U.S. Nuclear Regulatory Commission

1983 Annual Report

NRC

June 18, 1984

The President
The White House
Washington, D.C. 20500

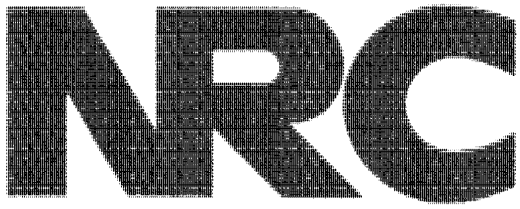
Dear Mr. President:

This Annual Report for 1983 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 1983, with additional treatment of events after that period where circumstances warranted.

Respectfully

Nunzio J. Palladino
Chairman



U.S. NUCLEAR REGULATORY COMMISSION

1983 Annual Report

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ENERGY REORGANIZATION ACT OF 1974, AS AMENDED

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

"...the short-range and long-range goals, priorities, and plans of the Commission as they relate to the benefits, costs, and risks of nuclear power." (See Chapter 1 for overall policy and planning guidance. Specific goals concerning nuclear power reactors are also discussed in Chapters 2 and 3; operating experience and assessment in Chapter 4; fuel cycle in Chapter 5; safeguards in Chapter 6; waste management in Chapter 7; inspection, enforcement and emergency preparedness in Chapter 8, nuclear nonproliferation in Chapter 10; and nuclear regulatory research in Chapter 11.)

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

"(1) insuring the safe design of nuclear power plants and other licensed facilities ...." (For reactors, see Chapters 2, 3 and 11; for materials facilities, devices and transportation packages, see Chapters 5 and 11; for waste facilities, see Chapters 7 and 11.)

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

"(3) safeguarding special nuclear materials at all stages of the nuclear fuel cycle ...." (See Chapters 6, 10, and 11.)

"(4) investigating suspected, attempted, or actual thefts of special nuclear materials in the licensed sector and developing contingency plans for dealing with such incidents ...." (See Chapters 6, 8 and 11.)

"(5) insuring the safe, permanent disposal of high-level radioactive wastes through the licensing of nuclear activities and facilities ...." (See Chapters 1, 7 and 11.)

"(6) protecting the public against the hazards of low-level radioactive emissions from licensed nuclear activities and facilities ...." (See Chapters 2, 5 and 7.)

Section 205 requires development of "a long term plan for projects for the development of new or improved safety systems for nuclear power plants" and an annual updating of the plan. (See Chapter 11.)

Section 209 requires the Commission to include in each Annual Report a chapter describing the status of the NRC's domestic safeguards program. (See Chapter 6.)

Section 210 directs the Commission to submit "a plan providing for the specification and analysis of unresolved safety issues relating to nuclear reactors," and to include progress reports in the Annual Report thereafter concerning corrective actions. (See Chapter 2.)

NUCLEAR NONPROLIFERATION ACT OF 1978

Section 602 requires annual reports by the Commission and the Department of Energy to "include views and recommendations regarding the policies and actions of the United States to prevent proliferation which are the statutory responsibility of those agencies ...." (See Chapter 10.)

ATOMIC ENERGY ACT OF 1954, AS AMENDED

Section 170i directs the Commission to report annually on indemnity actions implementing the Price-Anderson Act which provides a system to pay public liability claims in the event of a nuclear incident. (See Chapter 9.)

PUBLIC LAW 96-295

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

"(1) the direct and indirect costs to the Commission for the issuance of any license or permit and for the inspection of any facility; and (2) the fees paid to the Commission for the issuance of any license or permit and for the inspection of any facility." (See Chapter 13.)

PUBLIC LAW 97-415

Section 10(c) requires that the "Commission include as a separate chapter a description of the collaborative efforts ... by the Commission and the Department of Energy with respect to the decontamination, repair or rehabilitation of facilities at Three Mile Island Unit 2 ...." (See Chapter 3.)

1983 Highlights/1984 Planning

CHAPTER 1

This is the ninth annual report of the U.S. Nuclear Regulatory Commission (NRC). The NRC was created by enactment of the Energy Reorganization Act of 1974 and began operation in 1975 as an independent agency of the Federal Government. The five Commissioners are nominated by the President and confirmed by the U.S. Senate. The Chairman of the Commission is appointed by the President from among the confirmed Commissioners.

The mission of the NRC is to assure that non-military uses of nuclear materials in the United States—as in the operation of nuclear power plants or in medical, industrial or research applications—are carried out with proper regard and provision for the protection of public health and safety and of the environment, the safeguarding of nuclear materials and facilities from theft and sabotage, and safe transport and disposal of nuclear materials and wastes. The NRC accomplishes its purposes through the licensing of nuclear reactor operations and other possession and use of nuclear materials, the issuance of rules and regulations governing licensed activities, and inspection and enforcement actions.

This report covers the major activities, events, decisions and planning that took place during fiscal year 1983 (October 1982 through September 1983) within the NRC or involving the NRC. There is some additional treatment of events occurring during the last quarter of 1983. The report is prepared 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. Other statutory reporting requirements related to the report are set forth on the preceding page.

This highlights chapter deals with salient changes and noteworthy events which took place during the report period (and which are covered in greater detail within the body of the report). The chapter also sets forth, in condensed form, the policy and planning guidance for fiscal year 1984, which was approved by the Commission and provided to every member of the NRC staff.

Changes Within Commission and Senior Staff

The following changes occurred on the Commission and at senior staff level during the report period:

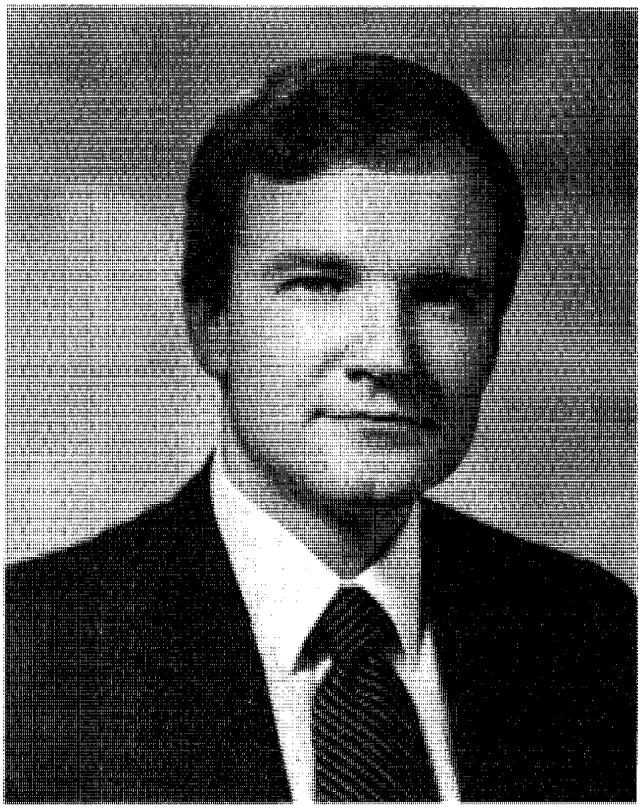
- Commissioner John F. Ahearne left the Commission upon expiration of his term on July 1, 1983.
- Commissioner Frederick M. Bernthal was appointed to the Commission on August 5, 1983.
- In February 1983, Herzel H. E. Plaine was appointed General Counsel, following the resignation of Leonard Bickwit from that post.
- In February 1983, Ben B. Hayes was appointed Director of the Office of Investigations, succeeding James A. Fitzgerald, who had been Acting Director.
- In March 1983, Clemens J. Heltemes, Jr., was appointed Director of the Office for Analysis and Evaluation of Operational Data, following the retirement of Carlyle Michelson, the first Director of the Office.
- In April 1983, John B. Martin was appointed Regional Administrator for NRC Region V (San Francisco), succeeding Robert H. Engelken, who retired.
- In June 1983, Thomas E. Murley was appointed Regional Administrator for NRC Region I (Philadelphia), following the untimely death of his predecessor, Ronald C. Haynes.

Noteworthy Events of 1983

The following are some of the more significant events or actions taken during the report period.

Requirements for Electrical Equipment Strengthened. The Commission amended regulations in January 1983 to strengthen and clarify requirements for the environmental qualification of electrical equipment in nuclear power plants. The new rule covers equipment that is safety-related and also non-safety-related equipment whose failure could prevent fully satisfactory functioning of safetyrelated equipment. It also applies to some monitoring equipment with postaccident uses.

Licensing Amendments Effective Immediately. Public Law 97-415 allowed the Commission to make immediately effective—with certain conditions—any amendment to an operating license upon a determination that such an amendment involved no "significant hazards" consideration, even though a request for a hearing on the amendment might be pending. This authority was invoked once during the report period in an action related to repairs on the Unit 1 reactor at Three Mile Island (Pa.). (See Chapter 2.)



Commissioner Frederick M. Bernthal was appointed to the Nuclear Regulatory Commission on August 5, 1983. The Commissioner has been a professor of chemistry and physics and has engaged, during the last 15 years, in collaborative research with nuclear scientists from Denmark, Germany, Canada and the United Kingdom.

Proposed Policy on Severe Accidents Issued. In April, the Commission issued a proposed policy statement on severe accidents and related matters. The statement proposed a new approach to replace the plan which had been under consideration, namely a long term generic rulemaking affecting all classes of existing or proposed nuclear power plants. Under the new approach, the long term rulemaking plan would apply only to proposed new standard plant designs. Decisions regarding the acceptability of existing plants or plants under construction would be made in parallel with standard plant reviews. (See discussion later in this chapter.)

Commission Confident on Waste Disposal. In the culmination of hearings and deliberations extending over three years, the Commission declared in May 1983 that there is reasonable assurance that radioactive wastes from nuclear power plants can eventually be stored safety in underground vaults. The Commission expressed its confidence that one or more mined geological repositories for commercial high level radioactive waste and spent fuel will be available by the years 2007 to 2009. (For background, see the *1980 NRC Annual Report,* pp. 130 and 131, and the *1981 NRC Annual Report,* pp. 81 and 82. See also discussion in Chapter 12 of the present report.)

New Staffing Requirements for Nuclear Plants. Interim requirements established in the wake of the Three Mile Island accident regarding staff qualifications at nuclear plants were made part of the regulations in 1983. The requirements are that (1) a shift supervisor with a senior operator's license shall be at the plant at all times when fuel is in the reactor, (2) another individual with a senior operator's license—and someone other than the person at the controls—shall be in the control room at all times, ready to respond to accident conditions, and (3) an individual with a senior operator's license shall supervise fuel loading or fuel transfers.

Backfit Policy Being Revamped. In a September 1983 policy statement, the Commission affirmed that existing NRC regulations and actual staff practices on backfitting—new requirements imposed after issuance of construction permits or operating licenses—do not adequately identify and justify the new requirements imposed. Consequently, the Commission directed the staff to implement certain interim measures while a rulemaking procedure was undertaken to replace current regulations on backfitting. The interim measures are essentially those employed by the Committee to Review Generic Requirements (see discussion below) which seek to eliminate unnecessary demands on licensees by providing that the need for a new requirement be demonstrated by those seeking to impose it. The interim procedures apply to plant-specific backfits as well as generic, and include cost-benefit analyses as part of the demonstration of need. An informal appeal process will be set up to deal with licensee objections, and a proposed requirement shall not take effect during the appeal process unless the Director of the issuing office determines that prompt implementation is warranted on grounds of public health and safety.

Requirements proposed by the NRC staff related to one or more classes of reactors must be reviewed by the Committee to Review Generic Requirements (CRGR). (See *1982 NRC Annual Report,* pp. 1-3, for full description of CRGR's structure and review process.) Following its review, the CRGR recommends to the Executive Director for Operations (EDO) that the proposed requirement be approved, disapproved, modified, or conditioned in some way. It also makes recommendations as to the method and scheduling of implementation. The EDO considers CRGR recommendations as well as those of relevant NRC offices in deciding whether a requirement shall be imposed. From its inception in November 1981 through December 1983, the CRGR has held 52 meetings with a total of 111 agenda items concerning 86 issues. The number of items to be considered by the CRGR is expected to range from 70 to 80 per year.

Policy and Planning Guidance for 1984

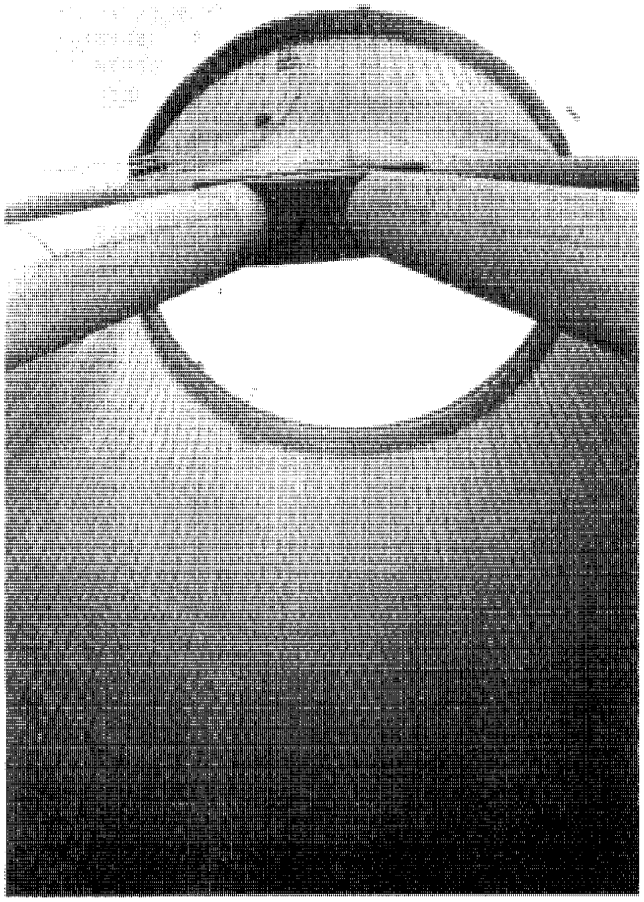
Each year the Commission sets forth explicit policy judgments and positions on basic subjects of importance

to the NRC mission, so that the NRC staff offices can develop program plans and objectives consistent with the Commission's purposes and with one another. The policy and planning guidance for 1984 (NUREG-0885, Issue 3) addresses such basic policy themes. The following is a brief explication of Commission policy on these themes, based on the formal guidance furnished to the entire NRC staff.

Assured Safe Operation of Facilities. As it has been from its inception, the prime concern and task of the NRC is to make sure that both existing nuclear power plants and those coming on line operate safely. The highest priority ofthe agency remains taking whatever actions are necessary to assure that adequate protection of the public health and safety is provided in the operation of licensed nuclear power plants. Licensees and vendors continue to bear the primary responsibility to maintain adequate safety, and the NRC will continue—by requirements, inspections and enforcement actions—to see to it that they are doing so. Both the industry and the agency need to give close study to operating experience and to act upon what is learned. Containment integrity and emergency planning are of particular current importance; the latter should be based on realistic assumptions regarding severe accidents and their potential consequences.

Planning Guidance: Maintenance activities will continue to receive special attention during on-site inspections of operating reactor facilities. The staff should report to the Commission as necessary on any serious safety concerns uncovered in these inspections and should, by April of 1984, develop for Commission consideration a human factors program proposal which offers alternative approaches to the regulation of maintenance activities. The staff should also provide the Commission with its evaluation of the need for and nature of an integrated safety assessment program by the end of fiscal year 1984; the Commission will give due recognition to the self-policing efforts of the nuclear industry in weighing alternative regulatory concepts, to the extent that such efforts are consistent with the NRC's statutory responsibilities. The staff is also directed to formulate criteria by which to identify plant-specific safety issues and problems and communicate their plans to the Commission by February 1984.

Raising the Quality of Nuclear Facilities. With the recurrence of quality assurance problems at nuclear construction sites, and operating plants as well, it has become apparent that the NRC must give active attention to the level of quality in the nuclear industry generally. The goal is to promote a higher level of quality in management, reactor design, power plant construction, operations and maintenance. The NRC's quality assurance program should integrate licensing, inspection, standards, and research functions into a comprehensive program giving clear direction on quality assurance to the NRC regional offices and to the industry. The program should identify overall program goals and set out a task-oriented framework for implementation of those goals. The staff is directed to complete the Congressionally mandated study of existing and alternative programs for improving quality assurance in the construction of nuclear power plants and begin implementing identified improvements.



An unusual view of a cooling tower under construction at the Perry nuclear power facility in Ohio. Because of several serious lapses in quality assurance at nuclear construction sites in recent years, the NRC is giving greater emphasis to comprehensive QA programs at such sites.

Improving Regulation of the Nuclear Industry. This policy theme encompasses the spectrum of concepts, attitudes and efforts by which the NRC strives constantly to make the regulation of civilian nuclear activities more effective and efficient. Some of the guiding principles to be observed in this continuing process are:

- Only necessary requirements should be imposed on licensees, i.e., requirements which make positive contributions to safety in themselves and also in the context of the entire body of regulations.
- NRC regulations should allow licensees the flexibility to select the most cost-effective ways to satisfy safety objectives.

- Unresolved safety issues are to be resolved on the basis of careful analysis of both costs and benefits of implementing a solution.
- In general, issues affecting more than one licensee should be addressed in the context of rulemaking rather than case-by-case; the effort should be made to avoid building in more differences among licensed plants than already exist.
- Priorities in the imposition and implementation of new requirements should be based on expected risk-reduction potential and associated costs.

Planning Guidance: The Committee to Review Generic Requirements shall continue to review proposed generic requirements for reactor licensees and make recommendations on them to the Executive Director for Operations. (See *1982 NRC Annual Report,* pp. 1-3, for discussion of the Committee's origin and functions.) The Committee shall, as before, seek assurance that any new requirement does in fact contribute effectively and significantly to public health and safety and makes efficient use of both NRC and licensee resources, if it is to receive positive recommendation. For proposed requirements affecting only a single facility, the staff should implement its recommendations for management of plant-specific backfitting of operating reactor plants and give its evaluation to the Commission after one year of experience with them. Implementation schedules for new and existing requirements should be established for each power reactor licensee and, where practical, a cost-benefit analysis should be employed in setting priorities. The schedules should reflect the importance of the requirement to public health and safety and also take into account the licensee's ability to complete the necessary engineering, evaluation and design activities associated with a new requirement. Once compliance dates have been established, the Commission will vigorously enforce them. By the end of fiscal year 1985, the staff shall issue for public comment draft technical resolutions for all currently identified unresolved safety issues (see Chapter 2).

Other aspects of policy and planning guidance related to improved regulation of the nuclear industry include the following:

- *Standardization* of nuclear power plants is advantageous and desirable; staff should continue to review standard plant design applications in hand and maintain licensing capabilities to process future applications.
- *Decentralization* of certain NRC headquarters functions to regional offices shall continue to be carefully carried out in accord with Commission policy and planning guidance; views of the public, the industry and other government agencies should be given due consideration, and overall consistency in the activities of the regions should be closely monitored by headquarters offices. (See Chapter 13 for extended description of decentralization activity.)
- *Investigation* of all significant allegations of wrongdoing by other than NRC employees and contractors shall be conducted by the Office of Investigations, at the request of the Commission, the Executive Director for Operations, the Regional Administrators, or on its own initiative. Criteria will be developed to permit clear determination of a threshold for initiating an investigation.
- *Enforcement* of NRC safety and safeguards requirements should be firmly, fairly and uniformly applied through the regional offices. A licensee shall not benefit by a violation of regulations, and those who cannot achieve and maintain an adequate level of protection of the public health and safety will not be permitted to operate. The staff should study ways to motivate management and operating personnel to strive for higher standards of safety; staff should pursue the goal of issuing proposed civil penalty actions within eight weeks after completion of an inspection or investigation. (See Chapter 8.)
- *Unwarranted delay* in reaching licensing decisions must be avoided. The licensing boards are urged to continue taking action to assure efficient conduct of hearings. The aim should be completion of hearings and reviews on schedules which assure that the licensing process will not itself delay startup of a reactor facility unnecessarily. NRC will continue to work with the Federal Emergency Management Agency on difficulties in developing acceptable off-site emergency plans. There must be no compromise to safety from the effort to avoid needless delay. (See Chapter 8.)
- *Transportation* of radioactive materials continues to be an important regulatory concern; staff should seek clearer enunciation of NRC responsibilities in the matter and better coordination with other cognizant Federal agencies under an integrated Federal program of public and environmental protections.

Protecting Nuclear Material and Facilities. Safeguarding materials and facilities from theft and sabotage should receive the same defense-in-depth attention as is accorded nuclear power plant construction and operation. The emphasis should be on performance of licensees rather than on prescriptive requirements, so as to allow licensees to select the most cost-effective ways to provide necessary safeguards.

Planning Guidance: The basis for safeguards regulation shall be the thorough evaluation of both domestic and foreign experience in protecting nuclear materials from theft or sabotage. NRC staff shall continue their independent assessment of the adequacy of safeguards at operating facilities and in the transport of materials and shall report annually to the Commission on those assessments. In the international sphere, the NRC shall continue to carry out its role in helping control the import and especially the export of nuclear materials, equipment and

facilities by the timely processing of export license applications, by meeting its commitment to apply safeguards of the International Atomic Energy Agency to U.S. facilities, and by discouraging the use of highly enriched nuclear fuel in research reactors, domestic and foreign.

Continuing Cleanup of Three Mile Island Unit 2. The expeditious and safe conduct of cleanup operations at the damaged reactor at Three Mile Island (Pa.) remains one of the NRC's highest priorities. The staff will continue to provide oversight of the licensee's cleanup activities and direction, if need be, to ensure that the unit is decontaminated and radioactive materials removed from the site swiftly and safely. The staff should work closely with DOE to obtain whatever analysis of the Unit 2 reactor core can disclose regarding the consequences of severe accidents.

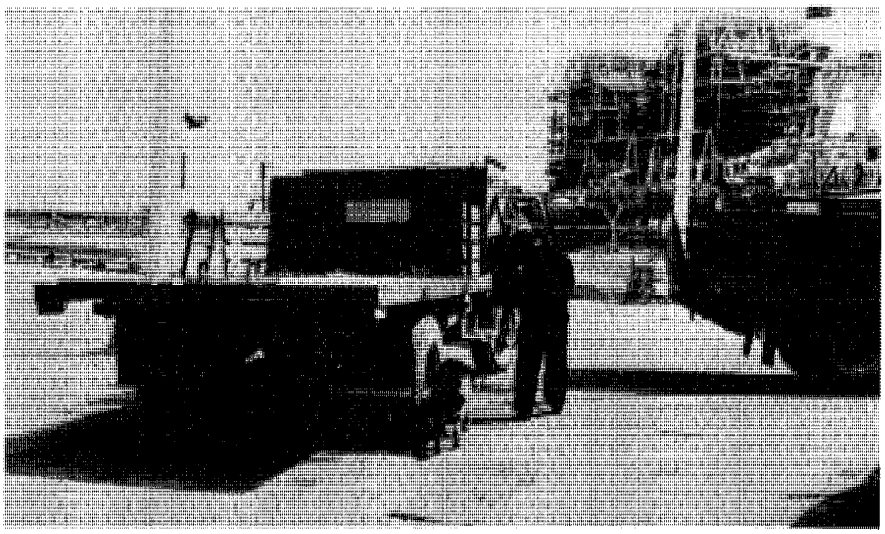
Planning Guidance: The NRC staff, through its TMI program office, should continue close surveillance of the TMI cleanup and of actions implementing the agreement under which the DOE is removing and disposing of solid nuclear wastes and is ultimately to remove the damaged reactor core.

Managing Nuclear Waste. The urgent national task of providing for the permanent disposal of high level nuclear waste is a DOE responsibility, with the NRC as the licensing and regulatory authority. In that capacity, the NRC shall take care that, in the absence of any unresolved safety concern, the regulatory program will not delay implementation of the Executive Branch program. To that end, NRC staff will keep in close communication with DOE and others involved and continue developing licensing criteria and pursuing the early identification of relevant technical issues. The NRC will also monitor activities related to low-level radioactive waste disposal and give advice and technical assistance to the States as needed.

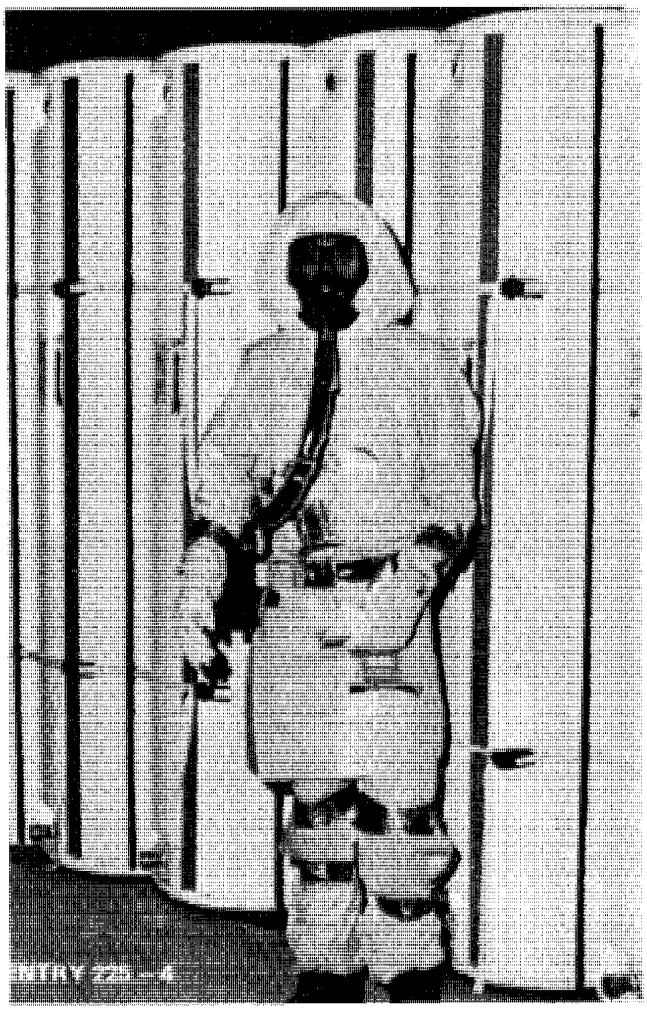
Planning Guidance: The staff should develop a Memorandum of Understanding with DOE defining their roles and relationships in implementing the Nuclear Waste Policy Act of 1982 (NWPA) and also review and, as necessary, revise regulations to bring them into conformance with NWPA. Staff should make sure that their review of utility plans for adding spent fuel storage capacity does not, in the absence of any unresolved safety issue, occasion delays in reactor operation. Staff should also be ready to review any DOE proposal for limited Federal interim storage of spent fuel under NWPA, and continue work on a possible rulemaking by the NRC that would, to the extent practicable, permit use of storage casks for dry spent fuel without site-specific licensing review. Staff shall also report to the Commission on changes needed or recommended in the regulations to implement the mill tailings standard promulgated by the Environmental Protection Agency.

Certain important regulatory tools are also cited in the 1984 policy guidance, including the following:

- *Safety goals* and related safety guidance, such as probabilistic risk assessment (PRA), should continue to be tested and evaluated. The preliminary safety goals (see *1983 NRC Annual Report*, pp. 4 and 7) are not to be used as a basis for regulatory decisions during the two-year evaluation period which began in 1983.
- *Severe accidents* continue to be the subject of serious policy concern and research. The Commission urges an early resolution of technical issues and supports initiation of any necessary rulemaking proceedings or other regulatory change addressing the possibility of severe accidents, whether at reactors operating today or future standard plants. The staff is to give severe accident technical issues a high priority in 1984, and the Commission should complete and adopt a policy paper on the subject by July 1 of 1984.



A nuclear plant security officer and his dog, which is trained to detect the presence of explosives, search a vehicle prior to permitting it to enter the protected area of the facility.



Close surveillance by NRC of the cleanup operations at Three Mile Island Unit 2 continues. This worker in protective clothing is standing in front of tanks containing water as shielding against radiation from contaminated areas inside the reactor containment building.

- *Probabilistic risk assessment* is a useful tool for judging the reliability of safety systems and weighing risks against one another, when used judiciously by staff and boards. The use of the methodology in regulatory decision-making must take its limitations and uncertainties into account. Special attention should be given to the methodology during the safety goal evaluation period (see above) and in such activities as difining generic safety issues, formulatint new requirements, re-evaluating existing requirements, appraising new designs or setting research and inspection priorities. A report on the "state-of-the-art" of the methodology will be prepared in early 1984.
- *The radioactive source terms*—the inventories of radioactive materials that could be released in a nuclear reactor accidents—will have to be better understood and defined before the Commission can propose new nuclear power plant siting policy. Systematic analyses of the release and transport of radioactivity is well under way and a first reassessment of the source terms should be available by December 1984. Any revision to NRC siting requirements will be based on these analyses and the two-year evaluation of the preliminary safety goals cited above. Emergency preparedness may also be affected; that possibility should be evaluated when new source terms have been validated through an effective peer review process.
- *Research* to provide the technical basis for rulemaking and regulatory decisions, to support licensing and inspection activities, to assess the feasibility and effectiveness of safety improvements, and to increase understanding of phenomena with regulatory implications will continue under NRC sponsorship. The emphasis will be on a balanced program of research to reinforce or revise the current regulatory base and conceptual research for improved reactor safety. The highest priority will continue to be research into light water reactor safety.

Reactor Regulation

CHAPTER 2

The Office of Nuclear Reactor Regulation (NRR) is responsible for reviewing applications for construction permits and operating licenses for nuclear reactors and for issuing such permits and licenses after consideration by the Advisory Committee on Reactor Safeguards, Atomic Safety and Licensing Boards and Appeal Boards, and the Commission. It is also responsible for regulation of operating reactors. These functions require resolution of generic and specific issues with regard to safety, the environment, and antitrust matters.

