRC's Office of Nuclear Regulatory Research (RES) constitute an essential service to the regulatory process and are vital to the implementation of a substantial 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 the implementation of Commission policies on safety goals and severe accident regulation, to the resolution of generic safety issues, and to the review of licensee submittals regarding individual plant examinations. It is also the responsibility of RES to conduct the NRC's rulemaking process, including the issuance of regulatory guides and rules that govern NRC licensed activities.

Regulations issued by the NRC in 1994 are listed in Appendix 4. Regulatory guides are described in Appendix 5, which includes a listing of those guides issued, revised or withdrawn during fiscal year 1994.

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, which stimulates technological innovation by small businesses, strengthens the role of small business in meeting Federal research and development needs, increases the commercial application of NRC-supported research results, and improves the return on investment from Federally funded research for economic and social benefits to the nation. The NRC has participated in the program since its inception in 1982, promoting high quality, "cutting-edge" research of relevance and potential importance to the NRC mission. One goal of the program is to couple this research with follow-on private funding, pursuant to possible commercial application. As of fiscal year 1994, the NRC was supporting 17 SBIR projects-in-progress.

In 1994, the NRC staff continued its active participation in the National Standards Program, 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 180 NRC staff members serve on working groups organized by technical and professional societies.

This chapter summarizes RES activities during fiscal year 1994 under the following major headings: Reactor Licensing Support, Reactor Regulation Support, Safeguards Regulation Program, and Assessing the Safety of High-Level Waste Disposal.

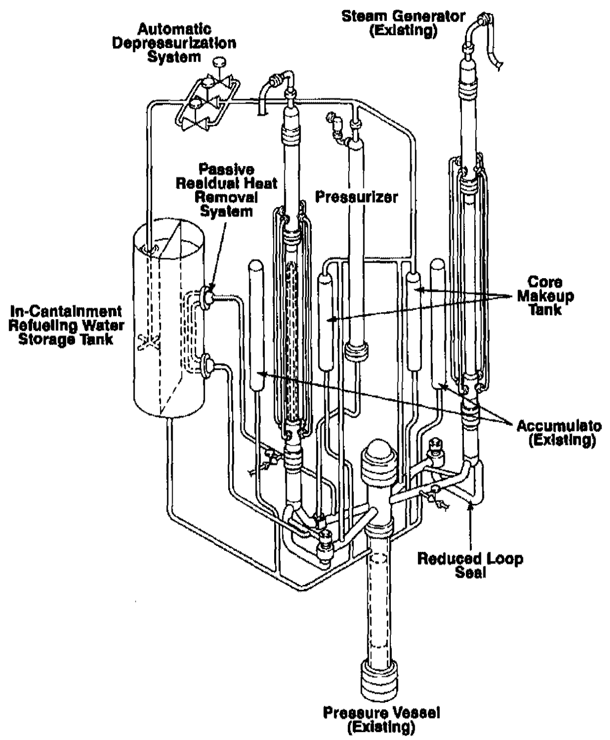
Reactor Licensing Support

Standard Reactor Designs

Systems Performance of Advanced Reactors

Support for AP600 Design Review. Confirmatory testing and analysis of the Westinghouse AP600 reactor and plant systems are being carried out to reinforce confidence in the NRC's evaluation of the safety of the AP600 design. The most cost-effective means of performing the desired tests was to modify an existing full-height, full-pressure test facility, rather than to build a new one. A screening process revealed that the best choice was the Rig of Safety Assessment (ROSA) large-scale test facility at the Japan Atomic Energy Research Institute (JAERI). To confirm initial results and to determine the extent of modification necessary to simulate the AP600 at the ROSA facility, the Idaho National Engineering Laboratory was contracted to perform a comparative study between ROSA and AP600, using the RELAP5 code.

LSTF Modifications for AP600 Experiment



The AP600 design is characterized by the use of passive safety features for emergency core cooling and decay heat removal. The ROSA–AP600 experiments are to be conducted in parallel with the ROSA–V accident management experiments.

A comparison of the existing ROSA facility and the AP600 design showed that modifications would be needed. Facility modifications were made by Sumitomo Heavy Industries, the firm which had constructed the ROSA facility and has been maintaining and operating it for the past several years, as a contractor to JAERI. Facility modifications were completed in February 1994.

As of November 1, 1994, eight tests have been conducted, with emphasis on accident scenarios that will challenge the unique safety systems employed by the AP600 reactor. Small-break loss-of-coolant accidents in different locations and of different magnitudes were investigated. Test results obtained so far indicate that the reactor will be effectively cooled, as designed, under these various accident conditions. However, two salient issues have arisen as a result of tests performed to date. One involves the large thermal gradient found in the cold leg, where cold water from the passive residual heat removal system enters. The other is the possibility water hammer in the cold leg or in the upper plenum, as a result of direct contact between sub-cooled water and steam. These matters are being carefully evaluated.

Six additional tests will be conducted by June 1995, with six more in 1996. The RELAP5/MOD3 computer code is being assessed against the test data from ROSA, and necessary improvements are being made, so as to be able to predict the data satisfactorily.

Support for SBWR Design Review. This program provides confirmatory testing and computer code assessment for the General Electric Simplified Boiling Water Reactor (SBWR). There are three elements in the program. First is a well-scaled, integral SBWR test facility, which has been designed and will be built at Purdue University. The test facility is called PUMA (the Purdue University Multi-Dimensional Integral Test Assembly). Second, 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. Third, the PUMA data will be used to (a) assess the capabilities of the thermal-hydraulic RELAP5 code for SBWR analysis, (b) assess the integral performance of the SBWR-unique, safety systems that maintain core and containment cooling, and (c) identify and understand the important phenomena observed in the tests.

PUMA is a low-pressure (150 psi) and reduced-height facility. Its design was completed in 1994, and procurement and fabrication of various components and instrumentation is under way. The PUMA facility will be completed by April 1995 and will be ready for testing by July 1995. A total of approximately 40 tests will be performed by August 1996.

Support for CANDU 3 Design Review. Several studies were completed in early fiscal year 1994 in connection with the pre-application review of the CANDU 3 design, and four significant research products were produced from these studies. One was a summary of Canadian regulation of CANDU reactors in the past, which revealed some contrasts with NRC regulation. The second identified and classified event sequences (i.e., accident scenarios), plant systems, and operator actions in ways that would facilitate the application of NRC regulations. The third was an assessment of data bases that constitute the basis for CANDU safety analyses. And the fourth was a preliminary analytical study, using Canadian computer codes, of events involving the design's positive coolant-void coefficient of reactivity. Additional work has been planned to support the formal review for design certification, but that work will not be initiated until more of the work on AP600 and SBWR is finished.

Human Reliability. Efforts continue to develop methods for assessing the impact on risk of changes in human performance attributable to the introduction of advanced digital displays and controls.

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 conducted on power plant and advanced control room simulators and through task network modeling.

Engineering Issues for Advanced Reactor Designs

Qualification of Advanced Instrumentation and Control System Hardware. The Oak Ridge National Laboratory (ORNL) is conducting a study to identify functional and environmental issues arising from the application of new technologies in instrumentation and control (I&C) systems for both current and next-generation nuclear power plants. The goal of this program is to establish the technical basis for augmenting the qualification process to accommodate "advanced" instrumentation. Initial studies have been documented in "Functional Issues and Environmental Qualification of Digital Protection Systems of Advanced Light-Water Nuclear Reactors" (NUREG/CR-5904), where the likely effects of environmental stressors on safety system components and interfaces are examined. A methodology for identifying the need for accelerated aging in qualifying new I&C systems for placement in benign environments was also proposed. Current research involves an experimental investigation into the functional behavior and failure modes that result for a microprocessor-based safety system under the application of environmental stressors—such as the presence of smoke, electromagnetic interference, radio-frequency interference, temperature, and humidity. The prototypic safety channel implemented for this study employs technologies representative of those proposed for use in advanced light-water reactors. Environmental tests should reveal any potential system vulnerabilities and help determine the expected effect of a stressor on advanced I&C system components. This information supports a clearer definition of what (and to what level) stressor equipment should be qualified to withstand, and thus builds the technical basis for supplementing current qualification guidelines.

Technical Basis for Regulatory Guidance on Electromagnetic Interference Issues. ORNL is developing the technical basis for acceptance criteria to address electromagnetic and radio-frequency interference (EMI/RFI) and power surge issues in I&C systems. The motivation for research stems from safety-related concerns associated with the application of advanced I&C systems, both analog- and digital-based, in commercial nuclear power plants. Installation and evaluation (testing) criteria for I&C systems have been developed at ORNL and are described in "Technical Basis for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related I&C Systems" (NUREG/CR-5941). These criteria are based on engineering practices documented in "Guide for Instrumentation and Control Equipment Grounding in Generating Stations, IEEE Std C62.41-1991, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits" (IEEE Std 1050-1989), and "Measurement of Electromagnetic Interference Characteristics" (U.S. MIL-STD-462). The electromagnetic environment in a nuclear power plant is virtually unknown; thus, ORNL is also collecting EMI/RFI and power surge measurement data at various plant sites. ORNL has assembled two measurement systems capable of unattended operation to collect long term radiated and conducted EMI/RFI data: one is configured to observe high-frequency electric fields and the other is configured to observe low-frequency magnetic fields. The output of the EMI/RFI measurement systems is a two-dimensional monitoring system used to collect long term power surge data. The in-plant measurement data will be employed to profile the electromagnetic environment in commercial nuclear power plants and establish the technical basis for EMI/RFI—and surge-related acceptance criteria.

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 is derived from the 1962 report, TID-14844.

Since 1962, a better understanding of the timing and nature of the fission product release has been obtained. As a result, a number of areas of regulatory activities have been identified that may benefit from changes introduced as a result of source term and severe accident research. In fiscal year 1994, work neared completion on "Accident Source Terms for Light-Water Nuclear Power Plants" (NUREG-1465), which is intended to replace TID-14844. In support of this effort, the following documents were issued:

(1) "A Simplified Model of Aerosol Scrubbing by a Water Pool Overlying Core Debris Interacting With Concrete" (NUREG/CR-5901), November 1993.

(2) "Estimate of Radionuclide Release Characteristics into Containment Under Severe Accident Conditions" (NUREG/CR-5747), November 1993.

Update of Siting Regulations. In fiscal year 1994, staff efforts continued on updating 10 CFR Part 100, "Reactor Site Criteria." A proposed rule to revise Part 100 was first issued for comment in October 1992. Source term and dose calculations for reactor siting purposes were proposed for elimination, to be replaced by specifying a minimum exclusion area distance and by stating population density criteria in the rule. 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. In July 1994, the staff recommended that the proposed rule be withdrawn and that a revised proposed rule be issued incorporating basic reactor site criteria and continuing the use of source term and dose calculations for the siting of custom plants. Modifications to standardized plant designs intended to compensate for poor site characteristics would, however, be discouraged. The Commission approved the staff's recommendation, in September 1994, that a revised proposed rule be issued.

Emergency Planning Regulations. In fiscal year 1994, staff efforts continued on emergency planning licensing requirements for independent spent fuel storage facilities and monitored retrievable storage facilities. The public comment period for the proposed rule expired in November 1993. The staff analyzed comments received and is developing final regulations. In fiscal year 1994, a notice of receipt of petition for rulemaking was published in the *Federal Register* (59 FR 17499) requesting public comment on a petition submitted by the Virginia Electric Power Co. (VEPCO; PRM-50-60) regarding NRC audits of emergency plans. The public comment period ended June 1994, and the staff is currently analyzing comments received. A petition for rulemaking was also received from VEPCO in December 1992 (PRM-50-58) related to emergency planning exercises. That petition was published in the *Federal Register* for public comment in March 1993 (41 FR 12341). The staff is currently evaluating public comments and developing a proposed resolution to the petition. In March 1994, a final rulemaking was published in the *Federal Register* (59 FR 14087) providing a revised emergency planning regulation that updates and clarifies the ambiguities that surfaced in the implementation of the Commission's emergency planning exercise requirements.

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, i.e., on keeping the boundary free from damage and leaktight. Ensuring the structural integrity of the pressure boundary has been at the center of several recent, well publicized regulatory issues—for example, the 1984 decision to require an accelerated schedule of five boiling water reactor (BWR) inspections because of cracking in the coolant pipes; the 1991 review of the Yankee-Rowe (Mass.) nuclear power plant; and the 1992 review of the Trojan (Ore.) nuclear power plant's steam generators. The underlying concern in ensuring the integrity of the pressure boundary is that failure to do so could compromise the operator's ability to cool the reactor core and possibly bring about a loss-of-coolant accident (LOCA) that could be accompanied by a release of hazardous fission products.

Research in this area is a broad-based program, initiated in 1967. The original program was focused solely on the properties and fracture behavior of the reactor pressure vessel—the large, thick-walled steel cylinder that houses and supports the reactor core. As the full challenge of ensuring the integrity of this critical component was realized, the scope of the research program was expanded to include irradiation damage, service-induced cracking mechanisms, and methods for periodically inspecting the pressure vessel. Incidents of cracking and leaking in pipes and steam generator tubes have accentuated the need for materials data, analysis methods, and inspection techniques relevant to these components.

The research program on pressure vessel safety has expanded to meet these added challenges. Much of the work is complete and improvements have been effected through several regulations, regulatory guides, and parts of the standard review plan, as well as through national codes and standards. The remaining work is providing the bases for both confirming and revising some of the earlier regulatory positions, with the overall aim of providing a stable, fully validated regulatory environment ensuring the integrity of the primary pressure boundary for the foreseeable future. The technical efforts in the research program—fracture evaluation and irradiation embrittlement—are central to sound regulatory positions addressing the safe operation of the pressure vessel. For example, efforts to revise the basis for determining the allowable operating pressure and temperature to preclude embrittlement failure of the pressure vessel drew on research results from the pressure vessel safety program.

Fracture Evaluation. Fracture analysis methods assumed a particularly large role in the overall program during fiscal year 1994. Fracture analysis involves an ongoing program to develop and reduce to practice advanced analysis methods that will improve the ability to predict the allowable pressures and temperatures for the pressure vessel and the ability to evaluate the integrity of the pressure vessels under design basis and hypothetical accident conditions. Basic work is being performed by researchers at ORNL, augmented by research being performed at Brown University, the University of Illinois, Texas A&M University, and the U.S. Navy's Naval Surface Warfare Center (NSWC). The researchers are developing state-of-the-art analysis methods and evaluating them against test data developed at ORNL, the National Institute for Standards and Technology (NIST), and the NSWC. The work performed during fiscal year 1994 has been very promising, and the programs have been continued vigorously to permit evaluation of test geometries and loadings that are more typical of reactor pressure vessels undergoing a ductile-to-brittle transition. The researchers are also coordinating their work with international 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 is well under way and is expected to provide results from a large-scale test that will closely simulate a reactor pressure vessel subjected to accident loads. This step will provide a more realistic validation of the revised analysis methods.

During fiscal year 1994, the results of several efforts were put to use in performing generic analyses of reactor pressure vessels fabricated from materials with a low resistance to a "ductile tearing" failure mode. In the early 1970s, the NRC recognized that some pressure vessels were fabricated using steel plates and some weld types that did not provide the high resistance to this failure mode exhibited by most of the plates, forgings and welds used in reactor pressure vessels. In 1973, the NRC issued Appendix G to 10 CFR Part 50 to provide explicit requirements on the Charpy upper-shelf energy—a measure of the ductile tearing resistance of these materials—for both new construction and for operating plants. The American Society of Mechanical Engineers (ASME) published a Code Case N-512 (Section XI, Division 1, February 1993) on this issue, but it did not address complete details of all the potential loading conditions for reactor pressure vessels, nor did it include guidance on determining appropriate material properties for use in the evaluation method.

The RES staff published a draft regulatory guide at the end of September 1993 expanding the ASME Code's guidance to include evaluation methods pertinent to all service loading conditions, guidance on selection of transients for consideration at various service load levels, and specific guidance on estimating material properties. During fiscal year 1994, public comments on the draft guide were received, analyzed, and applied in revising the draft guide for final reviews for publication in fiscal year 1995.

The RES staff worked with researchers at ORNL to develop technical bases in probabilistic fracture mechanics, for use in revising Regulatory Guide 1.154 on plant-specific evaluation of pressurized thermal shock in pressurized water reactor (PWR) pressure vessels. More research is being undertaken with the efforts of staff in thermal-hydraulics and probabilistic risk assessment, for use in revising Regulatory Guide 1.154, in accordance with the SECY-92-283 document on the lessons learned from the Yankee-Rowe (Mass.) reactor pressure vessel integrity evaluation. Development of these technical bases is scheduled for completion in fiscal year 1995 and a draft revision of the guide will be completed and published in 1996.

Radiation Embrittlement. Of special concern in ensuring the integrity of the reactor pressure vessel is the embrittlement of the pressure vessel steel caused by neutrons escaping from the reactor core during normal operation. These neutrons impinge on the pressure vessel wall and, through a complex process, reduce the ability of the steel to resist fracture. The embrittlement increases with continued operation. To ensure the continued safe operation of pressure vessels, the research program includes a substantial effort 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.

During fiscal year 1994, radiation embrittlement research moved forward on several fronts. Test reactor irradiations were completed by ORNL, using the University of Michigan test reactor, to evaluate the effects of neutron radiation on weld materials removed from the canceled Midland Unit 1 (Mich.) reactor pressure vessel. The materials are representative of the so-called "limiting" material in several operating nuclear power plants. The materials are also being irradiated in the surveillance programs of an operating power plant, as part of an NRC-industry coordinated research effort. When the results from each of these programs are available in the late 1990s, they will provide important information about embrittlement trends for these materials and equally important information about the differences between test reactor and power reactor irradiation conditions, as well as information on the mechanisms controlling embrittlement of these materials.

During fiscal year 1994, a collaborative research agreement was reached between the Japan Atomic Energy Research Institute (JAERI) and ORNL that provides for ORNL to examine pieces of the pressure vessel from the decommissioned Japan Power Demonstration Reactor. The examination will focus on the changes in microstructure and fracture properties caused by long term exposure to irradiation, while providing an opportunity to examine in depth a reactor vessel from an actual nuclear power reactor. The ORNL studies will complement ongoing research conducted by JAERI at their Tokai research establishment.

During fiscal year 1994, ORNL published neutron cross-section libraries, BUGLE-93 and VITAMIN-B6, that can be used in evaluating the neutron fluence for power reactors, an essential input in estimating the level of radiation embrittlement for reactor pressure vessels. Besides the cross-section library work, researchers at ORNL have worked with researchers in the Czech Republic, and with other East European researchers, in performing calculations to predict the results of certain carefully controlled "benchmark" experiments conducted by the Czech researchers. This continuing work is generating important data relevant to the NRC's program to validate neutron fluence calculation methods, and is also providing technology transfer and a validation of the methods in use by the different laboratories. This work contributed to the staff's effort to evaluate public comments on, and to revise a draft regulatory guide on, calculational and dosimetry methods for determining pressure vessel neutron fluence.

Work continued in fiscal year 1994 to compile and evaluate embrittlement trends using power reactor pressure vessel material surveillance data. These data are reported to the NRC in accordance with Appendix H to 10 CFR Part 50 and reflect embrittlement trends for reactor pressure vessels irradiated under typical power reactor conditions. The work by ORNL to compile these data into a comprehensive data base has provided the basis for work by Modeling and Computing Services to develop statistically based models for predicting radiation embrittlement. The ORNL data base has also been used by the regulatory staff in both plant-specific and generic evaluations. The ORNL work is a continuing effort while the Modeling and Computing Services work is expected to be completed in 1995. This work will enable the NRC to evaluate the need for further revision to Regulatory Guide 1.99, which provides the methods for estimating radiation embrittlement and is a fundamental part of the NRC's approach to ensuring pressure vessel safety.

Research to better understand the mechanisms of radiation embrittlement continued in fiscal year 1994, with significant advances being made by ORNL and the University of California at Santa Barbara, in conjunction with researchers in the United Kingdom, in modeling the complex interactions among the impinging neutrons and the atoms in the pressure vessel steel. This work is closely integrated with experimental work being done in Europe. Understanding the controlling mechanisms is essential to confidently extrapolating empirical models of radiation embrittlement to unique operating circumstances. Progress in mechanisms research is providing assurance that the empirical models are conservative and is helping to define the limits of extrapolation for those models.

Piping Integrity

During the 1980s, increased concern with intergranular stress corrosion cracking in BWR piping systems and increased needs for research on other aspects of environmentally assisted cracking and pipe fracture behavior led to increased research on piping integrity, as part of an overall pressure boundary integrity research program.

In fiscal year 1994, work on large-scale pipe fracture and fracture characteristics of cast stainless steels wound down. Other concerns in the piping system are, however, still being investigated. The potential for fatigue damage in reactor systems has long been recognized, but data from Japan indicate that the relationship of the water coolant to fatigue may not be adequately accommodated by the present ASME design rules. The Argonne National Laboratory (ANL) is collecting additional data on coolant effects on fatigue in BWR and PWR chemistries and analyzing these data and data obtained from other sources, as part of a program to develop better characterizations of fatigue behavior for NRC use in evaluating service life remaining in aging plants. During fiscal year 1994, new interim design curves incorporating the effects of reactor environments were published and will be updated using newly developed ANL data.

Pipe fracture research continued during fiscal year 1994, with one of the major programs at Battelle Memorial Institute drawing to a close. This research has provided the technical basis for the flaw evaluation methodologies for piping contained in the ASME Code Section XI and for the NRC's leak-before-break evaluation methodology. The balance of the research is being conducted as part of an internationally funded research project—the Second International Piping Integrity Research Group program, also being conducted by Battelle. That work is examining the effects of simulated seismic loading on the fracture behavior of cracked pipe and piping fittings. It is anticipated that all the NRC's large-scale pipe fracture research will be completed by early fiscal year 1996.

Core Internal Components

Irradiation-assisted stress corrosion cracking (IASCC) of core internal components of both BWRs and PWRs has been observed and is becoming a more common problem, as reactors age and core materials accumulate higher fluence. Although many of the affected components can be replaced, others are difficult or impractical to replace. The susceptibility of materials to IASCC seems to be strongly dependent on minor variations in material composition and microstructure. Thus nominally identical materials show large differences in resistance to IASCC. Ongoing research by the NRC and by others is attempting to identify those characteristics that make materials susceptible to IASCC. In particular, the NRC is sponsoring the irradiation of a large group of materials in the Halden reactor in Norway; examination of these materials should help to clarify the role of material composition.

Inspection Procedures and Technologies

The NRC's approach to ensuring the integrity of the reactor pressure boundary builds on the overall "defense-in-depth" concept. The research program parallels this fundamental approach and includes programs geared to each of the major considerations in providing structural integrity—analysis methods, material properties, and inspection techniques. The research program addressing inspection procedures and technologies provides an independent basis for evaluating the efficacy and reliability of industry inspection programs. The program includes studies of improved methods for selecting components for inspection and strategies for setting the sample size and inspection periods, in order to provide for a reliable overall inspection. The program also deals with the inspection technologies and methods necessary to ensure the reliable detection and accurate sizing of flaws. Finally, the program includes a focused effort to transfer this technology to practitioners in the NRC Regional and Headquarters Offices.

International Studies. The NRC is an active participant and a leader in the Program for the Inspection of Steel Components, Phase III (PISC III). This international program, organized in 1986, is assessing the effectiveness of nondestructive testing technologies and procedures for the inservice inspection (ISI) of nuclear power plant components. The participants in this program have invested an estimated $40 million in the program, including contributions of materials, inspection services, and manpower. The results of the program will assist regulators and code-making bodies in establishing technical bases for improving ISI requirements.

The focus of the PISC III program is on the nondestructive testing of realistic LWR primary circuit components containing realistic flaws. During fiscal year 1994, results were reported for a flaw-sizing study in a reactor pressure vessel, detection and sizing of flaws in dissimilar metal weldments, and the detection and sizing of flaws in stainless steel piping. This work shows that some inspectors were effective and had a high flaw-detection rate, with a corresponding low "false-call" rate. However, other inspectors demonstrated an ineffective performance with a low flaw-detection rate and high false-call rate. For flaw-depth sizing, there were a few inspectors and conditions in which performance was acceptable, but the overall performance was poor, with low correlation and large errors between the depth estimates and the true depth size.

Improved Ultrasonic Detection and Sizing of Flaws. An improved method for more reliably detecting flaws and sizing them with greater accuracy in LWR primary circuit components is the Synthetic Aperture Focusing Technique for Ultrasonic Testing (SAFT–UT). The SAFT–UT technology is based on physical principles of ultrasonic wave propagation and uses computers to process the data, in order to produce high-resolution, three-dimensional images of flaws to aid the inspector in locating and sizing them. The SAFT–UT technology has been developed through extensive laboratory testing and validated through blind trials. The technique worked well in the PISC III pressure vessel flaw sizing studies. A SAFT–UT system was fabricated for the NRC's nondestructive examination mobile laboratory and operational training was given the NRC personnel who conduct independent field audits of ISI results. This system was successfully used for the first time in 1994 by NRC staff for inspections of piping at the Peach Bottom (Pa.) nuclear power plant.

Field Trials for Improved Eddy Current Inspection of Steam Generator Tubing. Researchers from ORNL participated in two inservice inspections of steam generator tubes at Prairie Island Units 1 and 2 (Minn.), to test new eddy current probes and signal analyses techniques and instrumentation under field conditions. The new probes use multiple "pancake" type coils for better sensitivity. The design incorporates several coils around the circumference of the probe, so that rotation is not needed, and the probes can be translated along the tube at high speed. Thus the new array probes offer important features of the two currently used probes: high speed and sensitivity. In the field tests, the new probes produced signal levels from flaws that were 5-to-10 times greater than the current-practice rotating pancake coil (RPC) inspection. The ORNL inspection was 75 times faster than the current RPC inspection and nearly as fast as the bobbin coil inspection. The high sensitivity and high inspection speeds that can be achieved with these probes would permit inspection of the entire length of tubes in generators that are experiencing considerable degradation, in a fraction of the time currently required for inspecting short lengths of tubing with the RPC probes. The new array probes are also sensitive to axial cracks, circumferential cracks, and volumetric defects, which is a significant improvement over current bobbin coil probes.

United States-Russian Federation/Ukraine Cooperative Agreement

The NRC staff and researchers from ORNL and the University of California at Santa Barbara participated in September 1994 workshops and meetings in Kiev, Ukraine, and Moscow, Russia, as part of the Joint Coordinating Committee on Civilian Nuclear Reactor Safety (JCCCNRS). Working Group 3 on "Radiation Embrittlement" held a two-day workshop in Kiev to discuss pressure vessel integrity issues, followed by a four-day working group meeting in Moscow. A total of 16 papers were presented during the workshop (eight from the United States and eight from the Ukrainian participants), with a total of 24 papers presented during the working group meeting (eight from the United States and 12 from the Russian participants).

NRC staff members and representatives of the Department of Energy and the national laboratories participated in a September 1994 meeting in Moscow of the JCCCNRS Working Group 12 to discuss issues related to nuclear power plant aging and plant life extension. The United States delegation presented 10 papers during the working group meeting. Subsequent Working Group 12 activities have included the exchange of more information on special topics, and preparations for the sixth Working Group 12 meeting to be held in the United States in the summer of 1995.

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 such age-related degradation processes as corrosion, embrittlement, wear and fatigue. The objective of aging research is to develop the technical bases for continuous safe operation of nuclear power plants, as they progress through their design life; to define the operative aging mechanisms; and to confirm existing and/or developing recommendations for new detection and mitigation methods, in order to prevent or mitigate the deleterious effects of the aging process.

The Nuclear Plant Aging Research (NPAR) program provides information and technical bases useful in understanding the effects of aging on the safety functions of electrical and mechanical components of commercial nuclear power plants. During fiscal year 1994, preliminary or comprehensive aging assessments were completed, or final reports were issued, for the following safety-related components, systems, and associated special topics.

- Chemical and Volume Control System for Pressurized Water Reactors (NUREG/CR-5954)
- Containment Cooling Systems (NUREG/CR-5939)
- Reactor Core Isolation Cooling System (NUREG/CR-5692)
- Selected Fault Testing of Electronic Devices (NUREG/CR-6086)
- Managing Aging in Nuclear Power Plants—Insights from NRC Maintenance Team Inspection Reports (NUREG/CR-5812)
- Accumulators
- Isolation Condenser Systems

- Air-Operated Valves (NUREG/CR-6016)
- Characterization of Check Valve Degradation and Failure Experience (NUREG/CR-5944, Vol. 2).

Aging Effects on Motor-Operated Valve Performance. In 1994, initial research efforts were completed to identify the motor-operated valves (MOVs) in typical PWR and BWR plants that are most susceptible to internal environmental corrosion. The NRC concern is whether corrosion of internal valve parts can significantly affect the torque and thrust requirements for operating the MOVs when necessary, particularly when they are needed to mitigate accident conditions. Friction experiments were conducted on samples of corroded materials typical of certain valves. Although the test results indicated that friction from corrosion does increase the thrust requirements, many new questions about the need for simulating actual loadings, temperature and other parameters must be answered before the magnitudes of the increases in friction can be determined and validated. Subsequent investigations to answer these questions were carried out, and a better controlled series of friction experiments was scheduled to begin in late 1994 and to be completed in fiscal year 1995.

Information deriving from this project is important to the NRC because it can be used in evaluating the capability of licensees' MOVs and determining whether they are in compliance with Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance."

Air-Operated Valves. An evaluation of aging and service wear of air-operated valves was completed and reported in "Aging and Service Wear of Air-Operated Valves Used in Safety-Related Systems at Nuclear Power Plants" (NUREG/CR-6016). The evaluation was based on data taken from the Nuclear Plant Reliability Data System (NPRDS) for the period January 1, 1988, to December 31, 1990; after removal of inconclusive data, the data encompassed reports of 1,503 failures of varying degrees. These data were processed to reveal trends and the effectiveness of testing, and it was found that neither were there discernible trends nor was testing especially effective in detecting the degradation that led to the failures. The results showed that failures involving complete loss of function were usually the result of failures in the controls or the valve actuator, versus some failure of the valves themselves. While many of the controls and actuator components are known to have the higher failure rates, they have not usually exhibited signs of degradation prior to complete failure. It was concluded that a basis could be developed for replacing certain components on grounds of the aging environment alone, in any cases where failures are unacceptable.

Check Valves. The check valve degradation and failure study covering failures occurring in 1984-to-1990 was completed in 1993; the study was expanded to examine and process NPRDS records on failures of check valve internals occurring in 1991. After a screening of the data base to eliminate unsuitable records, 401 failures remained to be analyzed. As in the earlier effort, a primary goal was to identify any correlations of valve failure rates with plant age, valve size, system of service, manufacturer, etc. A further goal of the study was to identify any apparent trends in failure rates, failure detection, severity of failures, etc. With the cooperation and assistance of the Nuclear Industry Check Valve Group, additional information was obtained on most of the valves regarding specific valve type, specific design features, valve configuration, valve application, and the applicable inspection program. The latter information is important as an independent source of data allowing the NRC to assess expected industry requests for extension of check valve test and inspection intervals. The results, reported in "A Characterization of Check Valve Degradation and Failure Experience in the Nuclear Power Industry—1991 Failures" (NUREG/CR-5944, Vol. 2), showed some positive trends relative to those reported in Volume 1. For example, failures detected by abnormal occurrences declined from 19 percent to 5 percent, and the percentage of significant failures decreased from 5 percent to 36 percent. And the most effective means of detecting failures continued to be by programmatic inspections—77 percent, up from 59 percent in the earlier study. It is apparent that degradation is being detected earlier in the failure process.

In addition to NUREG/CR-5944, Vol. 2, two other reports have been published related to check valve testing and condition monitoring. They are ORNL/NRC/LTR-93/6, "Review of Monitoring and Diagnostic Methods for Check

Valves," and ORNL/NRC/LTR-94/04, "Utility Survey PWR Safety Injection Accumulator Tank Discharge Check Valve Testing." These results should enable further improvements to be made in check valve test and inspection programs and in valve standards development activities.

Aging Assessment and Mitigation of Major LWR Components. Of intrinsic importance to reactor aging research is the assessment and mitigation of aging damage to major components and structures. The objective of this aging assessment task is to assess various aging management techniques for the major LWR components and structures. The approach examines the synergistic influences of the various aging mechanisms affecting the degradation of major LWR components and structures. The major components covered in fiscal year 1994 were the LWR metal containments and the LWR reinforced and pre-stressed concrete containments. Results are documented in a multi-volume report, NUREG/CR-5314. A draft report, NUREG/CR-5824, discussing the identification of advanced monitoring methods for estimating stresses causing fatigue damage has also been completed and is undergoing internal NRC review. Publication is scheduled for 1995. Results in this area should assist NRC in its development of review guidance applicable to operating license renewal.

PRA-Based Methodology for Aging Assessments and Priority Assignments. The risk-based methodology for assessment of aging in nuclear power plants and for defining priorities among risk contributions and maintenance activities (published in previous years as NUREG/CR-5587 and NUREG/CR-5510) is subject to uncertainties because of the limited aging data available, and also because of certain modeling assumptions. Research has focused on developing sensitivity and uncertainty analyses to address the priority of data and the modeling uncertainties, as well as to validate risk-based methods. This work was documented in draft NUREG/CR-6045 in 1994 and submitted for NRC review.

A major limitation of the age-dependent methodology has been the lack of recorded component aging data and of approaches to developing aging failure rates based on the available information. To address this limitation, a method was developed to incorporate age-dependence in probabilistic risk assessments (PRAs) that does not require absolute age-dependent component failure rates. Instead, the aging of a component is expressed in terms of the relative aging rates found to be fairly constant across different components and different plants. A draft report, NUREG/CR-6067, was completed on the aging data assessment methodology. Because of the importance of the role of PRAs in focusing staff regulatory efforts, NUREG/CR-6067 was extensively reviewed by the NRC staff in fiscal year 1994. Many comments were forthcoming, and it is expected that they will be incorporated into the methodology in fiscal year 1995.

In a previous year, an important application of the risk-based methods resulted in the development of PRA-based approaches for identifying those safety-related MOVs with the greatest impact on plant risk, treated in Generic Letter (GL) 89-10, "Safety-Related MOV Testing and Surveillance." Dynamic tests and surveillance tests, in accordance with GL 89-10, could then be performed on those MOVs with the largest risk impact. Relative risk-importance of single MOVs, and the interaction of multiple MOVs, can be analyzed using this approach. A draft report documenting the results of this work was issued for NRC review in fiscal year 1994. The work has provided the technical basis for evaluating two different submittals by licensees by which to rank their respective MOVs for tests, in accordance with GL 89-10. These NRC evaluations resulted in the identification of a number of deficiencies in the license submittals, which are being resolved.

Work continued in fiscal year 1994 to set priorities for evaluating environmental stressors associated with advanced digital instrumentation and control (I&C) systems in nuclear power plants, based on stressor risk-significance. Analog I&C systems in nuclear power plants are gradually being replaced by digital systems. Digital I&C systems are potentially subject to common environmental stressors, such as moisture/humidity and temperature; these effects are being identified and measures are being developed to rank them. A draft report was issued in fiscal year 1994 identifying approaches useful to accomplish this prioritization work. This effort has required more time than expected because of the lack of failure data for these components in nuclear plant applications.

Aging of Passive Components. In earlier research efforts, a methodology was developed for including the effects of aging on passive components—such as pipes, structures and supports—in a PRA model, in order to determine the resultant impact on plant risk. The methodology, based on probabilistic structural analysis for estimating the failure probability of these components, was documented in a final draft report, NUREG/CR-5730, and submitted for NRC review in fiscal year 1994. This passive component methodology was, however, found to be complex and lacking in compatibility with state-of-the-art modeling of active components in a PRA and further work was undertaken to improve upon an integral modeling. A more practical and simpler approach—one which considers the passive component results of NUREG/CR-5730—is being developed to ensure that the goals of an integrated methodology will be completed in fiscal year 1995.

Equipment Operability. For the past five years, significant progress has been made by the NRC in advancing the state-of-the art of MOV technology. Full-flow experiments were conducted in prior years that led to the determination that MOVs are not being calibrated properly to ensure their operation when required. Since that time, evaluations of the large amount of data from those earlier experiments and from additional smaller scale tests have provided advanced understanding in this technology.

The transfer of research results to the NRC regulatory staff has been useful in determining the performance expectations for MOVs and has been a high-priority objective for this work. Specifically, the technical results that were transferred enable evaluations on whether licensees' MOV programs and the MOVs are in compliance with regulatory performance requirements of GL 89-10 for safety related valves (there are an average of 150 safety-related MOVs in each nuclear plant in the United States).

The results of research completed in prior years, as well as more recent findings in 1993 and 1994, have provided the technical basis for issuing several other NRC regulatory documents identifying potential MOV problems of which the licensees need take into account. Supplements to GL 89-10 have been issued for licensee compliance, both as a result of NRC research findings and of other findings from industry MOV testing.

During fiscal year 1994, efforts continued to develop technical basis for evaluating the performance of a.c. and d.c. motor-operators. When completed, this information will benefit the NRC staff in determining whether these devices (which open and close the MOVs) are achieving the outputs claimed by their manufacturer, particularly under degraded voltage and elevated temperature conditions.

The program's research results obtained over the past five years are being used by the NRC in evaluating the Electric Power Research Institute (EPRI) topical report on MOVs which presents the EPRI research findings that the licensees will rely on in complying with GL 89-10. The NRC evaluation of the EPRI topical report should be complete in fiscal year 1995.

Environmental Qualification Research. Questions arose recently concerning the environmental qualification (EQ) of electrical cables used in commercial nuclear power plants. Initial questions centered on whether the EQ requirements for older plants was adequate to support license renewal and plant operations beyond 40 years. After investigation, the NRC staff concluded that questions related to the differences in EQ requirements between older and newer plants was a potential generic issue that should be further evaluated for potential backfit implications, independent of license renewal activities.

EQ testing of electric cables was performed by Sandia National Laboratories (SNL), under contract to the NRC, in connection with license renewal activities. Results showed that some of the environmentally qualified cables either failed or exhibited marginal insulation resistance after a simulated plant life of 20 years, and under simulated severe accident conditions. This indicated that the EQ process for some electric cables may not be conservative. These results also raised questions regarding the EQ process, including the bases for conclusions about the qualified life of components based on artificial aging prior to testing.

As the first step in developing its confirmatory research program, RES held a public workshop to obtain technical input from industry representatives, as well as from experts in the field. The

Environmental Qualification Workshop was held on November 15-16, 1993. The workshop proceedings were issued in May 1994, as NUREG/CP-0135.

The workshop provided a unique opportunity for the open exchange of ideas and information among industry personnel, researchers, equipment manufacturers, and regulators involving EQ issues, descriptions of state-of-the-art activities in condition monitoring, and research techniques. The discussions included several recent equipment failures and their causes at operating facilities, as well as presentations describing current licensee actions related to monitoring normal service conditions, such as on-line temperature monitoring in specific plant locations. Additional discussions centered on the limitations of condition monitoring techniques currently available, qualification testing techniques, and pre-aging techniques. The NRC expects to further refine its confirmatory research needs in this matter during FY 95.

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 codes and standards writing committees, because portions of the ASME Boiler and Pressure Vessel (B&PV) Code have, since 1971, been incorporated by reference into 10 CFR 50.55a, in order 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 fiscal year 1994, work continued on rulemaking that not only would update the reference to the ASME B&PV Code, but would, for the first time, incorporate by reference the new ASME Operations & 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. Work also continued on a rulemaking that would, for the first time, incorporate by reference Subsection IWE and Subsection IWL, Section XI, ASME B&PV Code. 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 concrete containments and their post-tensioning systems. The proposed rule was published for public comments in the *Federal Register* on January 7, 1994 (59 FR 979). Comments were received from 25 separate sources and this rulemaking is expected to be finalized in FY 95.

ASME Code Cases provide alternatives to the rules specified in the ASME B&PV Code. Regulatory Guides 1.84, 1.85 and 1.147 identify those Code Cases for design and fabrication, materials, and inservice inspection, respectively, that the NRC has found to be acceptable. These regulatory guides, which are updated on a regular basis, were revised in 1994 and submitted for staff review prior to publication.

Structural Integrity

Containment Performance Goals. In support of the NRC Severe Accident Policy Statement, as it applies to advanced light-water reactors, work is in progress on development of additional design criteria for containments under severe accident conditions. Under the approach envisioined, deterministic criteria will be established for judging both steel and concrete containments. For these criteria, probabilistic models will be constructed allowing comparison with the conditional containment failure probability of 0.1 proposed in the Commission's safety goal.

Concrete containment structures play a vital role in the defense-in-depth safety of all light-water reactor plants. In general, the performance of concrete structures in nuclear power plants has been good. However, there have been several instances where the capability of concrete structures to meet future functional and performance requirements has been challenged, because of problems arising from either improper material selection, construction and design deficiencies, or environmental effects. Examples of some of the potentially more serious incidents include post-tensioning anchor head failures, leaching of concrete in tendon galleries, voids under vertical tendon-bearing plates, containment dome delaminations, corrosion of steel tendons and rebars, water intrusion through basemat cracks, and leakage of corrosion inhibitor from tendon sheaths. Such incidents indicate that there is a need for improved surveillance, inspection and testing, and maintenance to strengthen assurance of continued safe operation of nuclear power plants.

The structural aging (SAG) program is addressing the aging management of safety-related concrete structures in nuclear power plants to strengthen the technical bases for their continued service. To accomplish program objectives, the SAG program has conducted activities under four major technical task areas: (1) program management, (2) materials property data base, (3) structural component assessment/repair technologies, and (4) quantitative methodology for continued service determinations. The final program report is expected to be complete by mid-1995.

Regulatory applications of this research include: (1) improved predictions of long term material and structural performance and available safety margins at future times; (2) establishment of limits on exposure to environmental stressors; (3) the strengthened ability of the NRC to reduce its reliance on inspection and surveillance, by development of a methodology that will enable the integrity of structures to be independently assessed (either pre- or post-accident); and (4) improvements in damage inspection methodology that could be incorporated into national standards and referenced by Standard Review Plans.

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 under development. The proposed rule was published for public comment in September 1991. Over 120 comments were received on the technical analyses and certain procedural aspects of the proposed rule. Concern was expressed that the proposed rule would constrain public comment on environmental issues at the time of license renewal review for an individual nuclear power plant. In fiscal year 1994, four public workshops were held to discuss approaches to resolving specific concerns expressed by the Agreement States with respect to the need for generating capacity and alternative energy sources. All comments are being considered in the formulation of a final rule, the Generic Environmental Impact Statement, and other supporting documents. It is expected that the final rule and supporting documents will be published in fiscal year 1995.

Reactor Regulation Support

Plant Performance

Reactor Safety Experiments

High Burnup Fuel Behavior. By the early 1990s, it had become clear that burnups in commercial power reactors were exceeding the burnup range for validation of the NRC's fuel behavior computer codes and related fuel damage criteria. Fuel suppliers were providing high-burnup performance data to support the licensing of higher-burnup fuel designs, but the NRC's independent capability to generate such data had not been updated. For this reason, in light of the new data, it was decided to assess the need for (1) fuel performance model changes (e.g., UO_2 thermal conductivity, fission gas release), (2) fuel performance code updates (i.e., FRAPCON and resultant effects on fuel stored energy), and (3) changes in fuel failure threshold criteria (for reactivity transients).

Contracts with three laboratories were executed in response to this need. The first contractual effort focuses on phenomenological models, the second on the modification of computer codes, and the third on plant transient calculations to estimate the impact on reactor safety. During the year, the NRC through its international cooperative safety arrangements, became aware of new test results on high-burnup fuel 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. Invitations were extended to these laboratories to present preliminary information at the NRC's annual Water Reactor Safety Information Meeting, and such presentations were made on October 26, 1994. More definitive results will be available in 1995. These test results will be used to assess, and perhaps modify, the fuel damage criteria used by the NRC for plant licensing and operations.

Thermal-Hydraulic Phenomena. Experiments are being performed at the University of Maryland in a scaled experimental facility that simulates a Babcock & Wilcox reactor and is scaled 1:4 in height, with a 1:500 volume scale. This facility was originally constructed under NRC contract to study small-break, loss-of-coolant accidents. Following successful completion of that program, the facility's mission was shifted to the current study of mixing phenomena associated with boron dilution events. Such events have recently been postulated and would result in reactivity transients if they occurred.

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 by the use of computer codes. Most of the NRC's independent analyses for AP600 and SBWR will be done with the RELAP code, which is being upgraded for application to these designs. Before any 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 to be provided for these improved codes. The upgraded version of RELAP for use on the new passive plant designs will be released in early 1995.

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 17 member countries in CAMP, each of which participates in semi-annual meetings and makes cash contributions to supplement the NRC code development and assessment programs. Members also provide code assessment studies, recommend code improvements, and make other technical contributions to assist in the development and assessment of the codes.

Human Reliability

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.

The human reliability assessment research program has three objectives: (1) to broaden the NRC's understanding of human performance and to identify causes of human error, (2) to accurately measure human performance for enhancing safer operations and precluding critical errors, and (3) to develop the technical basis for requirements, recommendations, and guidance related to human performance.

The human reliability regulatory research program elements are (1) personnel performance, (2) human-system interfaces, and (3) reliability assessment.

Additional human factors research is performed for systems performance of advanced reactors and materials licensee performance. The human factors research for these activities are reported under appropriate sections of this chapter.

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 negative impacts that these factors might have on nuclear safety. Research in the human-system interface 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 methods and application, as well as multi-discipline research that integrates human, organizational and hardware considerations for evaluating reliability and risk in NRC licensing, inspection and regulatory decisions.

Personnel Performance

Work has concluded on the development of a method to assess the effectiveness of training programs at nuclear power plants. Measures and supporting documentation for a training effectiveness evaluation method will be published in a two-volume technical report. Data analyses from a project on the factors that are considered when making decisions on operations staffing, and on how staffing relates to safe startup, shutdown, and operation of nuclear power plants, are now complete. Results of these analyses have been incorporated into "Staffing Decision Processes and Issues" (NUREG/CR-6122). A second product of this study was published as NUREG/CR-6123, "An International Comparison of Commercial Nuclear Power Plant Staffing Regulations and Practice: 1980–1990." Work continues on a study to establish a technical basis for minimum shift staffing for both control room crews and for operational support staff outside the control room at nuclear power plants, based on workload and task allocation. A handbook on the effects of environmental factors on human performance, "The Impact of Environmental Conditions on Human Performance," for use by nuclear power plant inspectors, was published as Volume 1 of NUREG/CR-5680. A critical review of the literature was published as Volume 2 of NUREG/CR-5680. Two reports concerning training for responding to accidents were published as NUREG/CR-6126 and NUREG/CR-6127. These reports describe decision-making and stress coping skills that may be needed to respond to an accident situation, as well as potential training approaches for developing those skills.

Research has been initiated on communication errors in nuclear power plant events to characterize the root cause(s) of these errors, identify potential corrective actions for each category of communication error, and develop proposed review criteria and guidelines. A study on whether links exist between operator effectiveness and the simulator training received by operators at multi-unit stations, as compared to simulator training at single-unit stations, was initiated.

Human-System Interfaces

Human-system interface research includes NRC participation in the Organization for Economic Cooperation and Development 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 has been developed on (1) methods and tools for the development and verification and validation of safety-related software, and (2) experience with development and quality assurance of software systems at the Halden project.

Research continued to evaluate the positive and negative attributes of standards and computer-aided-software engineering tools for use in the certification of high-integrity software for nuclear power plant safety systems. Research continued on a project co-sponsored by the Electric Power Research Institute on verification and validation guidelines and quality metrics for digital high-integrity systems, and it will be completed in 1995.

A project was undertaken to independently evaluate, test and improve upon verification and validation guidelines for use in the audit of computer-based safety systems.

The NRC and the National Institute of Standards and Technology issued the proceedings of a jointly sponsored Digital Systems Reliability and Nuclear Safety Workshop (NUREG/CP-0136). The purposes achieved by the workshop were to (1) provide feedback to the NRC from outside experts regarding potential safety issues, proposed regulatory positions, and research associated with application of digital systems in nuclear power plants, and (2) continue the in-depth exposure of the NRC staff to digital systems design issues related to nuclear safety by discussions with experts in the state of the art and practice of digital systems.

Following the workshop, research was initiated to ensure the completeness of the technical bases for regulatory requirements intended to ensure the integrity of safety-related software.

After internal NRC and independent peer review, proposed guidelines for the review of advanced control room designs were published, under the title "Advanced Human-System Interface Design Review Guidelines" (NUREG/CR-5908). These guidelines were built on previously validated guidelines available from other industries, including the aerospace and defense industries, and were prepared in both paper and computerized form.

Work was completed during the report period toward resolving Human Factors Generic Issues 5.1, "Local Control Stations," and 5.2, "Review Criteria for Human Factors Aspects of Advanced Controls and Instrumentation," which resulted in the publication "Local Control Stations: Human Engineering Issues and Insights" (NUREG/CR-6146) and "Human Factors Engineering Guidance for the Review of Advanced Alarm Systems" (NUREG/CR-6105).

The review guidance published in the three documents described above is currently being integrated with other material to form Revision 1 to NUREG-0700, "Human System Interface Design Review Guideline," a draft of which will be issued for public comment in fiscal year 1995.

Work has begun on a new project, "Advanced Alarm System Review Criteria," to develop guidance for the review of advanced digital alarm systems.

Following recommendations from the Advisory Committee on Reactor Safeguards and from the Commission, the staff launched the first phase of a project with the National Academies of Sciences and Engineering to conduct a study and workshop on a coherent and effective approach to the regulation of computer-based (digital) systems in nuclear safety and control systems. The results of the full study and workshop is expected to provide advice to the NRC on the framework for a coherent and effective regulatory program.

Reliability Assessment

NUREG/CR-4639 revisions were issued to complete research on collecting, cataloguing and storing, in a computerized library, estimates of probabilities of operator error and hardware failure. Research continued to develop alternative quantification methods for incorporating the influence of organizational factors into PRA. A document, NUREG/CR-6208, was published describing the results of data collected at nuclear power plant simulators to reduce uncertainties associated with operator performance in judgmentally demanding simulated emergencies.

Efforts continued to analyze information from the simulator portion of the NRC-administered operator requalification examinations. Estimates from this source may provide certain error rates of usefulness to a nuclear power plant PRA.

For several years the NRC has been developing reliability and risk analysis tools to evaluate the risk impact of changes of selected requirements in technical specifications. The evaluation methods are complete and both detailed technical reports and a handbook to guide NRC reviewers in their uses will be issued in fiscal year 1995, as NUREG/CR-6141.

Reactor Accident Analysis

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 1994, work in this area consisted of both specific issue-oriented projects and more general work, including development and demonstration of risk analysis methods and the development of risk-related training and guidance for the NRC staff.

Issue-oriented projects continuing in fiscal year 1994 included:

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, in order to provide timely support for the Office of Nuclear Reactor Regulation's (NRR) regulatory analysis and to guide the Phase 2 effort. A salient finding is that the traditional concept of technical specification modes of operation does not adequately delineate the plant operating conditions needed for risk analyses. The Phase 2 effort concentrated on a specific operating state for each of the two plants, selecting the potentially highest risk operating state, based on the Phase 1 results. In addition, a simplified analysis of potential in-plant and off-site accident progression and health consequences of such accidents has been performed and provided to NRR, in support of its regulatory activities, as documented in NUREG-1449. The complete results of Phase 2 are being published as NUREG/CR-6143 for the BWR and NUREG/CR-6144 for the PWR.

Human Reliability Analysis. In connection with 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. It is intended to be fully integrated with PRA methodology and to enable a better assessment of the human contribution to plant risk, both during low-power, shutdown and at-power operations.

In fiscal years 1992 and 1993, 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 are documented in "An Analysis of Operational Experience During Low Power and Shutdown and a Plan for Addressing Human Reliability Assessment Issues" (NUREG/CR-6093).

During fiscal years 1993 and 1994, work continued on (1) the development of a multi-discipline framework for integrating HRA with PRA; (2) the characterization of errors of commission (EOCs) and human dependencies, including general guidance for their identification and representation in PRAs; and (3) the recognition of data base improvement needs, including a better characterization of human actions and their associated performance context (e.g., plant conditions, performance shaping factors, and dependencies), as well as a 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 of human dependency from operational events. Thus, the framework has enabled important aspects of EOCs and dependency to be considered in the development of an improved HRA methodology and has clarified the requirements for their more realistic inclusion in PRA models. By the framework's provision of a single language and common structure for relating the different dimensions of human-system interactions, the evaluation of EOCs and dependencies has been demonstrated to be 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 current work scope (fiscal years 1994 and 1995) will be a working HRA quantification process that includes the following: how to identify and incorporate human failure events in the logic models used in PRAs, what information is required for probabilities to be assigned to these failure events, how this information is used to estimate the probabilities, and how the probabilities are incorporated into the PRA quantification process. It is anticipated that the final phase (fisçal years 1995 and 1996) of the project will demonstrate the usefulness and acceptability of the implementation guidelines for the methodology, using selected parts of the low-power and shutdown Level 1 PRAs.

South Texas Risk Analysis. In 1992, the staff completed a review of the South Texas Project risk analysis and documented the results and findings (NUREG/CR-5606). The licensee estimated the overall mean core damage frequency to be 2 E-4-per-reactor-year, which is within the range of core damage frequency estimates provided for similar Westinghouse PWR facilities. The licensee has subsequently requested modifications to its plant technical specifications based, in part, on its risk analysis. The RES staff provided a draft safety evaluation report to NRR, which became a part of the basis for their regulatory decision.

Methods development projects performed in fiscal year 1994 included:

SAPHIRE Computer Tools. The set of computer codes called SAPHIRE (System Analysis Programs for Hands-on Integrated Reliability Evaluation) has been updated to version 5.0. This set of codes is to be used in performing probabilistic risk analyses and permit an analyst to perform many of the functions necessary to create, quantify and evaluate the accident risks of nuclear power plants. The codes were used extensively to perform the low-power and shutdown risk analyses previously described and are currently being used for analysis and resolution of generic safety issues and for evaluating the safety aspects of nuclear plant designs. During 1994, PRA data from four more licensed nuclear power plants were added to the SAPHIRE data base and most of the data from previous plant loads was updated to version 5.0. This brings the data base total to 17 plants, two of which are advanced concept plants added to support the agency's design certification reviews. Courses continued to be provided to both the NRC staff and contractors in the use of these codes. The documentation for version 5.0 has been published as NUREG/CR-6116, and the new codes and user manuals have been sent to the Energy Science and Technology Software Center at ORNL and made available for U.S. distribution. The previous version, SAPHIRE 4.17, has also been made available to foreign countries that do not have specific cooperative agreements with the NRC.

Consequence Code Benchmark. The NRC has successfully completed the work with the Commission of the European Communities (CEC) and the Organization for Economic Cooperation and Development (OECD) to carry out an intercomparison exercise on probabilistic accident consequence codes. The six codes being evaluated were MACCS (United States), COSYMA (CEC), CONDOR (UK), OSCAAR (Japan), LENA (Finland), and ARANO (Sweden). The intercomparison exercise used six radioactive accident source terms and calculated dose consequences for such measures as whole body dose and fatal cancers. The results of these comparisons were published in fiscal year 1994 by the CEC and OECD and demonstrated that the reactor accident consequences predictions calculated by these new codes were in agreement, within a reasonable range.

Off-Site Consequence Uncertainty Analysis. The NRC has completed a pilot probabilistic consequence uncertainty analysis in cooperation with the CEC. Sixteen internationally renowned atmospheric dispersion and deposition experts participated in a NUREG-1150-based expert judgment elicitation and evaluation process, in which the information needed for the pilot uncertainty study was elicited from the experts. The individual experts' assessments were aggregated to form probabilistic distributions for dry-deposition velocity, wet-deposition parameters, and Gaussian plume-dispersion parameters, respectively. The CEC will use the methods formulated jointly during the pilot study—with the NRC providing limited key technical support to the CEC—in obtaining other relevant information to complete a probabilistic consequence uncertainty study. The final data base will be shared by the two organizations for performing probabilistic consequence uncertainty analyses.

Risk-related training and guidance development in fiscal year 1994 included:

Guidance for Staff Use of Risk Analysis. In a July 1991 letter, the NRC's Advisory Committee on Reactor Safeguards identified a number of concerns with the staff's uses of risk analysis. In response, the NRC's Executive Director for Operations formed a working group of staff management to "consider what improvements in methods and data analysis are possible and needed, the role of uncertainty analysis in different staff uses of PSA. . . ." This working group was organized in early 1992 with the following objectives:

- To develop guidance on consistent and appropriate uses of PRA within the NRC.
- To identify skills and experience necessary for each category of staff use.
- To identify improvements in PRA techniques and associated data necessary for each category of staff use.

The group published NUREG-1489 in March 1994, which included initial guidance to the staff on the use of PRA in screening and analyzing reactor operational events and on basic terms and methods used in PRA. The report also contains a number of recommendations for additional guidance development, improvements to the NRC's PRA training program, and improvements in PRA tools and data bases used by the staff. A draft Commission policy statement on the use of PRA, as well as an implementation plan, has been developed to guide staff response to the recommendations.

Containment Performance

In order to ensure that existing regulations adequately protect the public from the consequences of severe accidents, the NRC conducts research in such areas as source term release and transport, core-melt progression, fuel-coolant interactions, direct containment heating, hydrogen combustion, and melt-concrete interactions. The overall goals of the research are to develop (1) technical bases for assessing containment performance over the range of risk-significant core-melt events, (2) an improved understanding of the range of phenomena expected during severe reactor accidents, and (3) improved methods for assessing fission product behavior. With these kinds of data, the NRC is better able to confirm the adequacy of its requirements for the design and reliability of the systems that may be used for mitigating the consequences of severe accidents.

High-Pressure Melt Ejection—Direct Containment Heating. In certain reactor accidents, degradation of the reactor core can take place while the reactor coolant system remains pressurized. A molten core left uncooled will drain 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 subsequently should be ejected from the reactor cavity into the surrounding containment volumes in the form of fine particles, thermal energy can be quickly transferred to the containment atmosphere, pressurizing it. The metallic components of the ejected core debris can further oxidize in air or in steam and can generate a large quantity of hydrogen and chemical energy that would further pressurize the containment. The projected process is called direct containment heating (DCH).

As part of the DCH issue resolution plan for PWRs, a study was completed for the Zion (Ill.) nuclear power plant and documented in NUREG/CR-6075 and 6075 Supplement 1, "The Probability of Containment Failure by Direct Containment Heating in Zion." Both reports have undergone peer review and will be published in fiscal year 1995.

The culmination of extensive experimental and analytical research undertaken principally for the Zion reactor has produced the finding that DCH loads are significantly lower than once estimated and consequently that 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 full spectrum of reactor designs.

Hydrogen Combustion. Significant information exists on hydrogen combustion to assess the possible threat to containment and safety-related equipment, but 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 (MITI) 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 Brookhaven National Laboratory. A small-scale developmental apparatus has been constructed and has provided a preliminary set of 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 has been completed, and high-temperature experiments have begun. As a result of the cooperative agreement with Japan, the NRC has access to the ongoing hydrogen research in Japan managed by NUPEC. This research provides a greatly expanded and improved data base for the validation of 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 300K and pressure of one bar. The facility has been redesigned to eliminate diffusion-flame interference with the walls. Construction will be completed during fiscal year 1995. 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.

Experiments have been conducted to determine hydrogen combustion behavior under conditions of rapidly condensing steam from water sprays. The experimental conditions were nearly prototypical of those that would be expected in a severe accident in the ABB Combustion Engineering System 80+ containment. The mixtures were initially non-flammable, because of dilution by steam. The mixtures were ignited by thermal glow plugs as the mixtures became flammable, after sufficient steam had been removed by condensation from the water sprays. No detonations or accelerated flame propagation were observed in these tests. The combustion mode was characterized by multiple deflagrations with relatively small pressure rises. The thermal glow plugs were effective in burning the hydrogen safely by igniting the gases as the mixtures became marginally flammable.

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 over-pressurization of the containment.

Early experiments on melt-concrete interactions were conducted without an overlying water pool. More recent experiments on melt-concrete interactions, also 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 activity 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 NRC, 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. Four tests, including a scoping test, were conducted in the MACE program in fiscal years 1992 and 1993. The latest MACE test, M3, performed at a scale more than two times larger than the previous tests, was conducted in December 1994. This test was designed to provide information on the effects of scale on crust formation, stability, and debris coolability. Analysis of the test data is under way and will guide the planning of future activities.

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 codes (MELCOR, SCDAP/RELAP5, CONTAIN) have been developed for various stages in severe accidents, both in-vessel and ex-vessel, for both BWRs and PWRs. Other codes such as COMMIX, VICTORIA, HMS and IFCI are being developed and maintained to perform the 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 light-water reactor (LWR) power plants. The code can be used to evaluate the progression of severe accidents from initiation through containment failure and 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 fiscal year 1994 has been to improve capabilities to model the phenomena of in-vessel natural circulation, core structure melting and relocation, and ex-vessel core-concrete interactions, and also to model the performance of passive safety systems in advanced light-water reactors (ALWRs). These and a few other improvements were made in response to a number of recommendations offered by an independent peer review group convened by the NRC. A significant effort was made in fiscal year 1994 to incorporate CORCON-MOD3, a stand-alone core-concrete interaction code, into MELCOR. With this work now completed, the NRC has no further plans to support maintenance of the stand-alone CORCON-MOD3 code.

The assessment of MELCOR by NRC contractors continued in this fiscal year, as did the MELCOR Cooperative Assessment Program. The goal of the latter work, initiated in fiscal year 1992, is to create an international forum for information exchange on the applicability, limitations and operational experiences with MELCOR. The goal of the former work is to broaden the MELCOR assessment data base through work conducted in the national laboratories and in other organizations in the United States. MELCOR has been applied to the analyses of various plant accident transients, and a large number of code assessments have been completed in fiscal year 1994 by several United States and international user organizations.

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. The code has been in world-wide use for several years. A SCDAP/RELAP5 peer review committee completed an extensive review of the code in fiscal year 1993 and identified several areas of modeling and documentation that needed improvement. The improvements completed in 1994 include: (1) bringing code manuals up-to-date, (2) making the code more reliable and user friendly, (3) streamlining the code output, (4) establishing a closer link between the code and associated documentation, and (5) making assessment reports available for each version of the released code. Specific SCDAP/RELAP5 activities completed in fiscal year 1994 include: (1) release of the new version of the code (MOD3.1) and a five-volume set of user and code manuals, (2) completion of BWR control blade/channel box-model testing, (3) analyses of severe accident sequences for the Zion (Ill.) and Surry (Va.) nuclear power plants to support resolution of the direct containment heating (DCH) issue, (4) completion of nodalization studies for a station blackout accident scenario (high-pressure case) for the Surry nuclear power plant, (5) completion of a TMI-2 accident sequence study using MOD3.1, and (6) addition of debris oxidation and eutectic interaction models for fuel rod cladding and PWR control rod materials. Ongoing work includes: (1) continuing to provide code maintenance, (2) performing time and spatial nodalization studies, (3) performing more assessment studies against experimental data, and (4) continuing to improve high-priority modeling deficiency items, as recommended by the peer review committee.

CONTAIN is a detailed code for the integrated analysis of containment phenomena. The code provides the capability to predict the physical, chemical and radiological conditions inside a reactor containment in the event of a severe accident. One issue currently under investigation is DCH and pressurization of the reactor containment atmosphere by molten core materials ejected after lower vessel head failure under pressure. Assessment of the DCH models in CONTAIN against experimental data continued in fiscal year 1994. Another development is related to containment analyses for ALWR designs. The industry is developing ALWR containment designs that incorporate passive cooling and decay heat removal features for protection against long term containment over-pressure in severe accidents. The CONTAIN code was modified in selected areas to model these passive ALWR safety features. Finally, a comprehensive peer review of the code was completed in which code modeling and validation were assessed for the code's intended applications.

COMMIX is a three-dimensional transient single-phase computer code for thermal-hydraulic analysis of single and multi-component engineering systems. The code solves a system of time-dependent and multi-dimensional conservation for mass, momentum, energy, and transport equations. A number of phenomena encountered in postulated severe accidents in ALWRs are inherently multi-dimensional in nature. The COMMIX code is intended for use in addressing such issues as natural circulation, flow stratification, and the effect of non-condensible gas distribution on local condensation and evaporation for the AP600 plant.

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 fiscal year 1994, assessment and validation were conducted for models used in the VICTORIA computer code against existing data bases and against new data from several experimental test facilities (e.g., FALCON VI, ST). An improved fission product chemistry model was implemented in VICTORIA. In fiscal year 1994, the code was used for a full plant station blackout (TMLB) analysis of the Surry (Va.) nuclear power plant.

Battelle Columbus Laboratory has performed a large number of experiments on boric acid and its interaction with a variety of chemical species expected in the RCS under severe accident conditions (e.g., cesium hydroxide, cesium iodide). The experimental results will enhance the chemistry models already in VICTORIA in simulating severe reactor accidents. Battelle and the NRC staff have modeled the retention of cesium on stainless steel in this chemical system for future implementation in the VICTORIA code.

HMS is a "best-estimate," three-dimensional, transient code for analyzing the transport, mixing and burning of hydrogen. The code can model geometrically complex structures with multiple compartments and can simulate the effects of condensation, heat transfer to walls and internal structures, chemical kinetics, and fluid turbulence. During fiscal year 1994, an HMS user's manual was developed to provide the basic information for setting up and running problems with the code. Also, HMS was converted from a main frame computer code to a workstation code.

IFCI, an Integrated Fuel-Coolant Interactions computer code, provides a numerical tool for calculating and predicting the consequences of fuel-coolant interactions, including the breakup of melt streams, the expansion work, and the dynamic pressure loads on in-vessel and ex-vessel structures. Models in the IFCI code are currently being validated against experimental data. During fiscal year 1994, operational assessment of the IFCI code was completed and a user's manual was published (NUREG/CR-6211).

Severe Accident Phenomenology

Severe accident phenomenological research seeks an improved understanding of severe reactor accidents and explores the quantification of source terms, core-melt progression, primary system failure from severe accidents, and fuel-coolant (meltcoolant) interactions.

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 off-site consequences of a hypothetical severe accident. 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 update of TID-14844, published in "Accident Source Terms for Light Water Nuclear Power Plants" (draft NUREG-1465), has been completed; the final NUREG-1465 will be issued in January 1995.

The NRC has entered into an agreement with the Commissariat a' L'Energie Atomique of France (CEA) to participate in the PHEBUS-FP (fission product) program. The program is sponsored by the CEA and the Commission of the European Communities and is aimed at studying—under sufficiently prototypic conditions in an inpile facility—those phenomena governing the transport, retention and chemistry of fission products under severe accident conditions in LWRs. Phenomena to be studied are those occurring in the core, in the primary reactor coolant circuit, and in 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 is confirmatory in nature and will be used to assess the revised source term assumptions used in NUREG-1465.

The first PHEBUS-FP test, FPT-O, was successfully conducted in December 1993. The interpretation of FPT-0 is continuing; lessons learned from FPT-0 will be taken into account in planning for the next test, FPT-1, scheduled for June 1995.

Core-Melt Progression. "In-vessel core-melt progression" describes the state of a light-water-reactor (LWR) core from core-uncovery up to reactor vessel melt-through, in unrecovered accidents or through stabilization of the temperatures and the core geometry in accidents recovered by core-reflooding. 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 the 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 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 also core conditions for assessing accident management strategies.

Current NRC research on melt progression is focused on two major issues. The first is a determination as to whether there are any accident conditions for boiling-water reactors (BWRs), and possibly for pressurized-water reactors (PWRs), in which a metallic core blockage similar to that which occurred at Three Mile Island Unit 2 (Pa.; TMI-2) would not be formed. In such a case, the metallic melt, and later the ceramic (fuel) melt, would, when formed from the core, drain into the water in the lower plenum of the reactor vessel. This would affect timing of the reactor vessel failure and lead to the release of a mostly metallic (Zircaloy) lower temperature melt after the reactor vessel boils dry and fails. The second issue concerns conditions for melt-through of the growing pool of ceramic melt above the metallic blockage. The melt-through threshold and location determine the mass of the melt released from the core and later, potentially, from the reactor vessel.

On the issue of blockage of the core by metallic melt, studies of TMI-2 and the results of in-reactor tests and laboratory experiments have indicated that, for "wet-core" conditions (with water in the bottom of the core), the relocating molten metallic Zircaloy in the core freezes to block the lower core. All but one of the previous experiments for both PWRs and BWRs were performed for these wet-core conditions, and this one experiment did not address the blockage or drainage question. The emergency operating procedures for U.S. BWRs, however, call for reactor depressurization, which lowers the water level below the reactor core by flashing, so that core-heatup occurs with very low steam flow through a "dry core." Analysis of these conditions indicates that the molten core metal (and later molten ceramic fuel) might possibly drain from the core rather than form a blocked core, as at TMI-2, with subsequent ceramic melt pool growth and melt-through.

A series of new ex-reactor (laboratory) experiments to address the question of metallic melt drainage or core-plate blockage under BWR dry core accident conditions has been started at Sandia National Laboratories. The experimental test assemblies constitute a mockup at full radial scale of a cross section of the lower quarter of a BWR core (and core-plate region) where such blockages might occur, and the test assemblies have prototypic reactor fuel rods, structure, and temperature distributions. Separate melts of metallic Zircaloy and control-blade materials are poured into a test assembly at prototypic rates (dribbles), and the melt relocation and blockage behavior are determined.

Last year, two developmental XR1 tests of the experimental system were successfully performed. In fiscal year 1994, preparations were made for a series of four XR2 experiments, under closely prototypic conditions, to provide definitive data on the question of metallic melt drainage or core-blockage under BWR dry-core accident conditions. A major part of the fiscal year 1994 effort was the development of a new melt delivery system to furnish the required separate pours (dribbles) of control blade and Zircaloy melt at prototypic times, rates, temperatures, composition and location at the entrance to the test assembly. If technically feasible, and subject to program review, the XR2 experiments are to be performed in fiscal year 1995.

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. When this molten core material is relocated into the lower head of the reactor pressure vessel, a molten pool forms which can impose a significant heat load on the reactor vessel lower head. 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. When a molten pool forms on the lower head, a solid crust of material forms around the periphery of the pool, but internal heat generation from the radioactive decay of fission products ensures that most of the debris remains molten and, in fact, undergoes significant internal natural convection in the pool. Detailed understanding of this 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 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. The program, named OECD RASPLAV, is being carried out at the Russian Research Center.

In order to remove the fraction of heat conducted through the vessel lower head, the possibility of flooding the reactor cavity, to externally cool the reactor pressure vessel lower head and prevent its failure, is being investigated. A 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 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 the study will include data on the critical heat flux (CHF) and the development of an analytical model for the CHF on downward-facing surfaces. The experimental apparatus was designed and built during fiscal year 1994 and a series of transient experiments performed. Further experiments, analyses, and CHF model development will continue in fiscal year 1995.

Fuel-Coolant Interactions. There are several aspects to the interaction of ceramic (fuel) melts and of metallic melts with water coolant in the reactor vessel, and also exvessel in a flooded reactor cavity, that are significant in reactor safety assessment. The first of these aspects is the non-explosive breakup and cooling of the melts in water with both steam generation, and, for metallic melts, oxidation and hydrogen generation. The cooling of the melt is significant both in-vessel, for reactor vessel integrity, and ex-vessel. Explosive melt-coolant interactions (i.e., steam explosions) have reactor safety significance both for the expansion work and for impulsive shock failure of reactor structures.

Since the quantification (in the reactor safety study WASH-1400) of the probability of a steam explosion-induced missile, resulting from expansion as a possible mode of containment failure (alpha mode), significant progress has been made in understanding the limitations on formation of potential missiles by an in-vessel steam explosion. Alphamode failure was not a dominant contributor to early containment failure in NUREG-1150. The emphasis in fuel-coolant interaction (FCI) research prior to NUREG-1150 was on the alpha containment failure mode process of in-vessel molten fuel pouring into lower plenum water and the probability of causing missile generation and containment failure by an energetic interaction (steam explosion). Current emphasis in steam explosion research has shifted to impulsive shock loading of ex-vessel structures. For application of the experimental results on FCIs, an Integrated Fuel-Coolant Interactions (IFCI) code has been developed by SNL.

The NRC and the Safety Technology Institute of the Joint Research Center (JRC) of the Commission of the European Communities at Ispra, Italy, have entered into a technical exchange arrangement to perform a series of experiments, in the FARO facility at Ispra, on melt breakup and cooling in water. In this facility, a large mass of reactor fuel (and other prototypic reactor core-melt materials) is melted and poured into different depths of water at a high pressure that suppresses steam explosion triggering. In the JRC KROTOS facility, steam explosion energetics (including shock impulse) with prototypic melts are also under investigation. Four melt cooling tests have been performed in FARO, one of which, in fiscal year 1994, used 150 kg of UO_2–ZrO_2 melt with 3 percent zirconium. Steam generation and the melt cooling characteristics have been measured in all these tests. In the KROTOS steam explosion experiments at one atmosphere, a series of tests with tin and with Al_2O_3 and UO_2–ZrO_2 ceramic melts have been performed. Seven of these tests have used UO_2–ZrO_2 melts, five of which were performed in fiscal year 1994. The results are being analyzed.

RES has an ongoing program of FCI research at the University of Wisconsin. This research includes: (1) simulant material experiments on the mechanisms of both nonexplosive and explosive FCIs; (2) technical participation in and analysis of the results of the FARO and KROTOS FCI experiments; and (3) assessment of the IFCI code against the FARO and KROTOS results. During fiscal year 1994, an initial series of experiments with molten tin was completed, and the results analyzed and interpreted. A principal finding was the importance of the fraction of the melt mass that actually interacts with the water in a steam explosion.

An experimental program has been started at Argonne National Laboratory to determine whether chemical augmentation of the energetics can occur in Zircaloy meltwater steam explosions. Such chemical augmentation can occur in aluminum melt-water steam explosions and has increased the energetics by a factor of up-to-five. This possible chemical augmentation of the energetics is of particular importance in assessing impulsive shock loads to structures. In fiscal year 1994, detailed experiment planning and construction of the apparatus were performed. The experiments are to be performed in fiscal year 1995.

In-House Severe Accident Analysis Capability. Increases in the capability of workstation-level computers provide an opportunity for running severe accident codes on other than main frame computers. In fiscal year 1994, RES purchased workstations to enhance the in-house analysis capability at the NRC. Reactor plant descriptions, or decks, for analyses using the MELCOR, SCDAP/RELAP5, CORCON, CONTAIN, and VICTORIA codes have been installed on the workstations. Typical uses of this in-house capability have been to review input decks developed by NRC contractors and using them to extend previous analyses. In-house analyses have been used to check new models in the codes and to do bounding calculations to determine the appropriateness of the new models.

Reactor Containment Structural Integrity

The major undertaking in this program for the next few years will be a cooperative one with the Ministry of International Trade and Industry (MITI) of Japan. Two areas of cooperation have been identified—one dealing with steel containments used in both the United States and Japan for BWR designs, and the other related to pre-stressed concrete containments. The current generation of Japanese PWR containments are of a prestressed 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 at Sandia National Laboratories (SNL) that was performed 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 are felt to be applicable to pre-stressed concrete containments as well. There are two main reasons, however, for performing an additional pre-stressed containment model test:

- Pre-stressed designs are the most common concrete PWR containment type in the United States, as stated above.

- 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; hence, it is important to have accurate predictions of the ultimate behavior of pre-stressed containments.

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 allows the model to be small enough for transportation from Japan to SNL, while being thick enough to ensure quality construction. The model fabrication by Hitachi, Ltd., in Japan, should be completed in November 1994, with the model being subsequently transported to SNL in January 1995.

The pre-stressed concrete containment vessel (PCCV) model will be a scaled representation of an actual PCCV in Japan, designed in accordance with the Japanese Concrete Containment Vessel Design Code. The basic design of the PCCV model was to be completed by the end of calendar year 1994. Construction drawings will be prepared for construction activities at SNL, scheduled for 1995–1997. Instrumentation of the model will be conducted in 1997–1998, partly in parallel with the on-site model construction. Testing of the PCCV model will then take place late in 1998.

Corrosion Studies. Recent experience suggests the possibility that corrosion effects may significantly degrade the margin that containments have to accommodate accidents beyond their design basis. Evidence of corrosion has been found in both Mark I BWR containments and in ice-condenser PWR containments. The robustness of containments, as verified in the tests performed at SNL showing their capacity to sustain loads well beyond design level, is a major element in the Commission's Severe Accident Policy Statement. Thus, there is a need for better understanding of the significant factors related to occurrence of corrosion, efficacy of inspection, and capacity reduction, so as to be able to formulate regulatory requirements that will ensure the continued availability of sufficient safety margins.

Comparison of remaining containment thickness against minimum ASME Boiler and Pressure Vessel Code requirements is an obvious first step of assessment. If the remaining thickness exceeds the limit, a decision on adequacy of margin is easy. Degradation beyond that limit at localized locations does not, by itself, suggest loss of containment capacity, unless the degradation is especially severe. The elastic analysis methods used for design cannot be extrapolated to provide estimates of actual failure. Methods using the results of research on actual failure modes of containments are being sought, those that can relate containment capacity to amount and location of degradation. If this effort is successful, a basis can be found for judging the seriousness of a given degree of degradation at a particular location. Oak Ridge National Laboratory initiated a program during fiscal year 1994 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 detection of corrosion occurrence. SNL initiated a program during fiscal year 1994 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.

Rulemaking. In order to improve the conduct of containment inspection and reduce the chance of significant undetected degradation resulting from corrosion, work continued in 1994 on the rulemaking to incorporate, by reference, Subsection IWE and Subsection 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. As written, Subsection IWE and Subsection IWL address only the accessible areas of containments. 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 in the inspection of inaccessible areas will have to be improved before resolution of this issue is achieved.