This chapter summarizes NRR activities during fiscal year 1983, under the following headings: Status of Licensing, Improving the Licensing Process, Human Factors, Unresolved Safety Issues, Safety Reviews, Protecting the Environment, and Antitrust Activities. Also included in this chapter is a section on the activities of the Advisory Committee on Reactor Safeguards.

Status of Licensing

Applications for Operating Licenses For Power Reactors

During fiscal year 1983, three power reactor facilities were licensed, first for low power operation and then to permit full power operation. In addition, two facilities previously licensed for low power operation were permitted full power operation (see Table 1). Three safety evaluation reports and two final environmental statements were also issued during the fiscal year. All plants under construction have operating license applications under review; the reviews are targeted for completion on a schedule consistent with plant completion. Specific review schedules have been established for plants to be completed through 1986. Some plants with construction permits are indefinitely delayed.

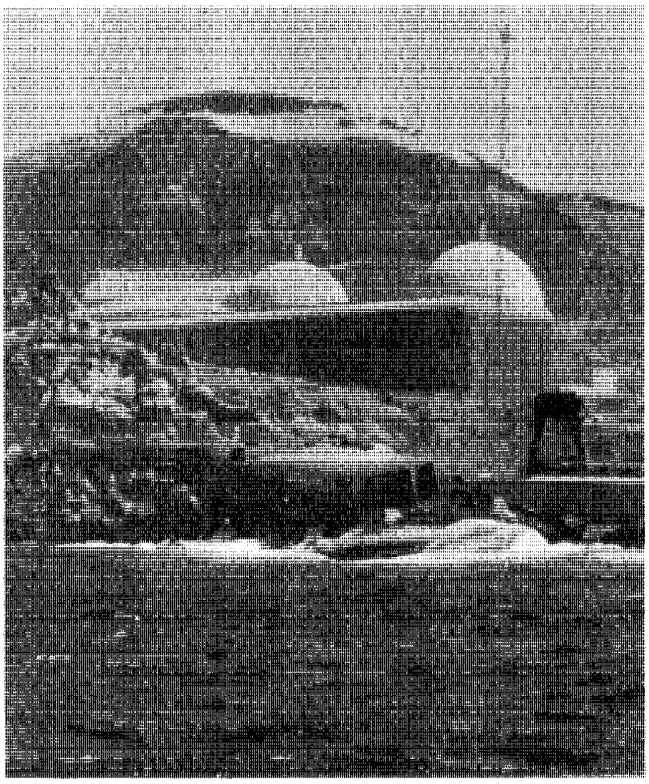
Several cases have experienced special problems. Among them are the following:

- Diablo Canyon Units 1 and 2 (Cal.) have been the subject of an independent design and construction verification program because of certain errors earlier discovered. A decision on reinstating the low power operating license, which was suspended in 1981, is scheduled for early fiscal year 1984.
- In November 1982, the Commission ordered that all safety-related work on the Zimmer nuclear plant under construction in Ohio be suspended.
- On December 2, 1982, most of the safety-related work on the Midland (Mich.) plant was halted because of significant problems with the quality assurance inspection process and with conformance of installed components to design documents. A construction completion program, which will verify the adequacy of previous construction and assure the adequacy of future construction, was submitted by the utility.

Applications for Construction Permits Or Manufacturing Licenses

On December 17, 1982, the NRC issued a manufacturing license to Offshore Power Systems for the Floating Nuclear Plant. No construction permits were issued during fiscal year 1983. Utilities announced the cancellation of the following units for which construction permits had been issued: Cherokee Units 1, 2, and 3 (S.C.) and North Anna Unit 3 (Va.). The applicant for Pebble Springs Units 1 and 2 (Ore.) announced cancellation. The applicant for Skagit/ Hanford (Wash.) announced its intention to cancel the application. There are no other construction permit or manufacturing license applications under review, except for the Clinch River project described below.

Clinch River Breeder Reactor. An authorization was granted by the Commission on August 17, 1982, of an exemption of the Clinch River Breeder Reactor Plant (Tenn.) from certain procedural requirements, in order to permit site preparation to begin before the holding of a public hearing. That authorization was appealed by petition of intervenors to the U.S. Court of Appeals for the District of Columbia Circuit. On December 10, 1982, that Court asked the NRC to identify the exigent circumstances that warranted such an exception, and the NRC did so on January 7, 1983. On February 28, 1983, an Atomic Safety and Licensing Board (ASLB), after holding a public hearing, issued a partial initial decision concluding that a limited work authorization (LWA) should be



Diablo Canyon Units 1 and 2 in California have been delayed in coming on line because of certain design and construction problems. The Commission was expected to come to a decision on whether to allow low power operations at the facility in early 1984.

issued. On May 19, the NRC staff issued an LWA to conduct the same activities of site preparation at Clinch River as had been previously authorized by the exemption. Also on May 19, the Circuit Court dismissed the intervenors' petition about the exemption as a moot question. However, the intervenors have appealed the decision of the ASLB on issuance of an LWA, and oral arguments on that matter were heard by the Atomic Safety and Licensing Appeal Board on September 28, 1983.

The environmental and safety reviews for a construction permit continued during fiscal year 1983 and were completed on schedule. A supplement to the Final Environmental Statement was issued by the NRC staff on October 29, 1982, and the environmental hearings before the ASLB were completed on December 17, 1982. The Safety Evaluation Report was issued by the NRC staff on March 11, 1983. It was reviewed by the Advisory Committee on Reactor Safeguards, whose concerns were addressed by the NRC staff in supplements issued on May 2 and May 20.

Safety hearings were conducted by the ASLB on August 8-11, 1983. The intervenors withdrew all contentions concerning safety matters prior to the commencement of the hearings and were consequently removed as parties to the safety hearings by the ASLB. A partial initial decision on safety matters is pending, and a decision on the construction permit is scheduled for June 1984.

Licensing Actions for Operating Power Reactors

At the end of fiscal year 1983, 80 power reactors were licensed to operate. There are generally four types of post-licensing actions that can affect operating reactors: (1) license amendment requests, (2) public hearings, (3) orders for modification of a license or exemptions to the regulations, and (4) review of information supplied by a licensee for the resolution of technical issues. With the publication of the "Clarification of TMI Action Plan Requirements" (NUREG-0737) in fiscal year 1981, the backlog of these kinds of actions increased dramatically to approximately 5400 by the beginning of fiscal year 1982. To reduce this backlog, the NRC established strong management controls over the issuance of new requirements and dedicated additional resources to the review of pending actions. As a result, the inventory of active licensing actions decreased by the end of fiscal year 1982 to 3557 and was about 3600 at the end of fiscal year 1983. The slight increase in fiscal year 1983 occurred as a result of the initiation of over 2200 new licensing actions during the year (over 1700 of which were plant specific). Efforts will be made to clear the backlog completely by the end of fiscal year 1986.

Licensing Actions for Nonpower Reactors

At the start of fiscal year 1983, 66 nonpower reactors—those designed for test, research and training purposes—were licensed for operation by the NRC. There was also a backlog of 22 license renewal requests. The three renewal actions involving contested proceedings (noted in last year's report) were still not resolved. During fiscal year 1983, renewals of operating licenses were issued for five nonpower reactors and two new applications for renewal were received, leaving a total of 19 renewal requests awaiting completion of staff reviews at the end of the year. Five renewals are scheduled for issuance in early fiscal year 1984. A supplement to the Safety Evaluation Report was issued for two of the reactors whose renewal was in contention, and summary dispositions were filed in two of the contested renewals. Two nonpower reactor operating licenses were terminated at the request of the licensee, and three licensees applied for authorization to dismantle their reactors and to have their licenses terminated. About 18 amendments to operating licenses were issued, changing license conditions such as physical security plans and technical specifications. Early in fiscal year 1983, all nonpower reactor licensees submitted emergency plans as required, and two had received NRC approval by the end of the year.

Table 1. Licenses Issued in 1983 for Operation of Nuclear Power Plants

Applicant	*Facility*	*Low Power*	*Full Power*	*Location*
Southern California Edison Co.	San Onofre 3	11/15/82	9/16/83	San Diego Co., Cal.
Duke Power Co.	McGuire 2	3/03/83	5/27/83	Mecklenburg Co., N. C.
Florida Power & Light Co.	St. Lucie 2	4/06/83	6/10/83	St. Lucie Co., Fla.
Pennsylvania Power & Light Co.	Susquehanna 1	7/17/82	11/12/82	Berwick, Pa.
South Carolina Electric & Gas Co.	Summer 1	8/06/82	11/12/82	Columbia, S.C.

Special Cases

Restart of TMI-1. With regard to the restart of Unit 1 of Three Mile Island (Pa.), the Supreme Court upheld the Commission's decision to exclude possible psychological stress in the community as a restart hearing issue. The Commission also determined that emergency planning at TMI-1 is adequate for purposes of restarting the facility. The modifications and repairs affecting plant readiness, including repairs to the steam generators, are essentially complete. All remaining restart hearing issues are before the Commission to determine whether the NRC Order of August 9, 1979, suspending operation should be lifted. During fiscal year 1983, the hearing was ordered reopened by the cognizant Appeal Board to receive additional testimony on (1) the viability of the "feed-and-bleed" mode of cooling at TMI-1 and (2) certain allegations from a former control room operator charging improprieties in determining reactor coolant system leak rates at TMI-2 prior to the March 1979 accident. The Appeal Board found in favor of restart on the first issue; proceedings on the second issue are continuing into fiscal year 1984.

During fiscal year 1983, at Commission direction, NRC staff reviewed the trial record from the lawsuit of General Public Utilities (the TMI licensee) against Babcock & Wilcox (the TMI reactor vendor) to determine whether any information in the record affects positions developed during the TMI-1 restart hearing, which preceded the lawsuit. This review required in excess of 15,000 person-hours and is documented in NUREG-1020 published in September 1983. The staff conclusions were that (1) the lawsuit record contains information in seven areas related to management competence/integrity requiring further investigation before the staff can make a decision regarding the revalidation of its position on management integrity and (2) that, except in the category of management integrity, none of the information contained in the lawsuit record caused the staff to alter its previous conclusions or their principal bases as presented in the TMI-1 restart proceeding.

Indian Point Hearings. Hearings were held in 1983 by an Atomic Safety and Licensing Board (ASLB) on whether Indian Point Units 2 and 3 should be shut down or other action taken. The record was closed on April 29, 1983.

Three of the Commission's original seven questions before the ASLB went to the character and magnitude of the risk posed by severe reactor accidents at Indian Point Units 2 and 3. To respond to these questions, the licensees published in March 1982 a thorough probabilistic risk assessment. The NRC staff, for its part, commissioned a thorough review and reanalysis of the character and likelihood of severe reactor accidents based upon the licensees' submittal and performed a fully independent analysis of the radiological releases and off-site consequences associated with the spectrum of severe reactor accidents.

These analyses of the risk posed by severe accidents at Indian Point turned up three accident scenarios at Indian Point Unit 2 and one at Unit 3 for which the vulnerabilities were pronounced and avoidable. These were (1) vulnerability of the control building of Unit 2 to damaging interactions with Unit 1 structures under earthquake conditions, (2) vulnerability of Units 2 and 3 to fires in the switchgear room and cable tunnels, and (3) vulnerability of Unit 2 to extreme hurricane winds. The staff, in collaboration with the licensees, identified highly cost-effective alterations in design or operating procedures to sharply reduce the vulnerability of the plants to these accident scenarios. These changes were voluntarily made by the licensees at each unit prior to restart in the winter of 1982 and the spring of 1983 for Units 2 and 3, respectively.

The staff's further inquiry into the severe accident risk—together with its study of the economic, environmental, and other consequences of shutdown— concluded that the plants, as modified, pose no undue risk and satisfy the other tests expressed or implied by the Commission's charge to the board. Hence the staff recom-

THE LICENSING PROCESS

Obtaining an NRC construction permit—or a limited work authorization, pending a decision on issuance of a construction permit—is the first objective of a utility or other company seeking to operate a nuclear power reactor or other nuclear facility under NRC license. The process is set in motion with the filing and acceptance of the application, generally comprising ten or more large volumes of material covering both safety and environmental factors, in accordance with NRC requirements and guidance. The second phase consists of safety, environmental, safeguards and antitrust reviews undertaken by the NRC staff. Third, a safety review is conducted by the independent Advisory Committee on Reactor Safeguards (ACRS); this review is required by law. Fourth, a mandatory public hearing is conducted by a three-member Atomic Saftey and Licensing Board (ASLB), which then makes an initial decision as to whether the permit should be gratned. This decision is subject to appeal to an Atomic Safety and Licensing Appeal Board (ASLAB) and could ultimately go to the Commissioners for final NRC decision. The law provides for appear beyond the Commission in the Federal courts.

As soon as an initial application is accepted, or "docketed," by the NRC, a notice of that fact is published in the *Federal Register*, and copies of the application are furnished to appropriate State and local authorities and to a local public document room (LPDR) established in the vicinity of the proposed site, as well as to the NRC-PDR in Washington, D.C. At the same time, a notice of a public hearing is published in the *Federal Register* and local newspapers which provides 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 ASLAB.

The NRC staff's safety, safeguards, environmental and antitrust reviews proceed in parallel. With the guidance of the Standard Format (Regulatory Guide 1.70), the applicant for a construction permit lays out the proposed nuclear plant design in a Preliminary Safety Analysis Report (PSAR). If and when this report has been made sufficiently complete to warrant review, the application is docketed and NRC staff evaluations begin. Even prior to submission of the report, NRC staff conducts a substantive review and inspection of the applicant's quality assurance program covering design and procurement. The safety review is performed by NRC staff in accordance with the Standard Review Plan for Light-Water-Cooled Reactors, initially published in September 1975 and updated periodically. This plan states the acceptance criteria used in evaluating the various systems, components and structures important to safety and in assessing the proposed site, and it describes the procedures 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 employed and accurately carried out; whether the applicant has conducted his analysis and evaluation in sufficient depth and breadth to support staff aproval with respect to safety. When the staff is satisfied that the acceptance criteria of the Standard Review Plan have been met by the applicant's preliminary report, a Safety Evaluation Report is prepared by the staff summarizing the results of its review regarding the anticipated effects of the proposed facility on the public health and safety.

Following publication of the staff Safety Evaluation Report, the ACRS completes its review and meets with staff and applicant. The ACRS then prepares a letter report to the Chairman of the NRC presenting the results of its independent evaluation and recommending whether or not a construction permit should be issued. The staff issues a supplement to the Safety Evaluation Report incorporating any changes or actions adopted as a result of ACRS recommendations. A public hearing can then be held, generally in a community near the proposed site, on safety aspects of the licensing decision.

In appropriate cases, NRC may grant a Limited Work Authorization to an applicant in advance of the final decision on the construction permit in order to allow certain work to begin at the site, saving as much as seven months time. The authorization will not be given, however, until NRC staff has completed environmental impact and site suitability reviews and the appointed ASLB has conducted a public hearing on environmental impact and site suitability with a favorable finding. To realize the desired saving of time, the applicant must submit the environmental portion of the application early.

The environmental review begins with a review of the applicant's Environmental Report (ER) for acceptability. Assuming the ER is sufficiently complete to warrant review, it is docketed and an analysis of the consequences to the environment of the construction and operation of the proposed facility at the proposed site is begun. Upon completion of this analysis, a Draft Environmental Statement is published and distributed with specific requests for review and comment by Federal, State and local agencies, other interested parties and members of the public. All of their comments are then 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 respective publication. During this same time period NRC is conducting an analysis and preparing a report on site suitability aspects of the proposed licensing action. Upon completion of these activities, a public hearing, with the appointed ASLB presiding, may be conducted on environmental and site suitability aspects of the proposed licensing action (or a single hearing on both safety and environmental matters may be held, if that is indicated.

The antitrust reviews of license applications are carried out by the NRC and the Attorney General in advance of, or currently with, other licensing reviews. If an antitrust hearing is required, it is held separately from those on safety and environmental aspects.

About two or three years before construction of the plant is scheduled to complete, the applicant files an application for an operating license. A process similar to that for the construction permit is followed. The application is filed, NRC staff and the ACRS review it, a Safety Evaluation Report and an updated Environmental Statement are issued. A public hearing is not mandatory at this stage, but one may be held if requested by affected members of the public or at the initiative of the Commission. Each license for operation of a nuclear reactor contains technical specifications which set forth the particular safety and environmental protection measures to be imposed upon the facility and the conditions that must be met for the facility to operate.

Once licensed, a nuclear facility remains under NRC surveillance and undergoes periodic inspections throughout its operating life. In cases where the NRC finds that substantial, additional protection is necessary for the public health and safety or the common defense and security, the NRC may require "backfitting" of a licensed plant, that is, the addition, elimination or modification of structures, systems or components of the plant.

mended against a shutdown order and recommended that no further alterations of design be made a condition of operation at Indian Point. The staff did, however, recommend that the licensees be ordered to implement a safety assurance program to strengthen the confidence that the risk assessments of the Indian Point units are, and remain, a valid model of the severe accident vulnerability of the station.

On August 24, 1983, the ASLB extended the deadline for issuance of recommendations to the Commission. (The recommendations were issued on October 24, 1983.)

Improving the Licensing Process

Temporary Operating Licenses

Public Law 97-415, enacted on January 4, 1983, authorized the Commission to issue temporary operating licenses (TOLs) in advance of conducting or completing a hearing on contested issues. The applicant may file a petition for a TOL after completion of the following documents: (1) the report of the Advisory Committee on Reactor Safeguards; (2) the initial Safety Evaluation Report, and the first supplement to the report prepared in response to the report of the Advisory Committee on Reactor Safeguards for the facility; (3) the final detailed statement on the environmental impact of the facility; and (4) a State, local, or utility emergency preparedness plan for the facility.

The initial petition for a temporary operating license must be limited to power levels not to exceed 5 percent of rated full thermal power. The licensee may file subsequent petitions to amend the license to allow facility operation in staged increases at specific power levels.

The issuance of a TOL is contingent on the following findings by the NRC:

(1) In all respects other than the conduct or completion of any required hearing, the requirements of law are met.

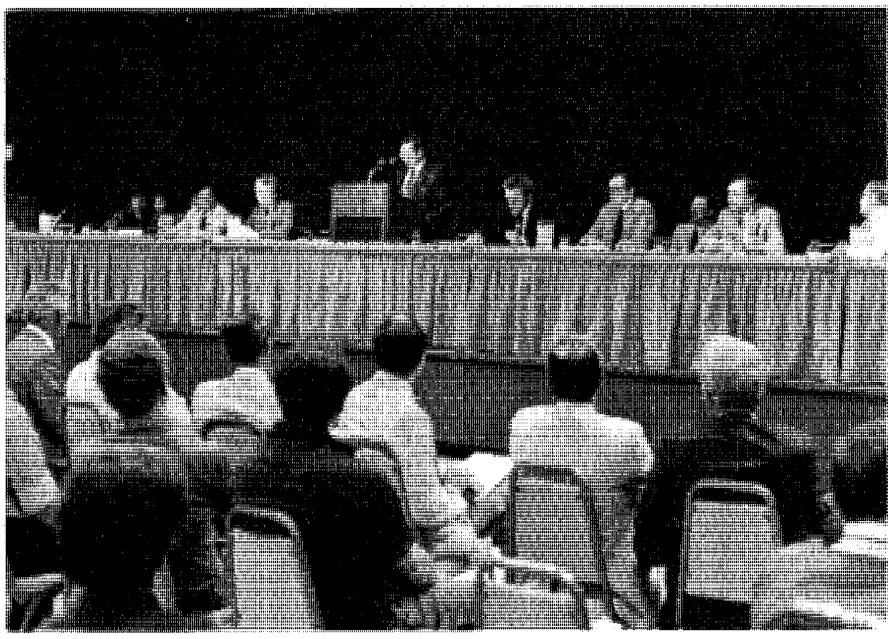
(2) In accordance with such requirements, there is reasonable assurance that operation of the facility during the period of the temporary operating license, in accordance with its terms and conditions, will provide adequate protection to the public health and safety and the environment during the period of temporary operation.

(3) Denial of such temporary operating license will result in delay between the date on which construction of the facility is sufficiently completed, in the judgment of the Commission, to permit issuance of the temporary operating license, and the date when such facility would otherwise receive a final operating license.

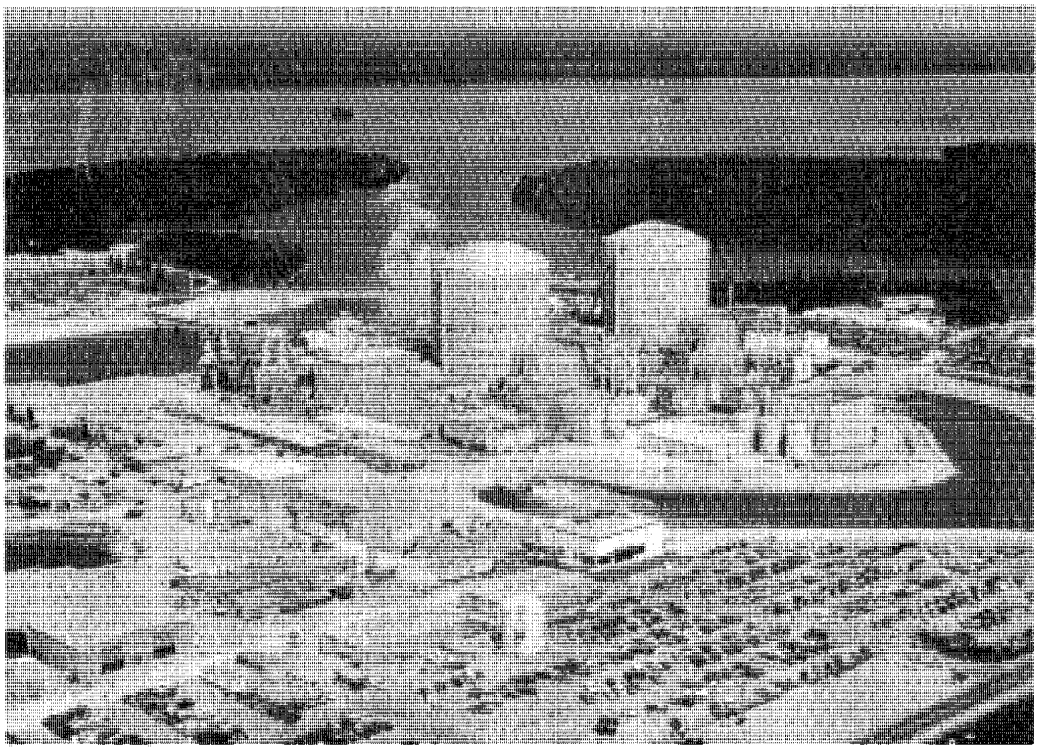
The authority to issue new temporary operating licenses was scheduled to expire on December 31, 1983.

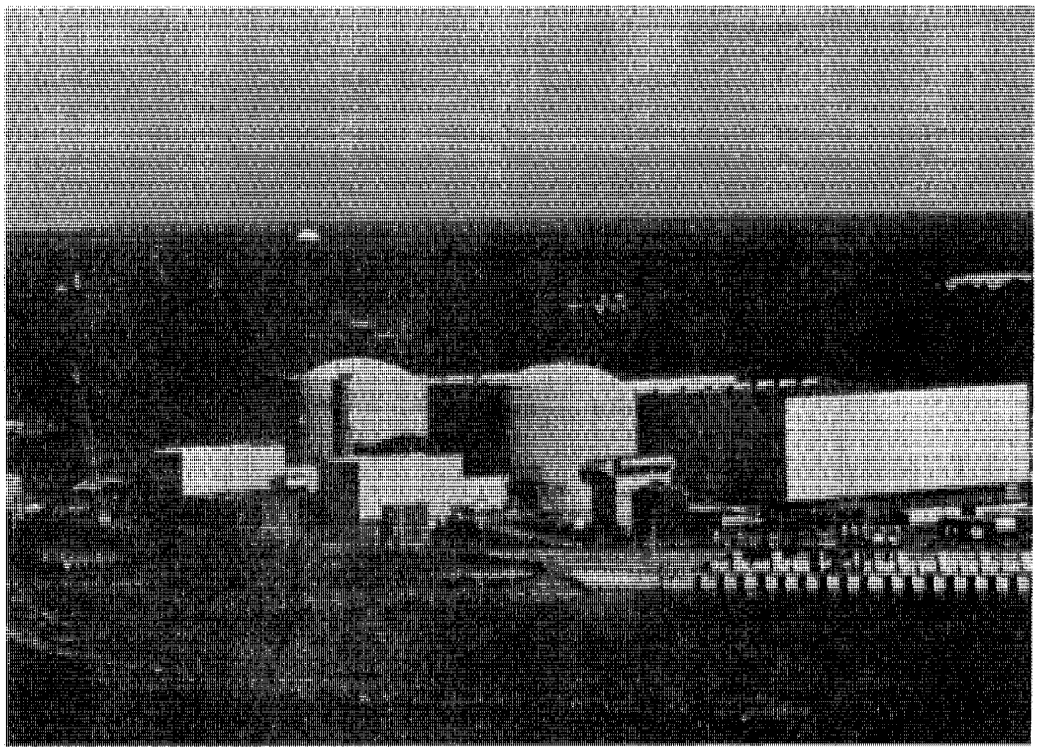
Amendments to Operating Licenses

Public Law 97-415 also authorized the NRC to issue and make immediately effective any amendment to an



Region III (Chicago) Regional Administrator James G. Keppler and members of the regional and headquarters staff held a public meeting in Midland, Mich., in August 1983 to provide area residents an opportunity to comment or raise questions on the "Construction Completion Program" submitted to the NRC by Consumers Power Company. The company is licensee for the Midland Nuclear Power Plant, where there have been difficulties in construction activities. More than 250 residents, public officials and media representatives attended the meeting.





The St. Lucie nuclear power facility, shown top left, is located on Hutchinson Island, off the east coast of Florida. Unit 2, on the left, received a full-power operating license in June 1983. Transmission line towers can be seen at upper left. The McGuire nuclear station, below right is located 17 miles north of Charlotte, N.C., where Unit 2, on the right, was licensed for full-power operation in May 1983. Unit 1 was licensed in 1981.

operating license upon a determination by the NRC that such an amendment involves no "significant hazards" consideration, notwithstanding the pendency before the Commission of a request for a hearing on the matter.

The legislation also required the NRC to:

- Consult with the State in which the facility is located in determining whether an amendment involves no significant hazards consideration.
- Publish a monthly notice of any amendments issued or proposed to be issued involving no significant hazards considerations.
- Promulgate regulations establishing (1) standards for determining whether any amendment to an operating license involves no significant hazards consideration, (2) criteria for providing or, in emergency situations, dispensing with prior notice and reasonable opportunity for public comment on any such determination, and (3) procedures for State consultation on any such determination.

The required NRC regulations were published on April 6, 1983, and became effective on May 6, 1983. Since then, the NRC has issued one amendment under its new authority. On August 25, 1983, the NRC issued an amendment for Three Mile Island Unit 1 (TMI-1) approving the kinetic expansion repair technique as an alternative to plugging of defective steam generator tubes, for purposes of steam generator hot functional testing using nonnuclear pump heat. The NRC concluded that the amendment did not involve a significant hazards consideration. The amendment was issued and made immediately effective, notwithstanding a hearing request from four persons regarding the larger issue of (nuclear) operation of TMI-1 with steam generator tubes repaired by kinetic expansion.

Decentralization

During fiscal year 1983, responsibility for about one hundred licensing reviews was transferred to the five Regional offices of the NRC. Included are such matters as plant shielding, mechanical and hydraulic snubber installations, shift manning, and selected plant-specific items. The Region conducts technical reviews, makes site visits when appropriate, and prepares Safety Evaluation Reports for the Office of Nuclear Reactor Regulation, which then takes appropriate licensing action. Responsibility for review and approval of changes made to a facility's security plan was transferred to Regions I and II (in Philadelphia and Atlanta, respectively) in fiscal year 1983 and is planned for transfer to the remaining Regions in fiscal year 1984. On December 3, 1982, the licensing authority for all of the Fort St. Vrain Nuclear Generating Station (FSV) licensing actions, except those involving generic issues or exemptions to regulations, was delegated to Region IV (Dallas). FSV is the only High Temperature Gas Cooled Reactor in operation in the United States. This is the first instance of regionalized reactor regulation, and it will be carefully evaluated prior to any decision on further decentralization of reactor regulation.

Standardization

On July 27, 1983, the NRC issued a Final Design Approval (FDA) for General Electric Company's BWR/6 Nuclear Island Design, called GESSAR II. The approval of GESSAR II constitutes the first FDA issued by the NRC for a major portion of a standard nuclear power plant design. Also, in fiscal year 1983, the NRC continued its review of the application by the General Electric Company for an FDA for the severe accident portion of GESSAR II. The NRC has continued its review of the application for an FDA of the Combustion Engineering Standard Safety Analysis Report (CESSAR) of their System 80 Design. All outstanding issues have been resolved and the NRC expects to reach a decision on an FDA for CESSAR in the near future. Westinghouse Electric has continued technical discussions with the NRC in preparation for filing an application for a preliminary design approval for their advanced PWR design. This application is expected in late 1983. The Electric Power Research Institute is engaged in continuing discussions with the NRC concerning their program for the development of standard designs for light water reactors.