Severe Accident Implementation

In the 15 years since the Three Mile Island (Pa.) accident, the NRC has sponsored intensive research on potential severe accidents at nuclear power plants. Aspects of the research include improved plant operations, human factor considerations, and probabilistic risk assessments. 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.

Individual Plant Examinations. In implementing the Commission's Severe Accident Policy Statement, the staff has required individual plant examinations (IPEs) of all existing plants to identify any plant-specific vulnerabilities to severe accidents. The task has involved development of guidance for performance of the IPE, preparing a generic letter to plant operators requesting the IPE, and developing review plans and reviewing the results of the IPE submittals. Imposition of requirements to correct any identified plant-specific vulnerabilities not voluntarily corrected are governed by the procedures of the backfit rule. The 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 (i.e., internal events such as equipment failures, pipe breaks). The second effort is to consider severe accident vulnerabilities from external hazards (e.g., earthquakes, floods, winds). The latter activity is referred to as the individual plant examination for external events (IPEEE).

Fifteen IPE submittals for the internal events were received from licensees in fiscal year 1994, making an overall total of 77 submittals received to date. Staff evaluations were issued for FitzPatrick (N.Y.), Surry Units 1 and 2 (Va.), Millstone (Conn.), Monticello (Minn.), Palo Verde Units 1, 2 and 3 (Ariz.), Perry 1 (Ohio), Nine Mile Unit 2 (N.Y.), Oyster Creek (N.J.), Robinson Unit 2 (N.C.), Browns Ferry Unit 2 (Tenn.), McGuire Units 1 and 2 (N.C.), Catawba Units 1 and 2 (S.C.), and Haddam Neck (Conn.), and draft staff evaluations were completed for Sequoyah (Tenn.) and Watts Bar Unit 1 (Tenn.). It is expected that IPE submittals for all licensed nuclear power plants will be received and reviewed by the end of calendar year 1996.

The reviews of the IPEEE will closely follow the approach developed for review of the internal-event IPE submittals. The staff completed a procurement process to obtain contractual assistance for the IPEEE reviews. Eight IPEEE submittals were received in fiscal year 1994, and five are currently in the review process.

Safety Issue Resolution and Regulation Improvements

Earth Sciences

Seismic hazard is an important consideration in nuclear power plant design, since it affects the entire plant, simultaneously challenging the redundancy of several safety systems. Because of the large uncertainties in estimating seismic hazards, there is also a large uncertainty in estimating nuclear power plant risks associated with them. In order to reduce these uncertainties and to provide a 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 for 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 operates 32 broadband three-component stations and satellite telemetry, providing data on significant earthquakes within minutes. During fiscal year 1994, a broad agency announcement was issued soliciting research proposals to analyze NSN data and other available seismological, geological and geophysical data. A number of proposals were received, resulting in five research contracts. This research will continue the type of investigation previously carried out by the universities operating regional networks. The high quality, broadband and three-component data of the NSN will lead to new insights into the causes and distribution of seismicity and ground-motion propagation characteristics of the earth's crust, particularly in the central and eastern United States.

Southeastern Tectonics. The search for possible liquefaction features and investigations of landslides and cave deposits in the southern Appalachian area did not produce any clear evidence of prehistoric earthquakes. This activity concluded the search for evidence of prehistoric earthquakes in the Southeast outside of the Charleston, S.C., area. While the search did not result in positive evidence, the fact that clearly liquefiable deposits outside the coastal area did not show evidence of liquefaction reinforces the impression that the Charleston area—where there is evidence of a significant seismic event, occurring about 1,800 years ago—is unique with respect to its seismicity.

Paleoseismicity of Southern Illinois and Indiana. Previous liquefaction studies have found indications that a large earthquake, centered near Vincennes, Ind., occurred between 2,500 and 7,500 years ago. The earthquake may have been larger than the 1886 Charleston earthquake (with a magnitude of approximately 7.0 on the Richter scale) but smaller than the 1811–1812 New Madrid, Mo., earthquakes (magnitude approximately 8.0). During this report period, investigations of the Wabash drainage system were extended farther into Illinois and Indiana, and also into the Anna, Ohio, seismic area. Evidence for another, smaller prehistoric earthquake was found in the Vincennes region, but no evidence for prehistoric events large enough to cause liquefaction was identified in the Anna, Ohio, area. The results thus far confirm the conservatism of past licensing decisions regarding the seismic hazard at nuclear power plant sites in this region.

New Madrid Seismic Zone. Paleoliquefaction studies are being conducted at several locations in the New Madrid seismic zone, particularly near the Missouri-Arkansas State line, to determine the ages and extent of prehistoric earthquakes. Evidence, both geological and archaeological, indicates the occurrence of at least two prehistoric events.

Seismic reflection investigations are being partially supported by the NRC in the New Madrid seismic zone, in the area where waterfalls appeared in the Mississippi River during the 1811–1812 earthquakes. The studies are looking into the possibility that these short-lived features were caused by faulting associated with those earthquakes.

The investigations are part of the ongoing effort to estimate the recurrence of the large-to-great earthquakes (magnitudes 6–to–8) in the New Madrid seismic zone and to define the causative faults.

West-Central United States. Three suggested Quaternary faults are being investigated—the Cheraw and Fowler faults on the Colorado Piedmont and the Harlan County fault in Nebraska. (The Quaternary period extends from about two million years ago to the present and comprises the Pleistocene and Holocene epochs.) Preliminary results indicate that the Fowler feature is not a fault but appears to be one because of the current setting of the Quaternary stratigraphy, geomorphic features, and jointing in the underlying Pierre Shale. The Cheraw and Harlan County faults appear to be Quaternary tectonic faults and will be investigated further. The investigations are part of an ongoing effort, which began with the discovery of late Holocene displacement on the Meers fault, to identify other Quaternary faults in the central United States.

Fault Segmentation Studies. During the past two years, the surface rupture that occurred during the 1992 Landers earthquake was studied in detail, and, during the last half of fiscal year 1994, the surface deformation that occurred during the 1994 Northridge earthquake was investigated. Geological evidence from faults that ruptured the ground surface at Landers indicates that from two-to-four prehistoric earthquakes occurred in this area. These events are estimated to have been about the same size as the 1992 event, suggesting that the Landers earthquake fault segments behaved in a similar manner in the past. These findings confirm the validity of using fault segmentation to estimate future fault behavior and earthquake magnitude, one of the methods used to estimate the seismic hazard of the Diablo Canyon (Cal.) nuclear power plant site.

Preliminary results indicate that the surface deformation at Northridge is most likely the result of strong ground motions and secondary faulting. Evidence pointing to prehistoric events of a similar kind was also found.

Strong Ground Motion Studies. The NRC participates in several cost-sharing, ground motion programs, in cooperation with the U.S. Geological Survey. Among these are studies estimating high-frequency ground motions in the central and eastern United States, using data from the Landers, Petrolia, and Northridge earthquakes; attenuation and source parameter studies for the eastern and central United States, using data from the NSN; and strong ground motion studies of large intra-plate earthquakes, using data from teleseismic and regional recordings. Results of the studies will be used to make more realistic hazard determinations and to reduce uncertainties in the probabilistic estimates.

Geo-chronological Studies. The NRC is supporting a research program to assemble all state-of-the-art information on methods for determining the age of geological materials. Geo-chronological analysis of faults, paleoliquefaction features, and other paleoseismic features are an important factor in determining the seismic and geological hazard of a site. A limited field research project to validate new dating methods is under way, as part of this project. The goal of this project is to develop a Regulatory Guide to assist applicants and the regulatory staff in evaluating potential nuclear sites.

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 fiscal year 1993. After the strain network was established, it became the backbone of a new geodetic network for the United States, based on Global Positioning System (GPS) measurements. In the meantime, high-precision GPS networks have been established in many States and, within the next few years, all of the United States will be covered with detailed high-precision GPS networks, including continuously operated GPS stations. From preliminary strain analyses, it appears that strains in the central and eastern United States are in the range of 10^{-8}-per-year. Because strain rates in this region are so low, many years may be needed to arrive at meaningful strain determinations. However, with the many high-precision GPS stations now available, it should eventually be possible to get a very detailed picture of strain distribution. Information on strain distribution and strain rates will then provide a basis for refinements in seismic hazard determinations.

Probabilistic Seismic Hazard Assessments. During fiscal years 1993 and 1994, a panel of scientists assembled under the sponsorship of the NRC and the Department of Energy (DOE), with input from the Electric Power Research Institute (EPRI), conducted a study of methodologies for probabilistic seismic hazard analysis (PSHA), that is nearing completion. The study has the goal of analyzing existing methodologies—those developed by Lawrence Livermore National Laboratory and by EPRI under the NRC and nuclear utility sponsorship, respectively—and of deriving an improved methodology, one that will be scientifically balanced and usable for regulatory decisions over the next decade. The project is undergoing peer review by a panel appointed by the National Academy of Sciences to ensure impartiality and objectivity. Considerable weight has been given methods of eliciting expert opinions, which are of fundamental importance in probabilistic hazard estimates. After the final report is issued, the new PSHA methodology will be verified by means of site testing.

Plant Response to Seismic and Other External Events

Revision of Appendix A to 10 CFR Part 100. In August 1994, the Commission approved the staff's recommendation that a second revision of Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," to 10 CFR Part 100, "Reactor Site Criteria," be issued for public comment. The revision reflects new information and research results available since the first proposed revision to the regulations was issued and comments were received from the public (see the *1993 NRC Annual Report*, p. 199). The proposed regulations were published in the *Federal Register* for a 120-day comment period on October 17, 1994 (59 FR 52255). The availability of draft Regulatory Guides and Standard Review Plan sections providing methods acceptable to the NRC staff for implementing the proposed regulations was to be available for public comment during the first quarter of calendar year 1995.

Northridge Earthquake. On January 17, 1994, a magnitude 6.7 earthquake occurred in the San Fernando Valley near the town of Northridge, Cal. This is the same general area affected by the magnitude 6.5 San Fernando earthquake in 1971. Site visits to the damaged area were made by the Lawrence Livermore National Laboratory (under NRC and DOE sponsorship) and by a team composed of members from the NRC Offices of Nuclear Regulatory Research (RES) and Nuclear Reactor Regulation (NRR), DOE, EPRI and other nuclear industry organizations. The NRC, other government agencies, and the nuclear industry continue to study the effects of such earthquakes to improve knowledge of the causes, frequency and severity of earthquakes, seismic wave transmission, local site amplification, seismically caused soil failure, and performance of structures, equipment, and piping similar to that found in nuclear power plants. Although there were many failures associated with this earthquake, many structures, systems and components, even those close to the epicentral region, evidenced little significant damage and could be occupied or were functional after the earthquake. In general, well-engineered structures and equipment that may have experienced ground motion far in excess of their design remained functional. Components made of brittle materials, such as ceramic insulators and cast iron components, received damage consistent with other earthquakes. A report documenting the reconnaissance investigations and co-sponsored by the NRC, DOE and EPRI is to be published by EPRI in the first quarter of calendar year 1995.

Shear Wall Ultimate Drift Limits. The ultimate "drift limit" is defined as the lateral displacement at the top of the wall relative to its base, normalized by the height of the wall. A research program with the objectives of establishing appropriate values of ultimate drift limits and obtaining the statistics to define this parameter in a probabilistic sense was completed this year (see the *1993 NRC Annual Report*, p. 199) The final report, "Shear Wall Ultimate Drift Limits" (NUREG/CR-6104), was published in March 1994. The information in this report will be useful in the seismic probabilisitic risk assessment (PRA) analyses or seismic margins analyses carried out to identify seismic vulnerabilities to severe accidents (in response to Generic Letter 88-20, Supplement 4 that initiated the IPEEE).

Cooperative International Seismic Programs. The NRC's participation in international seismic test programs is beneficial both for the sharing of research resources and for gaining different perspectives on seismic design issues. The pooling of resources allows the development of larger-scale tests, an important element in the validation of 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 is a follow-on to the SSI experiments at Lotung, Taiwan.

The LSST program was initiated in January 1990, and it was expected to continue for five years. The goal of the program is to collect real earthquake-induced SSI data for the purpose of evaluating the computer codes used in SSI analyses of nuclear power plant structures. In the program, observations are made of the motions of the reactor building model and the surrounding ground during large-scale earthquakes. The expectation was that the test model will be shaken by numerous earthquakes in this seismically active area of Taiwan.

To date, several earthquakes have been recorded at the LSST site—one on September 16, 1993 (4.1 magnitude), another on January 20, 1994 (5.7 magnitude). Instrumentation located on the scale model and in the field along a three-dimensional strong ground motion array recorded the earthquake data.

EPRI has organized the Hualien LSST experiment and coordinated participation with the Taiwan Power Company (Taipower), the NRC, the Central Research Institute of Electric Power Industry (CRIEPI), the Tokyo Electric Power Company (TEPCO), the Commissariat a l'Energie Atomique (CEA), Electricite de France (EdF), Framatome, the Korea Power Engineering Co. (KOPEC), and Korea Electric Power Corporation.

During the report period, a collaborative effort involving exchange of technical information was established with the Ministry of International Trade and Industry (MITI) and Nuclear Power Engineering Corporation (NUPEC) of Japan. In this effort, NUPEC is carrying out a seismic proving test program for a main steamline typical of the PWR plants and for a feedwater system typical of the BWR plants. Preliminary tests have begun at the "shake-table" of Tadotsu Engineering Laboratory and will continue in 1995. Tests will be conducted at several levels of seismic excitation, using energy absorber supports for the piping systems. The NRC in this collaborative effort will carry out pre- and 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.

Generic Safety Issue Resolution

In December 1983, the Commission approved a priority list of all generic safety issues (GSIs), including TMI-related issues, based on the potential safety significance of each issue and cost of implementation of each issue. Information and guidance on GSIs are reflected in the NRC's Five-Year Plan.

Priorities of Generic Safety Issues. The NRC continued to use risk and cost data in implementing the methodology set out in the *1982 NRC Annual Report* for determining the priority of GSIs. In December 1983, a comprehensive list of the issues was published in "A Prioritization of Generic Safety Issues" (NUREG–0933), and this list has generally been updated semi-annually, with supplements in June and December. The results of the NRC's continuing effort to identify, set priorities among, and resolve GSIs will be included in future supplements to NUREG–0933.

During fiscal year 1994, the NRC identified no new GSIs, established priorities for three issues (Table 1), and resolved five GSIs (Table 2). Table 3 contains the schedules for resolution of the 14 unresolved GSIs extant at the end of fiscal year 1994.

Table 1. Issues Prioritized in FY 1994

Number	Title	Priority
158	Performance of Power-Operated Valves Under Design Basis Conditions	MEDIUM
165	Spring-Actuated Safety and Relief Valve Reliability	HIGH
167	Hydrogen Storage Facility Separation	LOW

Table 2. Generic Safety Issues Resolved in FY 1994

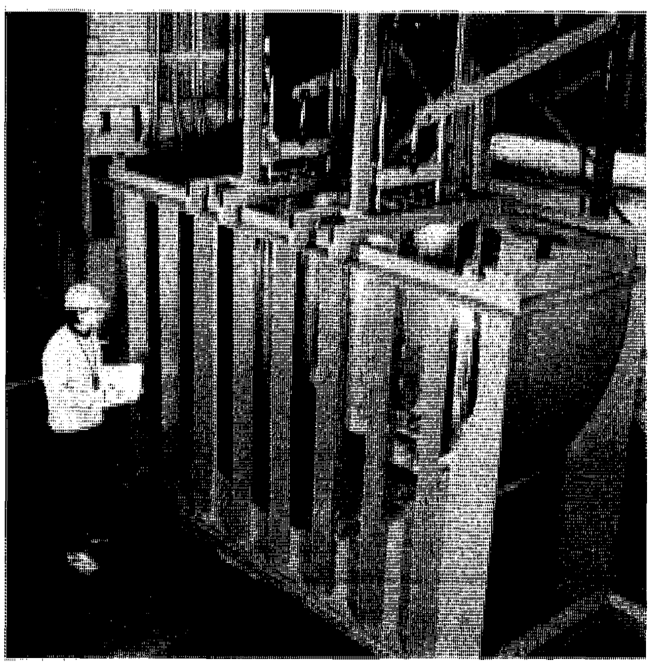
Number	Title
57	Effects of Fire Protection System Actuation on Safety-Related Equipment
106	Piping and Use of Highly Combustible Gases in Vital Areas
B–64	Decommissioning of Nuclear Reactors
I.D.5(3)	On-Line Reactor Surveillance Systems
II.H.2	Obtain Technical Data on the Conditions Inside the TMI-2 Containment Structure

Table 3. Generic Safety Issues Scheduled for Resolution

Number	Title	Priority	Scheduled Resolution Date
15	Radiation Effects on Reactor Vessel Supports	HIGH	11/94
23	Reactor Coolant Pump Seal Failures	HIGH	12/95
165	Spring-Actuated Safety and Relief Valve Reliability	HIGH	TBD
24	Automatic Emergency Core Cooling System Switch to Recirculation	MEDIUM	09/95
78	Monitoring of Fatigue Transient Limits for Reactor Coolant System	MEDIUM	06/95
158	Performance of Safety–Related Power-Operated Valves Under Design Basis Conditions	MEDIUM	04/96
B–17	Criteria for Safety-Related Operator Actions	MEDIUM	06/95
B–55	Improve Reliability of Target Rock Safety Relief Valves	MEDIUM	08/97
B–61	Allowable ECCS Equipment Outage Periods	MEDIUM	02/95
83	Control Room Habitability	NEARLY-RESOLVED	01/95
145	Improve Surveillance and Startup Testing Programs	NEARLY-RESOLVED	12/94
155.1	More Realistic Source Term Assumptions	NEARLY-RESOLVED	11/94
166	Adequacy of Fatigue Life of Metal Components	NEARLY-RESOLVED	TBD
168	Environmental Qualification of Electrical Equipment	NEARLY-RESOLVED	TBD

Progress on GSI Resolution. Important information has been developed during this report period on factors contributing to blockage of Emergency Core Cooling System (ECCS) strainers in BWR suppression pools. Although the issue had been considered resolved in 1985 (as A–43), more recent events at Barseback Unit 2 in Sweden and at the Perry (Ohio) nuclear plant have showed that, during a Loss-of-Coolant Accident (LOCA), fibrous insulation debris, coupled with sludge and foreign materials in the drywell, could block strainers more rapidly than previously thought. Restudy of the issue in the United States is considered prudent, because a change to the use of fibrous insulation by many utilities has occurred since the A–43 resolution.

The potential for BWR ECCS strainer blockage caused by LOCA-generated debris was studied in detail, using a BWR6/MK1 reference plant to estimate the probability of occurrence and attendant impacts on net pump head suction (NPSH) margin. The results, reported in NUREG/CR-6224, revealed that severe strainer blockage and loss of NPSH margin could occur within the first 30 minutes of a LOCA if other materials or particulates, such as suppression pool sludge, are present, in addition to the LOCA-generated debris. Studies are also under way at the Alden Research Laboratory to develop a broader experimental data base of strainer blockage, particulate transport, and settling phenomena, under simulated post-LOCA suppression pool turbulence conditions for a variety of fibrous debris and sludge configurations, for broader applicability to all BWRs. The NRC is also participating in an international working group sponsored by the OECD/NEA–CSNI—Principal Working Group 1—whose charter is to develop an internationally acceptable knowledge base for assessing the reliability of ECCS recirculation systems, especially as related to strainer blockage.



Shown is an experimental assembly at Alden Research Laboratory to study settling phenomena of insulation and debris with simulated post-LOCA suppression turbulence for the ECCS strainer blockage generic safety issue.

Elimination of Requirements Marginal to Safety

Regulatory Improvement Program. The NRC has instituted an ongoing effort to eliminate requirements marginal to safety and to help reduce the regulatory burden by permanently integrating this activity into the regulatory process. This measure is taken, among other things, to satisfy the requirement for a periodic review of existing regulations set out in Section 5 of Executive Order 12866, "Regulatory Planning and Review." The regulatory improvement (RI) program is intended to implement the principle adopted by the Commission that all regulatory burdens must be justified and that the NRC's regulatory process must be efficient. The reasons for seeking to remove regulations and license conditions marginal to safety are to eliminate or modify requirements where burdens are not commensurate with their safety significance and thus to provide for more efficient use of both licensee and NRC resources and to improve the focus and effectiveness of the body of regulations. This program should result in a sharper regulatory focus on safety-significant areas; an overall net increase in safety is expected to result from the program. Specific policies, framework for rulemakings, and procedures for the program have been drawn up and are in place.

In a major action under the RI program, the NRC will propose a revision to its regulations—in

Appendix J to 10 CFR Part 50, concerning containment leakage testing. Consistent with RI program policies and framework, the proposed rule is formulated to adopt performance-oriented and risk-based approaches. It is less prescriptive than in the past and allows licensees flexibility for cost-effective implementation of the safety objectives in the regulation. The revision would permit greater intervals between required tests, provided that satisfactory performance is achieved on the tests applied. The nuclear industry has supported this innovation through the collection of data at nuclear power plants and has developed a guideline for implementation of the rule. The rule revision is expected to result in greater focus on safety-significant activities and produce a significant burden reduction to the industry.

The NRC has also initiated action and studies for revising its regulations for fire protection of power reactors, under Appendix R to 10 CFR Part 50. The NRC is conducting a review of initiatives for performance-oriented fire protection regulation in other industries in the United States and abroad and in the nuclear industry in other countries. The NRC is also developing the application of PRA in determining the significance of fire protection features and enhanced focus on fire protection design activities. The industry is playing a major role in the rule revision and is expected to submit a petition for rulemaking to adopt performance-oriented approaches in the fire protection area.

The NRC is also in the process of revising 10 CFR 2.802, Petition for Rulemaking, to implement another aspect of regulatory improvement. The proposed revision would offer an alternative beyond the minimum threshold information required by the current 10 CFR 2.802(c) to encourage any petitioner to submit more detailed information and analyses to support the petition. The information would be of the same type the NRC staff is currently required to develop for a rulemaking. The revision is expected to expand use of the petition process to reduce or eliminate requirements that impose a regulatory burden with no commensurate safety benefit and to bring about a faster disposition of the petitions, as well as more efficient use of NRC staff and industry resources.

Reactor Regulatory Standards

The Commission issued a final rule, on February 9, 1994 (59 FR 5934), on requalification requirements for licensed operators for renewal of licenses (10 CFR Part 55). The amendment removes the requirement that each licensed operator pass a comprehensive requalification written examination and an operating test conducted by the NRC during the term of the operator's six-year license, as a pre-requisite for license renewal. Forty-two comments were received, most of them in support of the proposed amendments.

The Commission issued a proposed rule for public comment, on October 24, 1994 (59 FR 53372), regarding the procurement of commercial-grade items by nuclear power plant licensees (10 CFR Part 21). It is expected that the final rule will be published in fiscal year 1995. The proposed amendments 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-21-02) submitted by the Nuclear Management and Resources Council (NUMARC), later incorporated into the Nuclear Energy Institute (NEI).

The Commission issued a proposed rule for public comment, on November 2, 1994 (59 FR 54843), on the reduction of reporting requirements imposed on NRC licensees (10 CFR Parts 50, 55, and 73). The amendments would reduce reporting requirements currently imposed on licensees for water-cooled nuclear power reactors and research and test reactors, and also on nuclear material licensees. This action implements an NRC commitment to review its current regulations with the intent to revise or eliminate duplicative or unnecessary reporting requirements. It is expected that the final rulemaking will be issued late in fiscal year 1995.

The Commission issued an advance notice of proposed rulemaking (ANPR), on November 3, 1993 (58 FR 58664), on standard design certification for evolutionary lightwater reactors (10 CFR Part 52). The ANPR requested public comment on the form and content of rules that would certify these designs. The Commission anticipates that two applications for design certification may be ready for such rulemakings in fiscal year 1995. An applicant for a combined license under 10 CFR Part 52 can use these certified designs without further in-depth review by the NRC.

The Commission, in SECY-94-042, approved withdrawal of six NRC policy statements that have been superseded by subsequent NRC rulemaking actions. The decision for this withdrawal does not change reporting requirements on licensees or in any way reduce protection of the public health and safety. The policy statements to be withdrawn are: (1) Nuclear Power Plant Access Authorization Program, March 9, 1988 (53 FR 7534); (2) Training and Qualification of Nuclear Power Plant Personnel, March 20, 1985 (50 FR 11147); (3) Fitness-for-Duty of Nuclear Power Plant Personnel, August 4, 1986 (51 FR 27921); (4) Maintenance of Nuclear Power Plants, December 8, 1989 (54 FR 50611); (5) Information Flow, July 20, 1982 (47 FR 31482); and (6) Planning Basis for Emergency Responses to Nuclear Power Reactor Accidents, October 23, 1979 (44 FR 61123). A notice of withdrawal of these policy statements will be published in the *Federal Register* early in fiscal year 1995.

Regulatory Analysis. The NRC continued its development of the regulatory analysis guidelines (NUREG/BR-0058, Rev. 2) and the regulatory analysis technical evaluation handbook (NUREG/BR-0184). The guidelines represent the NRC's policy-setting document with respect to regulatory impact analyses (RIAs). The document contains a number of policy decisions for the preparation of RIAs performed in support of NRC actions affecting reactor and non-reactor licensees. The accompanying handbook provides methodological guidance to regulatory analysts, promotes preparation of high-quality RIAs, and implements the policies of the guidelines. During this report period, the guidelines were revised in response to public comments, and the handbook was modified following internal NRC review. The NRC also continued its re-evaluation of the current $1,000-per-person-rem conversion factor, which is integral to the value-impact assessment portion of the RIA. This paper has also undergone a number of NRC internal reviews.

In further assistance to analysts in preparing RIAs, the NRC has published "Replacement Energy, Capacity, and Reliability Costs for Permanent Nuclear Reactor Shutdowns" (NUREG/CR-6080) and "Replacement Energy Cost Analysis Package (RECAP): User's Guide" (NUREG/CR-5344). The cost estimates available from these studies allow the NRC to estimate the costs associated with the temporary shutdown of a nuclear power reactor, in order to make safety modifications or its permanent loss because of an accident.

During the report period, the development or review of about 18 safety-related RIAs was completed or initiated to justify specific regulatory actions for reactor and nonreactor 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 members of the public from radiation and radioactive materials in connection with reactor licensed activities. The program encompasses the improving of health physics measurements, identifying and disseminating cost-effective dose reduction techniques, assessing health effects consequences of postulated reactor accidents, and monitoring health effects research.

Revision of 10 CFR Part 20 Radiation Protection Standards. Staff efforts to facilitate the mandatory implementation of the new rules continued through fiscal year 1994. These efforts included development of training courses, publication of questions and answers on Part 20, and publication of regulatory guidance. On January 1, 1994, the rule became mandatory for all licensees. In February 1994, the staff published "Health Physics Positions Data Base" (Revision 1 to NUREG/CR-5569), updating a number of positions consistent with the revision of Part 20. The data base is also now available on diskette. Several minor corrective rulemakings were completed, and a proposed rule (10 CFR Parts 19 and 20) was issued in February 1994 dealing with more substantial issues regarding use of "controlled areas," the definition of occupational and public exposure, and training requirements (59 FR 5132).

In February 1994, the staff published "Impact of Reduced Dose Limits on NRC Licensed Activities: Major Issues in the Implementation of ICRP/NCRP Dose Limit Recommendations" (NUREG/CR-6112), as a draft report for comment. A critical ongoing issue has been how the agency should respond to the recent recommendations of the ICRP on occupational dose limits. The report provided the information currently available by which to assess impacts of several alternative approaches.

In an ongoing effort to reduce regulatory burdens, where such reductions would not reduce health and safety, the staff published a proposed rule (10 CFR Part 20), in September 1994 (59 FR 47565), on frequency of medical examinations for the use of respiratory protection equipment. The proposed rule would remove the requirement for an annual medical examination and allow for alternative timeframes, based upon the determination of a physician. The rulemaking comments will be considered and final action taken in fiscal year 1995.

Brookhaven National Laboratory ALARA Center. The Brookhaven National Laboratory (BNL) ALARA Center, funded by the NRC, continued its surveillance and dissemination of DOE and industry dose reduction and ALARA research (to attain radiation levels "as low as reasonably achievable"). BNL continued work that abstracts national and international publications discussing dose reduction in areas such as plant chemistry, stress corrosion cracking, steam generator repair and replacement, robotics and decontamination. In May 1994, "Data Base on Dose Reduction Research Projects for Nuclear Power Plants" (NUREG/CR-4409) was published. The report provides a summary of projects that have been completed or are under way to help reduce doses. This information is particularly important to power reactor facilities in the planning stages of activities. BNL also continued publication of the newsletter, "ALARA Notes," on about a quarterly schedule. In 1994, BNL focused on making the data base more easily accessible through an on-line fax system, adding information from overseas contacts, and also continued development of an ALARA handbook. In May 1994, BNL hosted the third ALARA international workshop, which was well attended by representatives from the United States and other countries. The proceedings of that conference will be published in fiscal year 1995. The center provided information and advice on dose reduction to NRC staff and licensees.

Occupational Exposure Data System. The NRC continued to collect and process data in the computerized data system called the Radiation Exposure Information Reporting System (REIRS). REIRS provides a permanent record of worker exposures for reactors and several other categories of licensees. A report on 1992 exposures, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 1992," was issued (NUREG-0713, Volume 14; December 1993). Compilation of the statistical reports indicated that approximately 200,000 individuals were monitored and half received a measurable dose. The average measurable dose dropped from 0.31 rem (cSv) in 1990 to 0.30 in 1992. The collective dose obtained from all the individual doses was 32,000 person-rems (person-cSv). The data base also includes exposure data on individuals who have terminated employment with certain licensees. Data on some 687,000 persons are in the system, 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 the examination of the doses incurred by transient workers as they move from plant to plant.

In September 1994, the staff published Generic Letter 94-04, "Voluntary Reporting of Additional Occupational Radiation Exposure Data," as a mechanism to complete the data available in the REIRS data system on occupational exposure. With the revision to Part 20, licensees are required to submit only data on the present year's activities. Previously data were collected at the time a person terminated employment. Thus, in order to complete the data base, data were requested for persons employed as of January 1, 1994, who were not already covered by termination reports.

National Institute of Standards Technology. An Interagency Agreement, RES-93-01, between the NRC and the National Institute of Standards and Technology (NIST) involves an ongoing study aimed at establishing traceability between NIST and the Pacific Northwest Laboratories (PNL) for neutron irradiations. PNL provides the neutron irradiation to NIST/NVLAP, as part of its duties as the testing laboratory for dosimeter processor accreditation.

Electronic Personnel Dosimeters. PNL is currently involved in developing a set of performance tests and implementing procedures that would permit electronic personnel dosimeters (EPDs) to be used in place of film or thermoluminescent dosimeters (TLDs), in order to establish radiation doses for radiation workers. The product of this effort is to be a report that could be used by the NRC to evaluate EPDs until such time as an appropriate ANSI standard for EPDs becomes available. The report would be used as the basis for a possible future certification program to qualify EPDs for use in radiation measurements.

In December 1993, "Performance of Portable Radiation Survey Instruments" (NUREG/CR-6062), was published. The report evaluated the current status of performance in the portable instrument area and is part of an ongoing activity to examine performance to determine whether new or modified regulatory standards are necessary.

Gamma Dose Spectrometer. Work is being carried out under a Small Business Innovative Research Phase II contract involving the development of a gamma-ray dosimeter/spectrometer that will measure the gamma-ray spectrum over a wide range of energies. From this information and the electronic signal retrieved from the dosimeter, it will be possible to calculate, through the use of appropriate algorithms, the dose delivered to the skin, the eye and the whole body. To date, an Active Differential Absorption Spectrometer has been designed, developed and tested.

Spent Fuel Heat Removal. The Oak Ridge National Laboratory, funded by the NRC, is also continuing to improve the data base in the guide for BWR and PWR fuel decay heat generation, by including analysis of recent data to provide a basis for evaluating the adequacy of the storage system heat removal capability to limit fuel rod temperature.

Safeguards Regulation Program

Nuclear Materials Research

Materials Licensee Performance

Through its human factors regulatory research program, the NRC seeks to expand its understanding of the effect of human performance on safety procedures involving the medical and industrial use of nuclear materials, and to confirm the bases for requirements related to those procedures.

Reports are being prepared on the results of comprehensive human factors evaluations of teletherapy and remote after-loading brachytherapy systems. The first volume for each set of results includes identification of human factors problems within each system, alternative approaches to solving those problems, and an assessment of those approaches with respect to their relative ability to solve system human factors problems. The remaining volumes for each system evaluation will contain support for the findings described in the first volume—specifically, the results of job and task analyses, as well as in-depth studies of human-system interface, procedures, training, and organizational practices and policies for each of the systems.

Materials Regulatory Standards

The Commission issued a final rule (10 CFR Parts 30, 40, 50, 70, and 72) allowing self-guarantee as another mechanism for financial assurance for decommissioning, on December 29, 1993 (58 FR 68726). The rulemaking was in response to a petition for rulemaking (PRM-30-59) submitted by the General Electric Company and Westinghouse Electric Corporation. The final rule allows certain financially large, non-utility licensees to use a self-guarantee as financial assurance for decommissioning funding. It would not apply to electric utility licensees.

A final rule (10 CFR Part 73) to require a physical fitness program for security personnel at Category I facilities was published on July 28, 1994 (59 FR

38347). The rule adds new requirements for a physical fitness program and annual performance testing or a quarterly site-specific content-based performance test.

A proposed rule (10 CFR 72.214) adding a standardized HUHOMS cask to the list of approved spent fuel storage casks was published for public comment on June 2, 1994 (59 FR 28496). The 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. It is expected that the final rule will be issued early in fiscal year 1995.

A proposed rule (10 CFR Parts 30, 32, and 35) on the medical use of byproduct material was published for public comment in July 1993 (58 FR 33396). This action was taken in response to a petition for rulemaking (PRM–35–9). The final rulemaking, sent for Commission approval in September 1994, is intended to provide greater flexibility by allowing properly qualified nuclear pharmacists and authorized users who are also physicians more discretion to prepare radioactive drugs containing byproduct material for medical use. The proposed rule would also allow research involving human subjects using byproduct material and the medical use of radio-labeled biologics. It is expected that the final rulemaking will be completed early in fiscal year 1995.

A proposed rule (10 CFR 72.214) that would amend regulations regarding cask VSC–24, to permit storage of spent fuel with control components in the storage casks, is being developed. The holders of power reactor operating licenses can use approved spent fuel storage casks under a general license to store spent fuel at the reactor site.

A proposed rule (10 CFR Part 73) updating nuclear power reactor physical protection requirements is being developed. The proposed rule, which would update the requirements for the physical security of nuclear power reactors, will be published for comment in fiscal year 1995.

A proposed rule (10 CFR Part 70) on domestic licensing of special nuclear materials is being developed. The proposed rewrite of Part 70 would amend the Commission's regulations to provide performance-based, rather than prescriptive, regulations for special nuclear material licensees. The rewrite will also develop regulations that are framed according to risk and that clarify existing requirements. It will also provide that licensees with large quantities of special nuclear material would have safety programs based on integrated safety analyses.

A petition for rulemaking from Advanced Medical Systems, Inc. (PRM–32–3), denied on April 12, 1994 (59 FR 17286), requested that the Commission amend its regulations in response to petitioner's belief that the requirements in Part 32, which are applicable to original manufacturers and suppliers, were not equally applicable to manufacturers and suppliers of replacement parts. The petition was denied with a determination that the existing NRC regulations do apply equally to manufacturers and suppliers of both original and replacement parts, thereby ensuring the integrity of these parts.

Materials Radiation Protection and Health Effects

Irradiator Rulemaking. On February 9, 1993, the NRC published in the *Federal Register* (58 FR 7715) a final rule on "Licenses and Radiation Safety Requirements for Irradiators." The rule established a new Part 36 to specify radiation safety requirements and licensing requirements for the use of licensed radioactive materials in certain irradiators. Irradiators use gamma radiation to irradiate products, in order to change their characteristics in some way. The safety requirements apply to panoramic irradiators, those in which the material being irradiated is in air in a room that is accessible to personnel when the source is shielded, and underwater irradiators, in which the source always remains shielded under water and the product is irradiated under water. A "Guide for the Preparation of Applications for Licenses for Non-Self-Contained Irradiators" (Draft Regulatory Guide DG–0003) was published for comment in January 1994. The guide is related to the irradiator rulemaking and describes the information that an applicant should submit for a new license application or renewal license application.

Sewer Disposal. In February 1994, the staff published an advance notice of proposed rulemaking (ANPR) on disposal of radioactive material by release into sanitary sewer systems (59 FR 9146). Regulations in 10 CFR Part 20 currently permit disposal into a sanitary sewer of certain specific quantities of soluble material, with the additional constraint of meeting concentration values in Table 3 of Appendix B to the regulation. This rule will also respond to a petition for rulemaking (PRM-20-22) submitted by the Northeast Ohio Regional Sewer District. The ANPR requested comments on the appropriateness of current NRC regulations and solicited comments on a number of possible alternative approaches to the form and content of the regulations. Interest in this area continued with the publication of a report by the General Accounting Office, and the NRC staff is currently contracting with PNL for more information related to sewer chemistry to determine what types of regulatory changes might be appropriate.

Radiography. In February 1994 (59 FR 9429), the staff published a proposed rule related to 10 CFR Part 34, "Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations." This portion of NRC regulations covers the conduct of radiography operations using sealed sources and has not been the subject of any extensive revision for a number of years. The proposed rule would respond to a petition for rulemaking (PRM-34-04) submitted by the International Union of Operating Engineers, Local No. 2, and constitute a complete revision to this part of the Commission's regulations, including proposals for certification of radiographers and implementation of a "two-person rule" for work with radioactive sources. The proposals took into account recent regulatory approaches of a number of Agreement States and the Conference of Radiation Control Program Directors. Interest of the Agreement States has been significant, and the NRC staff plans to hold a workshop early in fiscal year 1995 with the States to discuss the issues and possible resolutions.

In related activities, "Large Area Self-Powered Gamma Ray Detector: Phase II Development of a Source Position Monitor for Use on Industrial Radiographic Units" (NUREG/CR-4833), was published. This work resulted from a Small Business Innovative Research contract and examined the feasibility of a source position monitor as an additional safeguard for the prevention of overexposures resulting from disconnected sources during radiographic operations.

Uranium Mill Tailings. In November 1993, the staff published a proposed rule (10 CFR Part 40, Appendix A) on uranium mill tailings to conform the NRC regulations to Environmental Protection Agency (EPA) regulations under the Clean Air Act and to support recision of certain EPA Clean Air Act requirements, as outlined under a memorandum of understanding and a settlement agreement between EPA, several States, and environmental organizations. The final rule was published in June 1994 (59 FR 28220), and EPA published its recision at the end of June.