Priorities of Generic Safety Issues

A priority list of generic safety issues has been developed, using the method described in the *1982 NRC Annual Report,* page 29; the list is contained in NUREG-0933 (draft of March 31, 1983). The list includes items from the Action Plan formulated after the accident at the Three Mile Island plant in 1979, but it does not include Unresolved Safety Issues, which are handled separately (see discussion later in this chapter). The list presently consists of 26 high-priority, 34 medium-priority, and 29 nearly-resolved issues. Schedules have been developed for the completion of these 89 issues, and their status will be monitored by a Generic Issues Management Control System.

Coordination of Regulatory Requirements

Licensees have urged that NRC requirements be better coordinated to take account of their overall effect on plant operation and utility resources. The NRC staff has taken steps to integrate implementation schedules for formally approved new requirements and existing requirements, using the Duane Arnold (Iowa) nuclear

power plant as the lead plant. In May 1983, an amendment was issued to the Duane Arnold license to provide for the implementation of a plan for integrated scheduling of plant modifications. The NRC is preparing to negotiate similar arrangements with other utilities. This approach should help establish realistic and enforceable implementation schedules for NRC requirements at operating reactors.

Regulatory Reform

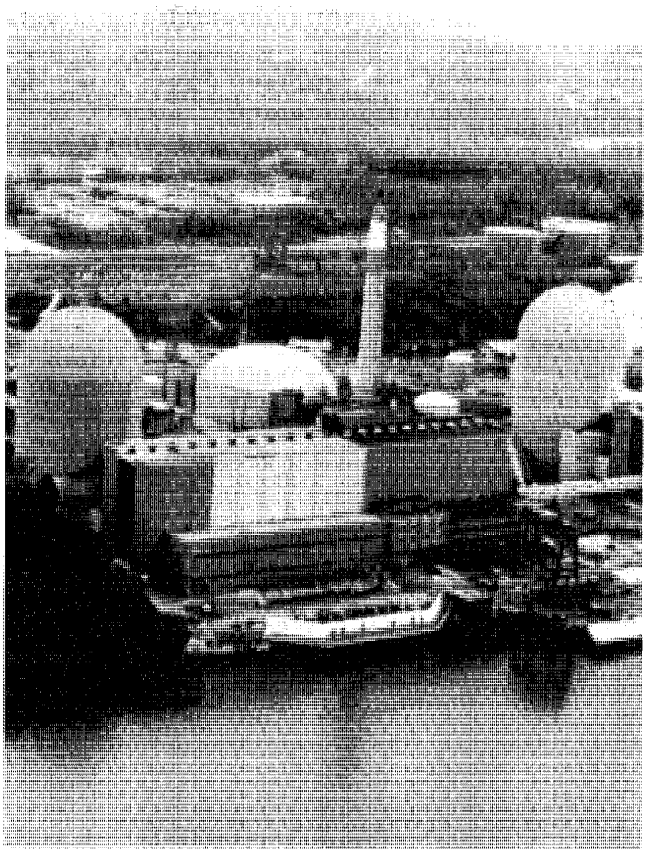
In November 1981, the Chairman of the NRC formed a Regulatory Reform Task Force to examine the NRC's licensing process for the design, siting, construction, and operation of nuclear power plants and other nuclear facilities. As a result of the task force's efforts, a comprehensive legislative proposal was developed and published for public comment in June 1982. After a review of the public comments, the Commission developed a final draft bill entitled the "Nuclear Power Plant Licensing Reform Act of 1983," which was submitted to Congress in February 1983. This legislative package is currently undergoing Congressional review. The proposed legislation, if adopted, would amend the Atomic Energy Act to permit the issuance of a combined construction permit and operating license, to delete the requirement for a mandatory construction permit hearing, to authorize the use of a modified hearing process, and to authorize early and separate approval of sites and designs for nuclear plants.

Backfitting

On June 22, 1983, the Commission approved a set of directions to the NRC staff for controlling plant-specific backfitting measures required of licensees of operating nuclear power plants. The Commission directed the NRC staff to prepare, on a plant-specific basis, a description of each staff-proposed requirement that involves a new staff position or a change in an existing staff position. The description must include a brief statement of how the proposed requirement would improve safety, and must be approved by NRC licensing management before being forwarded to the licensee.

The Commission directed the staff to provide an informal appeal process to provide an opportunity for operating reactor licensees to discuss any areas of disagreement with a staff-proposed requirement. If, after use of the appeal process, the licensee objects to the proposed requirement, the staff must prepare an assessment of the costs and benefits of the proposed requirement. Unless the appropriate Office Director determines that the prompt imposition of a requirement is needed to protect the public health and safety or the common defense and security, a staff-proposed requirement may not be imposed during the appeal process and, if the licensee objects, until after the cost-benefit assessment is completed and a final determination has been made that the requirement should be imposed. The NRC staff is preparing a plan for implementing the Commission's directions regarding plant-specific backfitting proposals for operating reactors. Following Commission review, the implementation plan and the appeal process will be sent to all operating reactor licensees. Finally, the Commission directed the NRC staff to conduct a study of the feasibility of, and alternatives for, applying backfit controls to plants for which a construction permit, but not an operating license, has been issued.

September 28, 1983, the Commission published in the *Federal Register* a policy statement describing the actions it had taken to control backfitting (48 FR 44173) and an advance notice of proposed rulemaking for public comment (48 FR 44217). Before proceeding with a proposed rule on backfitting, the Commission believes it would be helpful to obtain the views of electric utility licensees, other elements of the nuclear industry, and the public.



Hearings were held in 1983 regarding the risks associated with operations at Indian Point Units 2 and 3, about 40 miles north of New York City on the Hudson River. Discussion and deliberation as to whether the two units should be shut down, or some other action should be taken, continued through the report period.

Human Factors

The NRC is concerned with those activities in which human performance is a key element in the safe operation and maintenance of nuclear power plant equipment or facilities. These include staffing and qualifications of personnel, training of personnel, licensing of operators, development and application of procedures, man-machine interfaces, and management and organization of plants.

An NRC Human Factors Program Plan was published in August 1983 (NUREG-0985) to develop required technical data for regulatory action. An NRC Human Factors Review Group was established in February 1983 to assure coordination of activities and to consider related or new areas of concern.

Staffing and Qualifications

NRC regulations were amended by publication in the *Federal Register* on July 11, 1983 (48 FR 31611) of a requirement that licensees of nuclear power units provide a minimum number of licensed operators and senior operators on each shift and that a person with a senior operator license be in the control room at all times while the unit is being operated. The implementation date for this rule is January 1, 1984.

NRC published a draft Commission policy statement in the *Federal Register* on July 25, 1983 (48 FR 33781) regarding engineering expertise on shift. This would allow licensees to combine the functions of the senior reactor operator and the shift technical advisor and thus permit the integration of the shift technical capabilities into the normal operating crew.

During fiscal year 1983, NRC initiated a proposed rulemaking package that would eventually require a person in line management on shift to have a bachelor's degree in engineering or related science. Utilities would be given two years to have at least one person on each shift who holds both a degree (or equivalent) and a senior operator license. Further, the rule would require that utilities submit a timetable for providing that all shift supervisors have bachelor's degrees. This move will make for enhanced on-shift diagnostic and response capability, interactions of the operations and engineering groups within each utility, and increased professionalism of the operating staff.

Training

In January 1983, Congress enacted the Nuclear Waste Policy Act of 1982 (P.L. 97-425). Section 306 of this Act directs the NRC to promulgate regulations or other appropriate guidance for the training and qualifications of civilian nuclear power plant operators, supervisors, technicians and other appropriate personnel. In addition, this Act requires the NRC to establish simulator training requirements for applicants for operator licenses and for operator requalification programs, requirements governing NRC administration of requalification examinations, requirements for operating tests at civilian nuclear power plant simulators, and instructional requirements for licensee personnel training programs. In response to this Congressional mandate, NRC staff has developed a proposed rulemaking package that includes four regulatory guides.

NRC staff continued to monitor the program of the Institute of Nuclear Power Operations for accreditation of training in the nuclear power industry. A plan for evaluating this program was developed and will be implemented in fiscal year 1984.

An audit of the pertinent training program for operators at the Salem Nuclear Generating Station was conducted following the failure of the automaticshutdown system of Unit 1 on February 22 and 25, 1983. Recommendations were made and implemented for improving such training. NRC staff also developed criteria for evaluating related training programs for all licensees and applicants.

Operator Licensing

During fiscal year 1983, 368 new licenses and 190 license renewals were issued for reactor operators. For senior reactor operators, 358 new licenses and 412 license renewals were issued. There were also 21 instructor certifications issued. Initial licensing examinations were given for new operators at Palo Verde 1 (Ariz.), Diablo Canyon 1 & 2 (Cal.), WNP 2 (Wash.), San Onofre 3 (Cal.), Comanche Peak (Tex.), Waterford 3 (La.), LaSalle 1 (Ill.), Catawba 1 (S.C.), Grand Gulf 1 (Miss.), Susquehanna 2 (Pa.), Shearon Harris 1 (N.C.), Byron (Ill.), Perry (Ohio), and Fermi 2 (Mich.).

The scheduling and administration of requalification examinations began in May 1983, and they were given at 12 facilities in fiscal year 1983. Requalification audit examinations will be completed at 50 percent of operating power reactors by October 1984 and at all power reactors by the end of fiscal year 1985.

Decentralization of the operator licensing function continued with added staffing of all regional offices. Full responsibility and authority for licensing operators was transferred to Regions II (Atlanta) and III (Chicago) in December 1982, to Region I (Philadelphia) in June 1983, and to Regions IV (Dallas) and V (San Francisco) in September 1983, completing the decentralization of this activity. NRR retains responsibility for program direction and policy guidance.

In order to assure standardization across the NRC Regions, the examiner standards for administering examinations at power reactors were reviewed, rewritten, and approved for publication as NUREG-1021 in the first

quarter of fiscal year 1984. This effort completes the first major revision and update of guidance to examiners since 1973. Work has begun on the development of assessment standards to be applied in the NRR's oversight and coordination of operator licensing functions.

Idaho National Engineering Laboratory completed the initial development of a computerized examination question bank during the report period. Remote terminals have made this system available to all regional and nationallaboratory licensing examiners. Further development and refinements of the data bank are in progress. The examination data bank should aid in maintaining consistency and efficiency in the examination process.

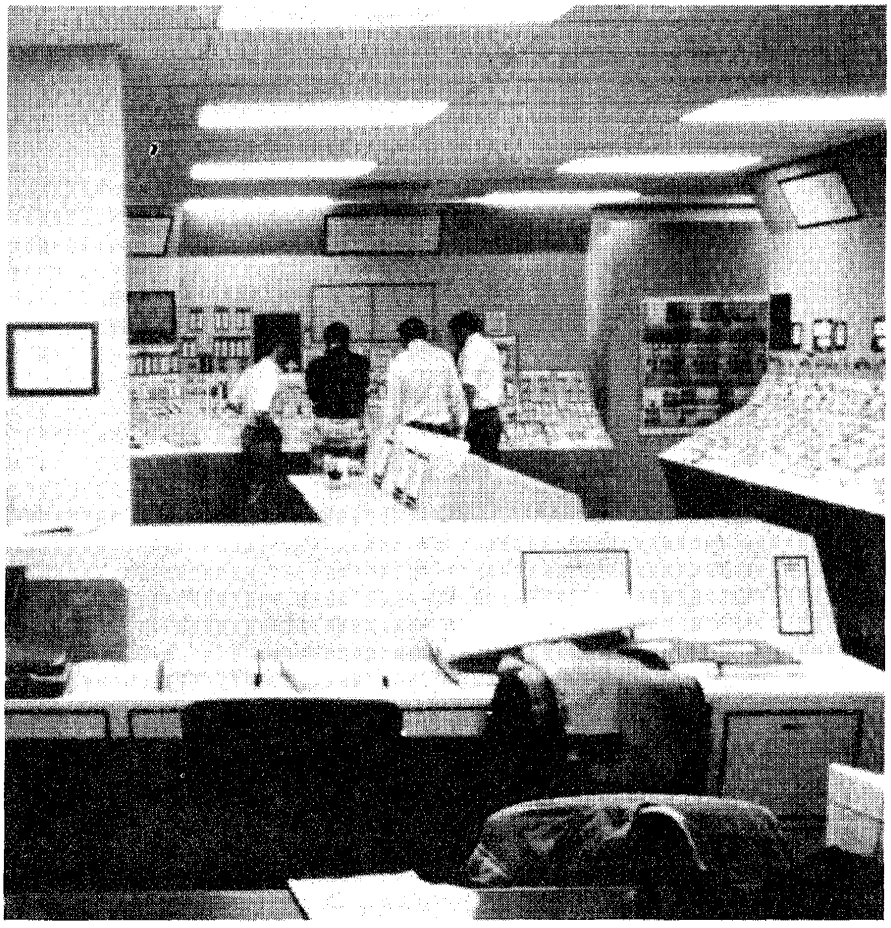
A program to establish the validity of the current licensing examination for operators and senior operators was continued in fiscal year 1983, under a contract with the Battelle Pacific Northwest Laboratories. This effort is intended to ensure that the content of the examination genuinely measures the knowledge, skills, and abilities required on the job. Guidelines, training, and other examiner aids are also being developed to ensure both quality and consistency in all such examinations. Long-term efforts aimed at further enhancing the examination are being developed, including a program to validate the examination by available measures of actual job performance.

Procedures

NRC staff review of reactor-vendor technical guidelines for emergency operating procedures was completed during fiscal year 1983, and each of the guidelines has been approved for implementation. The guidelines will serve as the technical basis for improved emergency operating procedures, to be implemented at operating plants within the next two years. NRC review of these procedures is under way. The NRC will audit the revised procedures as part of routine regional inspections.

The NRC has initiated a long-term program to evaluate the need for additional regulatory action for maintenance, surveillance, operating, and normal and abnormal operating procedures. These efforts involve a systematic and comprehensive survey of existing procedures and associated problems. Guidance and regulatory policy will be developed where there is a potential for impacting public health and safety. Development of guidance and requirements will be coordinated closely with the nuclear industry to minimize duplication of effort and maximize the exchange of information.

The NRC staff reviewed and evaluated the procedures used by licensee personnel in dealing with the failure of automatic shutdown systems at Salem (N.J.). Problems



NRC staff concerned with human factors in nuclear power plant operations are shown reviewing a mock-up of the control room for the South Texas plant. Early review of a mock-up reduces the number of changes and associated costs after the actual control panels are fabricated and installed.

with these procedures were reviewed for their possible generic implications, and important generic lessons were in fact learned.

Man-Machine Interfaces

During fiscal year 1983, the NRC continued to evaluate the human factors aspects of man-machine interfaces to minimize design-induced errors in nuclear power plants. In December 1982, the basic requirements for detailed control room design reviews and the safety parameter display system were issued. A meeting was held in each NRC Region early in 1983 to further discuss these requirements with industry and other interested parties. The NRC has received 24 plans for detailed control room design reviews, representing 80 units during fiscal year 1983; 21 plans have been started by various utilities; and NRC staff has conducted five in-progress audits. In addition, preliminary design assessments for control rooms were conducted for two applicants for operating licenses. These efforts will continue through fiscal year 1986.

Significant work continued during the report period in the areas of maintenance, control room annunciators, system safety status indication and local control stations. The man-machine interface aspects of the failures of the automatic shutdown system at Salem were evaluated. Such interface aspects of control room habitability have emerged as a new area requiring study and review.

Management and Organization

Draft guidelines for management and organization, and a workbook to aid NRC staff in consistent assessment of applicants for operating licenses, have been developed during the report period. An analysis of how other industries, governmental agencies, and regulatory bodies evaluate or audit organization and administration was conducted. The Institute of Nuclear Power Operations has developed performance objectives and criteria for management and organization evaluations of plant and corporate activities directed toward efficiency and reliability as well as safety aspects. The NRC effort concentrates on determining those management and organization factors most relevant to safety.

Management audits for the Shearon Harris Nuclear Plant, Units 1 and 2 (N.C.), which is under construction, and for the Clinch River Breeder Reactor (Tenn.), were conducted during the year by the Region II office and NRR. In addition, the Region I office and NRR completed a re-evaluation of certain aspects of management of the General Public Utilities Nuclear Corporation regarding the proposed restart of Three Mile Island, Unit 1 (Pa.), and completed an evaluation of possible management deficiencies related to failures of the automatic shutdown system at Salem.

Unresolved Safety Issues

Section 210 of the Energy Reorganization Act of 1974, as amended, requires that the annual report of the Commission to the President and the Congress include progress reports on those items previously identified as "Unresolved Safety Issues" (USIs). A total of 27 USIs have been identified, and a final technical resolution has been achieved for 14 of these (see Table 2). Resolution of the remaining 13 USIs involves (1) preparation of a regulatory analysis by NRR and a review by the Committee to Review Generic Requirements (CRGR), whose charter was approved by the Commission on June 16, 1982; (2) provision of a public comment period after CRGR review, followed by discussion and disposition of the comments received in a final report; (3) provision for the incorporation of the technical resolution into NRC Regulations, Standard Review Plan, Regulatory Guides, or other official guidance; and (4) provision for application of the final technical resolution to plants in operation or under construction.

SUMMARY OF STATUS

The USIs that are actively being worked on are listed in Table 3, together with the present schedule for technical resolution. A summary of the status of USIs is published quarterly in NUREG-0606.

PROGRESS REPORTS

The following are progress reports on each of the Unresolved Safety Issues under active consideration. For background on these issues, see the *1982 NRC Annual Report*, pp. 19-29.

Water Hammer

Water hammer events are high pressure pulses experienced by fluid systems and caused, for example, by collapse of steam voids in water lines, steam-driven slugs of water, pump startup into voided lines, or inadvertent valve closures. The frequency of occurrence is low and damage has generally been limited to piping supports. (See the *1982 NRC Annual Report*, p. 19.) Operator training and awareness, and plant design modifications, help to reduce the frequency of occurrence. Two relevant documents—"Evaluation of Water Hammer Occurrence in Nuclear Power Plants" (NUREG-0927) and "Value-

Table 2. Formerly Unresolved Safety Issues For Which A Final Technical Resolution Has Been Achieved

Title		*Report Number*	*Date*	*Implementation Status*
A-2	Asymmetric Blowdown Loads	NUREG-0609	November 1980	Additional criteria are being considered for resolution of the issue on remainingoperating plants.
A-6	Mark I Short Term Program	NUREG-0408	December 1977	Complete
A-7	Mark I Long Term Program	NUREG-0661	July 1980	Licensees are performing analyses and installing modifications in accordance with Commission order
A-8	Mark II Containment Pool Dynamic Loads	NUREG-0808	August 1981	Implemented as a part of the OL review of each Mark II containment
A-9	Anticipated Transients	NUREG-0460	September 1980	A final rule is being considered by the Commission[2]
A-10	BWR Feedwater Nozzle Cracking	NUREG-0619	November 1980	Thirteen plants have approved implementation plans. Nine plants have proposed plans under review.
A-11	Reactor Vessel Material Toughness	NUREG-0744, Revision 1	October 1982	Implementation on a case-by-case basisas needed.
A-12	Steam Generator and Reactor Coolant Pump Supports	NUREG-0577, Revision 1	September 1983	No implementation on operating plants required
A-24	Qualification of Class IE Safety Related Equipment	NUREG-0588 Revision 1	July 1981	Implementation in accordance with the new rule 10 CFR 50.49 in progress.
A-26	Reactor Vessel Pressure Transient Protection	NUREG-0224	September 1978	Complete
A-31	Residual Heat Removal	SRP[1] 5.4.7	1978	Implemented as part of the review for eachoperating license application
A-36	Control of Heavy Loads Near Spent Fuel	NUREG-0612	July 1980	Detailed implementation for each licensee in progress
A-39	SRV Dynamic Loads	NUREG-0802	September 1982	Implementation as part of the OL reviewof Mark II and Mark III containment
A-42	Pipe Cracks in Boiling Water Reactors	NUREG-0313	July 1980	Actions required for each licensee on acase-by-case basis in accordance with-operating experience

[1]Standard Review Plan (NUREG-0800)
[2]The final rule will determine the licensing requirements.

Table 3. Schedule for Resolution of Current Unresolved Safety Issues

Task No.	*Unresolved Safety Issue*	*Schedule for Issuing Staff Report "For Comment" (as of Sept. 30, 1983)*	*Schedule for Issuing Final Staff Report (as of Sept. 30, 1983)*
A-1	Water Hammer	Complete May 1983	December 1983
A,3,4,5	PWR Steam Generator Tube Integrity	November 1983	April 1984
A-17	Systems Interactions	January 1985	December 1985
A-40	Seismic Design Criteria	February 1984	October 1984
A-43	Containment Emergency Sump	Complete May 1983	January 1984
A-44	Station Blackout	April 1984	February 1985
A-45	Shutdown Decay Heat Removal Requirements	March 1985	October 1985
A-46	Seismic Qualification of Equipment in Operating Plants	June 1984	December 1984
A-47	Safety Implications of Control Systems	July 1984	March 1985
A-48	Hydrogen Control Measures and Effects of Hydrogen Burns	--------	June 1985
A-49	Pressurized Thermal Shock	June 1985	December 1985

Impact Analysis for USI A-1, Water Hammer" (NUREG-0993)—were issued for public comment in May 1983. Five replies were received and evaluated. Final technical resolution is at the stage of submission to the CRGR for review.

PWR Steam Generator Tube Integrity

Degradation of the heat-exchanger tubes in steam generators of pressurized water reactors continues to be a matter of concern. (See the section on steam generators later in this chapter.) An integrated program for the resolution of this problem (USIs A-3, A-4, and A-5) has been drafted by NRR staff and focuses on the following topics: prevention and detection of loose parts and foreign objects in steam generators, in-service inspection of steam generator tubes, control of secondary water chemistry, in-service inspection of the condenser for converting steam back to water, the limit on primary-to-secondary leakage, the limit on iodine radioactivity in the coolant water, and the reset of the safety injection signal after tube ruptures in steam generators. The proposed resolution was discussed with the CRGR in September 1983 and will be reviewed by the Advisory Committee on Reactor Safeguards and the Commission before being issued for public comment.

Fracture Toughness of Support Materials

An investigation has been made of the potential for low-temperature fracture of the supports for steam generators and reactor coolant pumps. Several significant developments took place during fiscal year 1983 resulting in the technical resolution of USI A-12. A report on "Fracture Toughness of PWR Component Supports" (NUREG/CR-3009) from the Sandia National Laboratories was issued in February 1983. A report on "An Assessment of Potential Increases in Risk Due to Degradation of Steam Generator and Reactor Coolant Pump Supports" (NUREG/CR-3345) from the Lawrence Livermore National Laboratory was issued in August 1983. The NRR staff completed a regulatory analysis based on the technical findings of the Sandia report and the probabilistic

risk analysis of the Livermore report and published the results in August 1983 (NUREG-0577, Revision 1). NRR concluded that modifications of existing support structures would not be cost effective, but that implementation of toughness requirements for new construction would be cost effective. It therefore has prepared a new Section 5.3.4 of the Standard Review Plan to implement the findings for new plant construction. This has been reviewed by CRGR and is to be issued for public comment.

Systems Interactions

Systems interactions (USI A-17) are events that may jeopardize the independent functioning of nuclear power plant systems important to safety. NRR staff efforts on systems interaction during fiscal year 1983 were directed principally toward methods of identifying adverse dependencies between systems. A report on "Initial Guidance on Digraph-Matrix Analysis for Systems Interaction Studies" (NUREG/CR-2915) from the Lawrence Livermore National Laboratory was issued in March 1983 to allow for peer review of this methodology. Work began in August 1983 on applying this method to Indian Point Unit 3 (N.Y.) and comparing the results with those to be obtained in 1984 by the utility using fault-tree analysis.

Seismic Design Criteria

Rapid advancement in technology and state of the art in seismic design over the past decade has resulted in a need to update the NRC acceptance criteria for seismic design of structures, systems, and components important to safety of nuclear plants (USI A-40). Changes are proposed in Sections 2.5.2, 3.7.1, 3.7.2, and 3.7.3 of the Standard Review Plan and will apply to new applications for construction permits. The changes are based on deterministic arguments, qualitative assessments, and, where feasible, probabilistic risk assessments. In some instances, the changes reflect current industry design practice. They will eliminate potential sources of non-conservatisms and excessive conservatisms and provide greater confidence in the seismic adequacy of nuclear plants. The proposed changes will be reviewed by CRGR and issued for public comment prior to incorporation into the Standard Review Plan.

Containment Emergency Sump Performance

After a loss-of-coolant accident, long-term recirculation must be maintained by operation of residual heat removal pumps and containment or core spray systems. The source of water is the containment emergency sump in pressurized water reactors and the suppression pool or wet well in boiling water reactors. Hydraulic performance might be affected by air ingestion, by debris from insulation destroyed by a water jet from a pipe break, and by other types of particulates generated by the accident (USI A-43). These concerns have been investigated extensively through full-scale sump hydraulics experiments, plant surveys, and analyses. Measured levels of air ingestion have been generally low and are not expected to significantly degrade pumping performance. Debris generation and potential blockage of sump screens or suction inlets are highly plant-dependent. The pumps employed will tolerate ingestion of insulation debris and other types of particulates that can pass through sump screens. Technical findings by the NRR staff were published in April 1983 in a report on "Containment Emergency Sump Performance" (NUREG-0897) and have been the basis for proposed revisions to Regulatory Guide 1.82 and Section 6.2.2 of the Standard Review Plan. Report NUREG-0869 on "USI A-43 Resolution Positions" was issued for public comment in May 1983; 14 responses have been received and are being evaluated.

Station Blackout

Concurrent loss of off-site and emergency on-site sources of alternatingcurrent electric power is referred to as station blackout (USI A-44). Many safety systems required for decay-heat removal from the reactor core and for containment heat removal are dependent on the availability of this power. A study is being made at the Oak Ridge National Laboratory of the frequency and duration of the loss of off-site power. An Oak Ridge report on "Reliability of Emergency AC Power Systems at Nuclear Power Plants" (NUREG/CR-2989) was issued in July 1983; it mainly concerns on-site emergency diesel generators. A report from the Sandia National Laboratories on "Station Blackout Accident Analyses" (NUREG/CR-3226) was issued in May 1983. Recommendations for specific improvements to reduce the risk from loss of all AC power have been developed, taking into account differences in the design of nuclear power plants, as well as differences in relevant site-related characteristics, such as susceptibility to severe storms. These recommendations are being incorporated into a proposed rule and regulatory guide, along with a supporting value-impact analysis, for review by CRGR and the Commission prior to issuance for public comment.

Shutdown Decay Heat Removal Requirements

A program has been established to evaluate the safety adequacy of systems for removing decay heat from a reactor core during shutdown and to assess the value and the impact of alternative measures for improving the reliability of those systems (USI A-45). In order to accomplish these objectives, numerous tasks and subtasks have been identified, including system reliability assessments,

system engineering feasibility studies, thermal-hydraulic analyses, power plant characterizations, reviews of emergency operating procedures, and evaluation of the vulnerability of the systems to special emergencies such as fire, flood, earthquake, and sabotage. Work on these aspects is in progress. A valuable meeting of specialists from 13 countries for the purpose of exchanging information on decay heat removal systems was held in Wurenlingen, Switzerland, on April 25-29, 1983, with the cooperation of the Nuclear Energy Agency and the Swiss Government.

Seismic Qualification of Equipment in Operating Plants

The margins of safety provided in equipment of existing nuclear power plants to withstand earthquakes and perform their intended safety functions may vary considerably and may not meet current seismic qualification criteria (USI A-46). Problems arise in qualifying such equipment because this would involve (a) excessive downtime of the plants and difficulties of shipping irradiated equipment to a test laboratory or (b) difficulties of acquiring identical unirradiated equipment for laboratory testing. The most viable approach to developing an alternative qualification method is the use of seismic experience data from nonnuclear plants. A feasibility study was conducted by the Lawrence Livermore National Laboratory and reported in "Correlation of Seismic Experience Data in Non-Nuclear Facilities with Seismic Equipment Qualification in Nuclear Plants" (NUREG/CR-3017), published in August 1983. The conclusion is that use of seismic experience data is feasible and can be as effective as current qualification methods. Feasibility was also demonstrated independently by a pilot program conducted by the Seismic Qualification Utility Group, which proposed to the NRC that a Senior Seismic Review Advisory Panel be formed to provide consulting services and expert opinion. This action was endorsed by the NRC, and the panel formed in June 1983 consists of five well known experts in the field of seismic engineering. An NRR status report on "Seismic Qualification of Equipment in Operating Plants" (NUREG-1018) was issued in September 1983.

Safety Implications of Control Systems

In-depth studies are being performed on control systems that are typically used during normal startup, shutdown, and operations of nuclear power plants to determine whether they can cause serious transients or accidents or make them more severe (USI A-47). The Oak Ridge National Laboratory is evaluating two designs of pressurized water plants, and the Idaho National Engineering Laboratory is evaluating a design of boiling water plants and a third design of pressurized water plants (the contract for the latter was awarded early in 1983). These studies have identified control systems whose failure could lead to steam generator or reactor vessel overfill and/or overcooling transients. In a parallel effort, the laboratories are developing computer simulations to analyze the dynamic behavior of the plants during such transients; this analysis is anticipated to begin in early 1984. On the completion of the technical work, any needed recommendations will be made to assure that control system failures do not pose an unacceptable risk.