Patient Release Criteria. In June 1994 (59 FR 30724), a proposed rule was published on criteria for the release of patients administered radioactive material. At the same time, "Release of Patients Administered Radioactive Materials" (Draft Regulatory Guide DG-8015), was published for comment. Criteria for release of patients is currently contained in 10 CFR 35.75 and is specified in terms of a quantity of material (30 mCi) in the patient. This rulemaking action addressed the requests of three petitions for rulemaking: PRM-20-20 from Dr. Carol S. Marcus and PRM-35-10/10a from the American College of Nuclear Medicine. The petitioners requested that the Commission adopt a dose limit of 5 mSv (0.5 rem) for individuals exposed to patients who have been administered radioactive material, rather than retain the activity limit in the present regulation. The Commission plans to analyze comments and consider final rulemaking action in fiscal year 1995.

Modification to Health Effects Models. "Health Effects Models for Nuclear Power Plant Accident Consequences Analysis" (Revision 2, Part I to NUREG/CR-4214), published in October 1993, contains an introduction, integration, and summary of health effects models and risk coefficients intended for use in severe accident analyses, probabilistic risk assessments, emergency response planning, and safety goal and cost/benefit analyses. Leading to modification of the models presented in NUREG/CR-4214 are the reports of the United States Scientific Committee on the Effects of Atomic Radiation (UNSCEAR, 1988), the National Academy of

Sciences/National Research Council BEIR V Committee (NAS/NRC, 1990), and other revised recommendations of ICRP-60 (ICRP 1991).

Embryo/Fetal Dose from Maternal Intake. A study to improve understanding of the contribution of maternal radionuclide burdens to prenatal radiation exposure was continued in fiscal year 1994 with significant progress. In October 1993, "Contribution of Maternal Radionuclide Burdens to Prenatal Radiation Doses: Relationships Between Annual Limits on Intake and Prenatal Doses" (NUREG/CR-5631, Revision 1, Addendum 1) was published. The report provides an expansion of the methodology presented earlier by examining the relationship between published Annual Limits on Intake in 10 CFR Part 20 and the dose to an embryo/fetus. Research that will permit inclusion of additional radionuclides—such as technetium, molybdenum, and other transuranic elements—began in fiscal year 1993 and continued in fiscal year 1994. The methods and data developed under this project have been used by the NRC in preparing "Radiation Dose to Embryo/Fetus" (Regulatory Guide 8.36), which describes acceptable methods of compliance with § 20.1208 of 10 CFR Part 20. The guide might be revised to incorporate the information presented in the addendum. The methods developed by these efforts are also useful in calculating doses in cases of accidental releases of radioactive materials.

In December 1993, the NRC placed a Letter Report from PNL, "Dose to the Embryo/Fetus from Selected Radiopharmaceuticals—Preliminary Recommendations" (PNL-8977), in the Public Document Room in support of ongoing rulemaking activities related to establishing limits for dose to the embryo/fetus as a result of medical treatments. This rulemaking effort will continue in fiscal year 1995.

Criticality and Fuel Cycle Safety. The final version of "Nuclear Criticality Safety Training" (Regulatory Guide 3.68) was published in April 1994. This Regulatory Guide was developed to provide guidance to licensees on an appropriate nuclear criticality safety training program for the use of special nuclear material, especially the prevention of criticality accidents.

The Los Alamos National Laboratory, funded by the NRC, continued its examination and revision of its "Nuclear Safety Guide" (TID-7016) for simplification of use, evaluation against new experimental data, and use of current computational codes. The document is a standard guide and reference used by industry and the Office of Nuclear Material Safety and Safeguards (NMSS) staff for initial criticality safety evaluations.

The Oak Ridge National Laboratory (ORNL), with funding from the NRC, continued its methods validation of the criticality analytical sequences in SCALE-4, using ENDF/B-V cross-section data. The validation effort will qualify the applicability of SCALE-4 to criticality safety problems covering the range of interests within the NMSS Fuel Cycle Safety Branch. The SCALE code system was developed at ORNL for criticality, shielding and thermal analysis of nuclear facility and package designs. The system is currently used at ORNL in support of several tasks funded by NMSS. In particular, SCALE-4 is used by ORNL and NRC staff for criticality safety analyses relevant to licensing issues. Valid criticality safety analyses require validation of both the methods applied and the user who applies them. The goal of the project is to validate the Criticality Safety Analyses Sequences within the SCALE-4 system by analyzing a large number of benchmark critical experiments whose parameters (enrichment, geometry, fissile fuel/moderator ratio, etc.) cover the range of interests within the NMSS Fuel Cycle Safety Branch. The work will be documented in a report that will include a description of the critical experiments modeled, calculational results, quantification of trends in calculated k-effectives for different types of experiments, and recommended calculational uncertainties to be applied.

Uranium Enrichment

In February 1994, the staff published a proposed rule (10 CFR Part 76) on certification of gaseous diffusion plants (59 FR 6792) to solicit comment on the standards that will be used by the NRC for certification of the operations of the gaseous diffusion enrichment facilities leased by the U.S. Enrichment Corporation from the Department of

Energy. The rule covered both the certification process and the standards to be used to judge acceptable performance for certification. Under the enabling legislation, the final rule was to be completed by the end of October 1994. The final rule, which addresses 10 CFR Parts 19, 20, 21, 26, 51, 70, 71, 73, 74, 76, and 95, was published on September 23, 1994 (59 FR 48944).

Low-Level Waste Disposal

NRC research in support of regulatory activities for low-level waste (LLW) disposal facilities is focused on making more realistic assessments of the overall performance of disposal systems. The results of NRC LLW research are also useful to the States regulating LLW disposal and are made available to the States through NRC-sponsored workshops, participation by NRC contractors in forums sponsored by other agencies, as well as the conventional method of publication in journals.

Materials and Engineering

Engineered Enhancements and Alternatives to Shallow Land Burial. Many States and State compacts are considering engineered enhancements and alternatives to shallow land burial, for the disposal of low-level radioactive waste (LLW). Several concepts have been proposed—particularly the use of concrete engineered barriers to contain LLW. NRC research conducted at the National Institute of Standards and Technology (NIST) has investigated the durability of such barriers, while the Idaho National Engineering Laboratory (INEL) completed their evaluation of concrete barriers in limiting radionuclide transport (NUREG/CR-6070). Three reports of the NIST work are being prepared as NUREG documents that address (1) a new method to determine chloride diffusion coefficients in concrete, (2) the evaluation of stress-induced micro-cracks on solute transport through concrete, and (3) the evaluation of the effects of stresses caused by sulfate attack in concrete. NIST also has completed a computer program for modeling the degradation of concrete for LLW performance assessment applications. The model incorporates synergistic degradation mechanisms, the effects of cracks and joints, and the precipitation of concrete dissolution products to predict concrete hydraulic properties.

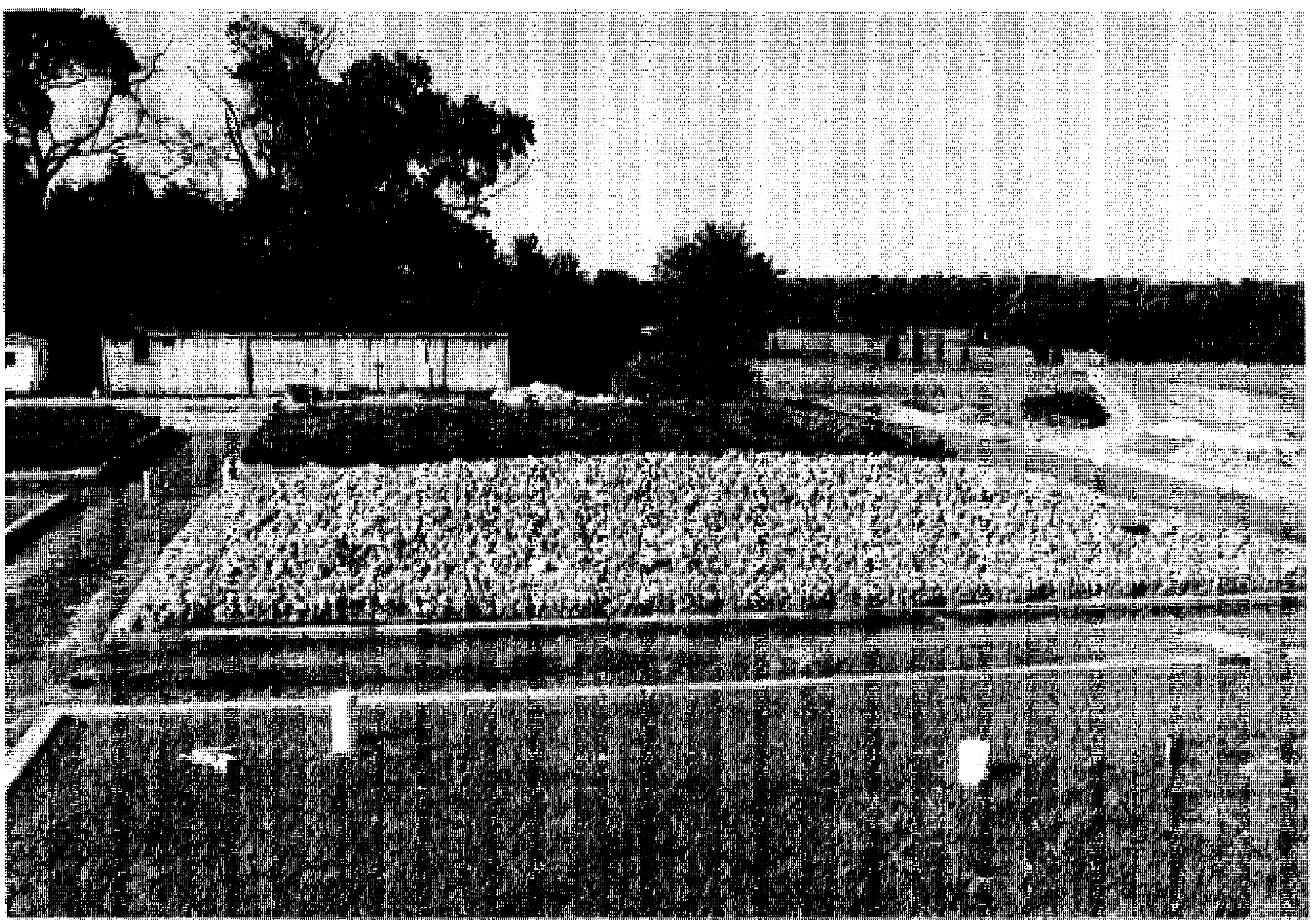
LLW Waste Forms. Research conducted at INEL on the stability of nuclear reactor decontamination waste is complete. The studies were aimed at determining radionuclide and chelating agent releases, as well as the compressive strength of the cement solidified waste. Results have been published as NUREG/CR reports; test results are also being summarized in papers to be published in scientific literature. Field lysimeter studies involving radioactive ion-exchange resins solidified in cement and vinyl ester-styrene are being carried out at the Oak Ridge and Argonne National Laboratories to determine radionuclide release rates under various environmental conditions. Studies are nearing completion at INEL to investigate biodegradation of LLW by micro-organisms, in order to ensure that the stability requirements of 10 CFR Part 61 can be met. Studies at Pacific Northwest Laboratory (PNL) to determine appropriate scaling factors in assessing hard-to-measure radionuclides in LLW are continuing. Also continuing at PNL are studies to determine the effect of naturally occurring radionuclide-chelating complexes in soils on radionuclide transport.

Infiltration of Water. The University of California at Berkeley, in cooperation with the University of Maryland, is continuing to field test—at the Maryland Agricultural Experiment Station in Beltsville, Md.—a variety of covers for use in LLW disposal These covers would not only be applicable to any LLW disposal method that includes an earthen cover, but also to LLW, SDMP (Site Decommissioning Management Plan), UMTRA (Uranium Mill Tailings Remedial Action), and hazardous waste sites. Two designs are proving to be particularly effective. One of these, called bioengineering water management, not only reduced water infiltration to a negligible amount, but also dewatered the cells to which it was applied. Hence this cover lends itself to use as a remedial action cover for sites susceptible to subsidence. The New York State Energy Research and Development Administration finished construction in 1993 of a bioengineering water management cover over such a trench, at the West Valley (N.Y.) LLW disposal facility. 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.

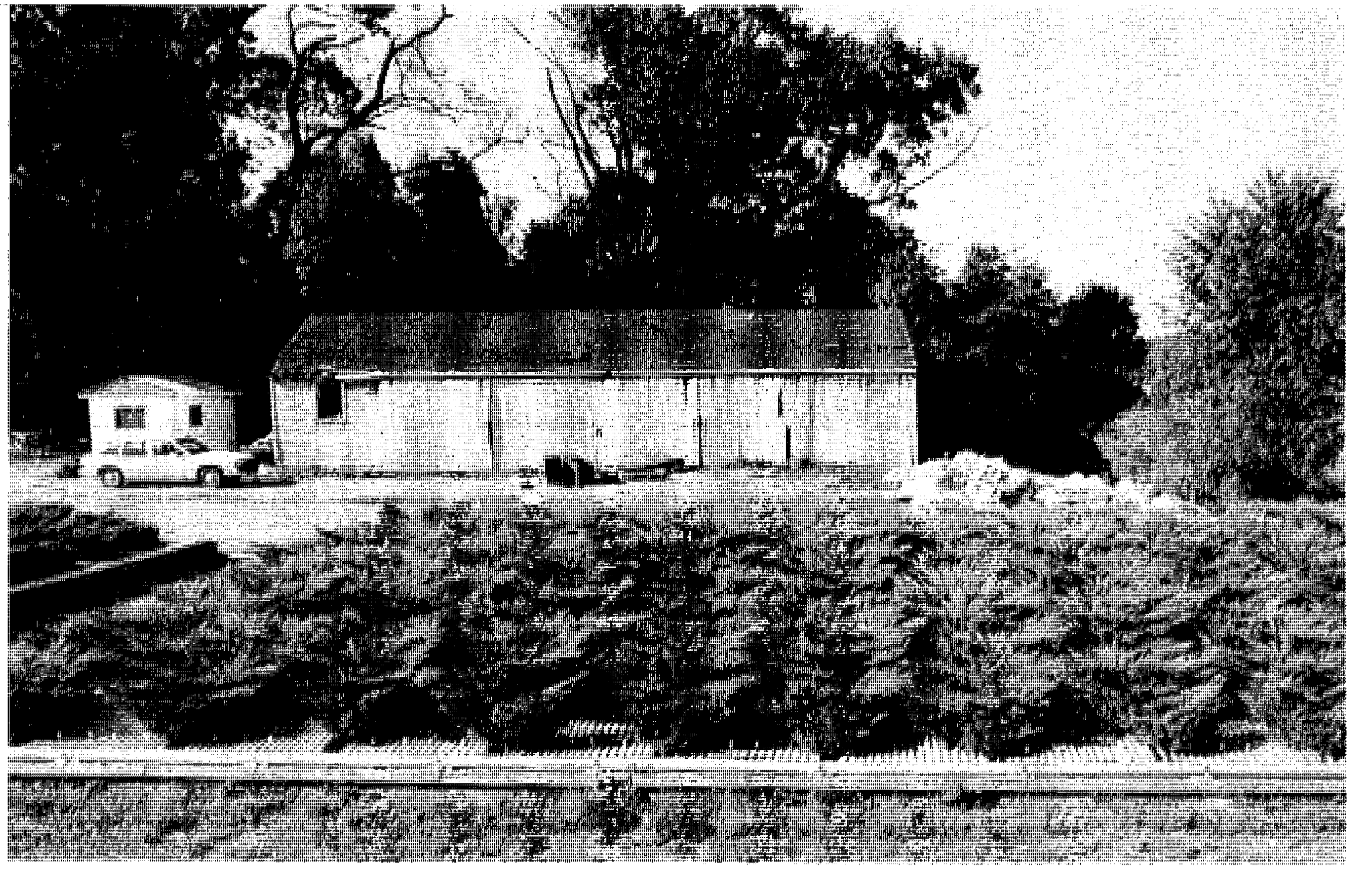
PNL has developed an infiltration-evaluation methodology (NUREG/CR-5523) and has separately modeled infiltration and moisture redistribution using a field experiment data set (NUREG/CR-5998). Various infiltration-estimation approaches have also been examined by PNL (NUREG/CR-6114). Future work will focus on applying the infiltration-evaluation methodology to an arid site, using data derived from related cooperative research conducted with the U.S. Geological Survey.

Hydrology and Geochemistry

Radionuclide Migration in Soil. To reduce uncertainty as to the degree of retardation to be expected in various soil types under various conditions, and to obtain more accurate assessments of the expectable performance of an LLW disposal facility, the NRC is developing more realistic retardation models, based on filed observations and laboratory experiments. Observations made by PNL at the Hanford, Wash., site (NUREG/CR 3712 and 4030) and at Chalk River Nuclear Laboratory in Canada (NUREG/CR 4879, Vols. 1 and 2) found radionuclide transport through soils at rates occurring faster than predicted by current transport models. This includes radionuclides (e.g., Fe-55, Co-60, Ni-63, Pu, and Am) generally considered unlikely candidates for mobilization, based on their presently understood geochemical behavior. Preliminary evidence suggests that



View of lysimeter experiments on cover performance, Beltsville, Maryland.



View of lysimeter experiments on cover performance, Beltsville, Maryland. The cover shown, which is called "bioengineering water management," is highly effective at sites susceptible to subsidence or which are underlain by low permeability media. In this lysimeter, the ground surface is covered by impermeable panels to limit infiltration. This system reduced infiltrating water to zero, lowered the water level in the lysimeter from 2 meters to zero, and dried out the soil in the lysimeter.

Soil beam used to measure unsaturated flow properties of soil used in covers for radioactive waste disposal sites.

naturally produced organic complexes and micro-particulates played a significant role in facilitating migration.

Hydrology and Contaminant Transport. PNL has evaluated and developed a data set from an earlier field study involving subsurface injection of radioactive tracers in heterogeneous unsaturated porous media at the Hanford site. The data sets, reported in NUREG/CR-5996, cover a period of 10 years and will allow confirmatory analyses of existing flow and transport models that may be useful in LLW performance assessment. Work has been completed by the Massachusetts Institute of Technology and Princeton University on the application of stochastic methods for simulating flow and transport in heterogeneous soils.

Compliance, Assessment, and Modeling

Performance Assessment. Research is continuing to develop a realistic and computationally tractable performance assessment methodology. The current capabilities and limitations of performance assessment models have been evaluated by the Sandia National Laboratories, with results published in NUREG/CR-5927, Volume 1, dealing with modeling approaches, and Volume 2, dealing with validation needs.

LLW Source Term Modeling. During fiscal year 1994, extensions were made to the existing LLW source term code—BLT (breach, leach and transport)—developed by the Brookhaven National Laboratory, in order to incorporate additional geochemistry and gaseous releases. The code is being tested and documented.

Low-Level Waste Regulatory Standards

A proposed rule to amend 10 CFR Parts 20 and 61 to revise low-level waste shipment manifest information and reporting was published for comment in April 1992. The rule is intended to improve the quality and uniformity of information regarding actual quantities and characteristics of LLW disposed at LLW disposal facilities, through the use of standardized NRC forms, when the waste is shipped. In turn, the more accurate and complete information on what is actually received at a disposal facility will facilitate more realistic assessments of expected disposal facility performance. It is expected that the final rule will be published in the first quarter of calendar year 1995.

Environmental Policy and Decommissioning

Decommissioning Cost Reassessment. In October 1993, "Revised Analysis of Decommissioning for the Reference Pressurized Water Reactor Power Station" (NUREG/CR-5884, Volumes 1 and 2) was published for public comment. This is the first of two documents deriving from an ongoing reassessment of decommissioning costs for commercial nuclear power reactors, using experience gained in the last 20 years and information available on costs of transport and disposal of waste materials. The draft report indicates that the waste disposal component could be significant, depending on the waste site assumed. In support of the revised analyses, the staff published "Estimating Pressurized Water Reactor Decommissioning Costs" (NUREG/CR-6054), in October 1993. The report contains the computer program developed by PNL for doing cost assessments. Similar work is under way for BWR facilities, and the reports will be published early in fiscal year 1995.

Radiological Criteria for Decommissioning. The NRC continued in fiscal year 1994 with its enhanced participatory rulemaking approach for establishing radiological criteria for decommissioning. In January 1994, "Summary of Comments Received from Workshops on Radiological Criteria for Decommissioning" (NUREG/CR-6156) was published to provide the comments received during the seven workshops held across the country on the issues and possible approaches to the rulemaking. In February 1994, the NRC staff published a draft of the rulemaking and support statement for public comment. Numerous comments were received on the draft, used in the preparation of a formal proposed rulemaking package for Commission consideration. The proposed rule was published for public comment on August 22, 1994 (59 FR 43200). The comment period expired in late December 1994.

In support of the proposed rule a number of additional documents have been published, including "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for Decommissioning of NRC-Licensed Nuclear Facilities" (NUREG–1496); "Working Draft Regulatory Guide on Release Criteria for Decommissioning: NRC Staff's Draft for Comment" (NUREG–1500); and "Background as a Residual Radioactivity Criterion for Decommissioning" (NUREG–1501).

Decommissioning Funding. In June 1994, the Commission published a proposed rule (10 CFR Parts 30, 40, 70, and 72) on clarification of decommissioning funding requirements (59 FR 32158). The proposed rule was intended to clarify when decommissioning funding assurance was required and to provide that assurance would be available after operations were terminated and decommissioning initiated. The staff will analyze comments and prepare a final rulemaking package during fiscal year 1995.

Timeliness. In July 1994, the final rule (10 CFR Parts 2, 30, 40, 70, and 72) on timeliness in decommissioning of materials facilities was published (59 FR 36026). The rule amended the Commission's regulations to establish timeliness criteria for decommissioning nuclear sites or separate buildings or areas following permanent cessation of licensed activities. The principal effect of these amendments is to formalize and codify the NRC's requirements for timeliness in decommissioning of materials facilities.

Safety Issues Related to Permanently Shutdown Reactors. Brookhaven National Laboratory continued its determination of technical and safety criteria that should remain as part of decommissioning regulations, under 10 CFR Part 50, when a licensee initiates action to permanently shut down a nuclear reactor in preparation for decommissioning. A financial assurance analysis for off-site liability requirements for shutdown reactors is part of this project. It will examine the environmental impact of the potential increase in the spent fuel transport and radiological exposure to the public in the event the licensees prefer to ship and store their spent fuel.

Assessing the Safety of High-Level Waste Disposal

High-Level Waste Research

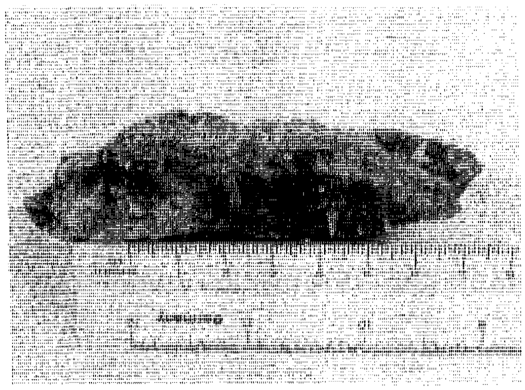
The Nuclear Waste Policy Act of 1982 requires that the Department of Energy (DOE) dispose of high-level radioactive waste (HLW), which can be spent reactor fuel or the byproduct of reprocessing spent fuel, in a deep geologic repository. The act further requires DOE to apply for a license from the NRC to dispose of the HLW.

The NRC maintains an active HLW research program of theoretical study and laboratory and field experiments directed at understanding the physical processes that control and determine repository performance in the unsaturated volcanic tuff at the Yucca Mountain (Nev.) site, currently under consideration by the DOE, as directed by the Congress in December 1987. The 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 Environmental Protection Agency's HLW standard, incorporated by reference into Part 60. The program is divided into three parts: (1) engineered systems research, which examines issues related to controlled release of radionuclides, containment of waste, and the engineering-geology interface in the repository; (2) geologic systems research, which examines issues related to the hydrology, geochemistry, and geology of the repository site; and (3) performance assessment research, which integrates mathematical models from the other research 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, Tex. However, a significant portion of NRC HLW research on hydrology is being carried out at the University of Arizona.

Engineered Systems Research

Controlled Release. Among criteria set forth in 10 CFR Part 60 is a declared maximum rate of release of radioactive material from the repository's engineered barrier system. Research on controlled release is being done by CNWRA at a natural analogue site at Pea Blanca, Mexico, located in an unsaturated tuff environment similar to that of 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.



This sample of high-grade uranium ore from the Nopal I deposit, Pena Blanca District, Chihuahua, Mexico, has been studied as a natural analog of corrosion of spent nuclear fuel. The black areas are uraninite, which has altered to yellow uranyl oxyhydroxides. This alteration is similar to the alteration that may occur upon exposure of spent nuclear fuel to the ambient geochemical environment anticipated at the proposed high-level nuclear waste repository at Yucca Mountain, Nevada.

Shown is Level +10 of the Nopal I uranium deposit in the Pena Blanca District, Chihuahua, Mexico. This deposit is being studied as a natural analog of spent nuclear fuel.

Containment. Also contained in 10 CFR Part 60 is a criterion for the minimum lifetime of HLW containment within waste packages to be placed in the repository. CNWRA is conducting confirmatory research on the behavior of waste package materials in the expected repository environment. During fiscal year 1994, research was done on stress-corrosion cracking, "repassivation" potentials for long term corrosion of stainless steel, corrosion of copper-based waste package container materials, effects of surface conditions on the corrosion of waste package container materials, and crevice corrosion of stainless steel. Work also was initiated on microbial corrosion of waste package container materials.

Engineering-Geology Interface. A requirement of 10 CFR Part 60 is that the repository's engineered and geologic systems function together, so as not to compromise repository safety. CNWRA has been conducting two projects on 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 in fiscal year 1994 produced a simplified thermosyphon model of the redistribution process and examined pressure-driven heat flows in unsaturated media. In the other project, on rock-mechanical aspects of repository performance, CNWRA researchers finished a study of the effect of mine seismicity on ground-water hydrology; finished research on rock-joint characteristics; issued an evaluation of the rock mechanics simulator, UDEC; and supported the NRC's continued participation in DECOVALEX—an international cooperative effort to test the validity of mathematical models of thermal-hydrological-mechanical interactions. The NRC also provided financial support to the Swedish Nuclear Power Inspectorate for administration of DECOVALEX.

Geologic Systems Research

Hydrology. Because transport by ground water 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 an experimental site with partially saturated fractured rock similar to that at the Yucca Mountain site—the Apache Leap Tuff site operated by the University of Arizona—research continued in fiscal year 1994 on testing hydrologic site characterization methods and on scale effects in fluid flow and radionuclide transport in unsaturated media. Results from theoretical work conducted at both the CNWRA and the University of Arizona suggested that scaling of certain aspects of permeability measurements may be universal, and not site-specific, as previously believed. In fiscal year 1994, the CNWRA also completed a project involving stochastic analysis of large-scale flow and transport in unsaturated fractured rock masses. The project generated an efficient method for estimating effective permeabilities measured in unsaturated fractured media and developed a methodology for probabilistic estimation of ground-water travel time. CNWRA is continuing to study hydrology on a regional scale, as well as a local scale.

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 fiscal year 1994, CNWRA finished a project on geochemical effects on mass transport in unsaturated media. In its final phases, the project examined the thermodynamics of ion exchange in the zeolite mineral called clinoptilolite, common in tuffs like Yucca Mountain's. This mineral is expected to play a key role in controlling radionuclide transport in the Yucca Mountain repository.

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 developed to make transport calculations tractable tend to oversimplify the chemistry to the point that even so-called bounding calculations may not be truly bounding. For this reason, the NRC asked the CNWRA to determine whether some model could be developed that is sufficiently realistic to retain the credibility of the results and yet be calculationally tractable. The CNWRA subsequently developed and tested in the laboratory a "double-layer surface complexation" model that meets both objectives.

In a workshop organized and conducted by CNWRA researchers, ways in which natural and archaeological analogues can be used to build confidence in the conceptual and mathematical models used in HLW performance assessment were addressed.

Geology. CNWRA has two geologic projects, one investigating techniques to estimate the likelihood of occurrence of volcanos in the Yucca Mountain area that would be alternatives to the method currently used by the DOE, and the other exploring possible consequences to HLW disposal of the existence of a volcano at Yucca Mountain. During fiscal year 1994, CNWRA found that alternative methods may suggest a higher likelihood of a volcano at Yucca Mountain than the method currently used by DOE. The application of seismic tomographic methods to provide insights as to the possible consequences of basaltic volcanism—the type that most likely would be found at Yucca Mountain—also was examined.

Performance Assessment

The NRC will assess DOE's demonstration of compliance with both the NRC's requirements for HLW disposal given in 10 CFR Part 60 and EPA's HLW standard. Use of a performance assessment methodology independent of DOE's performance assessment methodology is a key element in the NRC's strategy to review that demonstration of compliance. To support implementation of that strategy, RES 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 also will assist in setting priorities for future HLW research.

In fiscal year 1994, the CNWRA reviewed the methodology used in IPA's latest exercises, developed a mathematical model of infiltration that was applied in IPA, examined film flow in fractures, performed laboratory permeability tests on tuff samples from the Pea Blanca analogue, provided training on the flow and transport simulator called PORFLOW, and examined ways to increase the efficiency of performance assessment calculations with improved numerical algorithms and massively parallel computation.

Proceedings and Litigation

Chapter 10

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 NRC adjudicatory and rulemaking dockets for the Commission. The adjudicatory dockets contain the filings of all parties to the Commission's licensing and enforcement proceedings; transcripts of the adjudicatory hearings held in each case; and all Orders and Decisions issued by the Commission, or the Commission's Atomic Safety and Licensing Boards. The Secretary also serves Orders of the Commission and the Atomic Safety and Licensing Boards on parties to proceedings and certifies indexes of the dockets to the courts. The rulemaking dockets contain the comments of members of the public on newly proposed agency rules and rule amendments, as well as comments on specific petitions for rulemaking and NRC/State Agreements on which the NRC seeks views before taking final action.

Atomic Safety and Licensing Boards

Adjudicatory hearings at the Nuclear Regulatory Commission are conducted by administrative judges drawn from the Atomic Safety and Licensing Board Panel. The agency's regulations provide for a wide variety of hearings, so that members of the public have an opportunity to voice their concerns regarding the licensing of nuclear facilities and radioactive materials, and licensees and individuals may contest penalties brought against them by the NRC staff. Hearings by panel judges include *reactor licensing hearings*, which, as provided by the Atomic Energy Act of 1954, as amended by the Energy Reorganization Act of 1974 and the Energy Policy Act of 1992, are required to be held on all applications for a combined construction permit and operating license for a nuclear facility that produces electric power; *license amendment hearings*, which allow affected parties to challenge proposed license amendments for nuclear reactors; *materials licensing hearings*, which allow affected persons to contest NRC licensing actions involving the commercial use of nuclear materials; *enforcement hearings*, which allow individuals, employees, licensees, contractors, subcontractors and vendors to contest penalties assessed against them by the NRC staff for alleged infractions of NRC regulations; *antitrust hearings*, which allow affected parties to challenge the licensing of nuclear reactors if the operation of such reactors would create or maintain a situation inconsistent with the antitrust laws; *special hearings*, which can be ordered by the Commission for any nuclear-related matter; *personnel related hearings*, in which NRC employees are allowed to bring grievance cases and Equal Employment Opportunity cases before panel judges; and *Program Fraud Civil Remedies hearings* before an Administrative Law Judge on the Panel, which permit the NRC to seek assessments and civil penalties against persons submitting false claims to the agency and allow NRC employees and other individuals to contest NRC action against them for alleged fraudulent claims made to the NRC.

The panel's judges are lawyers or technical members with expertise in a wide variety of disciplines. Their appointment to the panel is based upon recognized experience, achievement and independence in the appointee's field of expertise. During fiscal year 1994, the panel was comprised of 39 administrative judges (15 full-time and 24 part-time). By profession, they included 11 lawyers, 10 public health and environmental scientists, 15 engineers or physicists, and three medical doctors. (See

Appendix 2 for a listing of the names and the disciplines of fiscal year 1994 panel members.)

The panel's Licensing Boards consist of three administrative judges, usually one legal member and two technical members. The Chief Administrative Judge assigns individual judges to particular hearings where their professional expertise will assist in resolving the particular technical and legal matters at issue in the proceeding. Some contested matters may be heard by a single administrative judge or administrative law judge from the Panel. The panel's policy in one-judge proceedings is to assign a legal or technical administrative judge from the panel as an assistant to the presiding administrative judge, thereby insuring the requisite level of technical expertise associated with the traditional three-member Licensing Boards.

A total of 659 cases have been filed since the first Licensing Board case began on November 9, 1967. Hearings at the NRC may be either formal or informal. The formal proceedings consist of the traditional procedures used in non-jury Federal Court cases including pre-trial discovery between the parties and formal trial procedures at the hearing. Formal procedures traditionally have been used at the NRC in cases involving the licensing of reactors and for enforcement proceedings brought by the agency against individuals and licensees. Informal hearing procedures are authorized in matters affecting one of the agency's more than 7,000 materials licensees. While the deliberative process for judges remains the same under either type of hearing, informal hearings involve significantly different procedures for developing the record upon which decisions must be based. The principal differences include the use of a single administrative judge, written submittal by the parties instead of a hearing on the record, and, if the presiding officer determines it to be necessary after considering the written submittal, oral presentation by the parties subject to questioning by the presiding officer.

Licensing Boards frequently structure their hearing schedules into distinct phases, each dealing with discrete groupings of related issues. In complex proceedings involving several topics with multiple issues, the panel sometimes creates separate Licensing Boards and assigns 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.

The panel continues its ongoing efforts to automate the hearing process. In past years, important innovations have included the installation of computerized work-stations for the judges and key panel personnel. To assist in decision writing, judges can now access full-text documents from their computers using in-house customized data base management systems while simultaneously doing legal research on the computer by utilizing external systems such as LEXIS and WESTLAW. In addition, judges and professional support staff can draft, share, and comment on proposed decisions from their desks; access and quickly search either the panel's electronic docket or the Commission's document-retrieval system; and communicate with each other through the panel's Local Area Network, or communicate with other employees of the NRC through the Commission's electronic mail system. In certain complex cases, the full text of significant documents such as pre-filed testimony and hearing transcripts are electronically indexed and added to the judges computerized data base. The panel has also recently installed a personal computer-based software system, using Personal Librarian Software, which has permitted the full-text inclusion of hearing documents into the panels' electronic data base. The panel is currently working to establish an electronic data interchange standard to make electronic filing of adjudicatory documents possible. The panel also is working with other Commission offices to improve other aspects of adjudicatory document filing at the NRC.

Panel Caseload

During fiscal year 1994, the panel's caseload comprised a total of 36 proceedings. Seven of these involved nuclear power plants or related facilities, 28 involved other Commission licensees, and one involved an NRC employee in a Program Fraud Civil Remedy Act proceeding. Twelve cases were closed and 17 new cases were docketed.

The panel's 1994 caseload followed the trend, begun in the late 1980's, toward cases primarily concerned with NRC enforcement actions, materials licensing actions, and actions pertaining to the regulation of nuclear reactors that have been licensed and operating. This caseload differed significantly from the three previous decades which were dominated by construction permit and operating license proceedings for licensing new reactors.

Significant ASLBP Decisions

Some of the panel's more significant decisions issued during fiscal year 1994 are discussed below.

Jurisdiction

Jurisdiction Of Licensing Boards. A number of important jurisdictional rulings were made in a license amendment proceeding for the River Bend (La.) nuclear facility where a board accepted a contention that a lack of funding could cause unsafe operation of a nuclear power plant. In *Gulf States Utilities Company* (River Bend Unit 1 (La.), LBP-94-3, 39 NRC 31 (1994), an electric utility cooperative, which was a co-owner of the facility, challenged a proposed merger that would replace the principal owner and operator of the facility, Gulf States Utilities, with a utility holding company and an independent operating company owned by the holding company. The co-op claimed the changes would adversely affect its ownership rights in River Bend and impair existing interconnection agreements that it had with Gulf States. The co-op also contended that the NRC should enforce certain River Bend license conditions which it claimed were being violated. The board found that most of the co-op's claims involved contractual disputes between the co-op and Gulf States that did not come under NRC jurisdiction because they were not related to the facility's safe operation or environmental concerns. According to the board, contractual disputes should be resolved by the appropriate State, local or Federal courts. The board also determined that the subject interconnection agreements pertained to interconnection and transmission provisions, rates for electric power and services, cost sharing agreements, long and short term planning functions, and similar utility-related operational agreements, and were matters that fall within the jurisdiction of FERC or appropriate State agencies that regulate electric utilities. The board also ruled that existing NRC license conditions could not be enforced in the present license amendment proceeding because Licensing Boards have no jurisdiction to enforce license conditions unless they are the subject of an enforcement action initiated pursuant to 10 CFR § 202a.

NRC Jurisdiction Over Owners Of Licensees. In a motion for summary disposition, the parent corporation of a uranium reprocessing company sought to be removed from an NRC order making it jointly and severally liable for providing financial assurance for decommissioning its subsidiary's nuclear processing facility near Gore, Oklahoma. In *Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site Decontamination and Decommissioning Funding, LBP-94-17, June 8, 1994 Slip Opinion), the parent corporation asserted that Section 161 of the Atomic Energy Act does not apply to nonlicensed entities such as itself. The board found that a principal issue in the proceeding was whether the NRC could regulate a parent corporation, as a *de facto* licensee, who exercised enough control over the activities of a licensee subsidiary to permit disregarding the corporate form separating the parent from the subsidiary. In denying summary disposition, the board found that, while the parent had been involved in some of the subsidiary's activities, the degree of such involvement could not be determined without further development in the proceeding.

Program Fraud Civil Remedies Act Violation

In the panel's first case involving 10 CFR Part 13, the NRC's implementation of the Program Fraud Civil Remedies Act, the NRC had charged a former NRC employee with 23 false claims for obtaining monies from the government to which he was not entitled (*In the Matter of Lloyd P. Zerr,* ALJ-94-1, 39 NRC 131 (1994); ALJ-94-2, May 4, 1994 Slip Opinion). Although the amount so obtained by the ex-employee was $8,855.68, the NRC sought penalties and assessments totaling $132,771.50, $28,514 of which was for expenses the government used to investigate the alleged fraud. The 23 false claims included reimbursement requests for overtime work, house rental, furniture rental, car rental and meals during the ex-employee's rotational assignment in an NRC Regional Office. The ex-employee claimed that he had not knowingly overcharged the government, blaming the over-charges on mistakes, a lack of knowledge of travel regulations, and sloppy record keeping. In rejecting this defense, the Administrative Law Judge (ALJ) found that the ex-employee had resorted to fraudulent documentation for some claims and that he either had or should have had actual knowledge that 22 of the 23 claims were false. As recompense, the ALJ found that the ex-employee should pay a total of $21,711, an amount which included a double assessment for the $8,855.68 in false claims paid by the government. The ALJ excluded additional penalties requested by the NRC staff on the basis that the ex-employee had already been subject to criminal prosecution, had lost his position with the NRC, and had reimbursed the government for the false claims he had collected. The ALJ thus reasoned that the ex-employee had already paid significantly, and that a price had been established for fraudulent conduct which should act as a deterrent for others.

Adding New Bases for Contentions

In *Georgia Power Company* (Vogtle Units 1 and 2 (Ga.), LBP-94-22, 40 NRC 37 (1994); LBP-94-27, 40 NRC 103 (1994)), a Licensing Board resolved a significant procedural matter regarding contentions filed by intervenors in NRC proceedings. The question presented was whether the board should apply the requirements for filing new contentions in 10 CFR § 2.714(a)(1) when an intervenor attempts to add a new basis to an existing contention. The board decided that the § 2.714(a)(1) requirements do not apply because intervenors are not required to supply all the bases known at the time they file their contentions. The board went on to conclude that the test for accepting new bases should be whether the motion for accepting the basis was timely and whether the new bases present important information regarding a significant issue.

Decommissioning

In a case involving potentially far-reaching decommissioning issues for nuclear facilities, a fuel processing company sought to withdraw a pending license renewal application and terminate the proceeding. In *Sequoyah Fuels Corporation* (LBP-93-25, 38 NRC 304 (1993)), intervenors opposed the withdrawal based on their fear that the facility could be decommissioned without their having an opportunity to contest the licensee's decommissioning plan. Although the presiding officer acknowledged that he could condition the withdrawal, he declined to interfere with the decommissioning process because the withdrawal was not prevented by Commission regulations. He also reasoned that preventing the withdrawal might minimize the NRC staff's regulatory role in overseeing decommissioning activities and delay the decontamination of critical areas.

Enforcement Actions

Agency Discretion To Prescribe Licensee Conduct Not Required By Agency Regulation. In a license suspension proceeding, a Pennsylvania medical clinic claimed that the enforcement action taken against it lacked legal basis because no specific NRC requirements were violated (*Oncology Services Corporation*, LBP-94-2, 39 NRC 1 (1994)). The NRC enforcement order had charged the clinic with "significant corporate management breakdown." The order had cited various incidents of alleged mismanagement in support of this charge, but, the licensee asserted, none of these violated NRC statutory provisions, regulations, license conditions, technical specifications, or orders. In upholding the order, the board concluded that Federal agencies like the NRC, vested with broad congressional regulatory mandates, have the discretion to take enforcement actions against unacceptable conduct even though the specific actions are not covered by agency rules or regulations. The board reasoned that agencies should be allowed to set standards by individual order because they cannot possibly anticipate and promulgate a rule regarding each activity that they undertake. The board further noted that, although the discretion to regulate by individual order might not apply when an order could create a new enforcement standard that a licensee had no reason to rely on, this exception was not present in this case because there was no showing that the staff's concern about "management breakdown" would be inconsistent with administrative precedent.

Relevancy Of Post-Violation Activities. In the same license suspension proceeding, the medical clinic sought to present evidence showing that suspension should be lifted because it had corrected the alleged improper activity after the order was issued. The board held that post-suspension activities were not relevant because the scope of the proceeding was limited to the sufficiency of the legal and factual predicates outlined in the suspension order. The board further held that the extent to which post suspension activities warrant action to modify or withdraw a suspension order is a matter within the discretion of the NRC staff and is not subject to consideration by a board.

Requirements for Intervention in NRC Proceedings

Several important 1994 decisions concerned whether parties could intervene in NRC proceedings. A petitioner seeking intervention must demonstrate that it has "standing" to intervene by establishing that there is potential for injury to itself related to its interest in the proceeding and that its interests are within the zone of interests protected by the NRC's governing statutes.

Standing Based On Injury To Property Interests. An especially important standing issue was decided in a proceeding involving the transfer of ownership and installation of a new operator for the River Bend (La.) nuclear reactor (*Gulf States Utilities Company* (River Bend Unit 1 (La.)), LBP-94-3, 39 NRC 31 (1994). There the Licensing Board granted standing on the grounds that the property interest of the petitioner, who was a co-owner of the facility, might be jeopardized by potentially unsafe operation of the facility caused by under-funding. The board acknowledged that, in past NRC cases, standing had traditionally been denied when based on property interests. However, it distinguished those cases from the instant case, because those property interests were primarily based upon economic interests of ratepayers and taxpayers, or on general concerns about a facility's impact on local utility rates and the local economy, and were thus too far removed from the purpose of the underlying statutes governing those proceedings. The board concluded that the property interests in this case were protected by the Atomic Energy Act since the petitioner's stated interest was to protect its property, the nuclear facility, from radiological hazards arising from the facility's unsafe operations.

Establishing Particularized Injury To A Petitioner. In *Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site, LBP-94-5, 39 NRC 54 (1994)), a petitioner sought to establish injury sufficient to confer standing to intervene by alleging that ground water flow from a nuclear site might migrate onto his property. To counter this assertion, the licensee of the facility furnished affidavits from technical personnel contending that such migration was not possible. In granting intervention, the Licensing Board concluded that the test for determining injury was whether there was a "potential for consequences" to a petitioner. The board found such a potential here, since groundwater conceivably could move in the general direction of the petitioner's property. The board cautioned that it must avoid the familiar trap of confusing the standing determination with any assessment of the petitioner's case on its merits.

Third Party Standing To Intervene In Enforcement Proceedings. A novel standing question was addressed by a Licensing Board when a Native American Tribe attempted to intervene in an NRC enforcement proceeding to support an NRC staff enforcement order. Third parties rarely attempt to intervene in enforcement actions against NRC licensees. The licensee claimed that a third party lacks standing in this type of proceeding. In allowing intervention, the board reasoned that the Tribe's interests could potentially be adversely affected if the order was not sustained, or if it was modified or withdrawn by some unilateral staff action or by a settlement between the staff and the parties (*Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site Decontamination Funding), LBP-94-5, 39 NRC 54 (1994)).

Discovery in NRC Proceedings

Three significant discovery rulings were made during the discovery phase of an enforcement proceeding involving the Vogtle reactor. The first involved the deliberative process privilege. The deliberative process privilege allows documents pertaining to government decision-making to be withheld from public disclosure, so that government officials will not temper their candor with a concern for appearances during the decisionmaking process. The privilege can be invoked in NRC proceedings, but it is qualified and it can be overcome by an appropriate showing of need. During the *Vogtle* proceeding, the staff wanted to delay producing an Office of Investigations report while it decided whether to institute an enforcement action. Weighing the needs of the parties, the board decided that the entire report did not have to be produced immediately, but that the factual information did have to be produced because of its importance to the outcome of the proceeding. With respect to the opinion portions of the report, the board limited the staff's request for additional time to one month, but it also tempered this early release by allowing these portions to be subject to a protective order requiring the parties to hold the information in confidence (*Georgia Power Company* (Vogtle Units 1 and 2 (Ga.)), LBP–94–6, 39 NRC 105 (1994)).

The second significant discovery ruling in this case pertained to discovery against the NRC staff. The board held that the staff stands on the same footing as any party with respect to answering requests for admissions, because neither 10 CFR § 2.742 nor any other section of the regulations specifically provide for different treatment of the staff. The board also ruled that the staff was not required to answer interrogatories, provided they were not necessary to the determination of the case and were not reasonably attainable from other sources (*Georgia Power Company* (Vogtle Units 1 and 2 (Ga.)), LBP–94–26, 40 NRC 93 (1994)).

The third ruling pertained to discovery of NRC investigative reports. The NRC staff requested that it be allowed to delay producing requested discovery for 128 days, while the NRC Office of Investigations completed an investigation (*Georgia Power Company* (Vogtle Units 1 and 2), LBP–93–22, 38 NRC 189 (1993)). The investigation had been ongoing for about three years, and the Licensing Board had earlier deferred document production for 75 days because of it. In determining whether to grant this extension, the board used a balancing test consisting of four factors: (1) the length of the delay, (2) the reason for delay, (3) the defendant's assertion of the right to a prompt proceeding, and (4) the prejudice to the defendant of a delay in the civil proceeding. The board also considered the staff's diligence in bringing the investigation to a close. Weighing these factors, the board limited the extension to 39 days based primarily on its concern that the longer the delay in discovery, the more likely that key witnesses would be lost and recollections would fade.

Financial Qualifications

Several significant financial qualification rulings were involved in a River Bend (La.) license amendment proceeding (*Gulf States Utilities Company* (River Bend Unit 1 (La.)), LBP–94–3, 39 NRC 31 (1994). The first concerned the licensee's claim that a lack of funding for the reactor could not adversely affect safety, because the plant would be safely shut down if funding became a problem. The board rejected this argument because it contradicted the rationale of 10 CFR § 50.33(f) requiring applicants for operating licenses to demonstrate that they have sufficient funds to operate a nuclear reactor. The board noted that this regulation is based upon safety factors, including the concern that insufficient funding might cause licensees to cut corners on operating or maintenance expenses. The board further noted that even during shutdown there are accident risks associated with a nuclear reactor.

The second ruling concerned the question of whether financial qualification should be an issue in the proceeding. The licensee argued that it should not since the NRC's "financial qualification" rule exempts electric utilities from demonstrating financial qualification. However, the board found this exemption to be inapplicable, since 10 CFR § 50.33(f) applies only to electric utilities. The operating company for River Bend, whose under-funding would allegedly cause the safety concerns, was not an electric utility.

Significant Commission Decisions

The Commission exercises its appellate authority over adjudications when a party to a Nuclear Regulatory Commission adjudicatory proceeding, dissatisfied with an Atomic Safety and Licensing Board decision, 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.

Commission Review of Licensing Board Decisions

The Commission reviewed, at its own discretion, a Licensing Board order resolving a discovery dispute in a license transfer proceeding involving the Vogtle (Ga.) nuclear power plant. The dispute began when the only intervenor, Allen Mosbaugh, sought discovery of certain information held by the NRC staff. The Licensing Board ordered release of information which included an Office of Investigations' report on alleged false statements made by senior officers of the Georgia Power Company, the licensee for the plant (see *Georgia Power Company* (Vogtle Units 1 and 2 (Ga.)), LBP-94-6, 39 NRC 105 (1994). The NRC staff filed before the Commission a motion for stay of the Licensing Board's order. The staff argued that release of the report and its exhibits would adversely affect the agency's ongoing deliberations on possible enforcement action against Georgia Power. The Commission affirmed in part and reversed in part the Licensing Board's order. The Commission determined that the evaluative portions of the report were properly withheld, but that purely factual exhibits that did not reveal deliberative analysis should be released. In making this determination, the Commission considered both the intervenor's present need for this information and the Commission's interest in protecting the integrity of enforcement deliberations. (See *Georgia Power Company* (Vogtle Units 1 and 2 (Ga.)), CLI-94-5, 39 NRC 190 (1994).)

The Commission also considered an appeal filed by Advanced Medical Systems, Inc. (AMS), a licensee authorized to possess and use radioactive byproduct material. The proceeding was initiated when AMS requested a hearing challenging a staff enforcement order that suspended AMS's license. AMS appealed a Licensing Board decision granting the staff's motion for summary disposition upholding the enforcement order without holding an evidentiary hearing (see *Advanced Medical Systems (AMS), Inc.* (One Factory Row, Geneva, Ohio 44041), LBP-90-17, 31 NRC 540 (1990)). AMS argued that factual matters remained in dispute and that, therefore, a hearing was necessary. In the order, the staff charged that AMS's employees had been performing service and maintenance on teletherapy equipment at various medical facilities, even though the employees lacked required training, did not have radiation detection and monitoring equipment or the required service manuals, and had objected to performing maintenance without proper training.

At issue before the Licensing Board was whether the NRC staff had a sufficient basis to summarily suspend AMS's activities based on the information that the staff possessed at the time it issued the suspension order. The Commission found that the order was well within the agency's statutory and regulatory authority. Because AMS's activities involved the potential for significant adverse safety consequences to patients, hospital workers, and AMS employees themselves, the Commission concluded that no material facts warranting an evidentiary hearing remained in dispute and that under the circumstances the staff acted reasonably in issuing the immediately effective suspension order. Therefore, the Commission denied AMS's appeal (see *Advanced Medical Systems, Inc.* (One Factory Row, Geneva, Ohio 44041), CLI-94-6, 39 NRC 285 (1994)). AMS has sought judicial review of the Commission's denial of its appeal.

The Commission also considered Gulf States Utilities Company's (GSU's) appeal of a Licensing Board decision granting intervention to Cajun Electric Power Cooperative, Inc. (see *Gulf*

States Utilities Company (River Bend Unit 1 (La.)), LBP-94-3, 39 NRC 31 (1994)). The proceeding concerns GSU's application to transfer control over the River Bend (La.) nuclear power plant from itself to Entergy Operations, Inc., and its request for a license amendment to reflect a change in ownership of GSU, which through a merger would become a wholly owned subsidiary of Entergy Corporation. The Licensing Board determined that Cajun had advanced the requisite interest to intervene in this proceeding. Essentially, Cajun asserted an adverse impact on its interests from potentially unsafe operation of River Bend if the funding resources for the plant were unduly strained. Cajun alleged that the proposed transfer and change in ownership would affect GSU's financial qualifications. The board also concluded that Cajun had fashioned an appropriate issue for litigation. Although the Commission recognized potential weaknesses in Cajun's arguments, it determined that plant safety can be affected by under-funding and that, at this threshold stage, the board's determinations regarding intervention were not irrational. Therefore, the Commission declined to disturb the Licensing Board's determination to grant intervention. (See *Gulf States Utilities Company* (River Bend Unit 1 (La.)), CLI-94-10, 40 NRC 43 (1994).)

The Commission considered a novel question regarding intervention in NRC enforcement proceedings in the context of a proceeding involving the staff's enforcement order holding Sequoyah Fuels Corporation (SFC) and its parent, General Atomics (GA), jointly liable for the funding of decontamination and decommissioning of the SFC site near Gore, Okla. SFC and GA filed appeals before the Commission that challenged the Licensing Board's decision to allow Native Americans for a Clean Environment (NACE), a group that favors the enforcement action, to intervene in this proceeding (see *Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site), LBP-94-5, 39 NRC 54 (1994), and LBP-94-8, 39 NRC 116 (1994)). In response to arguments raised by SFC and GA regarding the negative effect that such intervention would have on the NRC's enforcement discretion, the Commission stated that intervention by interested persons who support an enforcement action does not diminish the agency's discretion in initiating enforcement proceedings, because the Commission may lawfully limit the enforcement hearing to consideration of the remedy or sanction proposed in the agency order. Moreover, the Commission concluded that NACE had demonstrated that it possessed the required interest to intervene in the proceeding because NACE had articulated a reasonable threat of harm to a member of its organization, who lives near the SFC site, from contaminated groundwater, if the SFC site is not decontaminated and decommissioned properly. (See *Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site), CLI-94-12, 40 NRC 64 (1994).)

The Commission similarly denied subsequent appeals filed by SFC and GA in the same proceeding challenging the Licensing Board's grant of intervention to the Cherokee Nation, who also supports the enforcement action. (See *Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site), CLI-94-13, 40 NRC 78 (1994).)

Other Noteworthy Adjudicatory Matters

Two matters decided by the Commission in fiscal year 1994 involved the Commission's authority to enforce subpoenas issued by the NRC staff in the course of an investigation. The subpoenas were issued to Five Star Products, Inc., a supplier of grout and concrete products for the nuclear industry, and to Construction Products Research, Inc. (CPR), the corporation that certified that the quality of the grout and concrete met the applicable safety standards. These two corporations are owned by the same parent corporation, share the same premises, and share common officers.

The first proceeding involved a challenge by Five Star and CPR to a subpoena issued to these corporations in the course of an investigation into an allegation that CPR terminated an employee after the employee brought safety concerns to the NRC staff regarding the quality testing of nuclear-grade cement and grout (see *Five Star Products, Inc., and Construction Products Research, Inc.*, CLI-93-23, 38 NRC 169 (1993)). Five Star and CPR raised numerous objections to the NRC's authority to issue such a subpoena to a supplier of material. Essentially, they argued that

Five Star and CPR did not have the type of relationship with NRC licensees that is required for the NRC to take enforcement action against them. The Commission concluded that the use of grout and cement that does not meet the applicable safety standards creates a threat to public health and safety. The alleged employment practices by CPR and Five Star, if true, would create a situation in which substandard material could be supplied to the nuclear industry. Therefore, the Commission concluded that the staff was authorized to issue the subpoena. The Commission also found that arguments by Five Star and CPR that the subpoena should be quashed or modified were unpersuasive, because the same matters at issue in the staff's investigation were subject to a Department of Labor proceeding and that the United States Attorney for the District of Connecticut also appeared to be looking into this matter.

The second proceeding involved a challenge by Five Star, CPR and three of their employees who were issued subpoenas requiring each employee to appear for interviews in an NRC investigation. The investigation concerned the issue of whether Five Star was possibly supplying substandard grout and cement to the nuclear industry. Basically, CPR, Five Star and the employees challenged issuance of the subpoenas for the same reasons that CPR and Five Star challenged the subpoenas, discussed above. Similarly, the Commission concluded that the Commission does have the authority to require the employees to appear for interviews because the investigation involves allegations that, if true, would create a public health and safety threat and because the NRC Office of Investigations had reason to believe that these individuals had information relevant to this matter. Moreover, the Commission concluded that a parallel investigation being conducted by the Department of Justice into these same allegations did not provide a reason to quash or modify the subpoenas at issue here. (See *Henry Allen, Diane Marrone, & Susan Settino,* CLI-94-8, 39 NRC 336 (1994).)

In fiscal year 1994, the Commission also issued three decisions involving various challenges to transportation of nuclear fuel.

The first decision concerned the State of New Jersey's challenge to the legality of barge shipments along the New Jersey coast. The shipments contained slightly irradiated nuclear fuel being shipped from the Shoreham nuclear power plant in New York to the Limerick nuclear power plant in Pennsylvania. The Commission determined that the only clear right to a hearing related to this matter accrued at the time that the Commission issued a license amendment permitting the Limerick plant to use the Shoreham fuel. New Jersey did not request a hearing until nearly six months after the NRC first solicited hearing requests on this amendment. The Commission questioned its authority to reopen a proceeding at such a late date. The Commission concluded that even if the Commission could restart the proceeding it would not do so here because New Jersey failed to show that meaningful relief could be afforded, with a series of shipments already well under way. The Commission also declined to initiate a hearing into the barge transport or its route, because it was governed by a general transport license granted by rule, as well as a certificate of compliance that New Jersey had not challenged in a timely manner. Finally, the Commission found that New Jersey did not offer "good cause" for coming to the Commission late, because New Jersey knew of the Commission's consideration of the amendment early enough to seek intervention on time, but waited until months later. (See *State of New Jersey (Department of Law and Public Safety's Requests Dated October 8, 1993),* CLI-93-25, 38 NRC 289 (1993).)

In the second transportation proceeding, the Commission denied a request by the Nuclear Control Institute (NCI) for a hearing on an application for a license filed by Transnuclear, Inc. Transnuclear requested a license to export 280 kilograms of high-enriched uranium, in the form of mixed uranium and thorium carbide fabricated as unirradiated fuel, to COGEMA in France, to be processed for recovery of the uranium and thorium. NCI was concerned with the end use of the uranium, argued that shipment of the fuel would be inimical to the common defense and security of the United States, and claimed that approval of the license would be contrary to regulations discouraging the continued use of highly enriched uranium. Hearings in export licensing proceedings are held if the hearing would be in the public interest and would aid the Commission in complying with applicable laws. The Commission first held that NCI lacked standing to demand a hearing as of right, because its only interests were ideological and informational. The Commission also determined that nothing in the NCI filings before the Commission indicated that a discretionary hearing would generate significant new insights into Transnuclear's application. To the contrary, the Commission ruled that it already had abundant information and analysis on this matter and pointed out that the Executive Branch and staff had already approved of the export. (See *Transnuclear, Inc. (Export of 93.15 percent Enriched Uranium)*, CLI-94-1, 39 NRC 1 (1994).)

In the third proceeding, the Natural Resources Defense Council, Friends of the Earth, Hnuti Duha, Global 2000, Greenpeace Austria and Oberosterreichische Plattform gegen Atomgefahr ("petitioners") filed petitions for leave to intervene and requests for hearings on the license application filed by Westinghouse Electric Corporation to export nuclear fuel to the Czech Republic for use in the nuclear facilities at Temelin. The petitioners argued that, prior to authorization of any shipments of fuel, the public interest required a hearing on the health, safety and environmental effects of operation of the Temelin reactors. The Commission determined that the petitions were untimely filed and that the petitioners had failed to demonstrate that they were entitled to a hearing as a matter of right, even if the petitions had been filed on time. Although the petitioners raised general concerns with the safe operation of the Temelin reactors, the Commission concluded that the petitioners had not shown that denial of the license to export would prevent the alleged harm. The Commission reasoned that, if the United States did not export the necessary fuel, the reactor would not necessarily cease to operate, because another country may well step in and provide the fuel. The Commission pointed out that the Czech Republic, not the NRC, has authority over operation of the Temelin reactors. For essentially the same reasons, and because the information that petitioners submitted in support of their requests was not new, the Commission also denied a hearing as a matter of discretion. (See *Westinghouse Electric Corp. (Nuclear Fuel Export License for Czech Republic—Temelin Nuclear Power Plants)*, CLI-94-7, 39 NRC 322 (1994).)

In fiscal year 1994, the Commission also issued a decision in which it considered a request for an adjudicatory hearing on the decommissioning of the Yankee nuclear power plant in Rowe, Mass. Environmentalists, Inc., was concerned with dismantling activities undertaken by the licensee, transportation of radioactive components from Yankee to its place of disposal (the low-level waste facility in Barnwell, South Carolina), and activities associated with disposal of the material. The Commission denied the hearing request. First, the Commission determined that it was not required to offer a hearing to interested persons regarding decommissioning activities in the absence of one of the "hearing-triggering" licensing actions specified in Sec. 189a of the Atomic Energy Act. The Commission pointed out that here the licensee was already authorized under its license to conduct its proposed activities and did not need to seek fresh licensing approval from the NRC. Second, the Commission found that, although Environmentalists raised broad objections to matters inherent in the decommissioning process, it did not allege that the activities actually being conducted posed any unexamined issues significant enough to warrant the grant of a discretionary hearing. (See *Yankee Atomic Electric Company* (Yankee (Mass.) nuclear power plant), CLI-94-3, 39 NRC 95 (1994).)

Management and Administrative Services

Chapter 11

This chapter deals with internal events and activities of the NRC, such as changes in agency structure, initiatives in personnel management, developments in the agency's information resources program, license fees levied and collected, activities 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 the NRC.

NRC Consolidation Achieved

The collocation of NRC Headquarters Offices at a single venue was finally achieved in fiscal year 1994, in the 20th year of the agency's existence. For most of its existence, the NRC was dispersed among as many as 11 separate buildings, some of them widely separated. The two-building complex at One White Flint North (OWFN) and Two White Flint North (TWFN), in North Bethesda, Md., contains offices for about 2,400 NRC staff personnel, representing the entire Headquarters complement. About 1,000 staff personnel occupy OWFN, first occupied by the NRC in late 1987, and about 1,400 are in the newly constructed TWFN, with occupancy taking place over the spring and summer of 1994. The facility incorporates a new Operations Center for emergency response (see Chapter 3), an underground garage accommodating more than 1,000 vehicles, a full-service cafeteria, multipurpose auditorium, staff training facility, credit union, day-care center, fitness center, and other resources. The White Flint complex is located about 12 miles northwest of downtown Washington, D.C.

Personnel Management

1994 NRC Staff-Years Expended

During fiscal year 1994, the NRC expended a total of 3,286 staff-years in carrying out its mission. This total includes the time of employment of permanent full-time staff, permanent part-time staff, temporary workers, consultants, and cooperative education and "stay-in-school" employees.

Recruitment

During the report period, the NRC hired 54 permanent, full-time employees and lost 175 permanent, full-time employees, the latter figure representing an attrition rate of 5.5 percent. During the report period, agency representatives undertook 51 recruitment "trips," generating approximately 1,550 applications in the process. The NRC also recruits new employees by advertising in various news media (e.g., newspapers, trade journals, etc.). Applications received by the agency are managed and controlled through an automated applicant inventory/tracking system.

Awards and Recognition

In fiscal year 1994, the NRC continued to recognize and commend employees for excellent performance. At its Annual Awards Ceremony, on May 12, 1994, the NRC presented employees with three NRC Distinguished Service Awards and 43 Meritorious Service Awards. During fiscal year 1994, NRC employees also received 603 Performance Awards, 445 Special Act Awards, and 372 High Quality Performance Salary Increases. Eleven NRC employees and one NRC office were nominated for awards sponsored by other Federal agencies and national organizations. One NRC employee received the Presidential Distinguished Executive Rank Award, five received Presidential Meritorious Executive Rank Awards, 98 received Senior Executive Service (SES) bonuses, 13 received SES pay level increases, 18 received performance-based cash awards, and 11 received performance-based pay level increases.

Benefits

Thrift Savings Plan open seasons were conducted from November 15, 1993, to January 31, 1994, and from May 15, 1994, to July 31, 1994. A Health Benefits open season was conducted from November 8, 1994, to December 13, 1994. A Health Insurance Fair was conducted on November 16, 1993, in conjunction with the open season. Approximately 300 NRC employees attended this Fair.

The Voluntary Leave Transfer Program provides income protection to employees affected by a medical condition through the voluntary donation of annual leave by other employees. The original experimental five-year program was to end on October 31, 1993; President Clinton signed the new leave sharing program into law on October 8, 1993. Twenty employees qualified as leave recipients during this report period.

Because of the dissolution of Region V and URFO, the employees in these offices were offered voluntary separation incentive payments (VSIP) during fiscal year 1994. A total of 13 employees took advantage of this provision (four early-out retirements and nine optional retirements). During fiscal year 1994, the NRC conducted 11 group pre-retirement seminars. 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 to foster a cooperative relationship and to identify problems and propose solutions. The agency will also provide training in methods of dispute-resolution, helping parties to 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 which will have an impact on the agency are (1) the reduction of full-time equivalent resources 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.

Training and Development

During the report period, OP provided more than 90 different on-site courses in executive, management, supervisory, and administrative skills, and also in computer applications. The NRC also sponsored a wide variety of training and other developmental programs conducted at colleges and universities, at other government agencies, and in the private sector.

One major effort during the report period was training on Interest-Based Bargaining. This training was conducted to assist the newly established Labor-Management Partnership. Other major training efforts include Financial Management training and Ethics training.

The computer applications curriculum continued to be revised so that employees could learn how to use the latest computer resources available at the NRC. Areas in which courses were designed or updated include Wordperfect, Harvard Graphics, LOTUS, Windows, and ACCESS.

The Individualized Learning Center continued to provide employees with convenient access to training, through the latest in audio/video, computer-based, and multi-media programming. More than 250 programs were available to NRC employees in project management, communication, management and supervision, computer skills, secretarial skills, and employee assistance.

The NRC also sponsored a number of programs to help NRC 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 the fiscal year, the NRC entered into an interagency agreement with the Public Health Service to provide an additional Employee Assistance Program (EAP) contract counselor to serve headquarters employees. The 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. Supervisors were trained in recognizing and confronting troubled employees and referring them to the EAP. The agency conducted programs for employees on a variety of substance abuse and wellness topics.

Health Units operated by the Public Health Service provided a variety of health services to headquarters employees, including limited treatment and referral for on-the-job illness or injury; physical examinations for employees age 40 years and older; screening for diabetes, glaucoma, high blood pressure, and cancer; mammography testing; immunizations; and health awareness programs on topics such as breast cancer, seasonal affected disorder, prostate cancer, and smoking cessation.

Information Resources Management

Information Technology Strategic Planning

The Office of Information Resources Management (IRM) prepares an updated NRC Information Technology (IT) Strategic Plan annually, in collaboration with the IT Council, an advisory group composed of senior managers throughout the agency. The plan addresses three major areas: (1) Information Technology Program Management, (2) Information Technology Infrastructure, and (3) Information Technology and Applications Management.

In IT Program Management, the plan continues to emphasize IRM's commitment to becoming a customer-driven organization to serve the needs of the agency and the public. In IT Infrastructure, the plan presents long term strategies for supporting the mission of the NRC with modern desktop workstations, reliable networks, strengthened high performance computing capabilities for scientific codes, and improved communications outside the NRC. Finally, the Information Technology and Applications Management plan seeks to improve document management capabilities and streamline work processes using modern workflow and work process redesign practices.

Accomplishments supporting the IT Strategic Plan during fiscal year 1994 include (1) reorganization of the Office of IRM to improve delivery of services to its customers, (2) replacement of obsolete Intel 80286–based personal computers with modern equipment, (3) support for work process redesign efforts in the Offices of Administration, Nuclear Reactor Regulation, and Nuclear Material Safety and Safeguards, and (4) establishment of an Internet connection protected by a security firewall to facilitate public access to agency information.

The next update to the plan will focus on strategies for making NRC information more readily available to the public and on reassessing the roles of IRM, the program offices, and contractors in information technology to ensure that IT-related activities are conducted effectively and efficiently.

Personal Computer Refresh Program

IRM identified a program goal in its strategic planning process of upgrading the agency's personal computing equipment. Consistent with the high priority of this goal, IRM assembled a team, under the direction of a senior IRM manager, to work closely with the Division of Contracts and Property Management (DCPM) to expedite the award of a new personal computer hardware, software, and support services contract. This contract provided, among other things, a vehicle to replace personal computers that were identified as obsolete. Where possible, the computers were replaced simultaneously with the agency's consolidation of its staff at the new Two White Flint North (TWFN) building (see above). The first milestone of this program was met with the January 1994 award of the new contract to TRI-COR Industries, Inc.

During fiscal year 1994, this program replaced over 1,300 obsolete personal computers in both Headquarters and the Regions.

The basic workstation configuration consisted of the following:

- Intel 80486/33 megahertz processor with local bus.
- 8 megabyte random access memory.
- 14" Super Video Graphics Array (SVGA) color monitor.
- 2 megabyte local bus SVGA video graphics adapter.
- 245 megabyte fixed disk.
- 3.50" 1.44 megabyte flexible diskette drive.
- 5.25" 1.20 megabyte flexible diskette drive.

The goal of this program in fiscal year 1995 will be to refresh those personal computers that are rated less than an Intel 80386/33 megahertz processor. IRM will be working closely with the Information Technology Coordinators in Headquarters and the Regions to determine a schedule for the integration of the new equipment.

During the first year of this program, IRM exercised two engineering change options to the basic workstation configuration. The first increased the size of the monitor from 14 to 15 inches. The second increased the size of the fixed disk from 245 to 425 megabytes. Other engineering changes will be evaluated in the coming fiscal year.

Upgrade of Technology for Office Systems

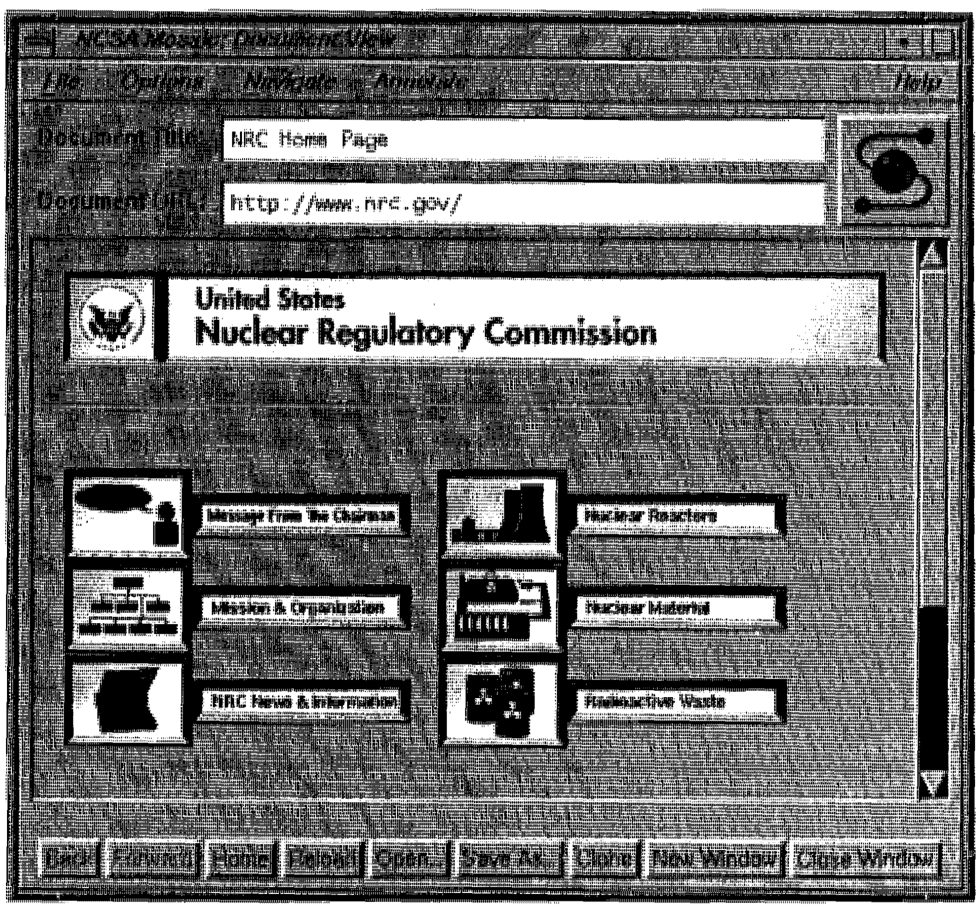
Work was also completed during the report period on the first of two option years of the Agency Upgrade of Technology for Office Systems (AUTOS) program, which provides office automation and network integration at the NRC. Operational support was provided for approximately 3,500 agency users. Improvements included an integrated high-speed campus network to provide enhanced connectivity and interoperability, and the installation of Transmission Control Protocol/Internet Protocol (TCP/IP) software for improved host connectivity and Internet access. Although AUTOS was originally intended as a replacement for the outdated IBM 5520 and Displaywriter wordprocessing equipment, it now provides an agency-wide network infrastructure supporting many of the administrative functions carried out daily by NRC offices. AUTOS furnishes integrated networking capability for high performance engineering workstations that enable technical staff to share computer codes, data and other related resources. It also provides connectivity to public networks, National Laboratories, research institutes, and universities. As planned, the AUTOS program has been extremely successful and gives promise of continuing to help increase individual productivity levels agency-wide.

NCSA Mosaic

The Internet is a global structure of networks connecting computers world-wide. These networks are inter-connected by a variety of telephone lines, satellite relays, and microwave and fiber optic links, resulting in a loose amalgam of thousands of computer networks reaching millions of people. Internet is the world's largest computer network and is one of many tools the public now has available to access information from the Nuclear Regulatory Commission.

The NRC makes use of Internet in two ways. The first is by offering Internet mail through the agency's AUTOS network. Internet electronic mail offers nexi for interchange with other agencies, licensees, power plants, and National Laboratories. It also offers those outside the agency a means of communicating with the NRC. The second way the NRC makes use of the Internet is through NCSA Mosaic, a network tool developed by the National Center for Supercomputing Applications (NCSA) at the University of Illinois. NCSA Mosaic has the potential to give the public access to information from the NRC and can deliver that information through the Internet to universities, elementary schools, high schools, community colleges, libraries, utilities, State and local governments, and individuals. Several Federal agencies are currently exploring NCSA Mosaic's potential.

The NRC is currently conducting a Mosaic pilot program with 200 internal participants, using both office desktop computers and technical workstations. Agency staff can now access external computer systems, as well as the agency's own Mosaic server, which is available to the public. Users can access the agency server using the Uniform Resource Locator (URL) http://www.nrc.gov.



NRC World Wide Web Home Page.

Computer Risk Assessment

The Computer Security Act of 1987 (Public Law 100–235) and Office of Management and Budget Circular A–130 require the development of security plans for all computer systems and facilities that process sensitive unclassified data, and also advise that risk assessment procedures be used to identify vulnerabilities of a given system. Many NRC computer systems are not available to the public and an effective security plan must be written and/or updated every five years, or when a modification is made to any major system or facility. The NRC currently utilizes a software package, Los Alamos Vulnerability and Risk Assessment (LAVA) system from the Los Alamos National Laboratory, to perform periodic vulnerability assessments and risk analyses which provide a systematic approach to determine vulnerabilities, threats and risks in computer systems and facilities.

IRM annually surveys the agency for sensitive unclassified computer systems and continually performs and/or updates security plans and assessments of risk for the appropriate systems. The NRC was also instrumental in the formation of a local area LAVA Users group, FLOW (Federated LAVA of Washington), made up of Washington area Federal employees, as well as people from private industry and the educational community, to discuss and share ideas related to computer security and the risk assessment and protection of systems and information. The NRC has both participated in and hosted a number of FLOW annual meetings and provided much of the leadership for the group.

NRC File Center Moved to New Building

Although the public can directly access certain types of agency information electronically, most of the agency's official records are kept as paper copies. During the report period, the agency successfully relocated more than 8,000 linear feet of records from the NRC File Center at One White Flint North (OWFN) to its newly constructed Two White Flint North (TWFN) Building site. The new File Center became operational April 11, 1994, with a 25 percent increase in storage capacity, which includes a vault for storing Safeguards Information and Confidential and Secret documents, a micrographics area, a separate customer reading room with a copier, and a work environment that is more conducive to increased productivity and improved employee morale.

The File Center is a central repository for the NRC's official reactor licensing, nuclear materials licensing, and research records. These record collections represent 60 percent of the mission-related programmatic records at NRC Headquarters. The increased storage capacity at the new File Center will enable the NRC to further accomplish its goal to consolidate all of its mission-related records in one central location.

Since the consolidation of the NRC offices at the White Flint North location, NRC managers have noticed a significant increase in the use of the File Center by staff to review official records associated with various programs, such as the Uranium Mill Tailings Radiation Control Act of 1978, as amended; records related to the Commission's Decision Tracking System; research programs; and the Presidential Advisory Committee on Human Radiation Experiments (ACHRE). The File Center has provided more than 1,000 cubic feet of records for the review of information related to research on human subjects in connection with the ACHRE's mandate.

NRC Electronic Bulletin Boards

In order to increase the public's access to agency information, IRM has continued to make use of electronic systems and sources. To enhance accessibility, IRM formed an Interagency Agreement with the National Technical Information Service (NTIS) to provide better access to NRC information. Established in 1950 as a part of the Department of Commerce, NTIS has statutory authority to be a central repository for scientific, technical, and engineering information, and to facilitate and implement the dissemination and transfer of such information to industry, business, State and local governments, to other Federal agencies, and the general public.

The NTIS uses bulletin board software as one of its strategies to support the distribution of information. NTIS's bulletin board system facilities are collectively known as FedWorld. The facility can be electronically accessed both by telephone contact via modem or by use of the Internet via telnet to "fedworld.gov." The NRC wished to provide toll-free access directly to the information and technical data files stored there. IRM, therefore, purchased and NTIS installed supplementary communication equipment that permits exclusive access to the NRC areas. Modem access via asynchronous communications may be gained using telephone number: 1-800-303-9672 (the communication parameters are eight data bits/no parity/1 stop bit/full duplex).

IRM is continuing the process of collecting NRC technical and regulatory policy information for access and distribution by the public via FedWorld.