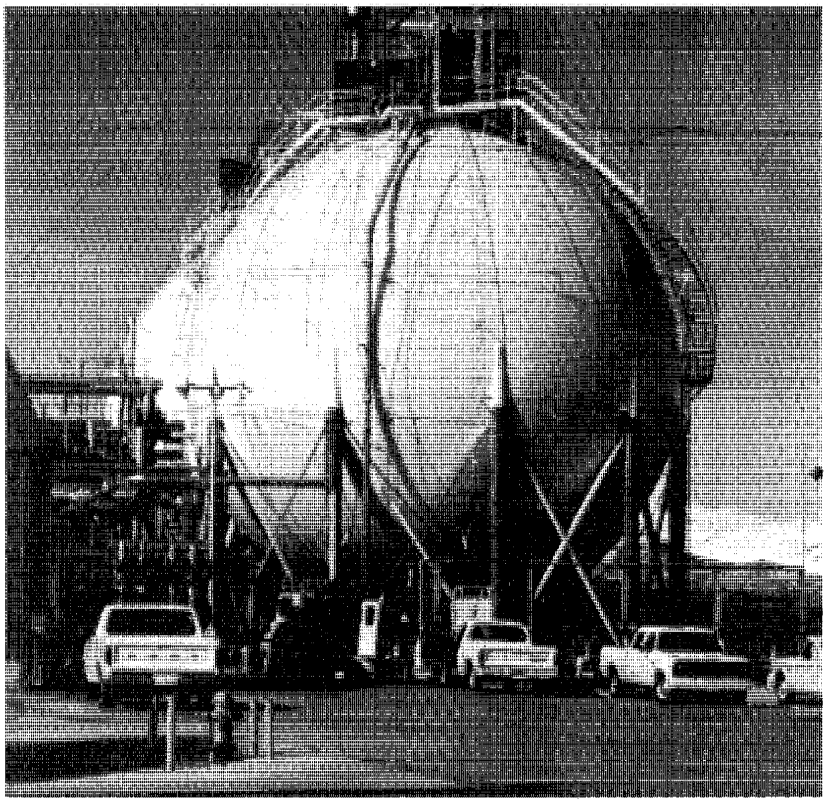
Hydrogen Control Measures and Effects Of Hydrogen Burns on Safety Equipment

Postulated reactor accidents that result in a degraded core, such as the one at Three Mile Island Unit 2 in 1979, can result in generation and release to the containment of large quantities of hydrogen, which can burn or explode under certain conditions (USI A-48). Consequently, the NRC determined that additional hydrogen control measures have to be considered for nuclear power plants with containments of small and intermediate volume, namely, Mark I, II, and III containments for boiling water reactors and ice-condenser containments for pressurized water reactors. A final rule for Mark I and II containments was published on December 2, 1981, and requires that these containments be inerted by insertion of nitrogen. A proposed rule for Mark III and icecondenser containments was issued for public comment on December 23, 1981, and a large number of comments were received; a draft of the final rule has been prepared, reviewed by CRGR, and submitted to the Commission for review. In compliance with the expected final rule, all nuclear power plants utilizing Mark III or ice-condenser containments that are in operation or undergoing licensing review have either installed or are committed to install glowplug igniters throughout the containment volume, in order to safely consume hydrogen in multiple burns as it is formed and before it reaches dangerous concentrations.

Extensive research programs have been undertaken by the nuclear industry and by the NRC on hydrogen combustion. Some of these programs have been conducted to validate the NRC approval of the distributed ignition system for the Sequoyah units. The Mark III Owners Group program for testing hydrogen combustion is under review and will be conducted by the end of 1983. Largescale hydrogen combustion tests, of which the NRC is one of the sponsors, are being conducted in Nevada in a spherical test chamber approximately 50 feet in diameter. The results of these tests will be coordinated with NRC licensing activities.

Pressurized Thermal Shock

Transients in pressurized water reactors, such as those resulting from instrumentation and control system mal-



This spherical chamber is designed for use in a large-scale program researching hydrogen combustion and control at the Nevada Test Site, carried out by the Electric Power Research Institute under the sponsorship of the NRC and domestic and foreign utilities. The chamber has a diameter of 52 feet and is designed for a pressure of 87 pounds per square inch.

functions, small break loss-of-coolant accidents, main steamline breaks, feedwater pipe breaks, and stuck open safety valves, can cause an overcooling of the reactor vessel concurrent with or followed by repressurization. This situation is called pressurized thermal shock (PTS). If the fracture toughness of the plate and weld materials in the beltline region of the reactor vessel has been decreased by neutron irradiation, severe PTS events could cause failure of the vessel and melting of the core (USI A-49).

An extensive review has been made by NRC staff of information solicited over the past year and a half from several individual licensees and groups of owners of pressurized water reactors. The staff has concluded that a reference temperature, indicating the range where mechanical properties of steel change rapidly from ductile to brittle behavior, should be below 270F for axial welds and plate materials and below 300F for circumferential welds. The staff has also concluded that increases in the reference temperature as the vessel steel is exposed to fast neutrons during normal reactor operation can be reduced by shielding or by rearrangement of the nuclear fuel. A draft of a PTS rule will be published for public comment and will propose extensive, plant-specific risk analyses by licensees and implementation of necessary corrective actions. An NRC-sponsored program is underway at several national laboratories to perform PTS risk analyses for three representative PWR plants. This will aid in the preparation of detailed guidance and acceptance criteria.

Safety Reviews

Other significant safety aspects of nuclear power plant operation are discussed below, including both general programs that involve a number of reactor systems in numerous plants and specific concerns that involve a particular system, safety feature, or plant.

TMI Action Plan

The accident at Three Mile Island Unit 2 (Pa.) in 1979 led to a thorough review of NRC regulatory and licensing requirements for nuclear power plants. A TMI Action Plan was issued as NUREG-0660, and the requirements approved for implementation at plants in operation or under construction were later clarified in NUREG-0737. Approximately 90 percent of these requirements for operating reactors have now been acted on, and 70 percent of required actions have been reviewed by NRC staff. TMI Action Plan requirements for plants under construction are being implemented as part of the licensing process, while those for operating reactors are being confirmed by NRC orders.

Emergency Response Capabilities

In November 1982, the Commission approved requirements for utilities to establish certain emergency re-

sponse capabilities at nuclear power plants. Included are a safety parameter display system, detailed control room design review, implementation of post-accident monitoring systems, upgrade of emergency operating procedures, and implementation of a technical support center, operational support center, and emergency operations facility.

These requirements were sent to all licensees and applicants on December 17, 1982, as Supplement 1 to NUREG-0737. Regional meetings were held with utilities and other interested parties during February and March of 1983. Schedules for implementation of the requirements were negotiated with licensees and applicants. This phase was essentially complete for operating reactors by September 1983; implementation dates will be formalized by confirmatory orders from the NRC. Most of the emergency response capability requirements for operating reactors are scheduled to be implemented by the end of calendar year 1985. Implementation dates for plants under construction will be established as part of the licensing process.

Systematic Evaluation Program

The Systematic Evaluation Program (SEP) is an ongoing program to assess the adequacy of the design and operation of older operating nuclear power reactors, to compare them with current safety criteria, and to provide a basis for integrated and balanced decisions on proposed procedural or plant modifications. The review of ten of the oldest operating reactors in SEP Phase II is currently nearing completion. All of the safety evaluation topical reports have been completed, except for San Onofre Unit 1 (Cal.), which is 97 percent complete. Integrated plant safety assessments for the completed plants cover all of the differences from current licensing criteria identified during the topic reviews. Nine of the integrated plant safety assessments have been completed, and the 10th is scheduled for fiscal year 1984.

The latest integrated assessment was for the Big Rock Point Plant (Mich.) and was larger in scope than the assessments for the preceding plants. At the request of the licensee and with the approval of the staff, it included not only the 137 topics in the SEP review, but also TMI Action Plan items, multiplant items, unresolved safety issues, and plant-specific items. It also considered a plant-specific probabilistic risk assessment that was performed by the licensee. The results of this integrated assessment provide a basis for setting priorities in the implementation schedules for all pending plant modifications and licensing actions.

The Systematic Evaluation Program has improved overall plant safety for the facilities reviewed and has provided a documented perspective of the extent to which the plants conform to current licensing requirements. Some modifications have been made, and some have been identified for future implementation. Other areas require further analysis or evaluation to define the optimum corrective action. While a number of safety improvements remain to be implemented, the NRC staff has concluded that an adequate basis for continued operation exists at these plants.

Examples of the more significant safety improvements evolving from SEP Phase II include:

- Upgraded seismic resistance, including anchorage of safety-related electrical and mechanical equipment and systems.
- Improved DC power-system availability, including battery testing, DC system monitoring and alarms, and operating procedures to reduce unnecessary DC loads.
- Revision of plant operating procedures for safe shutdown to incorporate use of both safety and non-safety equipment and alternate water sources for a large variety of events.
- Structural upgrade programs to address several issues arising from different topic reviews and related to environmental loads and the margins of safety in the structural design.
- Modification of protective relaying to assure that electrical buses for engineered safety features are not loaded with faulty equipment.

The NRC is currently developing a new program—the Integrated Safety Assessment Program (ISAP)—which would be undertaken in lieu of the previously proposed continuation of SEP (Phase III) and the conduct of the National Reliability Evaluation Program. The objective of ISAP is to provide a comprehensive review program for operating reactors to address all of the pertinent safety issues and provide an integrated, cost-effective implementation program developed by a dedicated review team that understands the specific plant design. ISAP would also provide the technical bases to resolve all outstanding licensing actions, establish overall plant improvement schedules, and serve as a benchmark from which future regulatory actions can be judged, on a plant-specific basis. The actual details of the program elements are still under development by the staff. This program will not be implemented until a cost-benefit evaluation of the results of SEP Phases I and II is reviewed by Congress, in accordance with Public Law 98-50.

Severe Accident Policy

In safety reviews in the past, the NRC has concentrated on "design-basis" accidents, i.e., potential events for which specific design and operating features must be provided to minimize any radiological consequences. Since the accident at Three Mile Island Unit 2 (TMI-2) in 1979, strong consideration has been given to the formulation of requirements for coping with accidents of greater

severity than design-basis accidents. These severe accidents would involve substantial physical deterioration of the fuel in the reactor core, including overheating to the point of melting through the reactor vessel, and deterioration of the capability of the containment structure to perform its intended function of limiting the release of radioactive materials to the environment. The probability of such an accident occurring is believed to be very small.

The Office of Nuclear Regulatory Research issued a report in January 1983 on a "Nuclear Power Plant Severe Accident Research Plan" (NUREG-0900) to cover research for the period of January 1982 through January 1986 to determine how safe the plants are from severe accidents and their effects, and where and how their level of safety might be improved. Some actions have already been taken to control hydrogen that may be released from a degraded core and may present a hazard of fire or explosion (see the earlier discussion of hydrogen control measures under Unresolved Safety Issues).

The Commission issued an advance notice of proposed rulemaking on the consideration of degraded or melted cores in safety regulation in the *Federal Register* on October 2, 1980; this approach was later supplanted by a proposed policy statement on severe accidents published in the *Federal Register* on April 13, 1983 (48 FR 16014). The focus of proposed rulemaking would be reduced to affect only new plants proposed to have standard designs; all other plants, including those currently under construction or in operation, would be handled separately. The proposed policy statement discussed the relationship of severe accident policy to lessons learned from the TMI accident, standard review plans, safety goals, probabilistic risk assessment, standardization policy, siting policy, and research on severe accidents. Comments were due by July 9, 1983, and the 25 communications received are being evaluated.

Meanwhile, consideration is being given to severe accident decisions for existing nuclear power plants, whether in operation or under construction. Discussions were held by the NRC staff with the Commission and with the Advisory Committee on Reactor Safeguards in August and September 1983. The objective is for Commission review and approval of a policy statement and decision regarding existing plants during fiscal year 1984.

Probabilistic Risk Assessment

Probabilistic risk assessment (PRA) is a systematic, comprehensive method for quantitative evaluation of the level of protection provided by various safety features of nuclear plant design and operation. It is used to gain insight into the importance of certain potential safety issues and to identify strengths and weaknesses in nuclear power plants. A review of the PRA for the Limerick Plant (Pa.) was performed by the Brookhaven National Laboratory and reported in NUREG/CR-3028, issued in February 1983. Review by the NRC staff of PRAs carried out by licensees has been completed for Indian Point (N.Y.) and is nearing completion for Zion (Ill.). Reviews of PRAs for Millstone Unit 3 (Conn.) and Shoreham (N.Y.) have been initiated by the NRC staff. The review of a PRA submitted by the General Electric Company for the GESSAR-II standardized design for a boiling water reactor is continuing and is scheduled for completion in fiscal year 1984.

Safety significance to be ascribed to certain selected issues, using PRA techniques, was assessed in fiscal year 1983 for the following plants under review in the Systematic Evaluation Program discussed above: Millstone Unit 1 (Conn.), Yankee Rowe (Mass.), La Crosse (Wis.), Haddam Neck (Conn.), and Big Rock Point (Mich.). Probabilistic studies were also performed on a number of specific safety issues that arose during fiscal year 1983, such as the failures of the automatic shutdown system at the Salem (N.J.) plant in February.

Insights into dominant contributors to severe core damage have been developed for Arkansas Unit 2 and Millstone Unit 1, based on NRC-sponsored PRAs, as part of the Interim Reliability Evaluation Program; these data will help determine whether modifications to increase plant safety are warranted on a cost-benefit basis. A proposal for a general Integrated Safety Assessment Program along these lines is currently being developed by the NRC staff.

As a result of probabilistic and site-specific analyses of the consequences of severe accidents, conducted in connection with a hearing on the Indian Point reactors in the spring of 1983, the NRC staff concluded that the usual assumption that immediate evacuation of people is indicated for accidents initiated by *external* events—such as severe earthquakes or hurricanes—might not be appropriate, because of concurrent off-site damage to terrain, buildings, automobiles, roads, and bridges. For these cases, the staff performed a separate analysis that assumed evacuation would not take place immediately, but that people in highly contaminated areas would be relocated to uncontaminated areas 24 hours after passage of the radioactive cloud.

For accidents initiated by *internal* events—but where immediate evacuation from the emergency planning zone within 10 miles of the reactors would not take place because of uncertain plant or off-site conditions—the staff considered the alternative of having people wait for the radioactive cloud to leave the region and then relocating from contaminated ground. On the assumption that emergency response time requirements for immediate evacuation and for delayed relocation would be similar, the early health consequences for both were not significantly different.

Equipment Qualification

The NRC requires that equipment important to safety be qualified to operate under seismic, dynamic, and en-

vironmental conditions such as may be associated with an earthquake or an accident. To date, most effort in this area has been addressed to the environmental qualification of electrical equipment. The NRC staff, with the assistance of a contractor, evaluated the environmental qualification of electrical equipment for 71 operating reactors. Technical evaluation reports for these reactors were completed by the contractor by March 1983 and were used by NRC staff as a basis for preparing safety evaluation reports for the reactors.

A new rule (Section 50.49 of 10 CFR Part 50), effective February 22, 1983, sets forth specific requirements for environmental qualification of electric equipment and sets a deadline by which the equipment must be qualified. During fiscal year 1984, NRC staff plans to meet with the licensees of the 71 operating plants previously reviewed to discuss their resolution of the qualification deficiencies earlier identified and their schedule for completing qualification.

With regard to applications for operating licenses, NRC staff continues to have the assistance of the Brookhaven National Laboratory and the Idaho National Engineering Laboratory in performing plant site audits and preparing safety evaluation reports. Ten site audits were conducted during fiscal year 1983, and an estimated 15 more are to be conducted in fiscal year 1984.

Fire Protection

The NRC fire protection rule for nuclear power plants became effective on February 17, 1981. It required all licensees of plants licensed prior to January 1, 1979, to submit plans and schedules for meeting the applicable requirements, a design description of any modifications proposed to provide alternative safe-shutdown capability, and any requests for exemption from specific requirements of the rule. For plants licensed after January 1, 1979, the criteria of the Standard Review Plan—which includes the requirements of the fire protection rule—are used in the NRC staff review prior to issuing a license.

The licensees for 69 plants licensed prior to January 1, 1979, were required to respond to the rule. By the end of fiscal year 1983, exemptions were requested for 64 of the plants, and modifications to provide alternative safe-shutdown capability were proposed for 55 plants. Licensing action on the exemption requests for 45 plants, and approval of modifications for alternative shutdown capability for 51 plants, have been completed. Because their exemption requests were denied, the licensees for nine plants will be proposing modifications for alternative shutdown capability during fiscal year 1984.

The regional offices have started the inspection program to verify compliance with the fire protection rule at those plants where proposed modifications have been completed. Five plants have been inspected, and significant items of non-compliance were identified. Additional requests for exemption and proposed modification are expected.

Operational Safety Assessments

Assessment of the significance of unanticipated events at operating reactors involves both NRC Regional and Headquarters offices. Prompt reviews and technical support are provided on issues and events of possibly immediate safety concern. In addition, the NRC staff has been called on frequently to review event sequences against licensing analyses, evaluate plant and operator performance during events, identify generic safety implications, review licensee analyses, and evaluate corrective actions prior to plant restart.

Examples of such events occurring in fiscal year 1983 at operating reactors are:

(1) The discovery of an inoperable containment spray system at Farley Unit 2 (Ala.) on October 28, 1982.

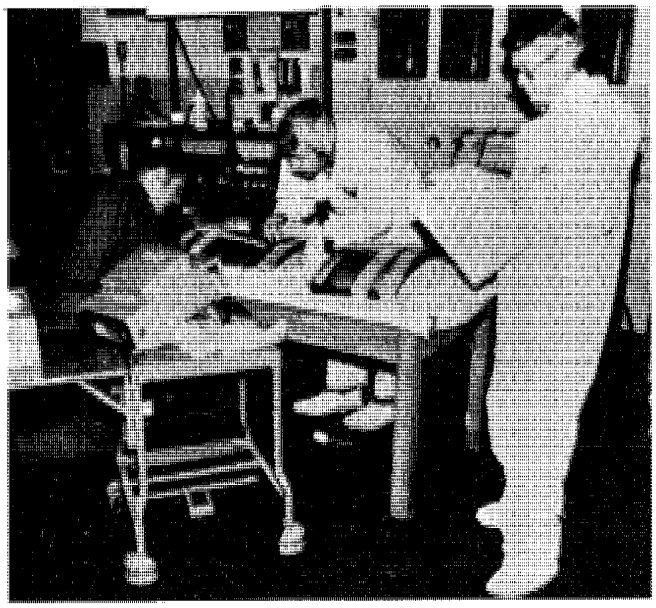
(2) A break in a main feedwater line due to water hammer at Maine Yankee on January 25, 1983.

(3) Failure of automatic shutdown systems at Salem Unit 1 (N.J.) on February 22 and 25, 1983.

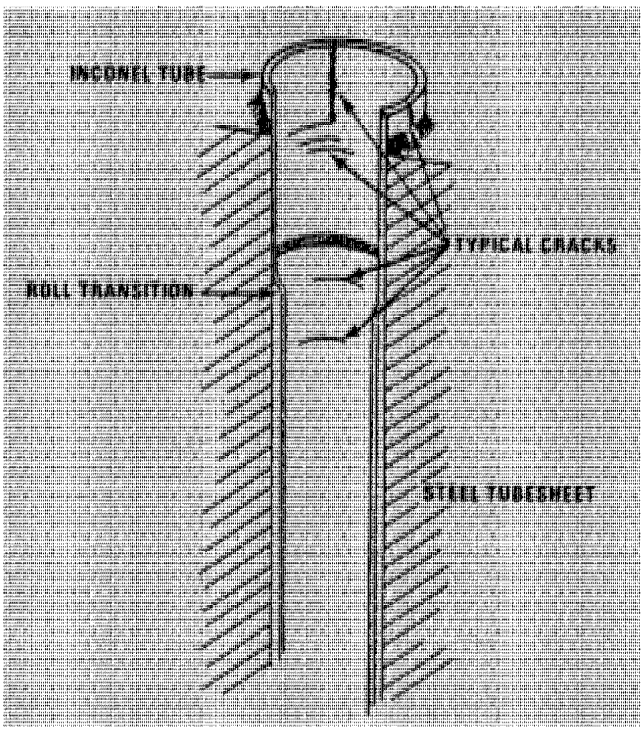
(4) Unavailability of all three auxiliary feedwater pumps at Turkey Point Unit 3 (Fla.) during the period of April 14 to 19, 1983.

Pipe Cracks at Boiling Water Reactors

Cracking in small diameter austenitic stainless steel piping in boiling water reactors (BWRs) has been observed for many years. However, an inspection at Nine Mile Point Unit 1 (N.Y.) in March 1982 revealed extensive intergranular stress corrosion cracking (IGSCC) in large



An NRC inspector from Region III (Chicago) is on the right monitoring a performance demonstration of ultrasonic testing to detect pipe cracks by utility inspection personnel.



Shown are cracks typical of those found in steam generator tubes at the Three Mile Island Unit 1 facility.

diameter piping, for the first time in the United States. The IGSCC was found in heat-affected zones near weld areas of the large-diameter piping of the reactor coolant recirculation system. The licensee decided to replace the piping in the recirculation loops.

In response to this problem, the NRC issued Inspection and Enforcement Bulletins in October 1982 and March 1983 requiring wide-ranging BWR inspections, and these have revealed extensive cracking in welds in large-diameter piping of both recirculation and residual heat removal systems at many BWR plants. No indications of pipe cracking were found at Quad Cities 1 (Ill.), Millstone 1 (Conn.), Oyster Creek (N.J.), Big Rock Point (Mich.) and Duane Arnold (Iowa).

IGSCC is influenced by the environmental conditions existing in the BWR reactor coolant system and stresses in the piping, including residual stresses induced by welding. There is no clear correlation between the extent of the cracking and the operating time; some plants with a relatively brief operating history show extensive cracking.

NRC staff has been reviewing the inspection results of each plant on a case-by-case basis. In general, for the plants where such cracking has been observed, repairs, analysis, and/or additional surveillance conditions have been required. NRC staff evaluation criteria require maintaining the inherent factor of safety prescribed by Section III of the ASME Boiler and Pressure Vessel Code for normal and faulted conditions, with consideration of the uncertainties in crack depth sizing and growth rates. Further, Orders were issued to five operating BWR licensees to accelerate the inspection schedules for their facilities.

Joint effort by the NRC and industry has been under way to train and qualify inspection personnel, using improved ultrasonic testing (UT) procedures on well-characterized pipe cracks in pipe segments removed from Nine Mile Point Unit 1, in order to assure higher reliability in the inspection process. Although this step has considerably upgraded the reliability of UT in crack detection, there still remains concern about the ability of current UT procedures to adequately characterize the depth of identified cracks in field situations.

The NRC, in concert with industry, is studying both near-term and longterm solutions to the IGSCC problem. In addition to the improved UT procedures discussed above, consideration is being given to such measures as replacing existing piping, improving water chemistry, using an in-place induction heat treatment to alter stress patterns, and improving UT inspector qualifications.

Steam Generators

Degradation of the heat-exchanger tubes in steam generators manufactured by the vendors of pressurized water reactors has been a concern for several years. Tube degradation results from a combination of problems related to mechanical design, materials selection, fabrication techniques, and secondary system design and operation. (A discussion of operating experiences with steam-generator tubes is contained in NUREG-0886 of February 1982.) An integrated program to consider the need for further NRC requirements related to steam generators was initiated in May 1982, and findings are expected to be issued for public comments in November 1983. Significant developments for specific plants during fiscal year 1983 are discussed below.

Steam Generator Leakage Events. A number of plants experienced primaryto-secondary leakage during fiscal year 1983, necessitating unscheduled shutdowns for steam generator repairs. These included Arkansas Unit 1, Millstone 2 (Conn.), Oconee 3 (S.C.), Rancho Seco 1 (Cal.), H. B. Robinson 2 (S.C.), and Sequoyah 2 (Tenn.).

Sleeving Repairs of Steam Generator Tubes. For several plants, the NRC has approved sleeving repairs of defective steam generator tubes in lieu of plugging. A smaller diameter tube or sleeve is inserted inside the parent tube so as to span the defective portion of the tube, and then the ends of the sleeve are joined to the tube by a brazing or expansion process. In this manner, the original integrity of the tube is restored. The advantage of sleeving over plugging is that it allows the repaired tube to remain functional, thus prolonging the useful lifespan of extensively degraded steam generators.

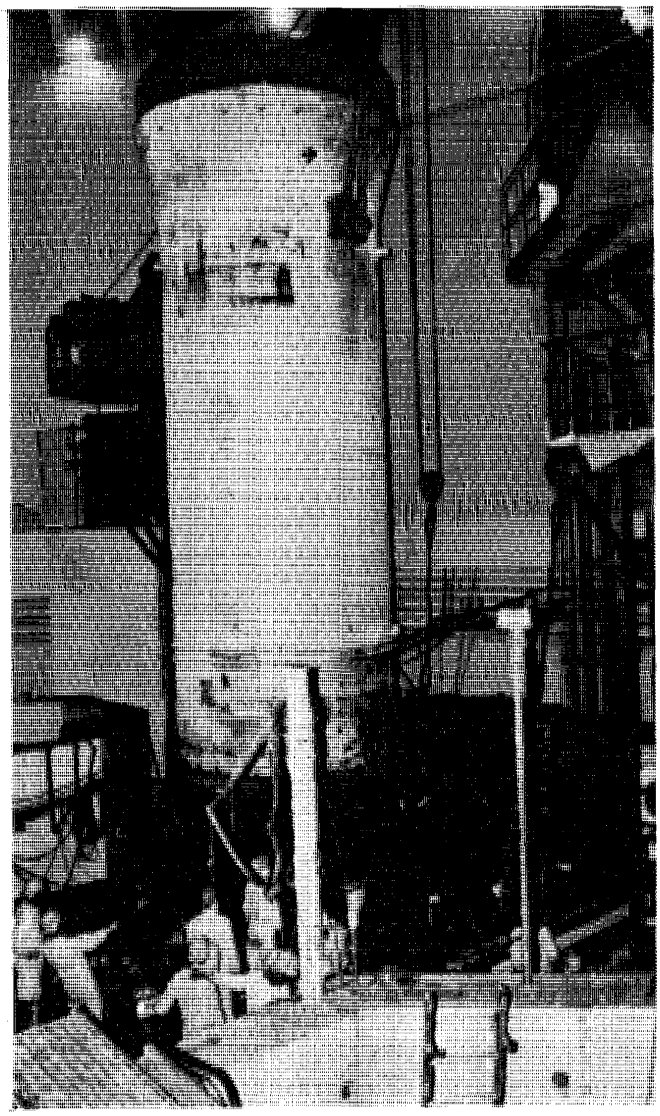
During fiscal year 1983, sleeving repairs were performed at Point Beach Unit 2 (Wis.), R. E. Ginna (N.Y.), Indian Point 3 (N.Y.), and Millstone 2 (Conn.), following

review and approval by the NRC. Large-scale sleeving repairs at San Onofre 1 (Cal.) were previously performed during fiscal year 1981.

Steam Generator Replacement. Extensive degradation of the steam generator tubes may lead to excessive downtime to perform steam generator maintenance and repair and to plug large numbers of tubes; it could lead eventually to the need for derating the plant. For that reason, some utilities have elected to replace their extensively degraded steam generators or are planning to do so. Steam generator replacement at Turkey Point 4 (Fla.) was completed in May 1983. The replacement involves the tube bundle and the moisture-seperator assembly. Steam generator replacement had also been performed at Surry 1 and 2 (Va.) and at Turkey Point 3 in prior years. The staff is currently completing its review of a license amendment authorizing steam generator replacement at Point Beach 1 (Wis.) in the near future. Steam generator replacement at H. B. Robinson 2 (S.C.) is also under staff review and is scheduled to commence in mid-1984.

Westinghouse Model D/E Steam Generators. To reduce the tube vibration and resultant wear observed in the preheat section of its Model D2/D3 steam generators, the Westinghouse Corporation proposed a modification consisting of an internal manifold assembly. After an extensive review by a group of plant owners, NRC staff, and NRC consultants, it was concluded that this modification is acceptable and that the modified steam generators can be operated at 100 percent of their design capacity (see NUREG-0966). The modification has been completed at all U.S. operating plants with model D2/D3 steam generators, namely, McGuire Units 1 and 2 (N.C.) and Summer Unit 1 (S.C.). The modification is expected to be made prior to operation of plants currently under construction, namely, Watts Bar Units 1 and 2 (Tenn.) and Catawba Unit 1 (N.C.). To reduce the tube vibration and resultant wear in the preheat section of the model D4/D5/E steam generators, Westinghouse proposed a modification consisting of the expansion of some of the steam generator tubes at selected baffle plate locations, along with a splitting of feedwater flow by diverting a fraction of the flow through the auxiliary feedwater nozzle. This modification has been reviewed by a utility group and the NRC staff and found acceptable. It is expected that appropriate modifications will be in place prior to operation of any U.S. plants using D4/D5/E steam generators.

Three Mile Island Unit 1. On November 21, 1981, it was determined that leakage from primary to the secondary side had occurred in both of the TMI-1 steam generators. The tube degradation in the steam generator was found to be due to intergranular stress corrosion from the primary side. It was most probably caused by sulfur in thiosulfate from the reactor building spray system, which was inadvertently permitted to enter the primary system at various times in 1981. Most of the defects were in the upper six inches of the tubes within the upper tube sheet. The licensee has completed repair of the steam generators by plugging all severely damaged tubes and repairing the remaining tubes. The repair utilized a kinetic expansion process within the upper tube sheet which closed the annular crevice area between the tubesheet and tube and established a new seal between primary and secondary fluid. The structural and leak-tight integrity of the expanded joint was qualified by model test and analysis prior to the repair. The licensee has also conducted a sulfur-removal and cleaning operation of the reactor coolant system. Currently, the licensee is conducting a nonnuclear "hot functional" test to verify the structural and leak-tight integrity leakage of the repaired steam generators. The staff will issue a supplement to its safety evaluation of issues related to TMI-1 steam generators prior to any startup of the TMI-1 reactor.



During steam generator replacement at Turkey Point 4 (Fla.), the lower assembly of one of the old steam generators is shown as it is being lifted by the polar crane and moved to the equipment hatch for removal.

Failures of Automatic Shutdown Systems

On February 22 and again on February 25, 1983, the reactor of Salem Unit 1 (N.J.) failed to "scram," i.e., to shut down automatically, following receipt of a signal to do so. In both cases, there was a simultaneous failure of two circuit breakers to open. The opening of at least one of the circuit breakers was required to interrupt power to the control rods, allowing them to drop into the core. This is an example of a category of events called "anticipated transients without scram" (ATWS).

On February 28, 1983, the NRC Executive Director for Operations directed the NRC staff to prepare an evaluation concerning restart of the Salem units, a fact-finding report on the events at Salem, and a report on the generic implications. A generic task force was established and included members and supporting staff from the Office of Nuclear Reactor Regulation, the Office of Inspection and Enforcement, the Office of Analysis and Evaluation of Operational Data, and the Region I Office, with advice provided by a high-level NRC management oversight group. The findings of the task force, published in April 1983, are contained in "Generic Implications of ATWS Events at the Salem Nuclear Power Plant" (NUREG-1000).

In addition to specific problems with the reliability of the devices used to shut down reactors at some plants, the generic task force found that the Salem events indicated potential problems with: (1) licensee programs, procedures, and data collection capability for evaluating the causes of unscheduled reactor shutdowns, and for determining that safety-related equipment has operated properly prior to plant restart; (2) licensee programs for determining the safety classification of components; (3) licensee procedures for ensuring that plant personnel have available and properly use information on the safety classification of components; (4) licensee procedures for equipment maintenance and testing; and (5) licensee-vendor communications related to equipment maintenance and repair.

Corrective steps have been developed that will require licensees to improve the reliability both of reactor shutdown systems and of overall plant management, and that will improve NRC staff oversight and evaluation of licensee performance.

Instrumentation to Detect Inadequate Core Cooling

On November 4, 1982, the Commission approved staff recommendations for implementation of an item in the TMI Action Plan regarding instrumentation to detect inadequate core cooling for all pressurized water reactors. The required instrumentation consists of upgraded subcooling margin monitors (SMM), upgraded core-exit thermocouples (CET), and a reactor coolant inventory tracking system (ITS). In response to an order of December 10, 1982, to owners of eight reactors of Babcock and Wilcox design and of Unit 2 of Arkansas Nuclear One, a schedule for installation of an ITS was proposed by the owners; the proposal was accepted and installation is expected to be completed either prior to or during the 1986 refueling outage. NRC staff has approved a request for exemption from the requirement of an ITS for the Yankee Rowe plant because of unique design characteristics. Some licensees have not completed their upgraded design for SMM and CET or have taken exceptions to the upgrading requirements; these exceptions are under review by NRC staff.

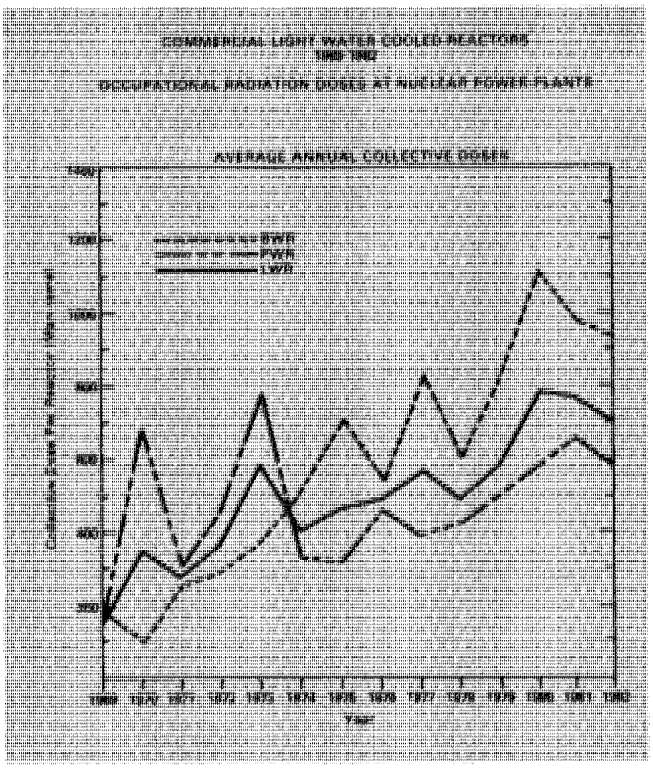
The generically approved Westinghouse reactor vessel level instrumentation system has been selected for 22 reactors of Westinghouse design and for one of Combustion Engineering design. Installation is virtually complete for 14 plants; schedules proposed by owners of other plants extend until late 1984. Special plant-specific designs of differential-pressure measurement systems have been selected for four reactors of Westinghouse design and one of Combustion Engineering design, with proposed installation schedules ranging from mid-1984 through 1985.

Occupational Radiation Doses

A "Coordination Plan for Radiological Protection Activities," effective in March 1983, was prepared and approved by the NRC and the Institute of Nuclear Power Operations (INPO), an organization established by the nuclear industry following the Three Mile Island accident. This Coordination Plan is an outgrowth of the Commission's "Policy and Planning Guidance," which states that the Commission will support alternative regulatory concepts that recognize the contributions of industry self-policing programs to the extent that such programs are effective and consistent with NRC responsibilities. The Coordination Plan would recognize an INPO program of radiological protection evaluations and also its assistance activities for member utilities. One main goal of this INPO effort is to minimize occupational radiation exposure in the nuclear industry. The NRC staff will evaluate the progress and success of this INPO/industry effort during the initial two years of implementation. NRC staff members will accompany INPO site-evaluation teams and prepare summary reports of their observations. Return visits to some of the sites over the two-year period are planned to provide for qualitative comparison of progress at these facilities.

Tracking of dose trends will be one of the key elements in the NRC evaluation of INPO/industry success in improving radiation protection programs. In an ongoing effort, the NRC staff has been tabulating the annual average occupational doses at light water reactors since 1969. Between 1969 and 1973, the annual average doses for pressurized water reactors (PWRs) have exceeded those

for boiling water reactors (BWRs). Since 1974, however, the annual average doses at BWRs have exceeded those at PWRs. Although both PWR and BWR annual dose averages have fluctuated over the years, the overall trend between the mid-1970s and 1980 was one of increasing annual dose averages. However, in 1981 the annual dose average for BWRs dropped by nearly 14 percent, and in 1982 by another four percent, to a value of 940 person-rems per reactor. In 1982, the average annual dose for PWRs dropped by 11 percent to 578 person-rems per reactor. This is the first decline in PWR average occupational doses since 1977. By working with INPO/industry, the NRC staff hopes to gain better understanding and control of occupational radiation doses.



Occupational Exposure Data System

In 1969, the Atomic Energy Commission promulgated requirements that certain types of licensees—including commercial nuclear power reactor operators and industrial radiographers—routinely submit reports on occupational radiation doses received by their employees. These data have been collected and are maintained today in an NRC computer system called REIRS (radiation exposure information reporting system). The system provides a permanent record of the data and permits expeditious analyses of the two kinds of reports provided.

Summaries of the annual statistical reports submitted for calendar years 1980 and 1981 reveal that the four categories of licensees monitored comprised about 160,000 individuals per year, of whom about 60 percent received a measurable dose. The monitored population received a collective dose of about 59,000 man-rems each year, or an average measurable dose of 0.6 rem per worker among those receiving a measurable dose (or 0.4 rem per monitored person). Most of the individuals monitored (83 percent) were employed in nuclear power facilities, and they incurred about 90 percent of the annual collective dose to all monitored licensees. The average measurable dose received by power reactor workers was about 0.7 rem.

A second kind of exposure report required from certain licensees of the NRC provides identification and a record of exposure each time that a monitored individual terminates employment with the licensee. Such information is now maintained for some 250,000 individuals, most of whom were or are employed by nuclear power plant operators. The computerization of these data enables the NRC staff to respond quickly to requests for individual exposure histories. The data can be used to assure that workers moving from plant to plant (as many as nine facilities in one year) do not receive doses in excess of regulatory limits. In most cases, the limit on whole body doses to workers monitored by NRC licensees is 1.25 rem per calendar quarter; under some conditions, an employee may receive three rems per quarter without a violation of regulations. (The 13th and 14th annual reports of Occupational Radiation Exposure (NUREG-0714, vols. 2 and 3) cover calendar years 1980 and 1981; NUREG-0713, vol. 3, contains occupational exposure data maintained in REIRS for nuclear power plant employees.)

Radioactive Effluents

A program for implementing Radiological Effluent Technical Specifications in operating reactors has been undertaken during the report period. These plant-specific requirements will formalize the commitment of each licensee to the long-standing safety concept that radioactive releases from nuclear power plants shall be as low as reasonably achievable and have a minimal effect on the surrounding environment and on members of the public. Complete documentation of any impact potentially attributable to radioactive effluents from a plant is required By the end of fiscal year 1983, about one-half of the operating nuclear reactors had submitted and gained technical approval for the specifications. These will be implemented during 1984, along with processing of submissions for the remaining reactors.

The NRC adopted a policy in 1981 calling on all licensees generating low-level radioactive wastes to reduce the volume of those wastes, in view of the diminishing space available in the three existing commercial low-level waste disposal sites. Licensees are being encouraged to carry out volume-reduction practices, and vendors are being encouraged to develop volume-reduction techniques.

Structural Engineering

An unprecedented effort has been devoted to reviewing the structural design of Units 1 and 2 of the Diablo Canyon (Cal.) nuclear power plant as a result of the discovery in September 1981 of errors in the seismic design of the plant structures and equipment supports. An Independent Design Verification Program (IDVP) has been carried out by a contractor hired by the licensee but functioning independently. The licensee formed a group within its own staff to respond to IDVP findings and ultimately to reanalyze plant structures and systems. Further, NRC staff has enlisted consultants at the Brookhaven National Laboratory to assist in evaluation of the independent technical reports produced by the IDVP, to evaluate reports from the licensee, and to produce independent structural design studies where necessary. The areas of structural review included safety-related structures, supports for heating, ventilation, and air-conditioning equipment, buried pipes, and cable-raceway supports. Specific structures investigated were the containment annulus, containment interior, containment exterior shell, auxiliary building, fuel handling building, intake for cooling water, outdoor water storage tanks, and turbine building. In some cases, structural modifications have been made or will be made to the plant in order to correct discrepancies.

Structural design audits are conducted by structural engineers of the NRR staff to verify the acceptability of design calculations and the implementation of design criteria for nuclear power plants. At least one audit is normally conducted prior to granting a construction permit and another one prior to granting an operating license. In fiscal year 1983, audits were conducted for Limerick (Pa.), Shearon Harris (N.C.), Clinch River Breeder Reactor (Tenn.), Midland (Mich.), and several at Diablo Canyon (Calif.). In each case findings were documented in an audit report forwarded to the applicant for resolution prior to licensing.

After structural deficiencies were found in some of the masonry walls of the Trojan (Ore.) nuclear power plant in 1980, NRR staff evaluated the adequacy of masonry walls of other operating reactors. In fiscal year 1983, Safety Evaluation Reports on masonry walls were issued for Farley 2 (Ala.), Monticello (Minn.), Robinson 2 (S.C.), Vermont Yankee, Browns Ferry 1, 2, and 3 (Ala.), Rancho Seco (Cal.), Three Mile Island 1 (Pa.) Fort St. Vrain (Colo.), Zion 1 and 2 (Ill.), Cook 1 and 2 (Mich.), Prairie Island 1 and 2 (Minn.), Indian Point 2 and 3 (N.Y.), and Salem 1 and 2 (N.J.).

A comprehensive study has been made for the NRC by the Ames Laboratory of Iowa State University on impacts on plant barriers of missiles that may be generated by turbine failures in nuclear power plants. Improved empirical formulas for prediction of damage to reinforced concrete, steel, composite, and multiple barriers have been derived from all available test data in the United States and other countries.

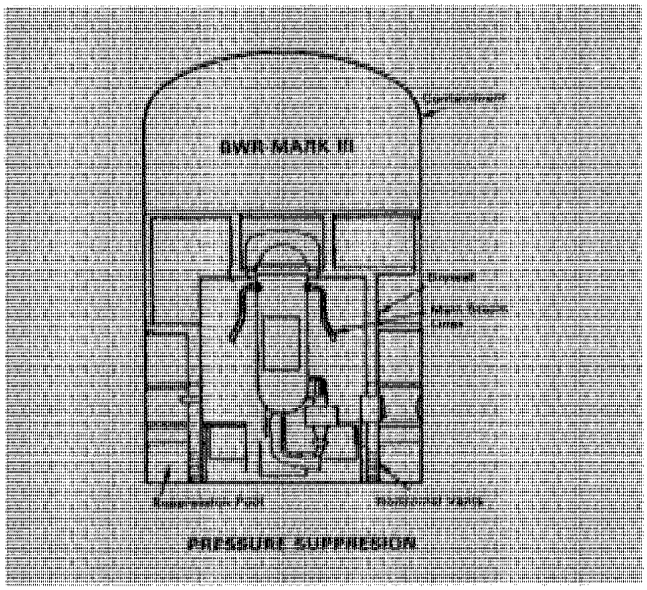
Foundations

At the Midland (Mich.) nuclear power plant, under construction, the main safety concern is poor soil support, caused by improper compaction of the earth fill beneath the auxiliary building, service-water pump structure, borated water storage tanks, and the diesel generator building. Remedial measures proposed by the licensee have been reviewed and found acceptable by the NRC staff and its consultants. The auxiliary building and the service-water pump structure will be provided with an underpinning of reinforced concrete piers and permanent walls extended from the base of the existing building foundations down to the natural soil. Close field control of underpinning operations is required to prevent damage to the already completed concrete structures, as small volumes of the plant fill are sequentially excavated and replaced with the concrete piers and foundation walls. The foundations of the borated water storage tanks and the diesel generator building have been deliberately overloaded to accelerate potential settlement. A permanent dewatering system will be provided to discharge excessive ground water into the cooling pond.

At Unit 2 of the Beaver Valley (Pa.) nuclear power plant, a zone of loose granular soil was discovered in the main plant area below the ground-water table during construction. The technique of pressure injected footing (PIF) was selected as the most suitable for improving the soil conditions at this site. PIF's are basically compaction piles that can be installed to the required depth of 50 feet. Positive verification of the soil densification produced is possible with borings for a standard penetration test. A pilot program of 24 PIF's verified the effectiveness of this technique. Foundation densification was then performed using a total of about 1300 PIF's.

Dynamic Loads in Mark III Containments

For boiling water reactors having the Mark III containment design, a loss-of-coolant accident can result in dynamic loads in the suppression pool, where steam escaping into the containment is condensed. The General Electric Company has conducted analyses of the effects of vent clearing, pool swell, chugging, steam condensation, and multivent interaction, which have provided final pool dynamic load definitions. Based on reviews of these analyses by the NRC staff and consultants from the Brookhaven National Laboratory, appropriate acceptance criteria have been developed by the staff, which it intends to apply to the Mark III containments in reactors currently under construction. The only reactor with Mark III containment already in operation (at low power) is Grand Gulf Unit 1 (Miss.), which was found by the staff to meet the criteria.



In the Mark III design of the containment for a boiling water reactor, steam escaping from a break in a main steam line would be condensed in a suppression pool to avoid increased pressure.

Tornado Missiles

The design of nuclear power plants must take into account the possible effects of the most severe tornadoes, so as not to impose undue risk on the health and safety of the general public. The traditional method to protect safety-related systems from tornado missiles has been to provide physical barriers. Recently, some utilities have sought to demonstrate that such positive design protections are not necessary because of the extremely low probability of tornado missile damage. A possible reevaluation of the matter was suggested by several independent developments of probabilistic risk assessment for these applications, for example, by the Electric Power Research Institute (EPRI) and the Bechtel Corporation. The NRC staff awarded contracts to the National Bureau of Standards and the University of Chicago to independently evaluate the EPRI methodology and compare it with the Bechtel methodology. The staff reviewed the resulting reports and recommended the use by utilities of the EPRI methodology with certain modifications; the NRC also called for justification for the proposed reliance on probabilistic methodology for meeting regulatory criteria. In fiscal year 1983, the staff accepted a probabilistic basis for tornado missile protection for the licensing of Washington Public Power Supply System Unit 2 and Palo Verde Units 1, 2, and 3 (Ariz.) and is in the process of reviewing other cases.

Geosciences

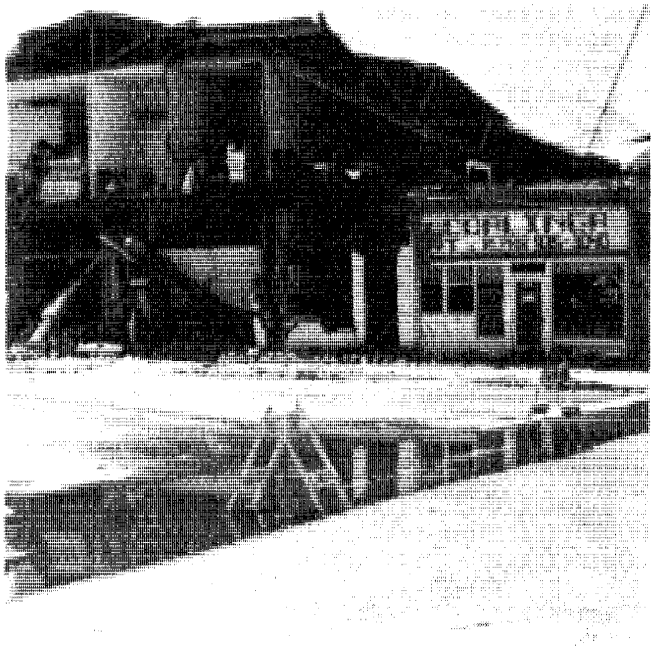
The effects of earthquakes on nuclear power plants is a matter of continuing concern, particularly for plants in areas where there are known geologic faults, such as the San Onofre and Diablo Canyon plants in California. As part of the evaluation of the site near Satsop, Wash., for WPPSS Unit 3, the U.S. Geological Survey has been reviewing a possibility of large thrust-type earthquakes, although none have been recorded in historical times.

The NRC continues to fund an extensive research project on the earthquake that has caused the most serious damage on the eastern seaboard of the United States; the earthquake occurred in 1886 in and near Charleston, S.C., and had an estimated magnitude of about 7 on the Richter scale. The U.S. Geological Survey stated in a letter of November 18, 1982, to the NRC:

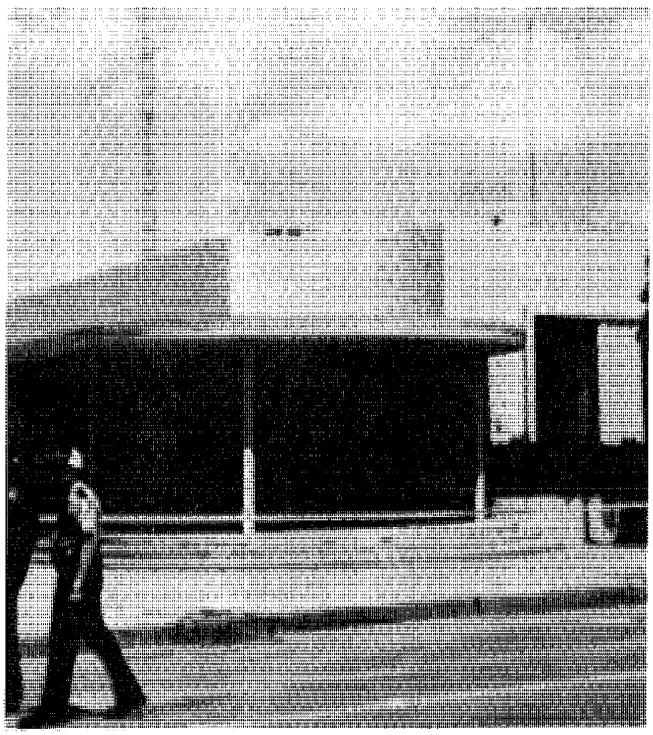
> "Because the geologic and tectonic features of the Charleston region are similar to those in other regions of the eastern seaboard, we conclude that although there is no recent or historical evidence that other regions have experienced strong earthquakes, the historical record is not, of itself, sufficient grounds for ruling out the occurrence in these other regions of strong seismic ground motions similar to those experienced near Charleston in 1886. Although the probability of strong ground motion due to an earthquake in any given year at a particular location in the eastern seaboard may be very low, deterministic and probabilistic evaluations of the seismic hazard should be made for individual sites in the eastern seaboard to establish the seismic engineering parameters for critical facilities."

As a result of this more explicit recognition of existing uncertainties with respect to the uniqueness of the 1886 Charleston earthquake, the NRC has augmented its plans for addressing eastern seismicity. The main change is undertaking a program to probabilistically characterize seismic hazards for the entire region of the United States east of the Rocky Mountains. Additionally, in the longer term, increased deterministic efforts are underway aimed at understanding the causes of large earthquakes, such as the Charleston earthquake, on the eastern seaboard. The nuclear power industry, through the Electric Power Research Institute, has also started a research program on earthquake hazards.

On May 2, 1983, an earthquake of magnitude 6.5 occurred near Coalinga, Cal. This area was visited by a number of engineers and scientists from the NRC, who obtained valuable information regarding the direct effects of seismic shaking on structures. Within the epicentral region, unreinforced concrete buildings in many cases suffered extensive damage and partial collapse. Reinforced concrete buildings appeared to have suffered little or no damage.



An earthquake in May 1983 near Coalinga, Cal., damaged a commercial building made of unreinforced concrete (above) but did not affect the structural integrity of the city hall below, which is made of reinforced concrete.



Protecting the Environment

Socioeconomic Impacts of Nuclear Power Plants

In January 1982, a U.S. Court of Appeals ordered the Commission to consider the potential psychological health effects of restarting and operating Unit 1 of the nuclear power plant at Three Mile Island (Pa.). Unit 1 had not been permitted to operate since the accident at Unit 2 in 1979. The Commission filed an appeal from this order with the U.S. Supreme Court. On April 19, 1983, the Supreme Court overturned the Court of Appeals decision, holding that the National Environmental Policy Act requires assessment only of impacts that bear a reasonably close causal relationship to a change in the physical environment and that a *risk* of an accident is not an effect on the physical environment.

In general, progress was made in improving the capability to estimate potential economic impacts of severe nuclear plant accidents. The Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce further modified its Regional Input-Output Modeling System to provide probability-weighted estimates of the impacts of severe nuclear plant accidents on a regional economy. Completion of a related study by Pacific Northwest Laboratories—which looked at a broader scope of potential socioeconomic consequences of severe accidents— resulted in a computer code to estimate health care costs and income lost due to illness or death caused by severe accidents.

Non-Radiological Public Health Issues In Licensing Nuclear Power Plants

NRC environmental impact statements include, among other things, consideration of non-radiological hazards to public health. Subjects of concern are contamination of groundwater and drinking water supplies, introduction or dispersal of disease causing agents, and use of chemicals on-site or on transmission or pipeline rights-of-way. The specific causative agents that have been addressed in environmental impact statements, or in case-related staff affidavits and public testimony, have included the following: known or suspected carcinogenic substances, such as trihalomethanes in chlorinated cooling water discharges; toxic or harmful substances, such as dissolved metals (e.g., arsenic) and other inorganic materials in power plant discharges; pathogenic agents, such as Legionnaire's Disease Bacterium, pathogenic amoebae responsible for primary amoebic meningo-encephalitis,

and Valley Fever fungus in cooling tower drift, cooling lake waters, and construction site dust, respectively; irritants, such as asbestos in drift aerosols and blowdown from cooling towers; low-level electric fields and shock hazards resulting from operation of transmission lines; and weed and vegetation control agents in aerosols from spraying equipment and in runoff from transmission and cooling-water pipeline rights-of-way.

Consideration of these substances not only covers cases where they are purposefully added to power plant systems or effluents during operation, but also to cases where constituents found in ambient waters are concentrated in power plant evaporative cooling systems and then discharged to the environment. Published criteria for the protection of human health are used by the NRC in determining the need for mitigative action at a particular power plant site. These criteria are taken from such sources as the Safe Drinking Water Act, the Clean Water Act, and the Toxic Substances Control Act.

Environmental Noise Levels At Nuclear Power Plants

NRC environmental impact statements include evaluations of off-site noise from nuclear power plants. Typical off-site candidates for noise assessment are nearby residences, schools, hospitals, churches, and parks or recreational areas. A large body of information on the subjective response to environmental noise levels has been accumulated as a result of the planning and operating of airports and other transportation projects. The major sources of environmental noise at nuclear power plants are the main and auxiliary transformers, pumphouses, and cooling towers. Reviews conducted to date have resulted in NRC staff recommendations for realignment of outdoor paging systems, installation of soundproof doors and weatherstripping at pumphouses, modifications and relocation of louvers in pumphouse ventilation systems, installation of barrier walls or soundproof enclosures for small transformers, and specifications for noise monitoring programs. Proposed plant designs for 13 nuclear power plants that have submitted applications for operating licenses are being evaluated to determine their noise potential.

Effects of Nuclear Plants on Aquatic Life

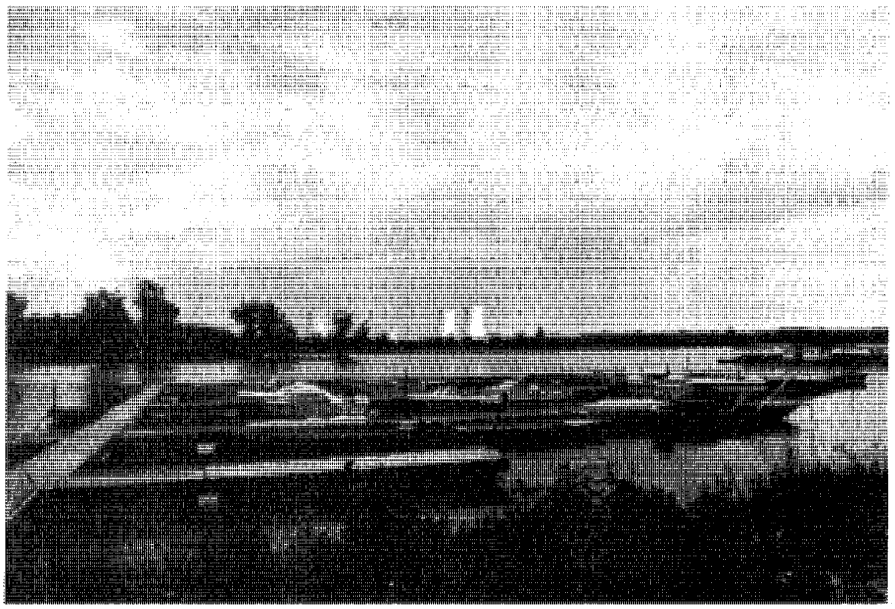
A draft environmental statement (NUREG-0974) was issued by the NRC for the Limerick Nuclear Station Units 1 and 2 (Pa.) in June 1983. The station design provides for cooling water for the facility to be transferred from the Delaware River upstream of Philadelphia to Limerick and then to the Schuylkill River, using natural stream beds and pipelines for water transport. Specific questions of aquatic impact examined by the NRC staff include groundwater contamination, changes in stream water chemistry and biotic composition by introduction of Delaware River water, scouring of stream beds due to increased stream flow during pumping, erosion of stream banks at the point where river water is introduced, aggravation of high water levels and flooding during storms in the stream watershed, and impingement or entrainment of fish at the intake structures. The potential of the proposed intake structure on the Delaware River to adversely affect the endangered shortnose sturgeon or the recreationally important anadromous American shad fishery has received particular attention from the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Pennsylvania Fish Commission, as well as the NRC. A Partial Initial Decision by an Atomic Safety and Licensing Board, on March 8, 1983, found that there will be no adverse impact on American shad, shortnose sturgeon, boating, or recreation which would render invalid the favorable results of the cost-benefit analysis by the NRC staff at the construction permit stage.

The Three Mile Island Nuclear Station utilizes the York Haven Pond of the Susquehanna River as a source of cooling water and for treated effluents. Studies of aquatic life there have been conducted since 1974. Since the accident at Unit 2 in 1979, NRC staff has monitored very closely the progress and results of those studies, to assure that cleanup activities are not affecting the integrity of the river aquatic system and its fishery resources. In early 1983, a modified program for York Haven Pond was approved by the NRC, which continues to monitor river water quality; bottom invertebrate animals; egg, larval, juvenile, and adult fishes; and the recreational fishery.

Antitrust Activities

As required by law since December 1970, the NRC has conducted prelicensing antitrust reviews of all construction permit applications for nuclear power plants and certain other commercial nuclear facilities. In addition, applications for amendments to construction permits that transfer an ownership interest in a nuclear facility to one or more additional applicants are subject to antitrust review. During fiscal year 1983, the NRC reviewed four applications for amendments to construction permits involving transfers of ownership interest. No antitrust hearings or license conditions resulted from these reviews.

Remedies to antitrust problems usually take the form of conditions attached to licenses, and the NRC has the responsibility to enforce compliance with these antitrust conditions. During fiscal year 1983, the NRC closed out enforcement actions pertaining to antitrust conditions in the Grand Gulf (Miss.), Davis Besse (Ohio), and Perry (Ohio) nuclear plant licenses and permits. Another enforcement action, with respect to antitrust conditions for Diablo Canyon, was still in the negotiating stage as of September 30, 1983.



The Goldsboro Marina is on the bank of York Haven Pond, just west of the Three Mile Island nuclear power station in Pennsylvania. The marina is one of the primary access points for fishermen on the Susquehanna River.