The following NRC bulletin boards are in the design phase for placement at FedWorld:

- Public Document Room System
- Materials and Reactor License
- Health Physics
- Public Meeting Notices
- Low-Level Waste Shipping Manifest
- Public Affairs System Information
- Generic Communications Electronic Distribution
- Improved Technical Specifications
- Plant Morning Reports.

In a parallel effort, IRM is working to develop an internal bulletin board capability designed to serve its employees with electronic access to informational material—such as NRC internal job announcements, training announcements, employee instructions, employee bulletins, policies and notices.

The following bulletin boards are operational and available through FedWorld.

Enhanced Participatory Rulemaking Process. The official vehicle used to inform the public regarding NRC rulemaking is the *Federal Register*. This publication is the place where all Federal agencies inform the public of various actions and intentions of the government. As part of the Enhanced Participatory Rulemaking (EPR) project, the public is afforded the opportunity to learn about and officially comment on various rulemakings of the NRC through FedWorld.

Status of Petition Appeals. The mission of the NRC is to protect public health and safety in the civilian use of nuclear power and materials in the United States. The NRC continuously analyzes technical issues which may potentially affect the safety of licensed activities at nuclear reactors and fuel cycle facilities. In its interest to assess all potential safety issues, the NRC encourages citizens to bring them to its attention. The primary mechanism for the public to raise these issues is described in Section 2.206 of the NRC's regulations—Title 10 of the *Code of Federal Regulations*. This mechanism permits any person to petition the NRC to take action against one or more licensees based upon facts that, if validated, would pose a significant threat to public health and safety, the environment, or the common defense. The bulletin board established at FedWorld provides to the public an up-to-date status of all pending petitions.

Enforcement Program Review. The enforcement program bulletin board subsystem contains information on the NRC enforcement program, which was established to promote and protect the radiological health and safety of the public, including employees' health and safety and the common defense and security. This is accomplished by ensuring compliance with NRC regulations and license conditions, obtaining prompt correction of violations and adverse quality safety-related conditions, deterring future violations and occurrences of conditions adverse to quality, and encouraging improvement of licensee and vendor performance.

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 NRC in operating more effectively and efficiently by identifying ways to improve the agency's programs and operations through the prevention and detection of fraud, waste, and abuse.

To accomplish its mission, 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 usually examine the implications of NRC's programs that affect national issues.

The OIG's investigative staff conducts investigations and special event inquiries. The OIG investigates violations of law or misconduct by NRC employees and contractors and allegations of irregularities or abuse in NRC programs and operations. Special event inquiries examine an event that does not focus specifically on individual misconduct.

In addition, the NRC's OIG shares some unique responsibilities with the agency. The NRC's primary mission is to provide adequate assurance that public health and safety is protected in the commercial use of nuclear materials and in the operation of nuclear facilities. The OIG assesses and reports 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 do not suffer adverse job actions as a result of these activities. The OIG continually evaluates NRC's efforts to combat this type of unlawful discrimination.

The NRC is relatively unique among Federal agencies because it is required by the Omnibus Budget Reconciliation Act of 1990 to recover approximately 100 percent of its budget authority. In fiscal year (FY) 1994, the NRC collected approximately $500 million in fees from the industries that it regulates. Therefore, the agency must employ sound financial practices to fully comply with its legislative mandates, and OIG's financial audits help the agency to meet these objectives.

Some of OIG's accomplishments during FY 1994 include participation with the U.S. Agency for International Development in a global initiative to review assistance provided by NRC to nations of the former Soviet Union for its nuclear power program. The OIG also assisted an NRC Management Review Team in assessing the agency's program for protecting allegers against retaliation. A review of fees for licensees suggested that the NRC adopt a single-fee structure, and the OIG continues to work with the agency to improve and strengthen its financial systems and control procedures.

Over the summer, OIG provided training seminars entitled Management Focus Groups. These seminars focused on prevention of misconduct and strengthening vulnerable fiscal and management information systems and were attended by OIG senior managers and top agency officials.

Toward the goal of helping the agency to improve its effectiveness, the OIG completed 21 performance and financial audits, analyzed 102 contract audit reports, and made 25 recommendations to NRC management. Also during FY 1994, the OIG received 420 allegations, initiated 93 new investigations, and closed 89 cases. In addition, 105 referrals were made to NRC management.

OIG Fiscal Year 1994 Audits

The following are representative of the results of our audit work for the year:

Decommissioning the Yankee Rowe Nuclear Power Plant: NRC Policy at a Crossroads. OIG conducted an assessment of NRC's policy and procedures for decommissioning. NRC's current decommissioning practice for prematurely shutdown nuclear plants represents a significant shift from its previous policy. Under NRC's initial policy, the agency allowed a utility to conduct only minor component disassembly, decontamination, and storage and shipment of spent fuel prior to NRC's approval of its decommissioning plan.

New criteria, issued by the Commission in January 1993, allows utilities to apply the provisions of 10 CFR 50.59 for decommissioning activities prior to NRC's approval of its decommissioning plan, provided that the utility meets certain conditions. With this change, a utility can remove major systems and components and thus significantly dismantle nuclear power plants before the agency approves their decommissioning plan.

Yankee Rowe was the first nuclear power plant to remove major components under NRC's new policy. In March 1994, a public interest group filed suit in the Federal District Court for the District of Massachusetts against the NRC to halt any and all activity that is part of the early component removal project at the Yankee Rowe plant. The suit was dismissed on May 20, 1994, for lack of subject-matter jurisdiction. However, on May 26, 1994, the public interest group filed a petition for review with the First Circuit Court of Appeals, as well as an appeal of the District Court's jurisdictional ruling. Consequently, the final resolution of this issue resides with the judicial system.

Review of NRC's Technical Assistance Activities Under the Lisbon Initiative. Following the accident at Chernobyl in 1986, NRC began a program of technical cooperation with the Soviet Union. Under the "Lisbon Initiative", NRC, along with the Department of State, the U.S. Agency for International Development (USAID), and the Department of Energy, developed proposals for assisting Russia and Ukraine, two of the New Independent States of the former Soviet Union. In FY 1992, USAID began to provide funding to NRC to support NRC's activities to improve the regulation of nuclear power in both Russia and Ukraine.

In FY 1994, OIG conducted two audits jointly with USAID's OIG. In both audits, OIG found that NRC's assistance program had a number of positive effects on the regulation of nuclear power in the host country. The reports made observations and recommendations, including the need for performance measures to enhance NRC's technical assistance program.

Review of NRC's Process for Regulating Parts Used in Nuclear Power Plants. OIG reviewed NRC's process for regulating parts used in nuclear power plants. Specifically, OIG examined NRC's justification for changing inspections of utilities' commercial grade dedication programs from a programmatic to a reactive type performance-based inspection.

OIG's review disclosed that NRC records do not support NRC's decision to change commercial-grade item inspections from a programmatic to a reactive type performance-based inspection only. OIG also found that NRC had not informed Congress of the change in its commitment to perform programmatic inspections of utilities' programs for approving commercial-grade parts used in the safety systems. NRC committed to this action in response to a U.S. General Accounting Office (GAO) report on the existence of substandard parts. The OIG made recommendations that NRC support and document NRC's decision to perform commercial-grade dedication inspections on a reactive basis only and to inform Congress and GAO of this change in inspection policy.

Review of Fees for Licensees. The Chairman requested that the OIG assist the Commission and staff in performing a comprehensive review of NRC's fee policy by conducting an audit of the basis by which license fees are established. In addition to answering several questions for the Commission, OIG suggested that eliminating Part 170 fees (fees for services rendered) and simplifying the calculation of Part 171 fees (annual fees for having a license) would:

- reduce the volume of quarterly fee billings, lessen the burden of tracking direct labor hours and
- contract support dollars, and
- significantly decrease the time needed to calculate annual fees.

The Commission included these suggestions in its report to the Vice President on the review of the agency's policy for assessment of annual fees, as required by the Energy Policy Act of 1992.

Survey of NRC's Information Systems. The OIG surveyed users and managers for selected NRC safety-related information systems to provide the agency with pertinent information regarding system use and data reliability.

The OIG found (1) that management controls over selected systems needed strengthening, (2) that NRC maintained an estimated 200 to 300 automated information systems costing tens of millions of dollars, but did not know the exact number or cost of these systems, and (3) that system shortcomings resulted in individual program managers developing approximately 80 additional systems to facilitate their operations. The OIG report made four recommendations to address the concerns raised by managers and users of the systems.

OIG Fiscal Year 1994 Investigations

The OIG Investigation of Thermal Science, Incorporated, the Manufacturer of Thermo-Lag Fire Barriers, Continued During 1994. In support of the OIG investigation, the NRC conducted three full-scale fire endurance tests of Thermo-Lag fire barriers, which are manufactured by Thermal Science, Incorporated (TSI). These fire barriers are installed in nuclear power plants to protect safe shutdown capability. This effort duplicated TSI's tests, the results of which were relied on by most of the nuclear power plants that installed Thermo-Lag fire barriers. The objective of the tests was to compare the performance of the fire barriers against the successful test results previously reported by TSI. Sandia National Laboratories provided technical assistance by designing and executing the test program and by preparing the test report. The tests were conducted at Underwriters Laboratories, Incorporated, in December 1993. The NRC's fire endurance tests resulted in significant failures of the fire barrier.

On April 14, 1994, Industrial Testing Laboratories (ITL) and its President pleaded guilty in U.S. District Court in Baltimore to five counts of aiding and abetting the making of false statements within the jurisdiction of the NRC. TSI used ITL to witness the fire endurance and ampacity derating tests that were used to demonstrate to the NRC, the nuclear utilities, and the American Nuclear Insurers (ANI) that Thermo-Lag met NRC requirements specified in 10 CFR Part 50, Appendix R. ITL and its President admitted to signing test reports and letters prepared by TSI on ITL stationery, which falsely purported to be test reports and letters written by ITL. The test reports also falsely represented that fire endurance and ampacity tests had been performed "under the supervision and total control of Industrial Testing Laboratories." These letters and test reports were signed by ITL even though the documents contained false information about the testing process and represented facts about the tests for which ITL had no knowledge. Between March 1982 and January 1991, ITL and its President aided and abetted TSI in the issuance of more than 30 false test reports on ThermoLag that TSI sent to the NRC, the nuclear utilities, and ANI.

On September 29, 1994, a special Federal grand jury returned a seven-count indictment against TSI and its President. The charges included conspiracy, false statements, and Atomic Energy Act violations in connection with the sale to nuclear utilities of more than $58 million of Thermo-Lag that was subsequently installed in over 70 nuclear power plants.

Conflict of Interest and Acceptance of Gratuities by Agency Employee. A senior agency employee was investigated for alleged conflict of interest and acceptance of gratuities from a subcontractor involved in contract work for the NRC. The OIG investigation disclosed evidence that the subcontractor paid for meal and entertainment expenses for the employee. The NRC employee had provided input that contributed to the award of the contract to the firm in question. Additionally, the agency employee developed an apparent financial interest with the subcontractor during the time the contract work was being performed at the NRC. The Department of Justice declined prosection in the matter and the individual subsequently resigned.

Misuse of NRC Diners Club Credit Card. This OIG investigation was initiated to determine whether an NRC employee improperly used an official Diners Club credit card to pay for expenses unrelated to official Government travel. The ensuing OIG investigation concluded that the NRC employee amassed more than $23,000 in unauthorized expenses on the Diners Club card. The OIG determined that over a 5-month period, the NRC employee allowed a family member to use the card for living and traveling expenses associated with a business venture. The Department of Justice declined prosecution in favor of administrative action by the NRC. The individual was suspended for 14 days without pay.

Travel Fraud by an Agreement State Employee. The OIG received information that an agreement state employee had submitted questionable travel vouchers and receipts while on assignment to the NRC. The OIG investigation developed substantial evidence that an Iowa Department of Public Health employee submitted fraudulent travel vouchers containing seven false claims for lodging expenses. The OIG determined that the lodging establishments for which the employee claimed expenses did not exist. Civil action under the Program Fraud Civil Remedies Act was initiated and the individual paid $4,000 to the Government.

Allegations Regarding NRC Avoidance of Regulatory Responsibility. The OIG received allegations from a utility engineer that the NRC did not adequately address safety equipment failures connected with the operation of nuclear reactors. The equipment, a pressure-monitoring device known as a Rosemount Transmitter, is generic to dozens of nuclear power plants. Among the allegations, the engineer maintained that through a series of delaying actions, the NRC:

- desired to minimize a regulatory burden on the nuclear power industry
- used selective enforcement of regulations in addressing the failed equipment
- demonstrated a reluctance to assume a tough regulatory stance on the issue.

The OIG identified substantial delays by the NRC in addressing the failures of Rosemount Transmitters. However, none of the delays were attributed to a desire to minimize a regulatory burden on the nuclear industry. It was determined that the time taken to implement a new NRC procedure for issuing generic communications contributed to the perception of intentional delay and an unwillingness by the NRC to aggressively regulate the problem.

NRC Fails To Protect the Identities of Tennessee Valley Authority Allegers. This investigation was conducted as a result of complaints received by the OIG from employees of the Tennessee Valley Authority (TVA). The OIG investigation disclosed that the complainants had brought safety concerns to the NRC because they feared retaliation if they reported their concerns directly to TVA. NRC granted the complainants confidentiality, but the NRC subsequently disclosed their names to TVA's OIG without the consent of the complainants. OIG learned that the disclosures were the result of a Memorandum of Understanding (MOU) between TVA's OIG and the NRC. Subsequently, the NRC rescinded its MOU with TVA's OIG.

Theft of $135,000 Through the NRC Payroll System. OIG conducted an investigation into the theft of money through the NRC payroll system. OIG determined that two NRC employees abused the payroll system by fraudulently receiving overtime payments in excess of $135,000. This theft was accomplished by adding hours to timecards after they were signed by a manager or by forging the signature of an overtime certifying and approving official. This matter was referred to the U.S. Attorney's Office for the District of Maryland for prosecution consideration.

At the request of the NRC Chairman, OIG conducted a separate review to provide the Commission with an understanding as to why managers failed to detect the time and attendance (T&A) fraud. OIG found that the present T&A system contains a number of measures to ensure that the system is not abused or manipulated. However, some NRC managers were unaware of the security measures, whereas others did not fully understand their responsibilities with respect to recording and verifying employee T&A.

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 1994:

- It was estimated that $80,000,000 in total prime contracts would be awarded during fiscal year 1994. The actual total for prime contract awards was $87,977,000.

- It was estimated that small business prime awards would be $39,000,000, or 48.75 percent of the total estimate. The actual achievement for small business prime awards was $40,538,000, or 46.08 percent of the actual dollar awards, reflected in the previous item.

- The NRC estimated that awards to "8(a) firms" would be $18,000,000, or 22.50 percent, in fiscal year 1994. Awards to "8(a) firms" were actually $23,385,000, or 26.58 percent of the actual dollar awards of all prime contracts, regardless of dollar value.

- The goal for prime contract awards to small disadvantaged business firms other than "8(a) firms" was $1,250,000, or 1.56 percent. The actual achievement was $549,000, or 0.62 percent of the dollars reported in the first item, above.

- The estimate for prime contract awards to small business concerns owned and operated by women was $3,700,000, or 4.62 percent. Awards to such firms came to $1,866,000, or 2.12 percent of the total dollar amount of all prime contracts, regardless of dollar value.

- The NRC's total subcontract goal in fiscal year 1994 was $3,200,000. The actual subcontract dollar awards were $2,487,000.

- The goal for subcontract awards to small business was $2,275,000, or 71.09 percent. Subcontracting awards achieved by small businesses was 1,754,000, or 70.53 percent.

- The goal for subcontract awards to small disadvantaged businesses was $450,000, or 14.06 percent. Subcontracting awards to small disadvantaged businesses totaled $285,000, or 11.40 percent of total subcontract dollars awarded.

During the report period, 175 interviews were conducted with firms wanting to do business with the NRC, and 35 follow-up meetings were arranged with NRC technical personnel. The staff of the Office of Small Business and Civil Rights also participated in five major small business conferences. Most noteworthy among these were the Small Business Week, in May 1994, and the Minority Enterprise Development Week, in October 1994.

Civil Rights Program

The Commission was briefed on December 7, 1993, and August 23, 1994, concerning the NRC's EEO and Affirmative Employment Programs, goals and accomplishments. The Office of Small Business and Civil Rights (SBCR) and the Office of Personnel (OP) jointly coordinated and participated in these semi-annual briefings. Each of the seven EEO committees (Hispanic Employment Program Advisory Committee, Blacks In Government, Asian Pacific American Advisory Committee, Committee on Age Discrimination, Federal Women's Program Advisory Committee, Joint Labor Management Equal Employment Advisory Committee, and the Affirmative Action Advisory Committee) provided input for review and discussion, as part of the briefing paper. Committee chairs were also asked to highlight any concerns during the briefings.

The purpose of the August 23, 1994, briefing was to examine the impact of the National Performance Review on the agency's EEO initiatives, to report on any EEO-related problems, and to highlight accomplishments made since the last report. The report specifically highlighted recommendations that would enhance or hinder any of the following efforts: (1) to enhance opportunities for recruiting Hispanic employees in all occupations; (2) to enhance opportunities for recruiting women and minorities in professional occupations; (3) to expand the pool of women and minorities eligible for supervisory, management, and executive positions; (4) to enhance opportunities for attracting, developing, and retaining disabled employees; (5) to provide a dynamic training and developmental program, including rotational opportunities, to enhance job performance and support affirmative action; and (6) to improve communication about EEO and affirmative action objectives, heightening awareness, and evaluating progress. The report also reflected workforce demographics for permanent employees for the first half of fiscal year 1994 (October 1, 1993, through March 31, 1994).

SBCR also took this opportunity to show appreciation to the agency's EEO Counselors for the outstanding job they perform in the EEO process. Twenty-eight counselors were presented award plaques by the Chairman and the EDO, with a reception for the awardees and their guests, following the EEO briefing.

The annual accomplishment report for the NRC's Multiyear Affirmative Action Program was signed by the Chairman and submitted to the Equal Employment Opportunity Commission (EEOC) on February 14, 1994. The agency has three main Affirmative Action Objectives: (1) to increase the number of women and minorities in professional occupations at the NRC, (2) to increase the number of Hispanic employees in all occupations, and (3) to increase representation of women and minorities in NRC supervisory, management, and executive positions. In response to the report, EEOC noted that progress had been made in the first of these objectives: both the numbers and the representation increased. It was affirmed, however, the NRC should develop plans to eliminate all under-representation, with a primary focus on the representation of Hispanics in all categories and of women in the Professional category. The NRC should also develop an Affirmative Employment Program which will ensure distribution of women and minorities throughout all grade levels comparable to the Census Availability Data (CAD). And the NRC needs to increase representation of women and minorities in supervisory, managerial, and executive positions.

The agency published a new policy statement, on April 15, 1994, on a Discrimination-Free Workplace, as mandated by Section 629 of the Treasury, Postal Service, and General Government Appropriations Act for fiscal year 1994 (Public Law 103–123). The policy was required to be in place by July 1, 1994, and it ensures that all of the agency's workplaces are free from discrimination and sexual harassment and not in violation of Title VII of the Civil Rights Act of 1964, as amended, the Age Discrimination in Employment Act of 1967, and the Rehabilitation Act of 1973.

A three-day advanced training course for headquarters and regional EEO Counselors was sponsored by SBCR at Hunt Valley, Maryland, in July 1994. In addition to training conducted by the Delaney, Seigel and Zorn firm, there were presentations by staff members from the NRC's SBCR, the Office of Personnel, and the Office of the General Counsel. The training encompassed a review of the EEO Counselor's duties and responsibilities under 29 CFR 1614 and EEO Management Directive 10.161, recent developments in Federal sector EEO complaint processing, exercises in using listening and communication skills for counseling, an introduction to conflict resolution, and managing diversity issues in conflict resolution.

During fiscal year 1994, the agency's EEO counselors made 140 contacts for the purpose of counseling agency employees. Formal complaints ensued in only nine, or 6 percent, of these cases; this result speaks well for the effectiveness of the counseling process and for the cooperation which exists between managers, supervisors, and counselors, and the complainants.

Affirmative Action and Federal Women's Program

The Office of Small Business and Civil Rights, in conjunction with the various special emphasis groups, celebrated several outstanding programs during the year to commemorate contributions made by the various groups to the American way of life.

The annual Black History Month Program observance was held on February 3, 1994, in the Commissioners' Hearing Room, sponsored by SBCR in conjunction with Blacks In Government. The theme for the celebration was "Empowering African American Organizations: Present and Future." The guest speaker was Dr. Kenneth Olden, Director, National Institute of Environmental Health Sciences, National Institutes of Health. Dr. Olden, the first African-American to become director of one of the National Institutes of Health, shared stories of his impoverished upbringing during the pre-civil rights era. He impressed upon the audience that those kinds of experiences can help build character, compassion, and values. Dr. John T. Larkins, Executive Director for the Advisory Committee on Reactor Safeguards, was the recipient of the Annual SBCR Civil Rights Award for his achievement in promoting minority upward mobility and intern recruitment at the NRC. A reception for all employees followed the program.

The celebration of Black History Month was continued with the annual NRC Black History Month luncheon held on February 15, 1994, at the National Naval Medical Center Enlisted and Chief Petty Officers' Mess. The guest speaker, Joseph Bundy, gave a Chautauqua Portrayal of James Weldon Johnson, the author of "Lift Every Voice and Sing," also referred to as "The Negro National Anthem." There was a record number of 154 attendees, of diverse ethnic backgrounds, at the luncheon. In addition to a masterful performance by Mr. Bundy, the audience was entertained by the BIG Choir.

The agency commemorated National Women's History Month in March 1994 with an agency-wide program. This celebration was in recognition that women from generations past have taken bold actions and made courageous choices that changed the course of their own lives, and sometimes the life of the nation as well. The theme for the month was: "In Every Generation, Action Frees Our Dreams." The guest speaker was Brigadier General Clara L. Adams-Ender, who has herself been an action-oriented trail-blazer in her military career. The program was well attended by a diverse population of NRC employees and was followed by a reception for all employees. Two NRC employees were honored at this event with the Annual Federal Women's Program Award for their outstanding support for programs that affect women of the NRC. The award recipients were: Robert M. Bernero, Director, NMSS; and Espanola "Nola" Hughes, Computer Assistant, ASLBP. During this month and throughout the year, the regional Federal Women's Program representatives, as well as the headquarters Federal Women's Program Advisory Committee, sponsored numerous "lunch-time seminars" on career opportunities and other issues of concern to women as well as to men.

SBCR, in conjunction with The Office of Public Affairs and the Federal Women's Program Advisory Committee, sponsored the first Headquarters "Take Your Sons and Daughters To Work Day," on April 28, 1994. The sons and daughters of NRC Headquarters employees had a chance to learn more about the agency where their parents work—and what future careers they might themselves find at the NRC. Approximately 180 students attended the program, which included talks by some key headquarters staff members, and a tour of the new Two White Flint North facility. The students were captivated by a magic show presentation by Roger Lindsay of the Office of Administration. The students who attended all received information packets that included brochures about the NRC career opportunities, as well as pamphlets on "Your Winning Attitude at Work," "What Everyone Should Know About Career Planning," and "What You Should Know About Getting A Job."

The Asian/Pacific American Heritage Month celebration was observed on May 25, 1994, in the Commissioners' Hearing Room, sponsored by SBCR in conjunction with the Asian/Pacific American Advisory Committee. The program featured Dr. Nguyen X. Vinh, Professor of Aerospace Engineering, University of Michigan, and U.S. Congresswoman Constance Morella, as guest speakers. The theme for the month, "Dedication, Dignity, and Distinction," was beautifully portrayed with a life-sized display in the White Flint lobby. The display featured photos of the guest speakers; two senior NRC employees of Asian/Pacific American Heritage: Lawrence Shao of the Office of Nuclear Regulatory Research, and Ashok Thadani of the Office of Nuclear Reactor Regulation, who were honored by the State Department for their achievements; and the names of over 100 NRC employees of Asian/Pacific American heritage. Mr. Amarendranath Datta of the Office of Nuclear Materials Safety and Safeguards, was the recipient of the Annual Asian/Pacific American Advisory Committee EEO award for his outstanding contributions to the Civil Rights Program. The program was followed by a reception for all employees.

With the Asian/Pacific American Heritage Display in the One White Flint North lobby are SES members Lawrence Shao of the Office of Nuclear Regulatory Research, left, and Ashok Thadani of the Office of Nuclear Reactor Regulation.

SBCR sponsored EEO training for all EEO Advisory Committee chairpersons and vice-chairpersons, and for all Federal Women's Program (FWP) Coordinators in Headquarters and the Regions, on July 14, 1994, and July 15, 1994, respectively. The training was conducted by Ms. Delores Burton, a private consultant. The purpose of this training was to provide members of the EEO Advisory Committees and the Federal Women's Program Coordinators with additional skills needed in carrying out their advisory roles with respect to EEO policy, procedures, and initiatives. Training for EEO Advisory chairs and vice-chairs focused on the Role and Responsibilities of EEO members, Identification of Barriers, Program Planning, Communication, Systemic Problem Identification and Analyses, and Data Analysis. Training for FWP Coordinators focused on the Role and Responsibilities of FWP Coordinators, Workforce Analysis, FWP Issues, Program Planning, and Preventing Sexual Harassment. This training will be provided periodically to accommodate the needs of new members.

The Federally Employed Women's (FEW) 15th National Training Conference was held in Washington, D.C., on July 18–22, 1994. Because of the proximity of the venue this year, offices were strongly encouraged to support employee participation in the conference. As a result, approximately 40 NRC employees, including regional staff, attended. This year's theme was: "Making Monumental Strides to the Top." The training covered a wide spectrum of subjects including personnel, EEO, Career Development, Management and Leadership, and Personal Growth. Many exhibits were featured from Federal agencies, private industry, educational institutions, non-profit organizations, small business vendors, and FEW Chapters. Child care services were also provided. This training conference was outstanding and provided employees the opportunity to gain additional skills to immediately take back to their offices to share and use.

Women's Equality Day was observed on August 26, 1994, with a poster exhibit honoring women in the 103rd Congress. The theme for this celebration was eloquently captured with the following quote by Barbara Williams, the NRC Affirmative Action and Federal Women's Program Manager: "One Vision and One Vote Can Make A Difference." It was noted, consistent with the year's theme, that the number of women is increasing in board rooms, as presidents and senior vice presidents of corporations; as partners in major law firms; as senior executive members and senior staff in Federal, State and local governments; and as members of Congress discussing and overseeing major national and international policy issues. Women have made a very important, significant, and qualitative difference in the workplace.

In conjunction with the Hispanic Employment Program Advisory Committee, SBCR sponsored the Annual Hispanic Heritage Observance on September 29, 1994, in the Commissioners' Hearing Room. The guest speaker was Dr. Frank de Varona, Regional Superintendent, Dade County Public Schools, Miami, Florida. Dr. de Varona was born in Camaguey, Cuba, and is a noted consultant in the field of Hispanic history and is the author of a book titled "Hispanic Presence in the United States." Mr. Victor Benaroya, who recently retired from the Office of Analysis and Evaluation of Operational Data, was the recipient of the Hispanic Employee Recognition Award. The program was well attended and was followed by a reception for all employees.

SBCR sponsored a poster exhibit in support of National Disability Awareness Month, during the month of October 1994. The exhibit featured NRC employees who are physically challenged and their staff contributions, NRC accommodations, the National Disability Awareness poster, and a representation of the disabled in sports. This exhibit was displayed in the lobbies of White Flint One and Two.

In recognition of Native American Heritage Month during November 1994, SBCR sponsored a poster exhibit and video presentation. This year's theme, "Native Americans: The History of a People," was depicted in the poster exhibit that featured a historical perspective of Native Americans throughout all the regions of the United States, Native Americans at the NRC, and a summary statement of Native Americans today. The video was shown for four consecutive Wednesdays during the month of November 1994 on TV monitors throughout NRC Headquarters.

SBCR coordinated "Town Meetings" with all Headquarters and Regional Offices. Staff from the Office of Personnel and the Office of the General Counsel also participated in these meetings. The meetings were scheduled for the purpose of providing information on and reviewing the agency's EEO program, including lessons learned from processed EEO complaints, and of highlighting the impact of downsizing on the EEO program, especially addressing the concerns of managers and supervisors with respect to their role in support of the EEO program. Several "brown-bag" sessions were also coordinated with employees to obtain their insight and perceptions of EEO initiatives and accomplishments. Employee issues were shared with the management staff to facilitate open dialogue and enhance communication that would yield "win-win" solutions for managers and employees. Follow-up action and communications are ongoing.

The Nuclear Regulatory Commission continues its commitment to the goal of increased opportunities for women in the '90's and beyond. Emphasis will continue to be placed on enhancing representation of women, especially minority women, in the feeder populations at the GG-14/15 grade levels. During fiscal year 1994, women in the NRC achieved several career gains. There are currently a total of 32 Senior Level System (SLS) positions, of which seven are held by women. Women in the Senior Executive Service (SES) increased by two (one pending final OPM approval, and one notably selected as an Office Director), for a total of 14. Twelve of the first 27 graduates of the NRC Supervisory Development Program were women; five of the 23 participants in the Senior Executive Service Candidate Development Program were women; 18 of the 19 participants in the Administrative Skills Enhancement Program are women; all 23 participants in the Certified Professional Secretaries Program are women; and all 11 participants of the Computer Science Program are women.

Appendix 1

NRC Organization

(As of December 31, 1994)

COMMISSIONERS

Ivan Selin, Chairman
Kenneth C. Rogers
E. Gail de Planque

The Commission Staff

Office of Commission Appellate Adjudication, Stephen G. Burns, Director
Office of Congressional Affairs, Dennis K. Rathbun, Director
General Counsel, Karen D. Cyr
Office of the Inspector General, David C. Williams, Inspector General
Office of International Programs, Carlton R. Stoiber, Director
Office of Public Affairs, William M. Beecher, Director
Secretary of the Commission, Samuel J. Chilk

Other Offices

Advisory Committee on Nuclear Waste, Dr. Martin J. Steindler, 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, Robert M. Bernero, Director
Office of Nuclear Reactor Regulation, William T. Russell, Director
Office of Nuclear Regulatory Research, Eric S. Beckjord, 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, Ben B. Hayes, Director
Office of Personnel, Paul E. Bird, Director
Office of Policy Planning, Richard H. Vollmer, Director
Office of Small Business and Civil Rights,Vandy L. Miller, Acting 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., John B. Martin, 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 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 Consolidation was created to oversee realization of the agency's long-term objective of consolidating all of the NRC's Headquarters operations at a single location; consolidation will be completed by the end of fiscal year 1994, at which time the Office will be merged with the Office of Administration.

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 Policy Planning serves as the principal advisor to the Executive Director for Operations (EDO) and the Commission for policy planning in support of the NRC mission. The office provides the lead in the agency's Strategic Planning Process. The Director, who serves as Chair of the Steering Committee for Strategic Planning, is responsible for developing and examining long-range policy issues relevant to NRC programs. The office assesses policy issues, operational environments, and alternatives, to provide recommendations to the EDO and the Commission.

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 Advisory Panel for the Decontamination of Three Mile Island Unit 2, established in October 1980, provides the NRC with views and perspectives of residents of the Three Mile Island area near Harrisburg, Pa., and affords State officials the opportunity to participate in the Commission's decision-making process regarding the cleanup of the damaged nuclear facility. The panel consists of representatives of agencies of the Commonwealth of Pennsylvania, of local government, of the scientific community, and persons having their principal place of residence in the vicinity of the Three Mile Island nuclear power plant. The panel held its last meeting during fiscal year 1993 and has been disbanded.

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

NRC Licensing Board Panel and NRC Advisory Groups

Atomic Safety and Licensing Board Panel

Full-time Panel Members:

CHIEF ADMINISTRATIVE JUDGE B. PAUL COTTER, JR., Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

DEPUTY CHIEF ADMINISTRATIVE JUDGE (TECHNICAL) FREDERICK J. SHON, Engineer, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE CHARLES BECHHOEFER, Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE PETER B. BLOCH, Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE G. PAUL BOLLWERK, III, Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE RICHARD F. COLE, Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE JAMES P. GLEASON, Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE CHARLES N. KELBER, Physicist, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE JERRY R. KLINE, Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE PETER S. LAM, Nuclear Engineer, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE MORTON B. MARGULIES, Chief Administrative Law Judge, U.S. Nuclear Regulatory Commission, Bethesda Md.

JUDGE THOMAS S. MOORE, Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE THOMAS D. MURPHY, Health Physicist, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JUDGE IVAN W. SMITH, Legal, U.S. Nuclear Regulatory Commission, Bethesda, Md.

Part-time Panel Members:

JUDGE GEORGE C. ANDERSON, Marine Biologist (retired), University of Washington, Seattle, Wash.

JUDGE GLENN O. BRIGHT, Engineer (retired), U.S. Nuclear Regulatory Commission, Norman, Okla.

JUDGE A. DIXON CALLIHAN, Physicist (retired), Union Carbide Corporation, Davidson, N.C.

JUDGE JAMES H. CARPENTER, Environmental Scientist (retired), U.S. Nuclear Regulatory Commission, Sunset Beach, N.C.

JUDGE THOMAS S. ELLEMAN, Nuclear Engineer, North Carolina State University, Raleigh, N.C.

JUDGE GEORGE A. FERGUSON, Nuclear Physicist (retired), Howard University, Shady Side, Md.

JUDGE HARRY FOREMAN, Medical Doctor (retired), University of Minnesota, St. Paul, Minn.

JUDGE RICHARD F. FOSTER, Environmental Scientist, Sunriver, Ore.

JUDGE DAVID L. HETRICK, Nuclear Engineer, University of Arizona, Tucson, Ariz.

JUDGE ERNEST E. HILL, Nuclear Engineer, Hill Associates, Danville, Cal.

JUDGE FRANK F. HOOPER, Marine Biologist (retired), University of Michigan, Ann Arbor, Mich.

JUDGE ELIZABETH B. JOHNSON, Nuclear Engineer, Oak Ridge National Laboratory, Oak Ridge, Tenn.

JUDGE WALTER H. JORDAN, Physicist (retired), Oak Ridge National Laboratory, Oak Ridge, Tenn.

JUDGE JAMES C. LAMB, III, Environmental Engineer, George Washington University, Charlottesville, Va.

JUDGE EMMETH A. LUEBKE, Physicist (retired), U.S. Nuclear Regulatory Commission, Chevy Chase, Md.

JUDGE KENNETH A. McCOLLOM, Electrical Engineer (retired), Oklahoma State University, Stillwater, Okla.

JUDGE MARSHALL E. MILLER, Legal (retired), U.S. Nuclear Regulatory Commission, Daytona Beach, Fla.

JUDGE PETER A. MORRIS, Physicist (retired), U.S. Nuclear Regulatory Commission, Potomac, Md.

JUDGE RICHARD R. PARIZEK, Geologist, Pennsylvania State University, University Park, Pa.

JUDGE HARRY REIN, Medical Doctor, Longwood, Fla.

JUDGE LESTER S. RUBENSTEIN, Nuclear Engineer (retired), U.S. Nuclear Regulatory Commission, Oro Valley, Ariz.

JUDGE DAVID R. SCHINK, Oceanographer, Texas A&M University, College Station, Tex.

JUDGE GEORGE F. TIDEY, Medical Doctor, University of Texas, Houston, Tex.

JUDGE SHELDON J. WOLFE, Legal (retired), U.S. Nuclear Regulatory Commission, McLean, Va.

Professional Staff:

LEE S. DEWEY, Chief Counsel and Director, Technical and Legal Support Staff, U.S. Nuclear Regulatory Commission, Bethesda, Md.

JACK G. WHETSTINE, Director, Program Support and Analysis Staff, U.S. Nuclear Regulatory Commission, Bethesda, Md.

Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards is a statutory committee established to advise the Commission on the safety aspects of proposed and existing nuclear facilities and the adequacy of proposed reactor safety standards, and to perform such other duties as the Commission may request.

As of January 1995, the members were:

CHAIRMAN: DR. THOMAS S. KRESS, retired Head of Applied Systems Technology Section, Oak Ridge National Laboratory, Oak Ridge, Tenn.

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, Ariz.

MR. JAMES C. CARROLL, retired Manager, Nuclear Operations Support Department, Pacific Gas & Electric, San Francisco, Cal.

DR. IVAN CATTON, Professor of Engineering, Department of Mechanical, Aerospace and Nuclear Engineering, School of Engineering and Applied Science, University of California, Los Angeles, Cal.

MR. WILLIAM J. LINDBLAD, retired President Portland General Electric, Portland, Oreg.

MR. CARLYLE MICHELSON, retired Principal Nuclear Engineer, Tennessee Valley Authority, Knoxville, Tenn., and retired Director, Office for Analysis and Evaluation of Operational Data, U.S. Nuclear Regulatory Commission, Washington, D.C.

DR. DANA A. POWERS, Manager Nuclear Facilities Safety Department, Sandia National Laboratories, Albuquerque, New Mex.

DR. WILLIAM J. SHACK, Associate Director, Energy Technology Division, Argonne National Laboratory, Argonne, Ill.

MR. CHARLES J. WYLIE, retired Chief Engineer, Electrical Division, Duke Power Company, Charlotte, N.C.

Advisory Committee on Nuclear Waste

The Advisory Committee on Nuclear Waste reports to and advises the Nuclear Regulatory Commission 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 will undertake other studies and activities related to those issues as directed by the Commission.

As of January 1995, the members were:

CHAIRMAN: DR. MARTIN J. STEINDLER, Senior Chemist/Senior Technical Advisor, Chemical Technology Division, Argonne National Laboratory, Argonne, Ill.

VICE-CHAIRMAN: DR. PAUL W. POMEROY, President, Rondout Associates, Incorporated, Stone Ridge, N.Y.

DR. B. JOHN GARRICK: President, PLG, Inc., Newport Beach, Calif.

DR. WILLIAM J. HINZE, Professor, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Ind.

Other NRC Advisory Groups

Advisory Committee on Medical Uses of Isotopes

The Advisory Committee on Medical Uses of Isotopes (ACMUI) was established in July 1958. The ACMUI, composed of qualified physicians and scientists, considers medical questions referred to it by NRC staff and gives expert opinions on the medical uses of radioisotopes. The ACMUI also advises NRC staff on matters of policy. Members serve two-year terms and are employed under yearly personal services contracts. Members may serve a maximum of three terms. As of July 1, 1994, the appointed members were:

DR. DANIEL S. BERMAN, Cedar Sinai Medical Center, Los Angeles, Cal.

JUDITH I. BROWN, Patient Rights and Care Advocate, Washington, D.C.

DR. DANIEL F. FLYNN, Holy Family Hospital and Medical Center, Methuen, Mass.

JOHN GRAHAM, Hospital Administrator, St. Mary Hospital, Livonia, Mich.

DR. A. ERIC JONES, U.S. Food and Drug Administration, Rockville, Md.

DR. WIL B. NELP, University of Washington, University Hospital, Seattle, Wash.