An application for an operating license is not subject to formal antitrust review unless the NRC first determines that "significant changes" in the applicant's activities have occurred since the review of the application for a construction permit (see 47 FR 9983 for the procedures used). During fiscal year 1983, three analyses were completed for determination of significant changes. In each instance, the finding was that the changes that had occurred were not significant in an antitrust context.

Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards (ACRS), established in 1957 by statute, provides the Commission advice on potential hazards of proposed or existing reactor facilities and the adequacy of proposed safety standards. The Atomic Energy Act of 1954 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. In accordance with Public Law 95-209, the ACRS is required to prepare an annual report to the U.S. Congress on the NRC Safety Research Program.

The ACRS reviews requests for preapplication site and standard plant approvals, each application for a construction permit or an operating license for power reactors, applications for licenses to construct or operate test reactors, spent fuel reprocessing plants, waste disposal facilities, and any matter related to the safety of nuclear facilities specifically requested by the Department of Energy.

Consistent with the statutory charter of the Committee, all 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, appointed from the scientific and engineering disciplines, includes individuals experienced in chemistry and chemical engineering, electrical engineering, mechanical engineering, structural engineering, reactor operations, reactor physics, and environmental health.

During fiscal year 1983, the Committee completed its annual report to Congress on the NRC Safety Research Program for fiscal year 1984-1985 and its annual report to the Commission on the Safety Research Program and Budget for fiscal year 1985-1986.

Members appeared and presented testimony to the Subcommittee on Energy Conservation and Power of the House Committee on Energy and Commerce on the use of probabilistic risk assessment and quantitative safety goals in the regulation of nuclear power plants.

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

- ECCS Evaluation Model Changes.
- Reactor Pressure Vessel Thermal Shock.
- The Integrated Human Factors Program Plan.
- Hydrogen Control in the Sequoyah Containment.
- Prioritization of Generic Issues.
- The Proposed Safety Goal Policy and the Safety Goal Evaluation Plan.

- Severe Accident Policy.
- Seismic Design Margins for Nuclear Power Plants, the Seismic Qualification Utility Group Program, and the engineering basis for the so-called "tau effect."
- Regionalization of NRC Staff Activities.
- Control Room Habitability.
- The Site Characterization Study for the High-Level Waste Respository at Hanford.
- Precursors to Potential Severe Core Damage Accidents.
- The Integrated Safety Assessment Program.

The Committee's activities during the report period reflected the continuing licensing activity within the Commission and included three reports on requests for operating licenses, six reviews of operating plants evaluated as part of the Systematic Evaluation Program, two reviews of requests for construction permits, and a review of a proposed new standard plant design.

In addition to its reports on licensed reactors and operating license applications, the Committee provided advice to NRC on 14 proposed rules, criteria, or regulatory guides, including:

- The proposed rulemaking on Licensee Event Reports.
- The Leak-Before-Break Criterion.
- Insider Safeguards Rules.
- Ultrasonic testing of reactor vessel welds.
- Immediate notification requirements.
- Licensed operator staffing.
- Transportation Accident Policy.
- The proposed Anticipated Transients Without Scram Rule.
- Packages for shipment of plutonium by air.

The Committee also provided advice on proposed resolutions for four unresolved safety issues, including:

- Water Hammer
- Containment Emergency Sump Performance
- Systems Interactions
- Station Blackout

Under the provision of Public Law 97-425, "Nuclear Waste Policy Act of 1982," the Committee provided a report on the training and qualification of personnel in nuclear power plants.

In performing the reviews and preparing the reports cited above, the ACRS held 12 full Committee meetings and 97 subcommittee and working group meetings.

On October 5-6, 1982, the ACRS held a meeting with the ReaktorSicherheitskommission (Reactor Safety Committee) of the Federal Republic of Germany to discuss safety-related issues of mutual interest. During the meeting, held in Washington, D.C., specific items discussed included radwaste management and disposal, use of probabilistic risk assessment, quantitative safety goals in the regulatory process, and consideration of Class-9 accidents.

On March 24-25, 1983, the ACRS and the Groupe Permanent Reactor (GPR) from the Republic of France held a joint meeting in Washington, D.C., to discuss safety-related issues and concerns. Items discussed with the GPR included liquid metal fast breeder reactor safety, most significant recent incidents, safety analysis and lessons learned therein, and consideration of Class-9 accidents.

Cleanup at Three Mile Island Unit 2

CHAPTER 3

At the end of September 1983, conditions at the Three Mile Island Nuclear Power Station (TMI) near Harrisburg, Pa., remained stable, and cleanup of the damaged Unit 2 by the operator, General Public Utilities Nuclear Corporation, was proceeding. The cleanup continues to be controlled by funding limitations and the lack of firm funding commitments for future activities. (See discussion at the end of Chapter 9.) In addition, in March of 1983, public allegations were made by several former and current licensee and contractor employees about inadequate testing of the reactor-building polar crane to be used in lifting the reactor vessel head and other cleanup-related issues. The NRC Office of Investigations and the Office of Inspector and Auditor undertook to evaluate the merits of the allegations. The end of cleanup, now projected to be mid-1988, may be affected by these new complications.

Meanwhile the Commission set forth explicit positions and intentions regarding TMI in its annual policy and planning guidance for the NRC staff. In this document, the Commission affirms that the "expeditious cleanup" of the Unit 2 containment and reactor is "one of the NRC's highest safety priorities." The TMI Program Office will continue to monitor cleanup activities from the site, and the NRC will generally provide oversight, support and, if necessary, direction to ensure the prompt decontamination of the facility and the safe removal of radioactive materials from the site.

The licensee submitted updated plans and schedules for the cleanup activities in December 1982, and the NRC staff reviewed these plans and provided recommendations to the Commission.

Reactor Building Entries

During fiscal year 1983, workers entered the TMI-2 reactor building 191 times. Their activities continued to focus on gathering post-accident data, decontamination and dose reduction efforts, and repair of the reactor-building polar crane. Other important tasks accomplished were the removal of the neutron shield tanks, decontamination of the reactor building air coolers, closed-circuit television inspection of the 282 ft. elevation, raising and parking of all eight axial-power-shaping rod leadscrews, and first steps toward a complete characterization of radiological conditions of the reactor-vessel underhead. As part of the underhead characterization task, the NRC has contracted with Battelle Pacific Northwest Laboratories to review such major elements as radiation measurements, cesium plate-out on the plenum, and related chemistry phenomena. Preliminary analysis of sonar mapping data from the underhead characterization study indicates that few, if any, of the 177 fuel assemblies remain intact.

Waste Management

The existing Memorandum of Understanding (MOU) dated March 15, 1982, between the NRC and the Department of Energy (DOE) for TMI-2 solid radioactive wastes specifies the interagency procedures for the removal and disposition of such wastes resulting from the cleanup of TMI-2. The MOU covers six categories of solid wastes including: (1) EPICOR-II system wastes, (2) submerged demineralizer system (SDS) wastes, (3) reactor fuel, (4) transuranic contaminated waste materials, (5) makeup and purification system resins and filters, and (6) other solid radioactive wastes (i.e., normal low-level solid waste which is acceptable for burial in licensed commercial low-level waste burial facilities).

The MOU provides that any materials with transuranic levels above those acceptable at commercial low-level waste burial facilities will be considered by DOE on a case-by-case basis. As stated in the MOU, the alternatives for such material could include archiving, research and development, temporary storage on-site at a DOE facility to await further processing and/or disposal in a permanent off-site repository. Recent more definitive guidance specifies that DOE may accept abnormal wastes from General Public Utilities (GPU) for storage and/or disposal on a cost reimbursable basis. (Abnormal wastes are defined as those which are significantly dissimilar in form, content, and/or quantity to wastes generated at other licensed nuclear facilities and which cannot be made acceptable for disposal in commercial low-level waste burial facilities at reasonable cost.) The guidance does not apply to the reactor core which is covered by a separate agreement with GPU, consistent with the MOU. The recent development by DOE of definitive guidance for the removal and disposition of TMI-2 abnormal transuranic contaminated waste is significant, because now there is clear direction for the removal and disposition of essentially all existing and anticipated TMI-2 solid radioactive waste.

Cooperative efforts between DOE and NRC have been essential to resolving the problem of disposing of abnormal waste from TMI-2 to DOE facilities. The last two of the 50 EPICOR-II prefilters of high specific activity were shipped from TMI-2 on July 12, 1983, and the last of the 13 highly contaminated SDS liners left the TMI site on August 30, 1983. The 50 EPICOR-II prefilters contained approximately 60,000 curies of primarily cesium radionuclides and the 13 SDS liners contained approximately 360,000 curies of primarily cesium and strontium radionuclides. These achievements are significant in that they represent the off-site disposition of the bulk of the radioactivity that was dispersed throughout the plant as liquid radioactive waste generated by the accident.

Polar Crane

Repair of the damaged polar crane is indispensable to progress on the major cleanup efforts, which are lifting the head of the reactor pressure vessel and removing the plenum prior to extracting the damaged core.

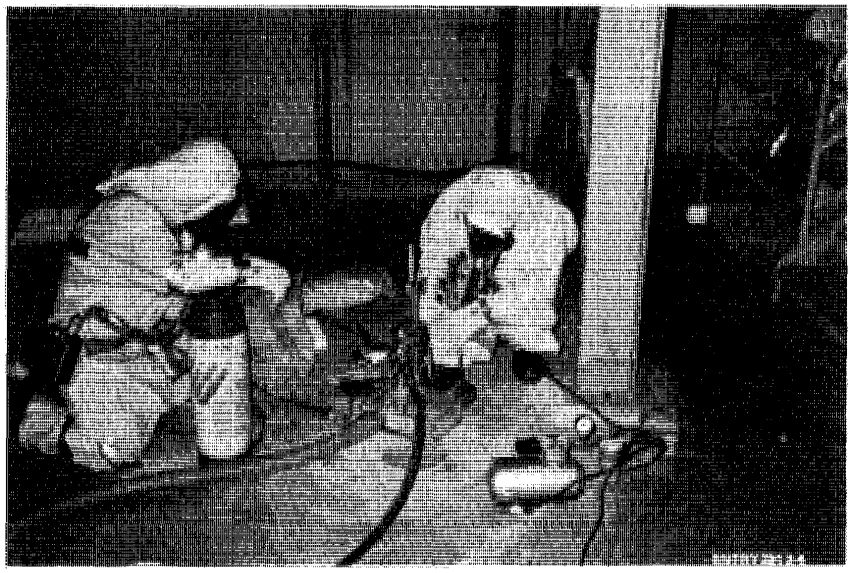
On February 18, 1983, GPU submitted a safety evaluation report (SER) for the polar crane load test and the NRC staff initiated a safety review of the proposed activity. The staff's review included the detailed load test and operating procedures for the polar crane as well as an SER addendum, dated March 15, 1983, submitted in response to the staff's initial review. The staff's safety review of the load test was in progress when, on March 22, 1983, a GPU contractor employee assigned to TMI-2 made allegations about the safety of the polar crane and other cleanup-related issues. Shortly thereafter, the investigation of the matter by the Office of Investigations and the Office of Inspector and Auditor was initiated. To avoid possible interference with this inquiry, the staff was requested to stop its safety review of those polar crane load test issues associated with the allegations and limit the use of the polar crane by GPU to lifts of five tons or less. By mid-July 1983, the staff's load test safety review was resumed. The report from OI regarding the evaluation of the allegations was dated September 1, 1983; it cited deficiencies in the administrative and procedural aspects of the polar crane repair.

On the basis of information from GPU related to the requalification of the polar crane, information exchanged in numerous discussions with GPU and its contractors, information provided in related correspondence, and the results of the OI investigation, the staff, with the assistance of an expert consultant, expects to complete the safety review of the polar crane load test early in the first quarter of fiscal year 1984.

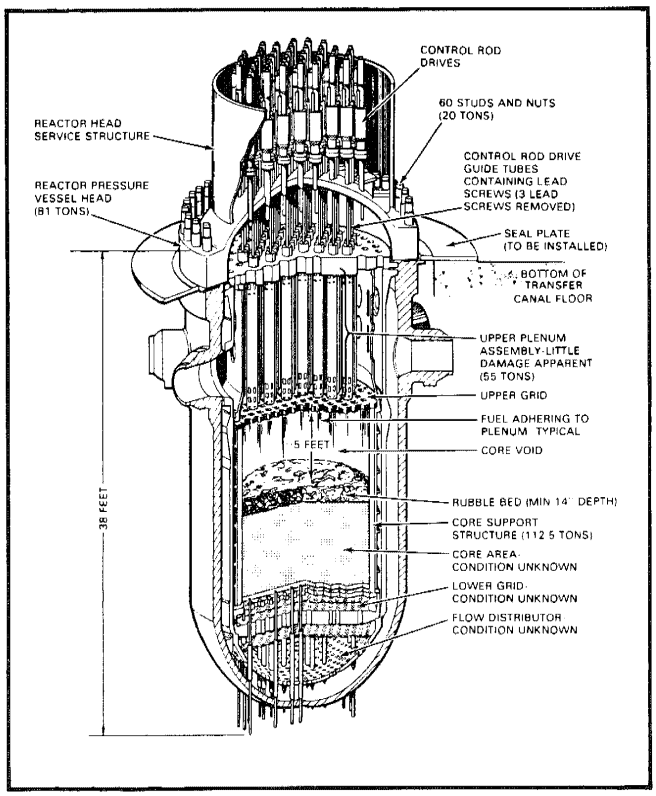
The report from OIA dated September 6, 1983, addressed alleged NRC employee impropriety in dealing with the licensee and its contractor at TMI-2. OIA concluded that the allegations were not substantiated.

Inspection of the Reactor Core

The first closed-circuit television inspections of the reactor core were performed on July 21, 1982. During this "Quick Look" inspection, a camera lowered into the core region revealed a rubble bed approximately five feet below the normal location of the top of the fuel assemblies. In an effort to verify and expand on data obtained during the Quick Look, the licensee received approval to conduct the Underhead Characterization Study, which is a datagathering effort preliminary to reactor vessel head removal. A first analysis of the Sonar Mapping Data indicates that the deep void found during the Quick Look inspection in 1982 extends across the entire cross section of the core and ranges from 5-to-6½ feet in depth. Gamma fields were measured in the range of 300-to-700 roentgens



Workers in protective clothing are inside the reactor containment building at TMI-2 drilling core samples from the concrete floor to determine how much radioactive contamination has been absorbed by the concrete.



CUTAWAY VIEW OF THE TMI-2 REACTOR VESSEL

per hour in the space formed by the underside of the reactor vessel head and the top of the plenum.

As a part of the Underhead Characterization Study, samples of core debris were taken from the surface of the rubble bed and at various depths in the core debris pile. The last step of the study will be the raising and parking of five control-rod-drive leadscrews from their fully inserted positions to determine the impact on general area dose rates in the vicinity of the reactor vessel head and service structure.

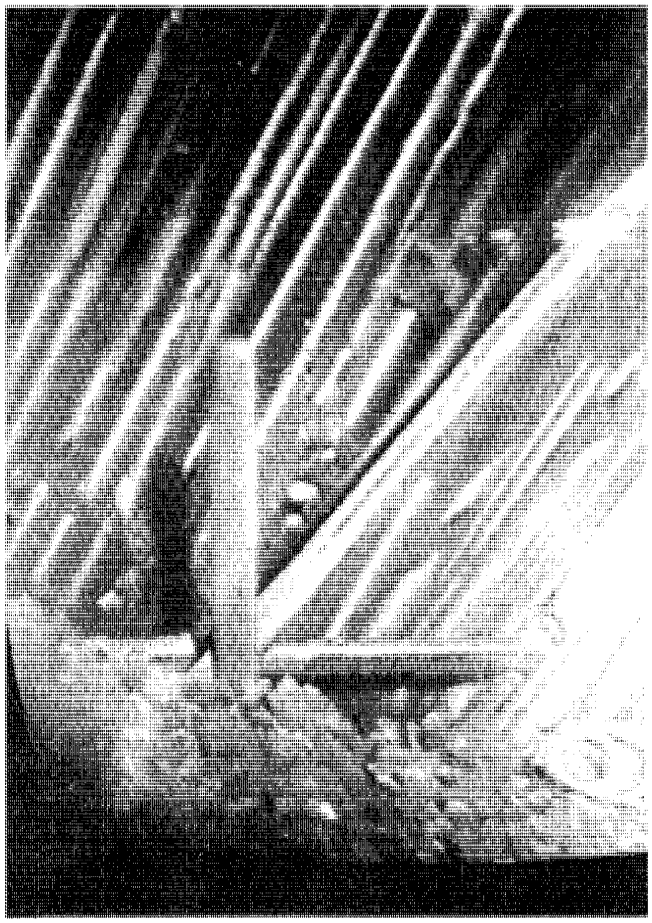
Radiation Dose Rate Reduction

A dose rate reduction program was initiated in late 1982 to reduce the radiation levels inside the reactor building, so that occupational radiation exposure during cleanup activities would be kept as low as possible.

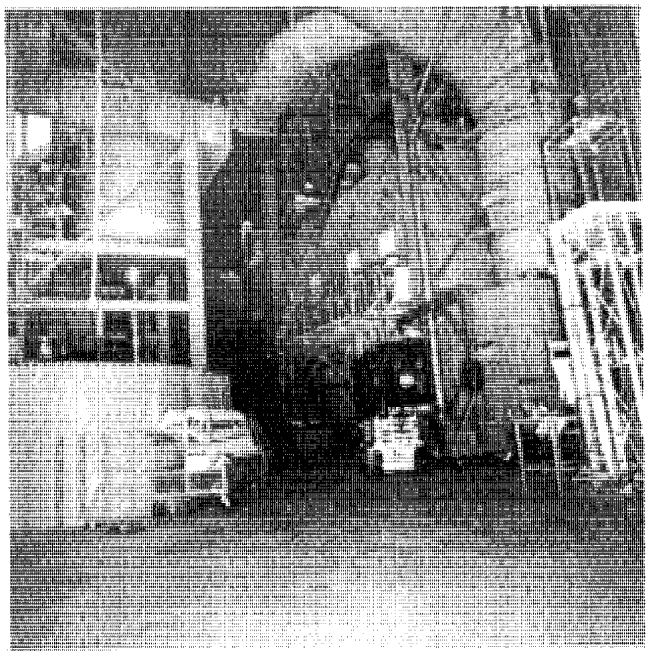
Dose reduction techniques applied during the first phases of this program included (1) shortening the transit time of workers in the reactor building by opening both personnel airlocks and modifying the ingress/egress paths; (2) decontamination by water flushing of such discrete radiation sources as the air coolers, elevator shaft, and enclosed stairwell; (3) elimination of other discrete radiation sources by removal of trash and contaminated equipment; and (4) placement of shielding at the 305-foot elevation, e.g., lead curtains around the core flood tank, lead sheets on the covered floor hatch, and water columns and bladder shields around the open stairwell, elevator, and enclosed stairwell.

Noticeable decreases in the general area radiation dose rates have been realized since the initiation of the program. For example, in July 1983, the average occupational dose rates, as recorded by personnel dosimeters, were 140 millirems (mrem)-per-hour at the 305-foot level, 106 mrem-per-hour at the 347-foot level and 73 mrem-per-hour at the reactor vessel head and service structure. The comparable dose rates at those areas prior to the dose reduction program in the fall of 1982 were 350 mrem-per-hour at the 305-foot level, and 140 mrem-per-hour at the 347-foot level and at the reactor vessel head and service structure.

The dose reduction program is an ongoing effort, along with future cleanup actions in the reactor building, such as reactor vessel head lift and plenum removal. It is expected that significant further reductions will become increasingly difficult. As discrete radiation sources are identified and removed or shielded, the remaining sources are either more dispersed or of a kind that is not readily susceptible to decontamination by water flushing.



The photograph shows the upper part of the nuclear core of the TMI-2 reactor, with portions of fuel elements (the white strips) lying on the rubble bed and, in one case, protruding from it.



The plastic-covered lead blanket at the left is a shield against radiation from contaminated equipment inside the reactor containment of TMI-2.

Substantial contamination remains in the elevator pit, floor drains and sumps, ductwork and other inner surfaces of the air coolers, cable surfaces inside cable trays, and in concrete surfaces and paints. Some of the more complex activities under consideration are decontamination of selected surfaces with chemicals, removal of concrete and paint, and decontamination or replacement of cable trays.

Advisory Panel on TMI Cleanup

An Advisory Panel for the Decontamination of Three Mile Island Unit 2 was formed by the NRC in October 1980 in order to gain input and reaction from the residents of the Three Mile Island area and to provide the Commission with advice on major cleanup activities. The 12 members of the Panel include local citizens, local and state government officials and scientists (see Appendix 2 for a list of members). During fiscal year 1983, the Panel had six public meetings in Harrisburg, Pa., and two before the NRC Commissioners in Washington, D.C. During the year, the Panel discussed a variety of issues pertaining to the cleanup including funding and repair of the polar crane.

Operational Experience

CHAPTER 4

ANALYSIS AND EVALUATION OF OPERATIONAL DATA

NRC's Office for Analysis and Evaluation of Operational Data (AEOD) was established several months after the accident at TMI-2 to identify, analyze, and feed back significant safety lessons of operational experience to the NRC, its licensees, the nuclear industry as a whole, and the public. These responsibilities include managing the NRC Licensee Event Report (LER) system (see box), from which AEOD analyzes operational experience in engineering evaluations and case studies. In addition, AEOD publishes the NRC's *Licensee Event Report (LER) Compilation*, which contains abstracts of LERs processed during a one-month period; the *Power Reactor Events* report, a bimonthly publication which contains abstracts of events of significance and interest to plant operators; and the quarterly *Report to Congress on Abnormal Occurrences*. (For a description of NRC's requirements, under law, to report abnormal occurrences, see the *1980 NRC Annual Report*, p. 82.)

Exchanging Information with Industry

Two industry organizations, the Institute of Nuclear Power Operations (INPO) in Atlanta, Georgia, and the Nuclear Safety Analysis Center (NSAC—a part of the Electric Power Research Institute in Palo Alto, Ca.) also study operational experience, among other subjects. The NRC has memoranda of agreement with INPO and NSAC for the exchange and feedback of operational experience and safety information on nuclear power plants. There are also periodic meetings to exchange information, in order to identify early warning signals and to encourage measures to prevent major problems.

In fiscal year 1983, the NRC continued to support the Institute of Electrical and Electronics Engineers (IEEE) in developing the Energy Industry Identification System. These efforts have resulted in the publication of three IEEE standards involving IEEE recommended practice for unique identification in power plants and related facilities: IEEE STD 803-1983 discusses principles and definitions; IEEE STD 803A-1983 discusses component function identifiers; and IEEE STD 805-1983 provides system descriptions. These documents will help standardize the nomenclature for systems, structures, and components throughout the nuclear industry, and will provide a common language for reporting information about specific components or generic classes of components in LERs.

NRC Handling of Operational Data Reports

Domestic. About 4,500 LERs were received in fiscal year 1983, covering a wide variety of events; however, some problems continued to occur with the existing reporting system. In July 1983, the NRC approved an LER rule (10 CFR 50.73) which codifies and revises the scope, content, and method of reporting. The revised reporting criteria focus on events most likely to have potential safety significance, and require a more detailed narrative report for each such event. The effective date for the new rule is January 1, 1984. A report, *Licensee Event Report System* (NUREG-1022), was issued in October 1983, providing information on the scope and content of the reporting procedures. Regional workshops, which were open to the public, were also held in October and November 1983 to discuss the revised reporting requirements with representatives of utilities licensed to operate nuclear reactors.

The Sequence Coding and Search System (SCSS), an improved computerized data storage and retrieval system was in operation at the end of the fiscal year. SCSS facilitates trend and pattern analyses, allows for statistical assessment of data, and brings a greater range of past experience to bear on cases under analysis and evaluation.

The trends and patterns analysis program within AEOD was expanded in fiscal year 1983 by the addition of staff resources and by an increase in contract support efforts. A Trends and Patterns Program Plan was developed to document the objectives and program activities, including milestones and resource estimates. The program will use more statistical techniques to detect trends or patterns from incidents of low individual significance which may signify an unrecognized safety concern. The program encompasses the SCSS and the Nuclear Power Plant Reliability Data System (NPRDS - a voluntary, industry run reporting system for failure data on safety components, which INPO is implementing and the NRC is monitoring), and the development of software for rapid statistical analysis.

AEOD upgraded the review of reactor operating experience for human factor implications and continued its program to gather and store nonreactor operational data on nuclear materials and fuel cycle operational events and

on personnel radiation exposure events on a computerized file.

Foreign. In fiscal year 1983, the NRC continued efforts to increase the number and usefulness of foreign experience reports that are received. The agency also participated in the exchange of operational event information with other countries through the Nuclear Energy Agency and through bilateral agreements. An NRC program at the Nuclear Operations Analysis Center (NOAC) in Oak Ridge, Tennessee systematically screens and assesses selected foreign information for its applicability to the U.S. program, and to abstract it for computerized data filing.

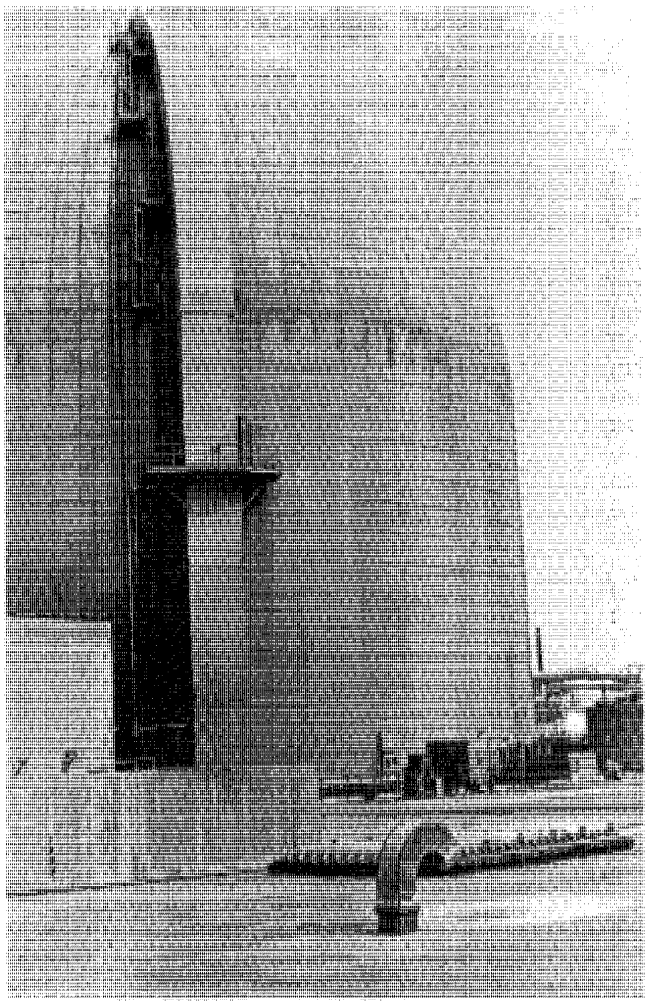
TECHNICAL STUDIES - SELECT CASES

During the 1983 report period, two special studies and two case studies (see Table 1), and more than 40 engineering evaluations (see Tables 2 and 3), were completed. Among the subjects examined in engineering evaluations were an overpressurization event at McGuire, loss of residual heat removal at Pilgrim, valve pit flooding at Surry, loss of all charging pumps at St. Lucie Unit 1, and loss of shutdown cooling at San Onofre Unit 2.

Other events evaluated involved water hammer, diesel generators, power distribution systems, instrumentation and control systems, support service systems, safety-related pumps and valves, and fuel assembly degradation. Summaries of the case and special studies issued during 1983 are presented below.

ATWS Events at Salem

On February 25, 1983, Salem Unit 1, a Westinghouse designed nuclear power plant, experienced a total failure of the reactor trip system (RTS) to automatically shut



Above is the containment building at the Salem Nuclear Generating Station in New Jersey. The pressurized water reactor facility was the scene in 1983 of two separate events known as "anticipated transients without scram." The events occurred when two circuit breakers failed to open in response to an automatic signal for the reactor to shut down, or "scram." The breakers were opened manually by control room operators.

LICENSEE EVENT REPORTS

Operating nuclear power plants must report unplanned operational events which have safety implications. Some events must be reported within one hour via dedicated direct phone lines, and many are also reported in writing within 30 days. The written reports are called Licensee Event Reports (LERs). The NRC staff reviews each event report to determine such things as the adequacy of short-term corrective actions and the need for possible action at other plants, or to identify potential generic problems and significant safety concerns warranting further study. Assessment of the causes and consequences of these events assists in developing preventive and mitigative measures, and in understanding unforseen cause-effect relationships between events. The more serious events may merit treatment as "abnormal occurrences." Frequent or widespread problems may be identified or studied as potential generic safety concerns.

For many safety-related operational events, NRC resident inspectors perform the initial NRC investigations, and the appropriate NRC regional office conducts reviews. In addition, the technical aspects of potentially significant operational events are studied by a number of separate organizations within the NRC, including the Office for Analysis and Evaluation of Operational Data and the Offices of Nuclear Reactor Regulation, Inspection and Enforcement, and Nuclear Regulatory Research.

NRC routinely disseminates information on operational events to power plant licensees and the public.

down the reactor upon receipt of a valid signal from the reactor protection system (RPS). A similar event had occurred at Salem Unit 1 on February 22, 1983. The failures were caused by two electro-mechanical circuit breakers, (reactor trip breakers (RTBs)), which failed to open in response to the automatic trip signal from the RPS because the associated undervoltage (UV) trip attachment did not actuate the trip mechanisms. The breakers subsequently opened when the operators actuated them via the manual scram switch. The proper functioning of the automatic feature of the RTS including the RTBs is of prime importance to the protection of public health and safety; its failure results in total reliance on operator actions to control plant transients.