MR. ROBERT M. QUILLIN, Agreement States Program, State of Colorado, Denver, Colo.

DR. BARRY A. SIEGEL, Nuclear Medicine Physician, Mallinckrodt Institute of Radiology, St. Louis, Mo.

DR. JUDITH ANNE STITT, University of Wisconsin Hospital, Department of Human Oncology, Madison, Wis.

MR. DENNIS P. SWANSON, University of Pittsburgh School of Pharmacy, Pittsburgh, Pa.

LOUIS K. WAGNER, Ph.D., Medical Physicist-Nuclear Medicine, University of Texas Medical School, Houston, Tex.

Licensing Support System Advisory Review Panel

(Membership as of December 1993.)

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. The panel consists of representatives of the NRC, DOE, the State of Nevada, the local government of Nye County (Nev.), the National Congress of American Indians, a coalition of nuclear industry organizations, and other Federal agencies with experience with large electronic document management systems.

CHAIRMAN: JOHN C. HOYLE, U.S. Nuclear Regulatory Commission.

BOYD ALEXANDER, U.S. Patent and Trademarks Office.

KIRK BALCOM, State of Nevada.

MIKE BAUGHMAN, Las Vegas, Nev.

DENNIS BECHTEL, Clark County, Nev.

STEVE BRADHURST, Nye County, Nev.

LES BRADSHAW, Nye County, Nev.

WAYNE CAMERON, White Pine County, Nev.

BARBARA CERNY, U.S. Department of Energy.

DAVID COPENHAFER, U.S. Securities and Exchange Commission.

EVE CULVERWELL, Lincoln City, Nev.

PETER CUMMINGS, Las Vegas, Nev.

BILL ELQUIST, Lander County, Nev.

ARLO FUNK, Mineral County, Nev.

PETE GOICOECHEA, Eureka County, Nev.

DANIEL GRASER, U.S. Department of Energy.

CHRISTOPHER HENKEL, Edison Electric Institute.

JUANITA HOFFMAN, Esmeralda County, Nev.

ROBERT HOLDEN, National Congress of American Indians.

ELGIE HOLSTEIN, Nye County, Nev.

FELIX KILLAR, U.S. Council for Energy Awareness.

STEVEN KRAFT, Edison Electric Institute.

JOHN LAMPROS, White Pine County, Nev.

ANTHONY LESSARD, Mineral County, Nev.

CORINNE MACALUSO, U.S. Department of Energy.

LORETTA METOXEN, National Congress of American Indians.

BRAD METTAM, Inyo County, Cal.

MALACHY MURPHY, Nye County, Nev.

JASON PITTS, Lincoln County, Nev.

JAMES REGAN, Churchill County, Nev.

JAY SILBERG, Shaw, Pittman, Potts & Trowbridge.

LENARD SMITH, Lincoln County, Nev.

HARRY SWAINSTON, State of Nevada.

Nuclear Safety Research Review Committee
(Membership as of December 31, 1993.)

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.

CHAIRMAN: DR. DAVID L. MORRISON, Technical Director, Energy, Resource and Environmental Systems Division, MITRE Corporation, McLean, Va.

DR. E. THOMAS BOULETTE, Sr. Vice President, Nuclear Operations, and Station Director, Pilgrim Station, Boston Edison Co., Plymouth, Mass.

MR. SOL BURSTEIN, retired Vice President and Director of Wisconsin Energy Corp.; Vice Chairman of the Board and Director of Wisconsin Electric Co. and Wisconsin Natural Gas Co., Milwaukee, Wis.

DR. SPENCER H. BUSH, Review & Synthesis Associates, Richland, Wash.

DR. ROBERT D. HATCHER, JR., Professor, Department of Geological Sciences, University of Tennessee, and Distinguished Scientist, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.

DR. HERBERT S. ISBIN, Professor Emeritus, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minn.

MR. EDWIN E. KINTNER, retired Executive Vice President of GPU Nuclear Corp., Parsippany, N.J.

DR. FRED J. MOLZ III, Huff Professor of Civil Engineering, Auburn University, Auburn, Ala.

DR. NEIL E. TODREAS, Professor and Head, Department of Nuclear Engineering, Massachusetts Institute of Technology, Cambridge, Mass.

DR. ROBERT E. UHRIG, Distinguished Professor of Engineering, Nuclear Engineering Department, University of Tennessee, Knoxville, Tenn., Distinguished Scientist, Instrumentation and Control Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.

DR. RICHARD C. VOGEL, retired Senior Scientific Advisor, Electric Power Research Institute, Palo Alto, Cal.

Appendix 3

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 the 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
  12 East McDowell Road
  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

- Ms. Margaret J. Nystrom
  Documents Librarian
  Humboldt County Library
  636 F 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

- Mr. 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. 32629
  Crystal River nuclear plant

- Ms. Peggy Peterson, 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. Marie Liang
  Paducah Public Library
  555 Washington Street
  Paducah, Ky. 42003
  Paducah Gaseous Diffusion Plant

LOUISIANA

- Mrs. Smittie Bolner
  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. Sue Cereste, Assistant Librarian
  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

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

- Ms. Susan Jarvis
James R. Dickinson Library
University of Nevada-Las Vegas
4505 Maryland Parkway
Las Vegas, Nev. 89154
Yucca Mountain high-level waste geologic repository site

- Ms. Janita Jobe
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. Ida Mangifesta
Pennsville Public Library
190 S. Broadway
Pennsville, N.J. 08070
Hope Creek nuclear plant

- Ms. Elizabeth C. Fogg, Director
Salem Free Public Library
112 West Broadway
Salem, N.J. 08079
Salem nuclear plant

- Ms. Ellen Parker
Reference Librarian
Reference Department
Ocean County Library
101 Washington Street
Toms River, N.J. 08753
Oyster Creek nuclear plant

NEW YORK

- Mr. Alexander Beattie
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

- Mr. Charles T. Cook
  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
  220 N. Fifth Street
  Hartsville, S.C. 29550
  H.B. Robinson nuclear plant
  Robinson independent spent fuel storage

- Mrs. Mary Mallancy
  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 Maroncy, Head
  Business, Science and Technology Dept.
  Chattanooga-Hamilton County Library
  1001 Broad Street
  Chattanooga, Tenn. 37402
  Sequoyah nuclear plant
  Watts Bar nuclear plant
  TVA Sequoyah low-level waste storage

TEXAS

- Mrs. Terry Wang
  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. Judy McMakin
  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. Nancy Steinhoff
  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 4

Regulations and Amendments—Fiscal Year 1994

REGULATIONS AND AMENDMENTS PUT INTO EFFECT—FY 1994

List of Approved Spent Fuel Storage Casks; Additions—Part 72

On October 5, 1993 (58 FR 51762), the NRC published an amendment to its regulations to add a spent fuel storage cask (TN-24) to its list of approved casks. This amendment, effective November 4, 1993, allows holders of power reactor operating licenses to store spent fuel in the approved cask under a general license.

Whistleblower Protection for Employees of NRC-Licensed Activities—Parts 19, 30, 40, 50, 60, 61, 70, 72, and 150

On October 8, 1993 (58 FR 52406), the NRC published an amendment to its regulations regarding the protection of employees who provide information to the NRC or to their employers concerning safety issues. This amendment, effective November 8, 1993, conforms NRC regulations to the new nuclear whistleblower protection provisions of the Energy Policy Act of 1992, which was enacted on October 24, 1992.

Export and Import of Nuclear Equipment and Material; Export of High-Enriched Uranium—Part 110

On October 28, 1993 (58 FR 57962), the NRC published an amendment to its regulations pertaining to the export and import of nuclear equipment and material to implement Section 903 of the Energy Policy Act of 1992. This amendment, effective November 29, 1993, augments NRC's regulations to include the criteria for the export of highly enriched uranium specified in the Energy Policy Act.

NRC Region III Telephone Number and Address Change—Parts 1, 20, 30, 40, 70, and 73

On December 6, 1993 (58 FR 64110), the NRC published an amendment to its regulations to change the address and telephone numbers of the NRC Region III office. This amendment, effective December 13, 1993, is necessary to inform the public of administrative changes to the NRC's regulations.

Standards for Protection Against Radiation; Removal of Expired Material—Parts 2, 19, 20, 30, 31, 32, 34, 35, 36, 39, 40, 50, 61, 70, and 72

On December 22, 1993 (58 FR 67657), the NRC published an amendment to its regulations, effective January 1, 1994, to remove the text of superseded standards and to conform references in the text of the NRC's regulations to the Commission's decision to require mandatory implementation of the revised standards on January 1, 1994.

Self-Guarantee as an Additional Financial Assurance Mechanism—Parts 30, 40, 50, 70, and 72

On December 29, 1993 (58 FR 68726), the NRC published an amendment to its regulations for decommissioning licensed facilities to allow certain non-electric utility licensees to use self-guarantee as a means of financial assurance. This amendment, effective January 28, 1994, also grants a petition for rulemaking from General Electric Company and Westinghouse Electric Corporation (PRM-30-59).

Standards for Protection Against Radiation; NRC Operations Center Telephone Number—Part 20

On December 30, 1993 (58 FR 69219), the NRC published an amendment to its regulations to include the telephone number for the NRC Operations Center. This amendment, effective immediately, is necessary to correct the inadvertent omission of this telephone number when the revised standards were issued.

Combined Licenses; Conforming Amendments; Response to Post-Promulgation Comment—Part 52

On December 30, 1993 (58 FR 69220), the NRC published an amendment to address the one comment received after issuance of the final rule (December 23, 1992; 57 FR 60975) that amended the regulations concerning combined licenses to incorporate changes required by licensing reform legislation. The final rule became effective on January 22, 1993. Comments were due on February 22, 1993.

Modifications to Fitness-for-Duty Program Requirements—Part 26

On January 5, 1994 (59 FR 502), the NRC published an amendment to its regulations governing fitness-for-duty programs applicable to licensees who are authorized to construct or operate nuclear power reactors and to licensees authorized to possess, use, or transport formula quantities of strategic special nuclear material. This amendment, effective January 1, 1994, permits licensees to reduce the random testing rate for all persons covered by the fitness-for-duty regulations to an annual rate equal to 50 percent.

Fingerprint Cards: Change in User Fee—Part 73

On January 6, 1994 (59 FR 661), the NRC published an amendment to its regulations to reflect an administrative change in the procedure for notifying licensees of changes in the user fee charged by the Federal Bureau of Investigation (FBI) for processing fingerprint cards. This amendment, effective February 7, 1994, also informs licensees of the new user fee adopted by the FBI effective January 3, 1994.

Minor Clarifying Amendments—Parts 1, 21, 30, 32, and 50

On February 7, 1994 (59 FR 5519), the NRC published an amendment to its regulations, effective immediately, to correct a number of minor typographical errors in the NRC's regulations.

Renewal of Licenses and Requalification Requirements for Licensed Operators—Part 55

On February 9, 1994 (59 FR 5934), the NRC published an amendment to its regulations, effective March 11, 1994, to delete the requirement that each licensed operator at power, test, and research reactors pass a comprehensive requalification written examination and an operating test conducted by the NRC during the term of the operator's six-year license as a prerequisite for license renewal.

Notification of Spent Fuel Management and Funding Plans by Licensees of Prematurely Shut Down Power Reactors—Part 50

On March 4, 1994 (59 FR 10267), the NRC published an amendment to its regulations, effective April 4, 1994, to clarify the timing of notification to the NRC of spent fuel management and funding plans by licensees of those nuclear power reactors that have been shut down before the expected end of their operating lives.

Restoration of the Generic Exemption From Annual Fees for Nonprofit Educational Institutions—Part 171

On March 17, 1994 (59 FR 12539), the NRC published an amendment to its regulations, effective April 18, 1994, to reinstate the annual fee exemption for nonprofit educational institutions.

NRC Operations Center Commercial Telephone Number Change—Parts 20, 21, 30, 35, 40, 50, 70, 72, and 73

On March 25, 1994 (59 FR 14085), the NRC published an amendment to its regulations, effective May 31, 1994, to change the NRC Operations Center commercial telephone and facsimile numbers.

Emergency Planning and Preparedness Exercise Requirements for Nuclear Power Plants—Part 50

On March 25, 1994 (59 FR 14087), the NRC published an amendment to its regulations to update the Commission's emergency planning exercise requirements for nuclear power plants and to clarify ambiguities that have risen in the implementation of the regulations. This amendment, effective June 23, 1994, also makes the

NRC's regulations consistent with Federal Emergency Management Agency regulations.

Supplemental Standards of Ethical Conduct for Employees of the Nuclear Regulatory Commission—Part 0

On April 13, 1994 (59 FR 17457), the NRC published an amendment to its regulations that supplements the Standards of Ethical Conduct for Employees of the Executive Branch issued by the Office of Government Ethics. This amendment, effective July 12, 1994, addresses outside employment by NRC employees and ownership of securities by NRC employees, their spouses, and minor children. This amendment also adds a cross-reference to the new provisions and preserves certain separable financial interest exemptions.

Consolidation of the NRC Region V Office With the Region IV Office—Parts 1, 20, 30, 40, 55, 70, and 73

On April 13, 1994 (59 FR 17464), the NRC published an amendment to its regulations, effective April 4, 1994, to inform the public of the consolidation of the NRC Region V office in Walnut Creek, California, with the NRC Region IV office in Arlington, Texas.

Equal Access to Justice Act: Implementation—Part 12

On May 5, 1994 (59 FR 23119), the NRC published an amendment to its regulations, effective June 6, 1994, to add new provisions designed to implement the Equal Access to Justice Act (EAJA).

Establishment of Revised FY 1991 and FY 1992 Annual Fee Surcharges—Part 171

On May 19, 1994 (59 FR 26097), the NRC published an amendment to its regulations, effective immediately, that establishes the revised FY 1991 and FY 1992 surcharges for NRC licensees based on the allocation method of low-level waste costs described and used in the FY 1993 final rule (July 20, 1993; 58 FR 38666).

Uranium Mill Tailings Regulations; Conforming NRC Requirements to EPA Standards—Part 40

On June 1, 1994 (59 FR 28220), the NRC published an amendment to its regulations governing the disposal of uranium mill tailings. This amendment, effective July 1, 1994, conforms existing NRC regulations to regulations published by the Environmental Protection Agency (September 30, 1983; 48 FR 45926).

Informal Hearing Procedures for Materials Licensing Adjudications—Part 2

On June 6, 1994 (59 FR 29187), the NRC published an amendment to its regulations, effective July 6, 1994, to require persons requesting a hearing in certain materials license proceedings to file their requests within 30 days of receiving actual notice of the pendency of the license application, or, if the person does not learn about the application until it has been granted, within 30 days of receiving actual notice of the grant of the application.

Combined Licenses; Conforming Amendments; Supplementary Post-Promulgation Comment Period—Part 52

On June 10, 1994 (59 FR 29965), the NRC published a notice providing a supplementary post-promulgation comment opportunity on a portion of its final rule that amended the regulations concerning combined licenses to incorporate changes required by licensing reform legislation. The final rule (December 23, 1992; 57 FR 60975) became effective on January 22, 1993.

Licensee Submittal of Data in Computer-Readable Form—Parts 40, 72, 74, 75, and 150

On July 13, 1994 (59 FR 35618), the NRC published an amendment to its regulations to require certain licensees to submit data to the NRC in computer-readable format. The final rule, effective October 11, 1994, streamlines the collection of nuclear material transaction data and increases the accuracy of the reported information.

Timeliness in Decommissioning of Materials Facilities—Parts 2, 30, 40, 70, and 72

On July 15, 1994 (59 FR 36026), the NRC published an amendment to its regulations to require timely decontamination and decommissioning by nuclear material licensees. The final rule, effective August 15, 1994, establishes specific time periods for decommissioning unused portions of operating nuclear materials facilities and for decommissioning the entire site upon termination of operations.

Revision of Fee Schedules; 100% Fee Recovery, FY 1994—Parts 170 and 171

On July 20, 1994 (59 FR 36895), the NRC published an amendment to its regulations that amends the licensing, inspection, and annual fees charged to its applicants and licensees. The final rule, effective August 19, 1994, implements Public Law 101–508, enacted November 5, 1990, which mandates that the NRC recover approximately 100 percent of its budget authority in Fiscal Year 1994, less amounts appropriated from the Nuclear Waste Fund.

Annual Physical Fitness Performance Testing for Tactical Response Team Members, Armed Response Personnel, and Guards at Category I Licensees—Part 73

On July 28, 1994 (59 FR 38347), the NRC published an amendment to its regulations, effective August 29, 1994, that requires Tactical Response Team members, armed response personnel, and guards at fuel cycle facilities possessing formula quantities of strategic special nuclear material (Category I licensees) to participate in a continuing physical fitness program and to pass an annual performance test.

Temporary Access to Safeguards Information—Part 73

On July 29, 1994 (59 FR 38553), the NRC published an amendment to its regulations, effective August 29, 1994, concerning requirements for criminal history checks of individuals granted access to safeguards information.

Protection Against Malevolent Use of Vehicles at Nuclear Power Plants—Part 73

On August 1, 1994 (59 FR 38889), the NRC published an amendment to its regulations, effective August 31, 1994, that modifies the design-basis threat for radiological sabotage to include (1) use of a land vehicle by adversaries for transporting personnel and their hand-carried equipment to the vicinity of vital areas and (2) use of a land vehicle bomb.

Standards for Protection Against Radiation; Clarification—Parts 19, 20, 35, and 40

On August 15, 1994 (59 FR 41641), the NRC published an amendment to its regulations, effective immediately, that reinstates certain requirements and provisions that were inadvertently deleted in the final rule published on December 22, 1993 (58 FR 67657).

Summary Report on the Status of Petitions for Rulemaking; Frequency—Part 2

On August 31, 1994 (59 FR 44894), the NRC published an amendment to its regulations, effective September 30, 1994, that reduces the frequency of the summary report on the status of petitions for rulemaking, which is included in the NRC Regulatory Agenda, from quarterly to semiannually.

Certification of Gaseous Diffusion Plants—Parts 19, 20, 21, 26, 51, 70, 71, 73, 74, 76, and 95

On September 23, 1994 (59 FR 48944), the NRC published an amendment to its regulations, effective October 24, 1994, that adds 10 CFR Part 76 (Certification of Gaseous Diffusion Plants) to the NRC's regulations. This new part includes the requirements for certification of uranium enrichment activities of the United States Enrichment Corporation (the corporation) in its operation of the two gaseous diffusion plants that the corporation is leasing from the U.S. Department of Energy.

Specific Licensing of Exports of Certain Alpha-Emitting Radionuclides and Byproduct Material—Part 110

On September 26, 1994 (59 FR 48994), the NRC published an amendment to its regulations, effective November 10, 1994, that conforms the export controls of the United States to international export control guidelines and a treaty obligation of the United States under the United States-Canada Agreement for Cooperation.

PROPOSED REGULATIONS AND AMENDMENTS

Annual Physical Fitness Performance Testing for Tactical Response Team Members, Armed Response Personnel, and Guards at Category I Licensees—Part 73

On October 6, 1993 (58 FR 52035), the NRC published an amendment to its regulations that would require Tactical Response Team members, armed response personnel, and guards at fuel cycle facilities possessing formula quantities of strategic special nuclear material to participate in a continuing physical fitness program and to pass an annual performance test.

Uranium Mill Tailings Regulations; Conforming NRC Requirements to EPA Standards - Part 40

On November 3, 1993 (58 FR 58657), the NRC published an amendment to its regulations that would govern the disposal of uranium mill tailings. This amendment would clarify the existing regulations by ensuring timely emplacement of the final radon barrier and by requiring appropriate verification of the radon flux through that barrier.

Protection Against Malevolent Use of Vehicles at Nuclear Power Plants—Part 73

On November 4, 1993 (58 FR 58804), the NRC published an amendment to its physical protection regulations for operating nuclear power reactors that would modify the design-basis threat for radiological sabotage to include use of a land vehicle by adversaries for transporting personnel, hand-carried equipment, and/or explosives.

Codes and Standards for Nuclear Power Plants; Subsection IWE and Subsection IWL—Part 50

On January 7, 1994 (59 FR 979), the NRC published an amendment to its regulations that would incorporate by reference the 1992 Edition with the 1992 Addenda of Subsection IWE, "Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants," and Subsection IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants," of Section XI, Division 1, of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code with specification modifications and a limitation.

Radiation Protection Requirements; Amended Definitions and Criteria - Parts 19 and 20

On February 3, 1994 (59 FR 5132), the NRC published an amendment to its regulations that would (1) delete the definition of "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; (2) revise the definition of "Occupational dose" to delete reference to the "Restricted area"; (3) revise the definition of unrestricted area to be consistent with the deletion of "Controlled area"; (4) revise the provision entitled "Instruction to Workers" to provide radiation protection training to all persons with the potential for being occupationally exposed and to restore a provision to require that whenever licensees must report exposure of individual members of the public to the NRC, then those exposed individuals are to receive copies of the report.

Certification of Gaseous Diffusion Plants—Parts 19, 20, 21, 26, 51, 70, 71, 73, 74, 76, and 95

On February 11, 1994 (59 FR 6792), the NRC published an amendment to its regulations that would add 10 CFR Part 76 (Certification of Gaseous Diffusion Plants) to the NRC's regulations. This new part would include the requirements for certification of uranium enrichment activities of the United States Enrichment Corporation (the corporation) in its operation of the two gaseous diffusion plants that the corporation is leasing from the U.S. Department of Energy.

Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations—Parts 34 and 150

On February 28, 1994 (59 FR 9429), the NRC published an amendment to its regulations that would include additional safety requirements to enhance the level of protection of radiographers and the public and would clarify the regulations so that licensees may have a better understanding of what is expected in radiographic operations.

Procedures and Criteria for On-Site Storage of Low-Level Radioactive Waste—Parts 30, 40, 50, 70, and 72

On April 22, 1994 (59 FR 19147), the NRC published an amendment to its regulations that withdrew a notice of proposed rulemaking published in the *Federal Register* on February 2, 1993 (58 FR 6730). This proposed rule would have amended the NRC's regulations for reactor, material, fuel cycle, and independent spent fuel storage licensees.

Revision of Fee Schedules; 100% Fee Recovery, FY 1994—Parts 170 and 171

On May 10, 1994 (59 FR 24065), the NRC published an amendment to its regulations that would implement Public Law 101-508, enacted November 5, 1990, which mandates that the NRC recover approximately 100 percent of its budget authority in FY 1994, less amounts appropriated from the Nuclear Waste Fund. The amount to be covered for FY 1994 is approximately $513 million.

Summary Report on the Status of Petitions for Rulemaking; Frequency—Part 2

On May 11, 1994 (59 FR 24371), the NRC published an amendment to its regulations that would reduce the frequency of the summary report on the status of petitions for rulemaking, which is included in the NRC Regulatory Agenda, from quarterly to semiannually.

List of Approved Spent Fuel Storage Casks: Addition—Part 72

On June 2, 1994 (59 FR 28496), the NRC published an amendment to its regulations that would add the Standardized NUHOMS Horizontal Modular Storage System to the List of Approved Spent Fuel Storage Casks. This amendment would allow the holders of power reactor operating licenses to store spent fuel in the approved cask under a general license.

Criteria for the Release of Patients Administered Radioactive Material—Parts 20 and 35

On June 15, 1994 (59 FR 30724), the NRC published an amendment to its regulations concerning the criteria for the release of patients administered radioactive material. The new criteria for patient release would be dose-based rather than activity-based and would be consistent with the recommendations of the International Commission on Radiological Protection.

Clarification of Decommissioning Funding Requirements—Parts 30, 40, 70, and 72

On June 22, 1994 (59 FR 32138), the NRC published an amendment to its regulations that would clarify decommissioning funding requirements to require that financial assurance must be in place during operations and must be updated when the licensee decides to cease operations and begin decommissioning.

Environmental Review for Renewal of Operating Licenses—Part 51

On July 25, 1994 (59 FR 37724), the NRC published an amendment to its regulations that would revise the definition of purpose and need for the proposed Federal action that will be used in the environmental review of applications for renewal of nuclear power plant operating licenses.

Radiological Criteria for Decommissioning—Parts 20, 30, 40, 50, 51, 70, and 72

On August 22, 1994 (59 FR 43200), the NRC published an amendment to its regulations that would apply to the decommissioning of all licensed facilities and those facilities subject to the Commission's jurisdiction. The proposed rule would provide specific radiological criteria for the decommissioning of lands and structures.

Nuclear Power Plant License Renewal; Proposed Revisions - Parts 2, 51, and 54

On September 9, 1994 (59 FR 46574), the NRC published an amendment to its regulations that would change the requirements that an applicant for renewal of a nuclear power plant operating license must meet, clarify the required information that must be submitted to the NRC for review so that the agency can determine whether those requirements have in fact been met, and change the administrative requirements that a holder of a renewed license must meet.

Frequency of Medical Examinations for Use of Respiratory Protection Equipment—Part 20

On September 16, 1994 (59 FR 47565), the NRC published an amendment to its regulations that would require determination by a physician before the initial fitting of respirators and either every 12 months thereafter or periodically at a frequency determined by a physician that the individual user is medically fit to use the respiratory protection equipment.

Technical Specifications—Part 50

On September 20, 1994 (59 FR 48180), the NRC published an amendment to its regulations that would codify criteria for determining the content of technical specifications.

ADVANCE NOTICES OF PROPOSED RULEMAKING

Rulemakings to Grant Standard Design Certification for Evolutionary Light Water Reactor Designs—Part 52

On November 3, 1993 (58 FR 58664), an advance notice of proposed rulemaking was published to invite public recommendations on issues pertaining to the form and content of rules that will certify evolutionary light water reactor designs.

Disposal of Radioactive Material by Release Into Sanitary Sewer Systems—Part 20

On February 25, 1994 (59 FR 9146), an advance notice of proposed rulemaking was published to invite public comment to determine whether an amendment to the NRC's regulations governing the release of radionuclides from licensed nuclear facilities to sanitary sewer systems is needed.

Consideration of Changes to Fitness-for-Duty (FFD) Requirements—Part 26

On May 11, 1994 (59 FR 24373), the NRC published a notice soliciting public comment on issues to aid the NRC staff in evaluating NRC's approaches for designation of persons who should be subject to random drug testing at nuclear power plants.

Land Ownership Requirements for Low-Level Waste Sites—Part 61

On August 3, 1994 (59 FR 39485), an advance notice of proposed rulemaking was published to invite public comment on allowing private ownership of low-level radioactive waste facility sites as an alternative to the current requirement for Federal or State ownership of these sites.

Steam Generator Tube Integrity for Operating Nuclear Power Plants—Part 50

On September 19, 1994 (59 FR 47817), an advance notice of proposed rulemaking was published to invite public comment on regulatory approaches that would maintain adequate assurance of steam generator tube integrity while allowing a more appropriate approach to steam generator surveillance and maintenance activities at nuclear power plants.

Appendix 5

Regulatory Guides—Fiscal Year 1994

NRC regulatory guides describe methods acceptable to the NRC staff of implementing specific parts of the NRC's regulations and also, in some cases, describe techniques used by the staff in evaluating specific problems or postulated accidents. Guides also may advise applicants regarding information 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 have received complete staff review and an official staff position has been 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.*

To reduce the burden on the taxpayer, the NRC has made arrangements for the sale of active regulatory guides by both the U.S. Government Printing Office (on an individual guide basis) and the National Technical Information Service (on a standing order basis). Draft guides issued for public comment receive free distribution. NRC licensees receive, at no cost, pertinent draft and active regulatory guides as they are issued.

The following guides were issues, revised, or withdrawn during the period from October 1, 1993, to September 30, 1994.

Division 1—Power Reactor Guides

None

Division 2—Research and Test Reactor Guides

None

Division 3—Fuels and Materials Facilities Guides

3.68 Nuclear Criticality Safety Training

Division 4—Environmental and Siting Guides

None

Division 5—Materials and Plant Protection Guides

5.67 Material Control and Accounting for Uranium Enrichment Facilities Authorized To Produce Special Nuclear Material of Low Strategic Significance

5.68 Protection Against Malevolent Use of Vehicles at Nuclear Power Plants

Division 6—Product Guides

None

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-1028 Proposed Revision 3 to Regulatory Guide 1.118, Periodic Testing of Electric Power and Protection Systems

DG-1031 Proposed Revision 1 to Regulatory Guide 1.160, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

Division 5

DG-5004 Proposed Revision 3 to Regulatory Guide 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)

DG-5006 Protection Against Malevolent Use of Vehicles at Nuclear Power Plants

Division 6

DG-6002 Establishing Quality Assurance Programs for the Manufacture and Distribution of Sealed Sources and Devices Containing Byproduct Material

Division 8

DG-8015 Release of Patients Administered Radioactive Materials

Division 10

DG-0003 Guide for the Preparation of Applications for Licenses for Non-Self-Contained Irradiators

Appendix 6

Civil Penalties and Orders—Fiscal Year 1994

CIVIL PENALTIES PROPOSED, IMPOSED AND/OR PAID IN FISCAL YEAR 1994
(Listed according to Enforcement Action (EA) numbers)

Licensee, Facility and EA Number	*Civil Penalties Proposed, Imposed and/or Paid in FY 94*	*Facts*
Advanced Medical Systems, Inc. Geneva, Ohio (EA 85–060)	$6,250 was proposed in FY85 and imposed in FY89, $1,800 was paid in FY94 following a settlement.	Violation involving a personnel overexposure
Northeast Nuclear Energy Co. Millstone (EA 91–127)	$220,000 was proposed and paid in FY94.	Deliberate delay in reaching operability determination and discrimination against an employee for disputing that determination.
Columbus, City of Columbus, Ohio (EA 92–132)	$2,000 proposed and imposed in FY93, and paid in FY94.	Unauthorized cleaning and maintenance of moisture density gauges by former RSO and other employees.
Arizona Public Service Co. Palo Verde (EA 92–139)	$130,000 proposed in FY92, and paid in FY94 following DOL decision.	Discrimination based on DOL ALJ decision that APS created a "hostile work environment."
Public Service Co. of Colorado Fort St. Vrain (EA 92–152)	$80,000 was proposed in FY94 but withdrawn by the NRC after review of licensee's response.	Discrimination against contractor for reporting unsafe health physics practices.
Philadelphia Electric Co. Limerick 1 (EA 92–164)	$25,000 proposed in FY93, imposed and paid in FY94 following DOL decision.	Discrimination against contractor employee.
VA, Department of Birmingham, Alabama (EA 92–204)	$10,000 proposed in FY93, imposed and paid in FY94.	Failure to maintain complete and accurate records, failure to follow procedures, and failure to conduct a prompt and adequate investigation.
Creative Biomolecules, Inc. Hopkinton, MA (EA 92–224)	$15,000 proposed and paid in FY94.	Falsification of records, and other violations suggesting a lack of attention to, and control of, licensed activities in the facility.
Yale-New Haven Hospital New Haven, Connecticut (EA 92–241)	$10,000 proposed in FY93, imposed and paid in FY94.	Failure to secure brachytherapy source, misadministrations, quality management program violations.
Tennessee Valley Authority Corporate Office (EA 93–003)	$200,000 proposed and paid in FY94.	Multiple examples of harassment and discrimination.
Cameo Diagnostic Center, Inc. Springfield, Massachusetts (EA 93–005)	$1,750 proposed in FY93, imposed in FY94, hearing requested. ASLB ruling upholding imposition is subject to Commission review.	Willful use of licensed material at unauthorized location.

Licensee, Facility and EA Number	*Civil Penalties Proposed, Imposed and/or Paid in FY 94*	*Facts*
Edwards Pipeline Testing, Inc. Tulsa, Oklahoma (EA 93-015)	$12,000 proposed in FY93, imposed and paid in FY94.	Willful failure to conduct quarterly audits of radiographers, failures to wear alarm ratemeter.
Lawrence County Medical Center Ironton, Ohio (EA 93-020)	$2,500 proposed and paid in FY94.	Breakdown in control of licensed activities.
Commonwealth Edison Company Zion 1 (EA 93-064)	$50,000 proposed in FY93, paid in FY94.	Auxiliary building door open since 1989 and 1/4 inch negative pressure could not be maintained, as described in the FSAR.
Saratoga Community Hospital Detroit, Michigan (EA 93-070)	$2,500 proposed and paid in FY94.	Breakdown in control of licensed activities.
Entergy Operations, Inc. River Bend (EA 93-071)	$112,500 proposed and paid in FY94.	Willful degradation of vital area barrier, failure to report, other safeguards and security violations.
Radiation Oncology Center at Marlton, New Jersey (EA 93-072)	$80,000 proposed in FY94, pending.	Corporate breakdown in control of licensed activities.
Twin Falls Clinic & Hospital Twin Falls, Idaho (EA 93-082)	$5,000 proposed and imposed in FY93, $2,500 paid in FY94 after settlement.	Licensee did not develop and submit a quality management program.
Ingham Medical Center Lansing, Michigan (EA 93-109)	$12,250 proposed in FY93, paid in FY94.	Misadministration involving iodine131. Violations of medical quality management program.
Indiana University Indianapolis, Indiana (EA 93-111)	$5,000 proposed and imposed in FY94, $2,500 paid in FY94 after settlement.	Teletherapy misadministration. Violations of medical quality management program.
Northeast Nuclear Energy Co. Millstone 1 (EA 93-130)	$50,000 proposed in FY93, paid in FY94.	Violations involving requalification training on all units.
GPU Nuclear Corporation Oyster Creek (EA 93-136)	$75,000 proposed in FY93, $50,000 imposed and paid in FY94.	Multiple violations involving the failure to follow plant technical specifications and procedures in entering and working in a locked high radiation area.
Nebraska Public Power District Cooper (EA 93-137)	$200,000 proposed and paid in FY94.	Technical Specification violation involving reactor building containment inservice inspection program and Appendix J.
Mallinckrodt Medical, Inc. St. Louis, Missouri (EA 93-140)	$1,000 proposed in FY93, $500 imposed and paid in FY94.	Failure to adequately survey package at pharmacy.

Licensee, Facility and EA Number	Civil Penalties Proposed, Imposed and/or Paid in FY 94	Facts
St. Joseph Radiology Assoc., Inc. St. Joseph, Missouri (EA 93-155)	$25,000 proposed in FY93, $22,000 paid in FY94 after settlement.	Abandonment of licensed material. Failure to comply with NRC Order.
Tulsa Gamma Ray, Inc. Tulsa, Oklahoma (EA 93-172)	$5,000 proposed in FY93, imposed and paid in FY94.	Failure to maintain immediate control of licensed material, failure to secure radiography exposure device during transport, possible failure to report
Washington Public Power Supply System Washington Nuclear 2 (EA 93-191)	$75,000 proposed and paid in FY94.	Both trains of residual heat removal system inoperable, numerous procedure violations, ineffective corrective action.
Northern States Power Company Prairie Island 1 (EA 93-192)	$50,000 proposed in FY94, pending outcome of Secretary of Labor's consideration of related case.	Employment discrimination in violation of 10 CFR 50.7.
Richardson X-Ray, Inc. Downey, California (EA 93-201)	$25,000 proposed in FY94, $20,000 imposed in FY94, being paid over time.	Willful failure to properly survey, post restricted areas, supervise assistant.
Physician's Lab. Service, Inc. Bozman, Montana (EA 93-202)	$2,500 proposed, imposed and paid in FY94.	Substantial failure to implement a quality management program and administration of radiopharmaceuticals without signed written directives.
John Sinkey, MD Toledo, Ohio (EA 93-204)	$2,000 proposed in FY93, paid in FY94.	Failure to implement medical quality management program, breakdown in control of licensed material.
Commonwealth Edison Company Quad Cities 1 (EA 93-210)	$125,000 proposed in FY93, paid in FY94.	Ineffective corrective actions, inadequate procedures, and failure to follow procedures caused HPCI turbine exhaust rupture disc failure and contamination of workers.
VA, Department of Dallas, Texas (EA 93-217)	$3,750 proposed in FY93, paid in FY94.	Failure to establish and maintain medical quality management program for teletherapy.
Schnabel Engineering Assoc., Inc. Richmond, Virginia (EA 93-219)	$375 proposed in FY93, paid in FY94.	Failure to control material. Gauge damaged by bulldozer.
Wayne City Office of Public Serv. Detroit, Michigan (EA 93-220)	$1,250 proposed in FY93, paid in FY94.	Gauge fell from truck, picked up by member of public, not reported to the NRC. Another gauge was run over by a bulldozer.
Northeast Nuclear Energy Co. Millstone 2 (EA 93-228)	$237,500 proposed and paid in FY94.	Failure to have adequate procedures and to follow them, failure to perform safety evaluation for temporary repairs of valve.

Licensee, Facility and EA Number	*Civil Penalties Proposed, Imposed and/or Paid in FY 94*	*Facts*
Glendive Medical Center, Inc. Glendive, Montana (EA 93-231)	$2,500 proposed and paid in FY94.	Licensed activities conducted without a Radiation Safety Officer or an authorized user.
Consumers Power Company Big Rock Point (EA 93-233)	$50,000 proposed and paid in FY94.	Containment integrity breach and rupturing four rupture discs.
Michigan Technological University Houghton, Michigan (EA 93-234)	$3,750 proposed, imposed, and paid in FY94.	Thirteen violations against the licensee involving a programmatic breakdown.
Commonwealth Edison Company LaSalle 1 (EA 93-235)	$112,500 proposed and paid in FY94.	Breakdown in the health physics program.
Northeast Nuclear Energy Company Millstone 3 (EA 93-237)	$50,000 proposed and paid in FY94.	Inoperability of Supplementary Leak Collection and Release System (SLCRS).
Louisiana Power & Light Company Waterford 3 (EA 93-239)	$25,000 proposed and paid in FY94.	Violation of Technical Specification 3.6.2.1 (Inoperable containment spray Train A).
S. K. McBryde, Inc. Greensboro, NC (EA 93-241)	$1,500 proposed and paid in FY94.	Intentional falsification of radiation safety records.
Vermont Yankee Nuclear Pwr. Corp. Vermont Yankee (EA 93-243)	$87,500 proposed and paid in FY94.	Multiple examples of failure to follow refueling procedures.
X-Ray Treatment Center Eastpointe, Michigan (EA 93-248)	$1,250 proposed and paid in FY94.	Teletherapy misadministration. Violations of medical quality management program.
Hahnemann University Hospital Philadelphia, Pennsylvania (EA 93-249)	$6,250 proposed and paid in FY94.	Failure to have policies and written procedures on quality management program, failure of RSO to ensure that day-to-day radiation safety functions were performed.
Morgan City Memorial Hospital Martinsville, Indiana (EA 93-250)	$9,750 proposed and paid in FY94.	Deliberate falsification of records, careless disregard of regulatory requirements.
Boston City Hospital Boston, Massachusetts (EA 93-256)	$2,500 proposed in FY94, $1,250 imposed and paid in FY94.	Failure to secure material against unauthorized removal.
Memorial Hospital Cambridge, Minnesota (EA 93-257)	$2,500 proposed in FY94, withdrawn by NRC after review of licensee's response.	Breakdown in licensee's implementation of the QMP resulting in two violations which collectively indicate Severity Level III problem.