In March 1983, AEOD initiated a special study to review and evaluate the implications of these anticipated transient without scram (ATWS) events at Salem on the NRC's program for collecting and analyzing operational experience. The study focused on the adequacy of NRC's reporting requirements as they relate to RTB failures, including the licensees' understanding of the requirements and the impact of proposed revisions to the requirements; and whether trends and patterns analyses of the reported RTB failures could have identified a significant potential for the problem at Salem Unit 1 before it occurred. Additional topics reviewed were the requirements for licensees to analyze operating experience with a specific focus on the ability to reconstruct the sequence of events.

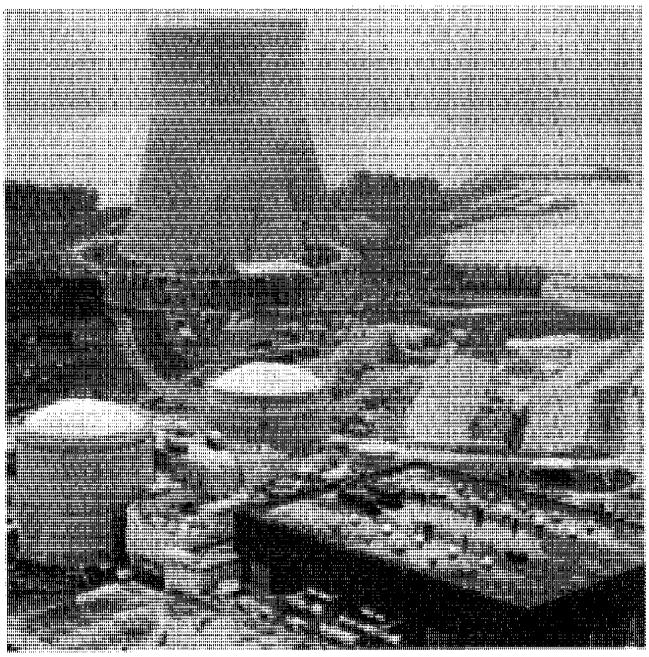
Some of the conclusions drawn from the study are described below.

- The Salem ATWS events emphasize that operational data assessment requires clear and in-depth licensee reports on failure history.
- Operational event analysis and feedback by each licensee, the industry, and the NRC is essential for the safe operation of nuclear power plants.
- Such aspects as what information is to be recorded following the course of a serious event; scanning and recording rates; quantity of data recorded and retention period; and the requirements for equipment availability, reliability, and qualification; need to be specifically addressed.
- Planned trends and patterns analyses, coupled with close scrutiny of failure data and detailed engineering assessment, particularly of those features related to reliability, should aid in the identification of specific plant and/or generic safety problems and the need for corrective actions.
- Even though the events at Salem involved no plant damage, no releases, and no immediate threat to public health and safety, the fact that the NRC and the industry have devoted extensive resources to studying its cause and implications is a strong indication of the heightened sensitivity to operational events and the progress made in understanding the lessons of operational experience.

Loss of Reactor Coolant Events

In October 1982, AEOD completed a study of two events at the Sequoyah Nuclear Plant which resulted in the inadvertent loss of reactor coolant during shutdown cooling. Separate events at Units 1 and 2 resulted from the opening of a single valve in the residual heat removal (RHR) system which allowed reactor coolant to leak into the containment. The leakage paths for both events originated from the hot leg of the reactor coolant system (RCS), and exited through an RHR containment spray valve in one case and through an ECCS recirculation valve in the RHR system in the other. This resulted in a lossof-coolant accident (LOCA) inside containment and could have subsequently resulted in a loss of one train of the decay heat removal or emergency core cooling recirculation capability required for mitigation of the LOCA.

This evaluation of the Sequoyah events concluded that all containment penetration piping in the RHR system was not designed with redundant isolation valves when operating in the normal decay heat removal mode. In this mode, the RHR system becomes an extension of the reactor coolant pressure retention boundary and single valves retain the pressure with respect to primary containment or the auxiliary buidling. Inadvertent operation of such valves could result in a loss-of-coolant event and possible degradation of RHR capability due to RHR pump cavitation.



An unplanned loss of reactor coolant at the Sequoyah nuclear power plant was the subject of special study during the report period. The plant in Tennessee is owned by the Tennessee Valley Authority.

Table 1. AEOD Reports Issued During FY 1983

CASE AND SPECIAL STUDIES

Designation	*Subject*	*Issued*
C206	Inadvertent Loss of Reactor Coolant Events at the Sequoyah Nuclear Plant, Units 1 and 2	10/82
C301	Failures of Class 1E Safety-Related Switchgear Circuit Breakers to Close on Demand	4/83
P301	Report on the Implications of the ATWS Events at the Salem Nuclear Power Plant on the NRC Program for Collection and Analysis of Operational Experience	7/83
NUREG/CR-3122 ORNL/NSIC-213	Potentially Damaging Failure Modes of High- and Medium-Voltage Electrical Equipment	8/83

Failures of Switchgear Circuit Breakers

Operational data has shown a number of failures of switchgear drawout circuit breakers associated with safety-related equipment that have prevented the circuit breakers from closing on demand. In April 1983, AEOD completed a study of related experiences occurring between January 1977 and August 1982 to determine the causes of these failures, and to provide findings which could lead to improvements in the operational performance of these units.

Based on this evaluation of operating experience, AEOD suggested upgrading the monitoring, surveillance, and maintenance of safety-related switchgear circuit breakers, as well as improved training of shift operating personnel in the logic and operation of circuit breakers.

Potential Failure Modes of Electrical Equipment

A study was conducted for AEOD by Oak Ridge National Laboratory on operating experience involving high and medium voltage electrical equipment. The report (NUREG/CR-3122) considered the electrical faults of transformers, switchgear (circuit breakers), lightning arrestors, high voltage cabling and buses, and other electrical equipment which through failure can be the initiating event that may expand the original fault to nearby or associated equipment.

Recommendations from the study included: (1) those of a general nature that apply to the entire electrical system and involve such activities as better quality assurance, better procedures, better failure documentation, and better information exchange; and (2) those specific to individual electrical components.

The report recommendations are under study to determine if further regulatory action is warranted.

Studies in Progress

In August 1983, AEOD issued three case studies for peer review:

Plant Systems Interaction Transient. A study was performed for a plant transient which occurred at the Hatch Unit 2 reactor facility on August 25, 1982. The complex series of systems interactions which followed during postscram recovery operations resulted in a sustained and uncontrolled loss of hot pressurized reactor coolant outside primary containment. The Hatch event underscores the potential for the reactor building equipment and floor drain systems to channel adverse environments to distant areas of the reactor building. The AEOD assessment provided in the study concludes that the Hatch event can be viewed as a "precursor" for a similar postulated accident sequence involving the loss of coolant from the reactor through a break in the scram discharge volume directly into open areas of the reactor building. This postulated sequence has recently been comprehensively reviewed on a generic basis by the NRC staff.

Moisture Intrusion in Electrical Equipment. Numerous occurrences of safety-related equipment failures resulting from moisture intrusion have been reported to the NRC. Primarily involved are electrical components located in high humidity/high temperature areas of the reactor building. NUREG-0588 indicates the staff's position on environmental qualification of safety-related electrical equipment; IE Bulletin 79-01B concerns the environmental qualification of electrical equipment in harsh environment for operating plants; and, recently, the environmental qualification rule 50.49 addresses both harsh and mild environments for safety-related electrical equipment in nuclear power plants. This AEOD report supplies an analysis of the collected operational events for operating light water reactors, and provides findings and recom- mendations related to maintaining installed equipment in a qualified condition.

Low Temperature Overpressurization

This study analyzes two events at Turkey Point Unit 4 where the pressure-temperature limits of the reactor vessel were exceeded. The possibility of the reactor vessel failure by brittle fracture as a consequence of the overpressure transients during low temperature operation is a safety concern. These were the first events exceeding the technical specification limits to occur at an operating pressurized water reactor since the NRC staff resolved the generic issue of low temperature overpressure transients in 1979. The events were identified to Congress in 1982 as abnormal occurrences, which indicates that the events involved a major reduction in the degree of protection to the public health or safety.

The technical specifications for low temperature overpressure (LTOP) protection were reviewed and generally found to be inadequate to prevent overpressure transients, and to ensure redundancy of the overpressure mitigating system during the short time interval that the system may be required to protect the vessel from brittle fracture. In addition, the AEOD evaluation of solid plant operations (e.g., no gas bubble in the pressurizer) concluded that this was an undesirable mode of operation that posed the major risk for overpressure events, and that it could be eliminated for all but a few operational conditions.

ABNORMAL OCCURRENCES— UPDATE FROM FISCAL YEAR 1982

The NRC quarterly reports to the Congress on abnormal occurrences for the periods April-June and July-September 1982 were published too late for inclusion in the *1982 NRC Annual Report*. No new occurrences were identified in the April-June 1982 issue. A summary of the new abnormal occurrences included in the July-September 1982 issue follows.

Loss of Auxiliary Electrical Power

On June 22, 1982, the NRC was notified of a sequence of events at Quad Cities Nuclear Power Station which resulted in a total unavailability of emergency diesel generator power for Unit 1 and the loss of offsite power and one emergency diesel generator for Unit 2.

Diesel generators (DGs) at nuclear plants provide emergency, onsite backup ac power in the event that normal offsite sources of ac power are unavailable. Quad Cities Units 1 and 2 have a combined total of three DGs. DG-1 is dedicated to Unit 1, DG-2 is dedicated to Unit 2, and DG-1/2 is a swing diesel that can be aligned to either unit. As a result of the sequence of events, normal offsite sources of ac power were available for Unit 1, but neither DG-1 nor DG-1/2 were available; simultaneously, all normal offsite sources of ac power were lost for approximately 40 minutes to Unit 2 and only DG-2 was available. For both units, such loss of power sources can be considered a major degradation of essential safety-related equipment. The safety significance was increased by several other failures which occurred during the event, including loss of several instrumentation indications in the control room. Nevertheless, the actions taken by the plant staff were timely and attentive and Unit 2 was safely shut down. Unit 1 operation was not affected.

The cause of the event was attributed to nonconservative planning of maintenance activities, personnel error, and design error. The event had been initiated by an operator pulling an incorrect fuse, which eventually led to a Unit 2 reactor scram and generator trip and resulted in the loss of all normal ac power to Unit 2. Later, a design error in the DG control logic system hindered startup of DG 1/2. In addition, the licensee had removed a transformer from service for electrical maintenance while the plant was operating, and while one DG was out of service for maintenance. Because of the interdependence of onsite power sources between Units 1 and 2, any scheduled maintenance of the offsite power system of either would affect the overall electric power system availabilities of both units.

The licensee took appropriate measures to minimize the possibility of similar operator errors, including a review of procedures and additional training for operating personnel. The licensee also planned to modify all DGs to prevent protective trips until normal offsite power is restored.

Occupational Overexposures

Radiological Contamination from Well Logging Operations. On August 27, 1983, Consolidation Coal Company of Library, Pennsylvania notified the NRC Region I office that they were in the process of recovering a well logging device from a well hole at a field site near Jollytown, Pennsylvania. The licensee had identified radiation levels greater than background, which were thought to be due to an intact device nearing the top of the well head. However, the radiation levels were apparently the result of one, and possibly two ruptured sources, since on September 1, 1983 the licensee identified americium-241 contamination.

The licensee's well logging device, used in coal exploration, included two sealed sources each containing 250 millicuries of americium-241 (a radioisotope with a 432 year half-life) as powdered oxide, compacted into a double-walled capsule. The licensee lowers the device (and sources) to the bottom of the drill hole, and then withdraws the device at a controlled rate to log (profile) the hole. If the well logging device becomes wedged in the hole, the cable is designed to release, at the point of attachment to the device, when extreme tension is ex-

Table 2. Reactor Engineering Evaluations

Designation	*Subject*	*Issued*
E241	Emergency Diesel Generator System Problems at James A. Fitzpatrick Nuclear Plant	10/01/82
E242	Fuel Assembly Degradation while in the Spent Fuel Storage Pool	10/21/82
E243	Plant Trip Followed by a Safety Injection Caused by Loss of "A" Cooling Tower Pump at Palisades on February 4, 1983	10/21/82
E244	Loss of Residual Heat Removal System Event at Pilgrim Nuclear Power Station December 21, 1981	10/21/82
E245	Failure of Westinghouse Type SC-1 No. 1876-072 Relays	10/21/82
E246	Events Involving Loss of Electrical Inverters Including Attendant Inverters to Vital Instrument Buses	10/21/82
E247	Engineering Evaluation of Turbine/Reactor Trip at Rancho Seco on August 7, 1981	10/26/82
E248	Engineering Evaluation Report on McGuire Overpressurization Event of August 25, 1981	11/02/82
E249	Engineering Evaluation Memorandum - Licensee Reporting of the Turbine/Reactor Trip at Rancho Seco on August 7, 1981 LER-81-39	11/04/82
E250	Quad Cities Unit 2 Loss of Auxiliary Electrical Power Event on June 22, 1982	11/08/82
E251	Salem Unit 2 Loss of Vital Bus No. 24	11/09/82
E253	Potential Control Logic Problem Resulting in Inoperable Auto-start of Diesel Generator Units under the Conditions of Loss-of-Coolant Accident (LOCA) and Loss of Station Power (LOSP)	11/17/82
E254	Review of Prairie Island-1 LER-82-015/OIT on Diesel Generator Operability	11/17/83
E255	Failure of the Vent Line on the Common Discharge of the Two Motor-driven AFW Pumps at San Onofre Unit 2 from an Improper Valve Line-up	11/17/82
E256	Loss of Shutdown Cooling and Subsequent Boron Dilution at San Onofre-2	11/24/82
E257	Insufficient NPSH for Charging Pump Service Water Pumps	12/02/82
E301	Fuel Degradation at Westinghouse Plants	1/19/83
E302	Potential Loss of Service Water Flow resulting from a Loss of Instrument Air	1/31/83
E303	Valve Flooding Event at Surry	2/16/83
E304	Investigation of Backflow Protection in Common Equipment and Floor Drain Systems to Prevent Flooding of Vital Equipment in Safety-related Compartments	3/11/83
E305	Inoperable Motor Operated Valve Assemblies Due to Premature Degradation of Motors and/or Improper Limit Switch/Torque Switch Adjustment	4/13/83
E306	Cooldown During Loss of Control Room Test at McGuire Unit 1	4/14/83
E307	Degradation of Safety-related Batteries Due to Cracking of Battery Cell Cases and/or Other Possible Aging-related Mechanisms	4/18/83
E308	Cracks and Leaks in Small Diameter Piping	4/19/83
E309	Potential for Water Hammer Damage During the Restart of RHR Pumps at BWR Nuclear Power Plants	4/22/83
E310	Loss of Shutdown Cooling and Subsequent Boron Dilution at San Onofre-2	4/25/83
E311	Loss of Salt Water flow to the Service Water Heat Exchangers for 23 Minutes at Calvert Cliffs Unit 2	4/25/83
E312	Operability of Target Rock SRVs in the Safety Mode with Pilot Valve Leakage	5/18/83
E313	Potential Contamination of the Spent Fuel Pool and Primary Reactor System	6/24/83

E314	Loss of All Three Charging Pumps Due to Empty Common Reference Leg in the Liquid Level Transducers for the Volume Control Tank	6/28/83
E315	Misuse of Valve Resulting in Vibration and Damage to the Valve Assembly and Pipe Supports	7/08/83
E316	Frozen Ice Condenser Intermediate Deck Doors	7/11/83
E317	Loss of High Pressure Injection System	8/01/83
E318	Biofouling at Salem Units 1 and 2	8/15/83
E319	Loss of Drywell-Torus Pressure Differential During Residual Heat Removal Pump Flow Testing at Cooper Nuclear Station	9/08/83
E320	Power-operated Relief Valve Actuation Resulting in Safety Injection Activation	9/08/83
E321	Three Similar Events of a Loss of Shutdown Cooling Flow at CE Plants	9/12/83

erted on the cable. Recovery operations for the device can include the use of drilling to enlarge the diameter of the drill hole. The licensee had successfully retrieved wedged devices on nine previous occasions using such a procedure.

During this well logging operation the device became wedged at the 420 foot level in a drill hole of 950 feet total depth. When tension was applied, the cable broke off about 80 feet above the device, rather than releasing at the device as designed.

Radiological surveys and contamination evaluations, both on and offsite, were performed by the NRC, the Commonwealth of Pennsylvania, and the licensee. The consequences of this incident were that, while no individual external or internal exposure limits were exceeded, there were several locations where loose radioactive material was found in unrestricted areas frequented by members of the general public. The financial impact on the licensee will be substantial; clean up costs are estimated by the licensee to be as much as $1,000,000.

The direct cause of the contamination incident was the rupture of at least one americium-241 source by the drill bit. Even though the licensee made radiological surveys during the source recovery operations with a survey instrument which had been approved in their NRC license, the licensee did not correctly interpret the positive readings by the instrument. The licensee plans to purchase instrumentation which is sensitive to low levels of radioactive contamination, and has changed recovery procedures to eliminate drilling operations during recovery attempts.

The NRC monitored the licensee's cleanup efforts. In addition, the NRC issued IE Notice 83-32 on May 26, 1983 to all applicable licensees, which described the event and contained suggestions regarding procedures.

ABNORMAL OCCURRENCES—FISCAL YEAR 1983

In fiscal year 1983, the NRC issued reports to the Congress on abnormal occurrences for the October-December 1982 and January-March 1983 quarters. A summary of the abnormal occurrences included in these two issues follows.

Inoperable Containment Spray System

On October 28, 1982, with the Farley Nuclear Plant Unit 2 in cold shutdown for refueling and maintenance, the licensee found the containment spray system header isolation valves locked closed. The valves were found in this position during scheduled maintenance, when the licensee was attempting to close the containment spray manual isolation valves to both A and B train headers. Since these valves were supposed to be locked open, an investigation was begun immediately. It was determined that the valves had been closed and locked since before the plant achieved initial criticality on May 8, 1981. Both redundant containment spray systems had thus been inoperable and unable to fulfill their safety function for nearly a year and a half. (The unit began commercial power operation on July 30, 1981.)

The safety function of the containment spray system is to spray borated water into the containment atmosphere. The spray will limit the maximum pressure and temperature in the containment to less than design conditions following certain sized steam line breaks or loss-of-coolant accidents (LOCAs). The system is also designed to spray sodium hydroxide into the containment to remove radioactive iodine (which could be released in the event of a break in the fuel cladding following a LOCA) to limit iodine doses to less than 10 CFR Part 100 limits.

The plant also has a containment fan cooler system, used during normal operation to recirculate and cool the containment atmosphere. Following a LOCA or steam line break accident, the system acts in conjunction with the containment spray system to reduce containment temperature and pressure. The amount of pressure and temperature reduction depends upon the number of containment spray rings and fan coolers that would operate following such an accident. The containment fan cooler system working alone, even with only one fan operable,

Table 3. Non-Reactor Engineering Evaluations

Designation	*Subject*	*Issued*
N210	Leaking Hoses on Self Contained Breathing Apparatus (SCBA) Manufactured by MSA	11/15/82
N301	I-125/I-131 Effluent Releases by Material Licensees	3/18/83
N302	Mound Laboratory Fabricated Pu-Be Sources	6/14/83
N303	Americium Contamination Resulting from Rupture of Well-logging Sources	6/14/83
N305	Human Factors Contributions to Accident Sequence Precursor Events	8/04/83

can be expected to protect the integrity of the containment and the safety equipment inside. However, the containment fan cooler system does not have the radioactive iodine removal capabilities of the containment spray system.

The containment spray header isolation valves are normally locked open during plant operation. During a valve position verification completed in March 1981, and a locked valve check and a separate check by the plant operations superintendent in February 1982, the position of the valves was verified by visual inspections to be "locked open." However, the stems of these two valves were not in accordance with design drawings in that the stems were approximately 6 inches too long, thus giving a false indication that the valves were opened. The nuclear steam system supplier, Westinghouse, had provided the valves with longer stems to accommodate a motor operator, if desired. However, they did not provide documentation of the design change to the licensee. The plant operators erroneously assumed that the valves were in the locked open position when they observed the extended valve stem. This deviation from design, in combination with an inadequate procedure for valve verification and check, resulted in the incident.

The licensee obtained concurrence from Westinghouse to cut the excess stem off the valves so as to conform with design drawings and with other rising stem gate valves throughout the plant. In addition, as a further safeguard to prevent recurrence, plant administrative procedures covering valve position verification have been changed to require that manual valves which are locked open will be moved in the shut direction to verify their position; then the valve will be returned, if applicable, to the original position.

Main Feedwater Line Break Due to Water Hammer

On January 25, 1983, the Maine Yankee Nuclear Power Plant underwent a reactor trip followed by loss of main feedwater and automatic initiation of the auxiliary feedwater system. The auxiliary feedwater initiation resulted in a water hammer transient in the feedwater lines for two of the three steam generators (SGs) with a resultant feedwater pipe rupture.

The cause of the event is attributed to incomplete consideration, in ongoing design and operational plant upgrading, of previous generic safety concerns related to steam generator water hammer and feedline thermal stress cracking. The installation of a steam turbine-driven main feed pump and automatic initiation of the cold water auxiliary feedwater system without the addition of SG J-tubes and operational procedures to alleviate these concerns increased the potential for feedwater piping thermal shock and water hammer at Maine Yankee.

The water hammer probably occurred when the outlet nozzle at the bottom of the SG feed ring became submerged in the rising SG water level and the steam in contact with the cold feedwater within the ring suddenly collapsed.

In the January 25, 1983 event, the trip was from full power and since the turbine-driven feedwater pump tripped, all warm feedwater was lost. Subsequently, auxiliary feedwater automatically initiated. However, the auxiliary feedwater was drawn from the demineralized water storage tank (DWST) at 60F. By comparison, normal feedwater temperature is about 440F. The extreme temperature differential between the normal and auxiliary feedwater can cause potentially high thermal stresses and cracking in the feedwater piping. Secondly, it may rapidly condense any steam in the feed lines, leading to a higher possibility of water hammer in the feed ring and feedwater line.

Repairs were made to components damaged by this event, including replacing cracked (and/or broken) feedwater piping, and the replacement or repair of damaged piping supports and SG internals. A design change was implemented adding J-tubes to the top of the SG feed rings. This change increases the area for pressure equalization and reduces the rate at which the feed rings drain

when the SG water level drops below the feed ring after a trip; thus, on early initiation of auxiliary feedwater flow, the feedwater line and feed ring are expected to remain full. A number of operational changes also were made, for various modes of plant operation, to reduce the differential in temperature between the main feedwater and the auxiliary feedwater.

Deficiencies in Management and Procedural Controls

On February 18, 1983, the NRC issued a Notice of Violation and Proposed Imposition of Civil Penalties for $600,000 to Carolina Power and Light Company, licensee for Brunswick Units 1 and 2. The action was based on violations involving technical specification surveillance requirements.

Inspection findings indicated that the Brunswick facility had been operated, in some cases since the issuance of the operating licenses (December 1974 for Unit 2 and September 1976 for Unit 1), without certain surveillance procedures and verification by surveillance testing of a number of safety systems and components. In addition, it was found that the licensee's quality assurance program failed to correct the problem once the lack of one of the surveillance procedures was identified. Even though testing performed subsequent to the identification of the missed surveillances demonstrated the affected equipment to be operable, the deficiencies were of serious safety concern. The facility had been operated for an extended period of time without the necessary assurance that the equipment would function properly if called upon; and the violations, when viewed collectively, and in light of later identified examples of failures to meet limiting conditions for operation and surveillance requirements, suggested a programmatic failure that unless corrected could lead to more serious events.

The cause of the violations was attributed to a breakdown in corporate and facility management controls in the areas of corporate oversight, facility management and operations, and problem identification and correction. The violations raised serious concerns about the adequacy of the safety operation of the facility in regard to properly protecting the health and safety of the public.

In response to issues raised by the NRC, the licensee developed a sevenpoint improvement plan to:

- Ensure full and timely compliance to all surveillance requirements, regulatory commitments, and regulatory requirements.
- Ensure that all necessary procedures exist and are clear, unambiguous, precise, complete, and of high technical quality.
- Increase frequency and scope of quality control surveillance and corporate auditing program activities.
- Ensure that maintenance activities do not degrade or render inoperable any component, system, or instrument.
- Increase the proficiency of plant personnel by means of expanded training programs.
- More effectively utilize the technical expertise of the onsite and corporate nuclear safety personnel in enhancing the safety and reliability of plant operations.
- Undertake actions to enhance and strengthen the management control and organizational discipline necessary to provide for safe and reliable operation.

Other actions taken included placement of a senior corporate official at the Brunswick site; visiting several other utilities to examine their programs; assuring that lessons learned at Brunswick would also be applied at the licensee's other plants; identifying every technical specification surveillance requirement and assuring that an updated, written procedure exists for each; and establishing a computerized system for monitoring technical specification compliance.

In its enforcement letter of February 18, 1983, the NRC also stated that it was vital that effective communications with and between all segments of the licensee's staff be established and that all segments of the operations staff be involved in identifying programmatic deficiencies and in developing procedures to remedy those deficiencies. Accordingly, in response to the Notice of Violation and Proposed Imposition of Civil Penalities, the licensee was directed to describe the efforts taken and to be taken to ensure that effective communications between management and staff are established and maintained.

In a letter dated May 2, 1983, the licensee described short, intermediate, and long term corrective actions. Subsequently, the licensee paid the $600,000 civil penalty.

Failure of Automatic Reactor Trip System

On February 22 and 25, 1983, the Salem Unit 1 reactor control rods failed to insert upon receipt of an automatic trip signal from the reactor protection system. Upon receipt of a manually initiated trip signal, however, the rods did insert and shut down the plant. These events were of major safety concern because all backup capability to automatically trip the reactor was lost, should plant operating conditions required a fast shutdown to protect the integrity of the reactor core. Safe control of certain anticipated operating transients depends on the reliable and fast operation of a reactor trip, either automatically or manually.

On February 25, approximately two hours after the Unit 1 event, the cause of the failure to trip was determined by licensee instrumentation technicians to be failure of the undervoltage (UV) trip device to function as designed in two redundant reactor trip breakers (RTBs).

The same problem had occurred on February 22, but had not been recognized by the licensee. The plant on both occasions was shut down by manual operator action.

Possible contributors to the failure of the UV trip devices are dust and dirt; lack of lubrication; wear; more frequent operation than intended by design; and nicking of latch surfaces, caused from repeated operation of the breakers. Based on an independent evaluation of the failed UV trip devices identified by the licensee, the NRC staff concluded that, while the Salem Unit 1 breaker failures occured as a result of several possible contributors, the predominant cause was excessive wear accelerated by lack of lubrication and improper maintenance. The RTB vendor (Westinghouse) also reviewed the possible contributors and indicated that excessive wear did not appear to be a predominant factor. The failure mechanism remains under staff review.

The licensee has completed or will complete many corrective actions to address various issues of RTBs; operator procedures, training and response; and management issues. Actions taken by the licensee include installing new UV trip devices on all Salem Units 1 and 2 RTBs, which incorporate all design changes made to the devices; augmenting surveillance test requirements; developing a comprehensive maintenance procedure; and incorporating Westinghouse recommendations regarding maintenance and testing. Actions concerning operator procedures, training, and response issues include revising emergency procedures to identify actions to be taken in the event a reactor trip signal is received, conducting additional operator training, and evaluating certain aspects of the control room design. Actions concerning management issues include reviewing past maintenance and procurement documents to ensure that the problems associated with the RTBs did not extend to other safety systems; strengthening administrative controls over maintenance, procurement and post-maintenance testing activities; establishing additional safety review groups within the company; developing a formal post-trip review procedure; instituting a program to update vendor-supplied information; and subjecting the company to independent management assessment by external consulting organizations.

In addition to issuing IE Bulletin 83-01 and 83-04 and IE Information Notice 83-18 concerning the Salem events, the NRC Executive Director for Operations (EDO) directed that NRC Region I develop a detailed report of the events (NUREG-0977). The EDO further directed that a special NRC task force be formed to evaluate the generic implications of the event.

The special NRC task force prepared a report (NUREG-1000, Vol. 1) recommending the issuance of a letter to licensees addressing intermediate term generic actions; amendments to the ATWS rule; and improvements to the regulatory programs affecting licensee management performance, maintenance activities, quality assurance, and the collection and analysis of operating experience.

On May 5, 1983, the NRC forwarded to the licensee a Notice of Violation and Proposed Imposition of Civil Penalties for $850,000. Violations included operation of the reactor even though the RPS could not be considered operable, and several significant deficiencies which contributed to the inoperability of the RTBs. The NRC Region I office has instituted an augmented inspection program at Salem to monitor the licensee's progress towards completion of longer term corrective actions, including the management consultant's recommendations. The general issues associated with RTB failures remain under active review by the nuclear industry and the NRC.

Agreement State Licensees

In 1977 procedures were developed under which Agreement States screen unscheduled incidents or events using the same criteria as the NRC and report the events to the NRC for inclusion in the quarterly abnormal occurrence reports to Congress. No incidents or events were identified in the AprilDecember 1982 issues. The January-March 1983 issue described the following events.

Contamination by and Ingestion of Radioactive Material. On February 5, 1982, authorities at Brown University, Providence, Rhode Island, reported to the Rhode Island Radiation Control Agency by telephone that a research worker had become contaminated and may have ingested radioactive material. The worker discovered that she was contaminated when she turned on a survey meter prior to starting a laboratory procedure involving the use of phosphorous-32 (P-32).