Licensee, Facility and EA Number	*Civil Penalties Proposed, Imposed and/or Paid in FY 94*	*Facts*
Duke Power Company McGuire 1 (EA 93-259)	$25,000 proposed and paid in FY94.	Steam leak due to maintenance failures, inadvertent Mode change.
Como Plastics, Inc. Columbus, Ohio (EA 93-261)	$750 proposed and paid in FY94.	Loss of five static eliminator devices.
Virginia Electric Power Co. North Anna 2 (EA 93-262)	$15,000 proposed and paid in FY94.	Failure to meet technical specifications requirements due to preoperational test inaccuracies - repetitive SLIV violations.
Chemetron Corporation Newburgh Heights, Ohio (EA 93-271)	$10,000 proposed in FY94, pending.	Violation of License Condition 12 - Incomplete submittal of site remediation plan.
Army, Department of the Barstow, California (EA 93-272)	$17,500 proposed and paid in FY94.	Breakdown in control of licensed activities.
Texas Utilities Electric Co. Comanche Peak 1 (EA 93-275)	$50,000 proposed and paid in FY94.	Violations associated with refueling water spill.
Iowa Electric Light & Power Co. Duane Arnold (EA 93-276)	$12,500 proposed and paid in FY94.	Failure to evaluate falsified application which resulted in an unauthorized individual being given access into the vital area.
Consumers Power Company Palisades (EA 93-277)	$50,000 proposed and paid in FY94.	Two breakdowns in engineering and operations programs.
Vermont Yankee Nuclear Pwr. Corp. Vermont Yankee (EA 93-279)	$100,000 proposed and paid in FY94.	Alternate cooling tower RHR source inoperable due to silt for prolonged period.
Gratiot Community Hospital Alma, Michigan (EA 93-281)	$2,000 proposed and paid in FY94.	Violations of medical quality management program indicative of careless disregard.
Miami Valley Hospital Dayton, Ohio (EA 93-288)	$2,500 proposed, imposed, and paid in FY94.	Overexposure, contamination event.
Construction Materials Testing Barstow, California (EA 93-292)	$500 proposed and paid in FY94.	Failure to file Form 241.
Detroit Edison Company Fermi 2 (EA 93-294)	$50,000 proposed and paid in FY94.	Ineffective corrective action and work control problems.

Licensee, Facility and EA Number	*Civil Penalties Proposed, Imposed and/or Paid in FY 94*	*Facts*
Duquesne Light Company Beaver Valley (EA 93-296)	$50,000 proposed and paid in FY94.	Emergency diesel generator load sequencer, which is designed to mitigate a serious safety event, would not have been able to perform its function.
Toledo Edison Company Davis-Besse (EA 93-297)	$25,000 proposed and paid in FY94.	Both trains of auxiliary feedwater system inoperable, and three violations relating to configuration control of valves.
Carolina Power & Light Co. Robinson 2 (EA 93-298)	$37,500 proposed and paid in FY94.	Violation of Technical Specification, misadjusted voltage regulator.
KCE Structural Engineers, PC Washington, DC (EA 93-299)	$375 proposed in FY94, later withdrawn by NRC following review of licensee response.	Failure to secure licensed material against unauthorized removal.
Commonwealth Edison Company LaSalle 1 (EA 93-300)	$75,000 proposed and paid in FY94.	Failed to take timely corrective action.
RMC Calibration Services, Inc. Wilmington, Delaware (EA 93-303)	$1,500 proposed in FY94, later withdrawn by NRC after review of licensee response.	Unauthorized possession of material.
Georgia Power Company Vogtle 1 (EA 93-304)	$200,000 proposed in FY94, pending.	Inaccurate/incomplete information regarding emergency diesel generator reliability.
H.C. Nutting Company Cincinnati, Ohio (EA 93-308)	$250 proposed and paid in FY94.	Failure to control licensed material. Unattended moisture/density gauge was run over at construction site.
Allegheny General Hospital Pittsburgh, Pennsylvania (EA 93-309)	$8,750 proposed and paid in FY94.	Programmatic breakdown in quality management involving two violations and a programmatic breakdown involving 20 violations.
Cooper Hospital Univ. Med. Ctr. Camden, New Jersey (EA 93-310)	$6,250 proposed and paid in FY94.	Lack of management oversight by radiation safety committee and radiation safety officer. Overexposure.
Duke Power Company Oconee 1 (EA 93-311)	$75,000 proposed and paid in FY94.	Inadequate control of safeguards material.
Public Service Electric & Gas Co. Salem 1 (EA 94-003)	$50,000 proposed and paid in FY94.	Multiple failures to implement procedures to control safety related activities.
Oncology Service, Inc. State College, Pennsylvania (EA 94-006)	$280,000 proposed in FY94, pending.	Misadministration. Exposure to members of the public. Corporate breakdown in control of licensed activities.

Licensee, Facility and EA Number	Civil Penalties Proposed, Imposed and/or Paid in FY 94	Facts
Oakland General Hospital Madison Heights, Michigan (EA 94–009)	$3,750 proposed and paid in FY94.	Failure to establish and maintain a medical quality management program for brachytherapy.
Entergy Operations, Inc. River Bend (EA 94–010)	$100,000 proposed and paid in FY94.	Failure to meet Appendix R and technical specifications regarding fire protection, failure to verify the safe shutdown capability in event of fire.
Arizona Public Service Co. Palo Verde (EA 94–011)	$100,000 proposed and paid in FY94.	Failure to ensure that contractor conducted adequate background checks before recommending employees for unescorted access authorization.
Genesys Regional Medical Ctr. Flint, Michigan (EA 94–014)	$3,750 proposed and paid in FY94.	Violations involving lack of training and lack of surveys, one of which led to a misadministration.
Radiation Management Consultants Philadelphia, Pennsylvania (EA 94–015)	$1,500 proposed in FY94, later withdrawn by NRC after review of licensee's response.	Failure to inform the NRC prior to transfer of ownership of material.
Washington Hospital Center Washington, DC (EA 94–020)	$2,500 proposed and paid in FY94.	Failure to provide personnel monitoring, failure to limit exposure, failure to work under supervision of authorized user.
Community Memorial Hospital Sidney, Montana (EA 94–025)	$11,000 proposed and paid in FY94.	Failure to establish and maintain a medical quality management program, failure to follow instructions of the supervising authorized user.
Omaha Public Power District Fort Calhoun 1 (EA 94–026)	$25,000 proposed and paid in FY94.	Violations of procedures related to the auxiliary feedwater system, rod control system, and control room ventilation.
Curators of the University of Mo. University of Missouri (EA 94–031)	$5,000 proposed and paid in FY94.	Failure to implement Part 35. Inadequate survey and audits and other violations which collectively represented a programmatic breakdown.
Ohio State University Columbus, Ohio (EA 94–032)	$17,750 proposed and paid in FY94.	Breakdown in control of licensed activities.
Duke Power Company McGuire 2 (EA 94–038)	$100,000 proposed and paid in FY94.	Loss of offsite power and main steam isolation valve (MSIV) failure.
Cincinnati, University of Cincinnati, Ohio (EA 94–039)	$5,000 proposed, imposed, and paid in FY94.	Failure to control licensed material.
Westinghouse Electric Corp. Chester, Pennsylvania (EA 94–040)	$1,250 proposed and paid in FY 94.	Failure to secure licensed material.

Licensee, Facility and EA Number	Civil Penalties Proposed, Imposed and/or Paid in FY 94	Facts
Consumers Power Company Palisades (EA 94-041)	$50,000 proposed and paid in FY94.	Failure to design service water and component cooling water system to meet single failure criteria for emergency core cooling.
Commonwealth Edison Company Dresden 1 (EA 94-044)	$200,000 proposed and paid in FY94.	Three violations of the order authorizing decommissioning.
Commonwealth Edison Company Dresden 2 (EA 94-048)	$75,000 proposed and paid in FY94.	Failure and drifting of Yarway level instruments. Licensee failed to take corrective actions.
Commonwealth Edison Company LaSalle 1 (EA 94-053)	$225,000 proposed and paid in FY94.	Deliberate contamination of individuals; collection of radwaste sample by an unqualified individual.
Rocky Mountain Phoenix Surveys Brighton, Colorado (EA 94-058)	$500 proposed and paid in FY94.	Agreement State licensee conducted well logging operations in Wyoming, and NRC jurisdiction, without filing Form 241.
Consumers Power Company Palisades (EA 94-059)	$25,000 proposed and paid in FY94.	Safeguards information on Wide Area Network.
Osteopathic Medical Center of PA. Philadelphia, Pennsylvania (EA 94-061)	$2,500 proposed and paid in FY94.	Failure to fully implement the medical quality management program.
William V. Agrait Mayaquez, Puerto Rico (EA 94-063)	$750 proposed and paid in FY94.	Licensed material not controlled or under constant surveillance.
Geisinger Medical Center Danville, Pennsylvania (EA 94-066)	$1,250 proposed and paid in FY94.	Timer malfunction on Co-60 unit, continued to use backup.
Milwaukee County Med. Complex Milwaukee, Wisconsin (EA 94-074)	$3,750 proposed and imposed in FY94, pending.	Failure to follow procedures resulting in an overexposure
Deaconess Medical Ctr. of Billings Billings, Montana (EA 94-077)	$7,500 proposed and paid in FY94.	Brachytherapy misadministrations. Violations of medical quality management program.
St. Vincent Hospital & Health Ctr. Billings, Montana (EA 94-078)	$8,750 proposed and paid in FY94.	Violations of medical quality management program. Doses to patients exceeded doses intended by authorized user.
Commonwealth Edison Company Zion 1 (EA 94-079)	$12,500 proposed and paid in FY94.	Programmatic breakdown.
AT Laboratories, Inc. Grand Prairie, Texas (EA 94-083)	$500 proposed and paid in FY94.	Agreement State licensee conducted gauge operations in Oklahoma in NRC jurisdiction without filing Form 241.

Licensee, Facility and EA Number	*Civil Penalties Proposed, Imposed and/or Paid in FY 94*	*Facts*
Mt. Sinai Medical Center Cleveland, Ohio (EA 94-085)	$1,250 proposed and paid in FY94.	Failure to follow medical quality management program. Teletherapy misadministration.
Georgia Power Company Vogtle 1 (EA 94-087)	$25,000 proposed and paid in FY94.	Inadvertent de-energization of certain components resulting in dampers not being able to properly function.
Northeast Nuclear Energy Company Millstone 2 (EA 94-091)	$87,500 proposed and paid in FY94.	Improper emergency preparedness issues: assessing emergency action levels; failure to assure adequate shutdown margin during stuck rod event.
Nuclear Pharmacy of Idaho, Inc. Boise, Idaho (EA 94-096)	$7,500 proposed in FY94, pending.	Release of radioactive material to unrestricted area in excess of Part 20 limits.
Medical Center of Central Worcester, Massachusetts (EA 94-099)	$2,500 proposed in FY94; later withdrawn after review of licensee's response.	Failure to secure licensed material from unauthorized removal or access.
Stamford Hospital Stamford, Connecticut (EA 94-103)	$1,250 proposed in FY94, pending.	Failure to maintain a written medical quality management program. Therapy misadministration.
Duke Power Company Oconee 1 (EA 94-104)	$15,000 proposed and paid in FY94.	Repetitive violation for fuel handling error and other examples of fuel movements not in accordance with approved procedures.
Louisiana Power & Light Company Waterford 3 (EA 94-105)	$112,500 proposed and paid in FY94.	Shield building ventilation system not capable of automatic operation under certain accident scenarios.
Radiation Management Consultants Philadelphia, Pennsylvania (EA 94-114)	$1,500 proposed in FY94, pending.	Change of location without authorization, transportation violations, missing quarterly exposure reports and inventory records, and failure to post high radiation area.
Carolina Power & Light Company Robinson 2 (EA 94-119)	$75,000 proposed and paid in FY94.	Inadequate testing of main steam isolation valves, inadequate ventilation.
Missouri, University of Columbia, Missouri (EA 94-121)	$8,000 proposed in FY94, pending.	Discrimination against a research scientist and group leader who had raised safety concerns.
Lucy Lee Hospital Poplar Bluff, Missouri (EA 94-126)	$2,500 proposed and paid in FY94.	Teletherapy misadministration involving Co-60. Problems identified with the quality management program and its implementation.

Licensee, Facility and EA Number	*Orders Issued In FY 1994*	*Facts*
Chemetron Corporation Newburg, Ohio (EA 93-068)	Confirmatory Order issued October 26, 1993.	Site remediation for the McGeon Complex.
Individual Western Stress, Inc. (EA 93-139)	Order suspending License issued October 27, 1993.	Radiographer deliberately and repeatedly failed to wear alarm ratemeter.
Ball Memorial Hospital Muncie, Indiana (EA 93-215)	Order Modifying License issued October 20, 1993.	Nuclear medicine technologists increased dosages of radiopharmaceuticals without authorization, and falsified records.
Nuclear Support Services, Inc. Hershey, Pennsylvania (EA 93-236)	Order restricting activities and requiring audit issued March 22, 1994.	Falsification of information relating to access authorization.
Western Ind. X-Ray Inspection Co. Evanston, Wyoming (EA 93-238)	Order Suspending License issued June 16, 1994.	Improper radiography practices including use of uncalibrated ratemeter, leaving a camera unattended, and failure to perform field inspections.
Individual Rio Piedras, Puerto Rico (EA 93-242)	Confirmatory Order issued June 3, 1994.	Deliberate utilization of Sr-90, deliberately provided false and incomplete information to the NRC.
Individual Nuclear Support Serv., Inc. (EA 93-260)	Order Prohibiting Involvement in NRC-Licensed Activities issued March 22, 1994.	False information relating to access authorization.
Licensed Operator Dresden 2 (EA 93-266)	Order Prohibiting Involvement in NRC-Licensed Activities issued April 21, 1994.	Deliberate attempt to mislead OI investigators regarding a mispositioned rod event and deliberate violation of procedures.
Operator Dresden 2 (EA 93-267)	Order Prohibiting Involvement in NRC-Licensed Activities issued April 21, 1994.	Deliberate attempt to mislead OI investigators regarding a mispositioned rod event and deliberate violation of procedures.
Individual Dresden 2 (EA 93-268)	Order Prohibiting Involvement in NRC-Licensed Activities issued April 21, 1994.	Deliberate attempt to conceal a mispositioned control rod and deliberate violation of procedures.
Indiana Reg'l Cancer Treatment Indiana, Pennsylvania (EA 93-284)	Order Suspending License issued November 16, 1993. Hearing requested, settlement and license terminated.	Unauthorized use of material.
Individual Duane Arnold (EA 93-295)	Order Prohibiting Involvement in NRC-Licensed Activities issued April 5, 1994.	False information to gain access authorization.
Individual Ball Memorial Hospital (EA 94-027)	Order Modifying License issued May 23, 1994	Unauthorized increase in diagnostic radiopharmaceutical dosages given to patients.

Licensee, Facility and EA Number	*Orders Issued In FY 1994*	*Facts*
Individual Indiana Regional Cancer (EA 94–028)	Order Prohibiting Involvement in NRC–Licensed Activities.	Unauthorized use of Sr–90 eye applicator. Inaccurate information.
Licensed Operator Indian Point 3 (EA 94–034)	Order Prohibiting Involvement in NRC–Licensed Activities issued June 28, 1994.	Licensed operator submitted bogus sample for drug testing.
Cameo Diagnostic Center, Inc. Springfield, Massachusetts (EA 94–035)	Order Modifying License issued February 15, 1994. See EA 93–005.	Willful use of licensed material at unauthorized location.
Ledoux & Company Teaneck, New Jersey (EA 94–034)	Order Suspending License issued May 4, 1994.	Failure to provide financial assurance for decommissioning.
Henry Ford Hospital Detroit, Michigan (EA 94–096)	Confirmatory Order issued March 28, 1994.	Previous Order required Licensee to have quality management program (QMP). A new QMP was established per regulation.
Allegheny General Hospital Pittsburgh, Pennsylvania (EA 94–051)	Confirmatory Order issued March 17, 1994.	Programmatic breakdown, violation of quality management program.
Individual Logan General Hospital (EA 94–054)	Order Prohibiting Involvement in Licensed Activities.	Deliberate violations involving failure to perform dose calibrator checks, daily and weekly radiation and contamination surveys.
Individual Morgan City Mem. Hospital (EA 94–055)	Order Modifying License issued March 14, 1994.	Deliberate falsification of records and consumption of beverage in prohibited area.
Individual American Inspection Company (EA 94–069)	Order Prohibiting Involvement in Licensed Activities issued August 26, 1994.	Provided false information under oath. Conspiring to deceive. Failure to train and certify employees.
Individual American Inspection Company (EA 94–070)	Order Prohibiting Involvement in Licensed Activities issued August 26, 1994.	Falsification of safety audits and making false statements.
Individual American Inspection Company (EA 94–071)	Order Prohibiting Involvement in Licensed Activities issued August 26, 1994.	Falsifying safety audits and providing false testimony.
Panhandle NDT & Inspection Boger, Texas (EA 94–076)	Order Modifying License issued May 9, 1994.	Re–instatement of general license.
August Corporation Dunsmore, Pennsylvania (EA 94–093)	Order Modifying License issued June 21, 1994.	Failure to submit license renewal, still holding radioactive material.

Licensee, Facility and EA Number	*Orders Issued In FY 1994*	*Facts*
Individual American Inspection Company (EA 94–100)	Order to Notify NRC issued August 26, 1994.	False information under oath, conspiring to deceive.
Individual Creative Biomolecules, Inc. (EA 94–108)	Order Prohibiting Involvement in Licensed Activities.	Falsified records. False information to NRC.
Missouri, University of Columbia, Ohio (EA 94–113)	Confirmatory Order issued July 13, 1994.	Confirmatory Order to confirm the licensee's commitments in its Safety Performance Improvement Program.
Omni–Wave Electronics Corp. Glocester, Massachusetts (EA 94–124)	Cease & Desist Order issued August 2, 1994.	Possession of material without license.
Western Ind. X–Ray Inspection Co. Evanston, Wyoming (EA 94–131)	Order Revoking License issued September 27, 1994.	Improper radiography practices.
Individual Chesapeake Imaging Center (EA 94–132)	Order Prohibiting Involvement in Licensed Activities issued July 14, 1994.	Failure to comply with NRC requirements; licensee deliberately permitted licensed activities to continue in violation of requirements.
Creative Biomolecules, Inc. Hopkinton, Massachusetts (EA 94–136)	Order Modifying License issued September 7, 1994.	Individual falsified wipe tests survey records and provided false information to the NRC.
Jones Inspection Services Alderson, Oklahoma (EA 94–138)	Cease & Desist Order issued July 26, 1994.	Performing radiography in nonagreement state without authorization or license.
Individual Western Ind. X–Ray Insp. Co. (EA 94–140)	Order Prohibiting Involvement in Licensed Activities issued September 27, 1994.	Failure to evaluate radiation exposure, failure to calibrate alarm ratemeters.
Individual Englewood, New Jersey (EA 94–145)	Confirmatory Order issued September 8, 1994.	Willful false statement and failure to possess and use a dose calibrator.

Appendix 7

Nuclear Electric Generating Units in Operation or Under Construction

(As of December 31, 1994)

The following is a listing of the 116 nuclear power reactor electrical generating units which were in operation or under construction in the United States as of December 31, 1994, representing a total capacity of 107,591 MWe (megawatts-electric; one megawatt is 1,000 kilowatts), of which 8,513 MWe was not yet licensed for operation. There are two reactor types represented, abbreviated PWR—pressurized water reactor, and BWR—boiling water reactor. Of the 116 reactor units listed, 78 are PWRs and 38 are BWRs. Plant status is indicated as follows: OL—has operating license (not necessarily for full-power operation), CP—has construction permit. The dates for operation are either actual (in the case of operating licenses) or as scheduled by the utilities, for plants not yet licensed for operation, as of December 31, 1994. At that time, there were 109 commercial nuclear reactors in the United States with operating licenses and operating; these units had been operating for a cumulative 1,550 reactor-years (an additional 155 reactor-years had been accumulated by reactors now permanently shut down). At the end of 1994, there were seven units for which construction permits were in effect (although construction of some of these has been postponed indefinitely). 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	804	PWR	OL 1977	Alabama Power Co.	1977
Dothan	Joseph M. Farley Unit 2 nuclear power plant	814	PWR	OL 1981	Alabama Power Co.	1981
Scottsboro	Bellefonte Unit 1 nuclear power plant	1,235	PWR	CP 1974	Tennessee Valley Authority	1993
Scottsboro	Bellefonte Unit 2 nuclear power plant	1,235	PWR	CP 1974	Tennessee Valley Authority	1995
ARIZONA						
Wintersburg	Palo Verde Unit 1 nuclear power plant	1,304	PWR	OL 1984	Arizona Public Service Co.	1986

Wintersburg	Palo Verde Unit 2 nuclear power plant	1,304	PWR	OL 1985	Arizona Public Service Co.	1986
Wintersburg	Palo Verde Unit 3 nuclear power plant	1,304	PWR	OL 1987	Arizona Public Service Co.	1988
ARKANSAS						
Russelville	Arkansas Nuclear One Unit 1 nuclear power plant	836	PWR	OL 1974	Arkansas Power & Light Co.	1974
Russelville	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 power plant	1,100	PWR	OL 1982	So. Calif. Ed. & San Diego Gas & Electric Co.	1983
San Clemente	San Onofre Unit 3 nuclear power plant	1,100	PWR	OL 1983	So. Calif. Ed. & San Diego Gas & Electric Co.	1984
Diablo Canyon	Diablo Canyon Unit 1 nuclear power plant	1,084	PWR	OL 1984	Pacific Gas & Electric Co.	1985
Diablo Canyon	Diablo Canyon Unit 2 nuclear power plant	1,106	PWR	OL 1985	Pacific Gas & Electric Co.	1986
CONNECTICUT						
Haddam Neck	Haddam Neck nuclear power plant	555	PWR	OL 1967	Conn. Yankee Atomic Power Co.	1968
Waterford	Millstone Unit 1 nuclear power plant	654	BWR	OL 1970	Northeast Nuclear Energy Co.	1971
Waterford	Millstone Unit 2 nuclear power plant	864	PWR	OL 1975	Northeast Nuclear Energy Co.	1975
Waterford	Millstone Unit 3 nuclear power plant	1,156	PWR	OL 1985	Northeast Nuclear Energy Co.	1986
FLORIDA						
Florida City	Turkey Point Unit 3 nuclear power plant	646	PWR	OL 1972	Florida Power & Light Co.	1972
Florida City	Turkey Point Unit 4 nuclear power plant	646	PWR	OL 1973	Florida Power & Light Co.	1973
Red Level	Crystal River Unit 3 nuclear power plant	806	PWR	OL 1977	Florida Power Corp.	1977
Ft. Pierce	St. Lucie Unit 1 nuclear power plant	817	PWR	OL 1976	Florida Power & Light Co.	1976
Ft. Pierce	St. Lucie Unit 2 nuclear power plant	842	PWR	OL 1983	Florida Power & Light Co.	1983

GEORGIA						
Baxley	Hatch Unit 1 nuclear power plant	757	BWR	OL 1974	Georgia Power Co.	1975
Baxley	Hatch Unit 2 nuclear power plant	771	BWR	OL 1978	Georgia Power Co.	1979
Waynesboro	Vogtle Unit 1 nuclear power plant	1,100	PWR	OL 1987	Georgia Power Co.	1987
Waynesboro	Vogtle Unit 2 nuclear power plant	1,100	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. -Iowa-Ill. Gas & Elec. Co.	1973
Cordova	Quad-Cities Unit 2 nuclear power plant	769	BWR	OL 1972	Comm. Ed. Co. -Iowa-Ill. Gas & Elec. Co.	1973
Seneca	LaSalle Unit 1 nuclear power plant	1,078	BWR	OL1982	Commonwealth Edison Co.	1984
Seneca	LaSalle Unit 2 nuclear power plant	1,078	BWR	OL 1983	Commonwealth Edison Co.	1984
Bryon	Byron Unit 1 nuclear power plant	1,120	PWR	OL 1984	Commonwealth Edison Co.	1985
Byron	Byron Unit 2 nuclear power plant	1,120	PWR	OL 1986	Commonwealth Edison Co.	1987
Braidwood	Braidwood Unit 1 nuclear power plant	1,120	PWR	OL 1986	Commonwealth Edison Co.	1988
Braidwood	Braidwood Unit 2 nuclear power plant	1,120	PWR	OL 1987	Commonwealth Edison Co.	1988
Clinton	Clinton Unit 1 nuclear power plant	950	BWR	OL 1986	Illinois Power Co.	1987
IOWA						
Pala	Arnold Unit 1 nuclear power plant	515	BWR	OL 1974	Iowa Elec. Power & Light Co.	1975

KANSAS						
Burlington	Wolf Creek nuclear power plant	1,150	PWR	OL 1985	Kansas Gas & Electric Co.	1985
LOUISIANA						
Taft	Waterford nuclear power plant	1,151	PWR	OL 1984	Louisiana Power & Light Co.	1985
St. Francisville	River Bend Unit 1 nuclear power plant	934	BWR	OL 1985	Gulf States Utilities Co.	1986
MAINE						
Wiscasset	Maine Yankee Atomic Power Co.	810	PWR	OL 1972	Maine Yankee	1972
MARYLAND						
Lusby	Calvert Cliffs Unit 1 nuclear power plant	825	PWR	OL 1974	Baltimore Gas & Electric Co.	1975
Lusby	Calvert Cliffs Unit 2 nuclear power plant	825	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						
Big Rock	Big Rock Point nuclear power plant	69	BWR	OL 1964	Consumers Power Co.	1963
South Haven	Palisades nuclear power plant	635	PWR	OL 1971	Consumers Power Co.	1971
Laguna Beach	Fermi Unit 2 nuclear power plant	1,093	BWR	OL 1985	Detroit Edison Co.	1988
Bridgman	Cook Unit 1 nuclear power plant	1,044	PWR	OL 1974	Indiana & Michigan Electric Co.	1975
Bridgman	Cook Unit 2 nuclear power plant	1,082	PWR	OL 1977	Indiana & Michigan Electric Co.	1978
MINNESOTA						
Monticello	Monticello nuclear power plant	525	BWR	OL 1970	Northern States Power Co.	1971
Red Wing	Prairie Island Unit 1 nuclear power plant	503	PWR	OL 1973	Northern States Power Co.	1973
Red Wing	Prairie Island Unit 2 nuclear power plant	500	PWR	OL 1974	Northern States Power Co.	1974

MISSISSIPPI						
Port Gibson	Grand Gulf Unit 1 nuclear power plant	1,250	BWR	OL 1982	Mississippi Power & Light Co.	1985
MISSOURI						
Fulton	Callaway Unit 1 nuclear power plant	1,188	PWR	OL 1984	Union Electric Co.	1985
NEBRASKA						
Fort Calhoun	Fort Calhoun Unit 1 nuclear power plant	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	1,198	PWR	OL 1989	Public Service of New Hampshire	1990
NEW JERSEY						
Toms River	Oyster Creek Unit 1 nuclear power plant	620	BWR	OL 1969	GPU Nuclear Corp.	1969
Salem	Salem Unit 1 nuclear power plant	1,079	PWR	OL 1976	Public Service Electric & Gas Co.	1977
Salem	Salem Unit 2 nuclear power plant	1,106	PWR	OL 1980	Public Service Electric & Gas Co.	1981
Salem	Hope Creek Unit 1 nuclear power plant	1,067	BWR	OL 1986	Public Service Electric & Gas Co.	1986
NEW YORK						
Indian Point	Indian Point Unit 2 nuclear power plant	864	PWR	OL 1973	Consolidated Edison Co.	1974
Indian Point	Indian Point Unit 3 nuclear power plant	891	PWR	OL 1975	Power Authority of the State of New York	1976
Scriba	Nine Mile Point Unit 1 nuclear power plant	610	BWR	OL 1969	Niagara Mohawk Power Co.	1969
Scriba	Nine Mile Point Unit 2 nuclear power plant	1,080	BWR	OL 1986	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	810	BWR	OL 1974	Power Authority of the State of New York	1975
NORTH CAROLINA						
Southport	Brunswick Unit 2 nuclear power plant	790	BWR	OL 1974	Carolina Power & Light Co.	1975

Southport	Brunswick Unit 1 nuclear power plant	790	BWR	OL 1976	Carolina Power & Light Co.	1977
Cowans Ford Dam	McGuire Unit 1 nuclear power plant	1,180	PWR	OL 1981	Duke Power Co.	1981
Cowans Ford Dam	McGuire Unit 2 nuclear power plant	1,180	PWR	OL 1983	Duke Power Co.	1984
Bonsal	Harris Unit 1 nuclear power plant	915	PWR	OL 1986	Carolina Power & Light Co.	1987
OHIO						
Oak Harbor	Davis-Besse Unit 1 nuclear power plant	874	PWR	OL 1977	Toledo Edison–Cleveland Electric Illuminating Co.	1977
Perry	Perry Unit 1 nuclear power plant	1,205	BWR	OL 1986	Toledo Edison–Cleveland Electric Illuminating Co.	1987
Perry	Perry Unit 2 nuclear power plant	1,205	BWR	CP 1977	Toledo Edison–Cleveland Electric Illuminating Co.	Indef.
PENNSYLVANIA						
Peach Bottom	Peach Bottom Unit 2 nuclear power plant	1,051	BWR	OL 1973	Philadelphia Electric Co.	1974
Peach Bottom	Peach Bottom Unit 3 nuclear power plant	1,035	BWR	OL 1974	Philadelphia Electric Co.	1974
Pottstown	Limerick Unit 1 nuclear power plant	1,065	BWR	OL 1984	Philadelphia Electric Co.	1986
Pottstown	Limerick Unit 2 nuclear power plant	1,065	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	852	PWR	OL 1987	Duquesne Light Co. Ohio Edison Co.	1987
Goldsboro	Three Mile Island Unit 1 nuclear power plant	776	PWR	OL 1974	GPU Nuclear Corp.	1974
Berwick	Susquehanna Unit 1 nuclear power plant	1,052	BWR	OL 1982	Pennsylvania Power & Light Co.	1983
Berwick	Susquehanna Unit 2 nuclear power plant	1,052	BWR	OL 1984	Pennsylvania Power & Light Co.	1985
SOUTH CAROLINA						
Hartsville	Robinson Unit 2 nuclear power plant	665	PWR	OL 1970	Carolina Power & Light Co.	1971

Seneca	Oconee Unit 1 nuclear power plant	860	PWR	OL 1973	Duke Power Co.	1973
Seneca	Oconee Unit 2 nuclear power plant	860	PWR	OL 1973	Duke Power Co.	1974
Seneca	Oconee Unit 3 nuclear power plant	860	PWR	OL 1974	Duke Power Co.	1974
Broad River	Summer Unit 1 nuclear power plant	900	PWR	OL 1982	So. Carolina Electric & Gas Co.	1984
Lake Wylie	Catawba Unit 1 nuclear power plant	1,145	PWR	OL 1984	Duke Power Co.	1985
Lake Wylie	Catawba Unit 2 nuclear power plant	1,145	PWR	OL 1986	Duke Power Co.	1986
TENNESSEE						
Daisy	Sequoyah Unit 1 nuclear power plant	1,128	PWR	OL 1980	Tennessee Valley Authority	1981
Daisy	Sequoyah Unit 2 nuclear power plant	1,148	PWR	OL 1981	Tennessee Valley Authority	1982
Spring City	Watts Bar Unit 1 nuclear power plant	1,165	PWR	CP 1973	Tennessee Valley	1988
Spring City	Watts Bar Unit 2 nuclear power plant	1,165	PWR	CP 1973	Tennessee Valley Authority	1989
TEXAS						
Glen Rose	Comanche Peak Unit 1 nuclear power plant	1,150	PWR	OL 1990	Texas Utilities	1990
Glen Rose	Comanche Peak Unit 2 nuclear power plant	1,150	PWR	OL 1994	Texas Utilities	1994
Bay City	South Texas Unit 1 nuclear power plant	1,250	PWR	OL 1987	Houston Lighting & Power Co.	1988
Bay City	South Texas Unit 2 nuclear power plant	1,250	PWR	OL 1989	Houston Lighting & Power Co.	1989
VERMONT						
Vernon	Vermont Yankee nuclear power plant	504	BWR	OL 1972	Vermont Yankee Nuclear Power Corp.	1972
VIRGINIA						
Gravel Neck	Surry Unit 1 nuclear power plant	775	PWR	OL 1972	Virginia Electric & Power Co.	1972
Gravel Neck	Surry Unit 2 nuclear power plant	775	PWR	OL 1973	Virginia Electric & Power Co.	1973
Mineral	North Anna Unit 1 nuclear power plant	865	PWR	OL 1976	Virginia Electric & Power Co.	1978

Mineral	North Anna Unit 2 nuclear power plant	890	PWR	OL 1980	Virginia Electric & Power Co.	1980
WASHINGTON						
Richland	WPPSS No. 1 (Hanford) nuclear power plant	1,266	PWR	CP 1975	Wash. Public Power Supply System	Indef.
Richland	WPPSS No. 2 (Hanford) nuclear power plant	1,103	BWR	OL 1983	Wash. Public Power Supply System	1984
Satsop	WPPSS No. 3	1,242	PWR	CP 1978	Wash. Public Power Supply System	Indef.
WISCONSIN						
Two Creeks	Point Beach Unit 1 nuclear power plant	495	PWR	OL 1970	Wisconsin Electric Power Co.	1970
Two Creeks	Point Beach Unit 2 nuclear power plant	495	PWR	OL 1971	Wisconsin Electric Power Co.	1972
Kewaunee	Kewaunee nuclear power plant	515	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, 833, 5/74, 8/87.
Big Rock Point (Mich.) = bwr, 69, 5/60, 5/64.
Braidwood 1 (Ill.) = pwr, 1120, 12/75, 7/87.
Braidwood 2 = pwr, 1120, 12/75, 5/88.
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, 790, 2/70, 12/74.
Byron 1 (Ill.) = pwr, 1105, 12/75, 2/85.
Byron 2 = pwr, 1105, 12/75, 1/87.
Callaway (Mo.) = pwr, 1145, 4/76, 10/84.
Calvert Cliffs 1 (Md.) = pwr, 825, 7/69, 7/74.
Calvert Cliffs 2 = pwr, 825, 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, 12/74.
Cook 1 (Mich.) = pwr, 1020, 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, 821, 9/68, 1/77.
Davis-Besse ((Ohio) = pwr, 860, 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, 515, 6/70, 2/74.
Farley 1 (Ala.) = pwr, 813, 8/72, 6/77.
Farley 2 = pwr, 823, 8/72, 3/81.
Fermi 2 (Mich.) = bwr, 1093, 9/72, 7/85.
Fitzpatrick (N.Y.) = bwr 778, 5/70, 10/74.
Fort Calhoun 1 (Neb.) = pwr, 478, 6/68, 8/73.
Ginna (N.Y.) = pwr, 470, 4/66, 12/84.
Grand Gulf 1 (Miss.) = bwr, 1142, 9/74, 11/84.
Haddam Neck (Conn.) = pwr, 569, 5/64, 12/74.
Harris 1 (N.C.) = pwr, 860, 1/78, 1/87.
Hatch 1 (Ga.) = bwr, 860, 9/69,10/74.
Hatch 2 = bwr, 768, 12/72, 6/78.
Hope Creek 1 (N.J.) = bwr, 1067, 11/74, 7/86.
Indian Point 2 (N.Y.) = pwr, 849, 10/66, 9/73.
Indian Point 3 = pwr, 965, 8/69, 4/76.
Kewaunee (Wis.) = pwr, 503, 8/68, 12/73.
LaSalle 1 (Ill.) = bwr, 1036, 9/73, 8/82.
LaSalle 2 = bwr, 1036, 9/73, 3/84.
Limerick 1 (Pa.) = bwr, 1055, 6/74, 8/85.
Limerick 2 = bwr, 1065, 6/74, 7/89.
Maine Yankee = pwr, 810, 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, 654, 5/66, 10/86.
Millstone 2 = pwr, 863, 12/70, 9/75.
Millstone 3 = pwr, 1142, 8/74, 1/86.
Monticello (Minn.) = bwr, 536, 6/67, 1/81.
Nine Mile Point 1 (N.Y.) = bwr, 610, 4/65, 12/74.
Nine Mile Point 2 = bwr, 1080, 6/74, 7/87.
North Anna 1 (Va.) = pwr, 915, 2/71, 4/78.
North Anna 2 = pwr, 915, 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, 620, 12/64, 8/69.
Palisades (Mich.) = pwr, 730, 3/67, 10/72.
Palo Verde 1 (Ariz.) = pwr, 1221, 5/76, 6/85.
Palo Verde 2 = pwr, 1221, 5/76, 4/86.
Palo Verde 3 = pwr, 1221, 5/76, 11/87.
Peach Bottom 2 (Pa.) = bwr, 1051, 1/68, 12/73.
Peach Bottom 3 = bwr, 1035, 1/68, 7/74.
Perry 1 (Ohio) = bwr, 1205, 5/77, 11/86.
Pilgrim 1 (Mass.) = bwr, 670, 8/68, 9/72.
Point Beach 1 (Wis.) = pwr, 485, 7/67, 10/70.
Point Beach 2 = pwr, 485, 7/68, 3/73.
Prairie Island 1 (Minn.) = pwr, 503, 6/68, 4/74.
Prairie Island 2 = pwr, 503, 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, 936, 3/77, 11/85.
Robinson 2 (S.C.) = pwr, 665, 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, 1070, 10/73, 9/82.
San Onofre 3 = pwr, 1080, 10/73, 9/83.
Seabrook 1 (N.H.) = pwr, 1198, 7/76, 5/89.
Sequoyah 1 (Tenn.) = pwr, 1148, 5/70, 9/80.
Sequoyah 2 = pwr, 1148, 5/70, 9/81.
South Texas 1 = pwr, 1250, 12/75, 3/88.
South Texas 2 = pwr 1250, 12/75, 12/88.
St. Lucie 1 (Fla.) = pwr, 839, 7/70, 3/76.
St. Lucie 2 = pwr, 839, 5/77, 6/83.
Summer (S.C.) = pwr, 885, 3/73, 11/82.
Surry 1 (Va.) = pwr, 781, 6/68, 5/72.
Surry 2 = pwr, 781, 6/68, 1/73.
Susquehanna 1 (Pa.) = bwr, 1032, 11/73, 11/82.
Susquehanna 2 = bwr, 1032, 11/73, 6/84.
Three Mile Island 1 (Pa.) = pwr, 776, 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, 504, 12/67, 2/73.
Vogtle 1 (Ga.) = pwr, 1079, 6/74, 3/87.
Vogtle 2 = pwr, 1165, 6/74, 2/89.
Washington Nuclear 2 = bwr, 1095, 3/73, 4/84.
Waterford 3 (La.) = pwr, 1075, 11/74, 3/85.
Wolf Creek 1 (Kans.) = pwr, 1128, 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, 1165, 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.

INDEX

Printed on recycled paper

Federal Recycling Program

NUREG – 1145, Vol. 11