Licensee personnel performed a survey and determined that the P-32 contamination was limited to the individual's lab coat, a piece of bread found on the individual's desk in her office, and a sheet of paper in the office. Bioassay of the individual indicated an uptake of P-32. Later, the licensee identified a second individual with an uptake of P-32. Both incidents were apparently due to food contaminated with P-32. Whole body counting indicated uptakes of 157 and 25 microcuries for the first and second individuals, respectively. No adverse health affects were noted.

The University temporarily suspended the use of radioactive materials in the microbiology laboratory until a determination was made that unsafe operating conditions did not exist. The licensee's radiation safety committee required improvements in security, survey procedures and records, which the laboratory has implemented. The committee also required the first individual to abstain from further radioactive materials use pending final dosimetry results. The second individual does not work with radioactive materials.

The State Radiation Control Agency (RCA) conducted an investigation and inspection on February 5, 10, and 18, 1982. Two immediate action letters were issued, confirming steps to be taken by the licensee to reduce the

possibility of any recurrence. Several items of noncompliance with regulations and license conditions were discovered during the investigation and inspection. The licensee took action to correct these items, and items relating to the ingestion incidents, in accordance with RCA enforcement procedures.

Lost Radioactive Source. Tex Well Service, Inc., of Corpus Christi, Texas, reported to the NRC that on March 15, 1982, one 125-millicurie cesium-137 source was found missing from its storage container.

A survey of the facility was performed, but the source was not located. The licensee then contacted their consultant and was instructed to remove any other sources from the facility and to perform another survey, being sure to stress the area in which the container was found to be lying on its side, and the downhole storage area. This survey also failed to locate the source. All of the employees were questioned concerning the source. None of the employees admitted to having removed the source from the container or remember knocking the container over.

The source evidently had not been stored in its proper downhole storage container. Also, the top of the container in which the source was stored was not secured with the bolts provided to ensure that the top would not come off. The licensee instructed its personnel on the proper procedures for storing radioactive material sources not in use.

Stolen Radionuclide Sources. On March 26, 1982, Huytech Corporation of Wake Forest, North Carolina reported the theft of a gauge containing a 25 millicurie americium-241 source. The gauge was stolen from a locked vehicle parked at a hotel in Houston, Texas the night of March 25, 1982.

Huytech Corporation was in Texas under reciprocity agreement, performing measurement tests for a Texas Company. The Corporation has a North Carolina radioactive materials license and an NRC license. On March 25, 1982, a licensee operator locked the gauge inside his vehicle, which was parked at the hotel in which he was staying. The following morning he discovered the door locks on the vehicle had been forced and the gauge and other materials had been taken. The licensee notified the Harris County, Texas Sheriff Department, the North Carolina Department of Human Resources, and the NRC.

Theft of a radiography source and camera was also reported by Magnuaflux Quality Services of Houston, Texas, on August 2, 1982. On Friday, July 30, 1982, at approximately 4:30 p.m., the source had been signed out by two radiographers and an assistant radiographer. At approximately 8:00 p.m., after performing their assignment, they returned to the work site and secured the radiography camera by chaining it to the wall inside the storage building and locking the door.

At 8:00 a.m. on Monday, August 2, 1982, the site supervisor arrived at work and found the storage shed door removed from the frame and leaning against the lab trailer. He checked inside the shed and found the camera missing. Checking the utilization log and calling all the technicians failed to locate the camera. The site supervisor then called the field supervisor who rechecked all the technicians, with the same negative results.

An extensive investigation and search for the source were performed and when the source could not be found, it was reported stolen to the proper authorities.

Among the updated abnormal occurrences covered in this report is the sequence of events at the Quad Cities nuclear power plant which led to the unavailability of emergency diesel generator power. The plant is in Illinois near the Iowa border, i.e., the Mississippi River. (See "Abnormal Occurrences—Update from Fiscal Year 1982," earlier in this chapter.)

Lost Radioactive Source. Dresser Atlas of Houston, Texas, reported on Friday, July 9, 1982, that a 2-curie cesium-137 source was missing from its downhole storage location. While preparing to test a logging tool, a technician proceeded to the downhole storage to get the source. He discovered the source handling tool in the storage hole without the source. The rest of that day was spent by the employee searching for the source. The technician failed to notify the Radiation Safety Officer (RSO) until the following Monday morning.

At that time, the RSO attempted to find the source by surveying the grounds of the Houston facility, including all of the storage locations. After normal work hours, all of the buildings on the site were surveyed to ensure the source was not in areas which could be occupied by the general public, or by personnel not involved with radiation work.

The loss of the source may have been avoided had stronger administrative controls been in effect. The source security has been changed for downhole storage by utilizing locks with a limited number of keys. The licensee has also revised the utilization logging system to provide greater administrative control.

Radioactive Contamination of a Metals Production Facility. On February 21, 1983, Auburn Steel Company of Auburn, New York, discovered that a batch of molten steel and some recently cast rods were radioactive. Auburn Steel Company manufactures steel rods for concrete reinforcement. The rods are made by melting a "charge" composed primarily of scrap steel and then loading the melted steel into a casting machine for continuous casting of the rods. A level gauge, consisting of a sealed radioactive source and a radiation detector, is used to assure that the proper level of steel in the casting machine is maintained.

On February 21, 1983, the level gauge responded abnormally after a charge was loaded into the casting machine. The company Radiation Safety Officer (RSO) closed the shutter on the level gauge, which shields the radioactive source; however, the radiation detector continued to respond. The RSO performed surveys with a geiger counter and found that the rods produced from this charge had radiation levels of about 24 mr/hr at three feet; in addition, the ladle, casting machine, and the "baghouse" (used to trap airborne particles) were contaminated.

The licensee notified the New York Department of Health, which is responsible for emergency response, and the New York Department of Labor, which licensed the level gauge.

It was determined that the contamination was confined to within the property boundaries of the steel plant and did not present a threat to public health or safety. There was no evidence of worker contamination or overexposure.

The most likely cause was the presence of a sealed cobalt-60 source in some scrap steel shipment received by the licensee. The origin of the source and how it became commingled in scrap steel, have not been determined. The licensee noted that scrap steel is obtained from about 100 sources in the northeast United States and in Canada. Such scrap is usually processed within 10-14 days. New York State Police are investigating the records of scrap shipments to the plant. The State Agencies also were investigating companies authorized to manufacture, distribute, or possess cobalt-60 sealed sources in New York State. The licensee also contacted its suppliers of scrap steel to attempt to determine the source of the contamination. As of the date of this report, the results of the investigation have not been conclusive.

The NRC issued IE Information Notice 83-16 on March 30, 1983 to all material licensees to inform them of the the event and to provide recommendations regarding control of licensed material and reporting of lost or stolen material.

Nuclear Materials

CHAPTER 5

The NRC's Office of Nuclear Material Safety and Safeguards (NMSS) administers the regulation of nuclear materials. NMSS conducts this regulation under three broad programs: fuel cycle and material safety, discussed in this chapter; materials and facilities safeguards, discussed in Chapter 6; and waste management activities, discussed in Chapter 7.

Activities discussed in this chapter include licensing and other regulatory activities concerned with (1) conversion of uranium ore concentrates (after mining and milling) to uranium hexafluoride; (2) conversion of enriched uranium hexafluoride to ceramic uranium dioxide pellets and subsequent fabrication into light water reactor fuel; (3) production of naval reactor fuel; (4) storage of spent reactor fuel; (5) transportation of nuclear materials; and (6) production and use of reactor-produced radioisotopes ("byproduct material").

Highlights of actions taken during fiscal year 1983 include:

- Completion of 35 major and 91 minor licensing actions dealing with fuel cycle plants and facilities.
- Completion of 146 design certification reviews for transportation packages.
- Completion of about 6100 actions on applications for new byproduct materials licenses and amendments and renewals of existing licenses. About half of these actions were completed at Headquarters; the remainder were completed by the five Regional Offices.
- New licensing sections were established in April 1983 in Regions II (Atlanta), IV (Dallas), and V (San Francisco), for certain categories of materials licenses, and at all five Regional Offices for certain categories of fuel facility licenses.

FUEL CYCLE ACTIONS

Decommissioning and Decontamination

Decommissioning and decontamination of fuel cycle facilities are taking up an increasing amount of staff time and effort. These activities are summarized below.

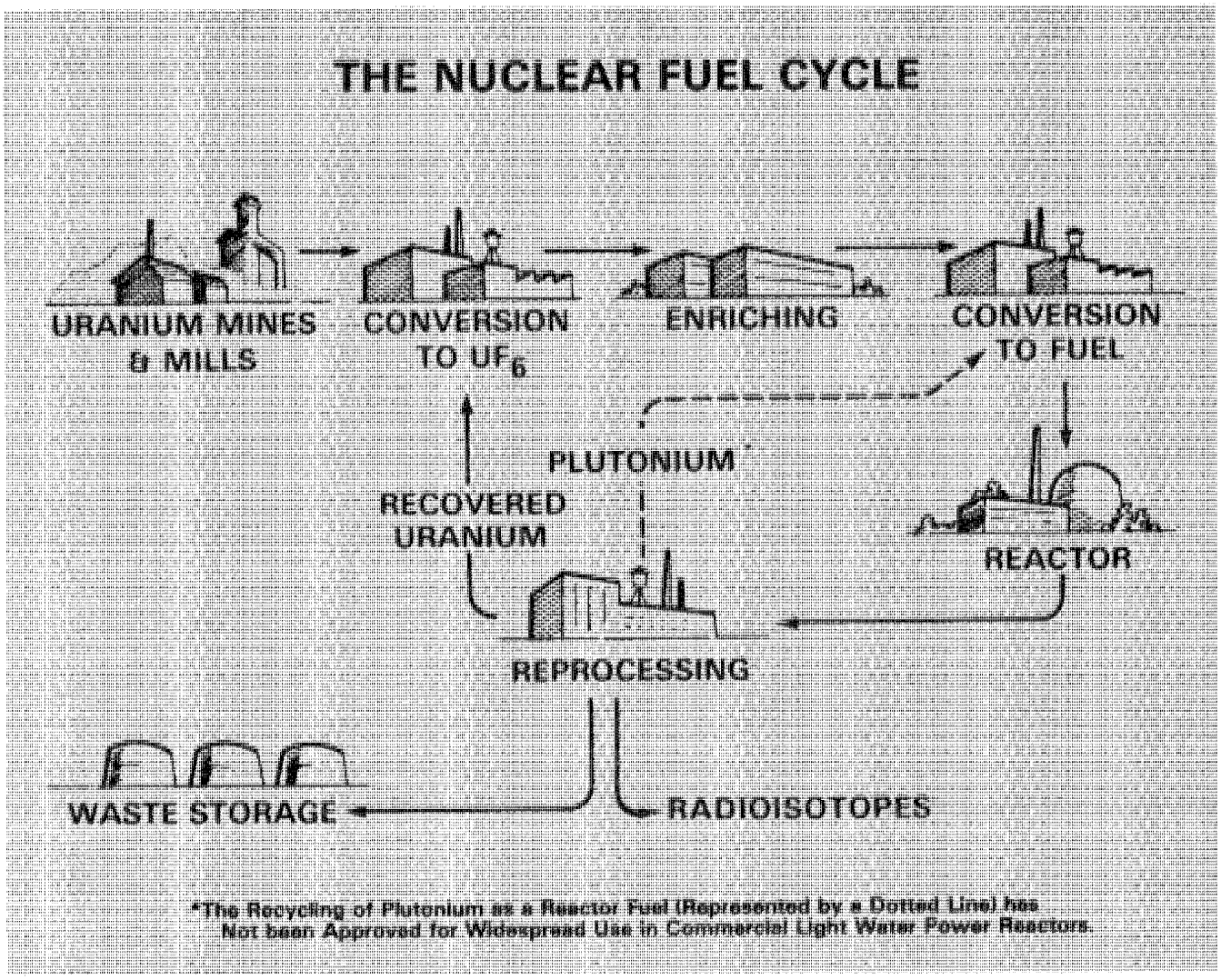
Formerly Licensed Sites. Approximately 20,000 docket files on former byproduct, source and special nuclear material licensees have been reviewed by NRC staff to see if there was any indication that the sites were not adequately decontaminated before license termination. Twelve sites, at all of which source material was formerly used, were identified as possibly requiring remedial action. Such actions were completed or were near completion for three sites at the close of the report period. The Department of Energy (DOE) has also identified five sites under its Formerly Utilized Site-Remedial Action Program. After evaluation, it was determined that no NRC action was required for three additional sites. Remedial action at the remaining site will be completed by June 1984.

Licensed Sites. The United Nuclear Corporation (UNC) has completed decontamination of its facility at Wood River Junction, R. I. The bulk of the waste material has been transported off the site. NRC will conduct a verification survey of the site early in fiscal year 1984.

An item still at issue in the UNC decontamination effort is the plume of contamination found in an underground aquifer that flows under the plant site. The contamination resulted from the leakage of liquid wastes from on-site storage lagoons. The volume of contamination is small and is being purged naturally into the Pawcatuck River, about 1500 feet from the former lagoon site. Radionuclide concentrations in the plume average less than 10 percent of the concentrations allowed in unrestricted areas under 10 CFR Part 20.

Babcock and Wilcox ceased fuel production activities at their Apollo, Pa. site in 1983. At year's end, decommissioning activities at the site were under way.

In May 1983, the Commission published a final environmental statement on the decontamination and stabilization of the wastes at the site of a Kerr-McGee Chemical Corporation facility in West Chicago, Ill. The staff's preferred course of action is on-site storage of waste in a stabilized condition. The waste would remain under a license issued to Kerr-McGee, until it is removed to an established disposal site or transferred to State or Federal ownership under the provisions of Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). The Attorney General of the State of Illinois and the Chamber of Commerce of West Chicago have petitioned the Commission for a hearing and for leave to intervene. At year's end, the Commission had made no decision on these petitions. The Attorney General of Illinois has also brought suit against the NRC, claiming that the NRC



environmental statement fails to satisfy requirements of the National Environmental Policy Act. No resolution of the suit had been reached at year end.

A number of commercial plutonium facilities are also undergoing decontamination and decommissioning. The equipment at the Westinghouse facility at Cheswick, Pa., and Babcock and Wilcox plant at Leechburg, Pa., has been decontaminated and shipped to a DOE disposal site. Westinghouse is in the process of decontaminating its buildings to levels of radioactivity acceptable to NRC for release to unrestricted use. Kerr-McGee at Cimarron, Okla., continues to decontaminate equipment. The Exxon Corporation at Richland, Wash., and Atomics International at Santa Susana, Calif., have begun decontamination of their facilities. Those facilities without contractual arrangements for disposal of low-level radioactive waste at a DOE site are packaging and storing their wastes until a commercial low-level waste disposal site is available.

DOE "UMTRCA" Site. During 1983, NRC reviewed and concurred in the draft and final environmental statements that the DOE prepared in support of proposed remedial action for the inactive nuclear fuel processing site in Canonsburg, Pa. DOE will take remedial action at this site under the provisions of Title I of the UMTRCA of 1978. Late in 1983, the NRC staff also completed its review, and concurred in the DOE remedial action plan for the site. Remedial action at the Canonsburg site will begin in early fiscal year 1984.

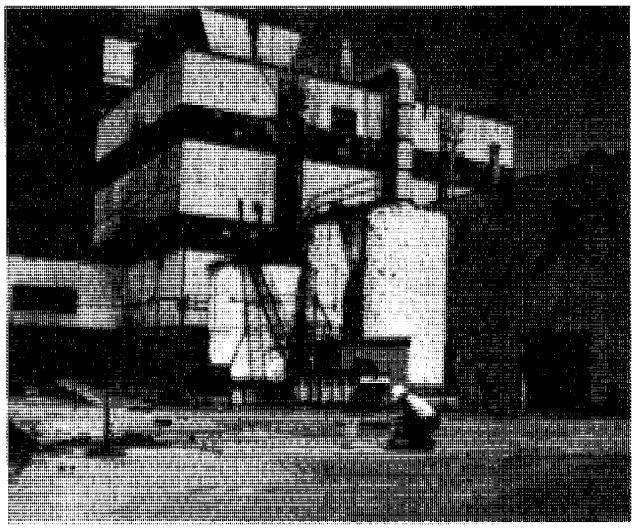
Special Sites. Under the "Special Sites" Section (Section 151(c)) of the Nuclear Waste Policy Act of 1982, title to low-level waste generated as a result of recovering zirconium, hafnium or rare earths from source material, and the land upon which the wastes are disposed, shall be transferred to DOE upon request of the owner. However, such transfer can occur only after the site has been decontaminated and stabilized in accordance with NRC requirements, and after the owner has made adequate financial arrangements, approved by NRC, for long term maintenance and monitoring. Eleven sites have been identified which may meet the requirements for inclusion

in the "Special Sites" category, including two sites that are also included above as formerly licensed sites for decontamination.

NRC staff are developing decontamination and stabilization criteria, and long-term financial arrangement requirements, to apply to these "Special Sites." This work will be closely coordinated with DOE to ensure that the final criteria and arrangements meet its needs.

Hearing Requested on Rockwell International. The Commission has received more than 700 postcards and letters from individuals allegedly living near the Energy Systems Group facilities of Rockwell International, Canoga Park, Cal., each requesting a public hearing on the Rockwell renewal application. Because the renewal application indicates there will be a major reduction in continued activities under the license — and also because of the obscure terseness of the hearing petitions — the Commission requested further filings to clarify the intentions of those who lodged the earlier submissions, and to help determine whether they meet the requirements for intervention by "interested persons." A member of the Atomic Safety and Licensing Board Panel with authority to determine the standing of persons seeking to intervene as parties to the proceeding will decide whether a hearing is justified.

West Valley Demonstration Project. In 1963, the New York State Energy and Research Development Authority (NYSERDA), owner of the Nuclear Fuels Disposal and Reprocessing Center at West Valley, N. Y., entered into several agreements with Nuclear Fuel Services (NFS) to construct facilities to receive and reprocess nuclear fuel wastes. Subsequently, spent fuel was received to be temporarily stored pending reprocessing. This fuel came from four utilities: Commonwealth Edison Company (Dresden), Wisconsin Electric Power Company (Point Beach), Nuclear Corporation (Oyster Creek), Rochester Gas and Electric Corporation (Ginna), and GPU.



The final environmental statement on decontamination and stabilization of radioactive wastes at the Kerr-McGee Chemical Corporation facility in West Chicago, Ill., was published in May 1983. The Attorney General of the State of Illinois has petitioned the Commission for a hearing on the matter and also brought suit against the NRC.

NFS reprocessed spent fuel at the West Valley facility from 1966 to 1972, when reprocessing was suspended in order to enlarge and modify the facility. In 1976, NFS withdrew from the reprocessing business and the West Valley facility was transferred to DOE to conduct a liquid nuclear waste management program known as the West Valley Demonstration Project.

In May 1982, NYSERDA filed suit in the U.S. District Court against three of the four utilities (Rochester Gas and Electric and NYSERDA reached an agreement on the return of the Ginna fuel) alleging that the licensees were obligated to remove the spent nuclear fuel stored at West Valley. In June 1983, the court concluded that the spent fuel must be removed from West Valley within a reasonable time. As a result of the court's order, the spent fuel presently stored at West Valley was scheduled to be shipped back to the respective original users beginning during the fourth quarter of 1983.

There has been considerable public interest in the matter. By letter dated August 24, 1983, the Sierra Club stated its view that the NRC should amend the license of the West Valley facility — or alternatively, amend the licenses of utilities with spent fuel in storage at West Valley — to allow shipment. They have further requested that notice of the pending license amendment be published in the *Federal Register* so that the public may be granted the opportunity to intervene. On September 9, 1983, the Attorney General for the State of Ohio also requested that the NRC, pursuant to 10 CFR 2.206, institute proceedings to modify, revoke, or suspend the licenses of NYSERDA, Wisconsin Electric Power Company, and Commonwealth Edison Company in connection with the transport of the spent nuclear fuel.

The NRC staff was reviewing these requests for action, pursuant to Section 2.206 of the Commission regulations, at the close of the report period.

Meanwhile, the NRC continued to consult with DOE and to monitor DOE activities at the facility. DOE has selected borosilicate glass as the form to be used for the solidification of the high-level waste at West Valley. This glass form is the preferred choice world-wide for high-level waste disposal. The site contractor has continued to prepare the former reprocessing plant for this solidification process by decontaminating cells and removing equipment. The contractor has also begun to construct a Component Test Stand for the non-radioactive testing of the process steps and equipment.

The geohydrological investigation of the facility waste disposal area is continuing. The U.S. and New York State Geological Surveys are preparing reports for the NRC on the results of their investigations. Radioactivity was detected by the DOE in one of the research monitoring wells. The DOE is continuing to investigate the source and extent of the radioactivity.

Interim Spent Fuel Storage

As nuclear power plants continue to approach the limits of spent fuel storage pool capacity at the reactor sites, interest grows in providing for additional storage capability.

A major focus of this interest is the dry cask storage of spent fuel, to be located at reactor sites. With the exception of potential DOE storage (mandated under the NWPA) — which may be on an away-from-reactor Federal site — new applications for interim storage outside reactor basins are likely to be for dry storage of spent fuel in casks at the reactor sites.

To date, four Topical Reports for dry storage cask designs have been received for safety review by the NRC. These include two received in 1982 from Gesellschaft für Nuklear Service, mbH (GNS) and one each from Combustion Engineering, Inc., (CE) and Ridihalgh, Eggers and Associates (REA). (See *1982 NRC Annual Report*, p. 65.)

Review and evaluation of these topical reports continued in 1983. A second revision to the GNS report was received in September and is being evaluated. In May 1982, REA submitted for NRC review its quality assurance plan to be used in the design and fabrication of dry storage casks. The remainder of the REA topical report on a cask design for dry storage of BWR spent fuel was received in April 1983 and was followed by a similar report on a cask for PWR spent fuel in May 1983. The PWR cask design capacity is for 24 PWR assemblies, approximately 11 tonnes uranium (TeU); the BWR cask capacity is 52 BWR assemblies, approximately 10 TeU. The two REA reports are under safety review. The CE report was evaluated for completeness and technical adequacy, and detailed comments on those aspects have been provided to CE.

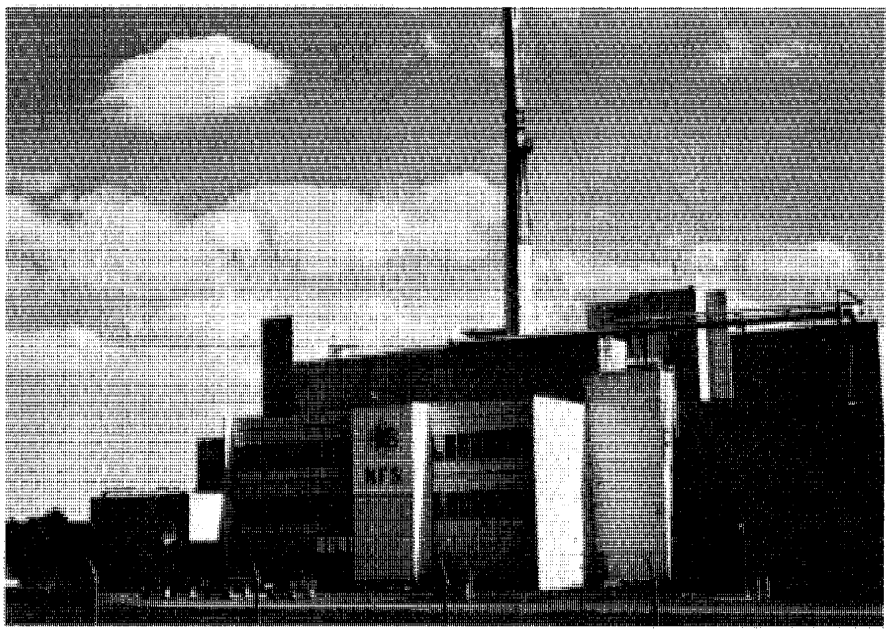
The Virginia Electric and Power Company (VEPCO) submitted an application on October 13, 1982, under the provisions of 10 CFR Part 72 to permit the dry storage of spent fuel in casks at its Surry nuclear station. This application is in addition to its request to NRC, filed in July 1982, to permit receipt of Surry spent fuel at VEPCO's North Anna Power Station for storage in the pool of Units 1 and 2, which is the subject of hearings before an Atomic Safety and Licensing Board. Transshipment of spent fuel from the Surry site to North Anna presently is prohibited by an ordinance of the county where the North Anna station is located, but VEPCO has initiated proceedings in a Federal district court challenging the ordinance.

Also, the Tennessee Valley Authority has informed NRC staff that it will apply in late 1983 for license authority to demonstrate the use of a cask from REA and possibly a cask from GNS for dry storage of spent fuel at its Browns Ferry site. This demonstration program is being planned in cooperation with the Department of Energy.

Monitored Retrievable Storage

Monitored Retrievable Storage (MRS) is the long-term isolation of spent fuel and high-level waste (HLW) in facilities that permit continuous monitoring, ready retrieval and periodic maintenance as necessary to ensure containment of the radioactive materials. Title I, Subtitle C of the Nuclear Waste Policy Act establishes long-term storage of HLW or spent fuel in MRS facilities as an option for management of such materials — although disposal in a repository should proceed regardless of the availablity of MRS.

By June 1, 1985, DOE is to complete a detailed study of the need for and feasibility of constructing one or more MRS facilities, and to develop a proposal for this construction. These MRS facilities are to be licensed by



From 1966 to 1972, spent fuel from four nuclear power facilities was reprocessed at the Nuclear Fuel Services facility at West Valley, N.Y. As a result of a lawsuit brought by the New York State Energy and Research Development Authority, a district court has ordered that the spent fuel currently stored at West Valley be shipped back to the original users.

NRC. Design criteria require that the facility be able (1) to accommodate commercial high-level waste and spent fuel; (2) to permit continuous monitoring and management for the foreseeable future; (3) to provide for ready retrieval; and (4) to safely store material as long as necessary through appropriate maintenance, including any required replacement of the facility.

DOE is to consult with both NRC and EPA in developing the proposal for Congress. The proposal must include: (1) site-specific design, specifications, and cost estimates sufficient to support Congressional authorization for construction and to solicit bids for the first facility; (2) three alternative sites and five alternative combinations of site and facility design for the first facility, with a recommendation of the preferred options; (3) an environmental assessment by DOE of the alternative technologies; and (4) the comments of NRC and EPA. In preparation for licensing activities related to MRS, the NRC staff is reviewing the existing regulatory base for handling spent fuel storage functions. The staff plans to modify the present regulation, 10 CFR Part 72, to make it appropriate for the licensing of both short- and long-term storage of spent fuel and HLW. A proposed regulation for this modification is scheduled for publication in mid-1984, with the final modified regulation to be in place by mid-1985.

Low-level Radioactive Waste Storage

At the beginning of 1983, about two-thirds of all nuclear power utilities had taken, or were planning, measures to increase their on-site contingency storage capability for low-level radioactive waste. Most of these actions come under the 10 CFR Part 50.59 provisions for making certain changes within the authority of existing operating licenses. Others are taken under separate 10 CFR Part 30 licenses (see *1982 NRC Annual Report*, p. 64). Two licenses were issued in 1983 for on-site storage of up to five years for low-level radioactive waste generated by utilities. On January 27, 1983, a license was issued to the Tennessee Valley Authority for its Browns Ferry Nuclear Plant (Ala.), and on April 15, 1983, a license was issued to Pennsylvania Power and Light Company for its Susquehanna Steam Electric Station. No new applications for low-level radioactive waste storage at nuclear power plants were received in 1983.

MATERIAL LICENSING

The NRC currently administers approximately 8900 licenses for the possession and use of nuclear materials in

IMPACT OF THE NUCLEAR WASTE POLICY ACT ON INTERIM STORAGE OF SPENT FUEL

The Nuclear Waste Policy Act (NWPA) of 1982 (PL-97-425) defines the Federal Government's overall program for the management of spent fuel and high-level waste from commercial nuclear power operations.

The NWPA specifies both policy and action on interim spent fuel storage, pending development of a repository or "monitored retrievable storage." The salient policy provisions are:

(1) Utilities have the primary responsibility to provide interim storage, by maximizing use of existing facilities and by adding new on-site storage capacity in a timely manner;

(2) DOE and NRC should take the actions necessary to encourage and expedite effective use of available storage and necessary construction of additional storage at each reactor site, consistent with safety, economic considerations, and the views of adjacent populations; and

(3) DOE should provide limited Federal storage (not more than 1900 tonnes) when reactors cannot reasonably provide the required storage for continued, orderly operations.

An important feature of this Federal interim storage program is that before DOE may enter into a contract with a utility to provide storage of any spent fuel, the Commission must determine that the utility cannot provide the necessary storage in a timely manner for continued orderly reactor operation. Within 90 days after enactment, the Commission was required to propose a rule specifying the criteria and procedures to be followed in making this determination. This proposed rule was issued April 29, 1983 (48 FR 19382). Under the limitations noted, DOE may enter into contracts with utilities until January 1, 1990, to provide Federal storage of spent fuel, not to exceed 1900 tonnes. DOE takes title to the fuel at the reactor and provides transportation, subject to NRC regulations.

DOE may not establish Federal interim spent fuel storage capacity at any candidate site for a repository, and must prepare an Environmental Impact Statement if 300 or more tonnes capacity is to be provided at any one site. A State or tribal council may veto plans for storage of 300 tonnes or more at any site, and both houses of Congress must override the veto for DOE to proceed. As of the effective date of NWPA, DOE is also prohibited from using any awayfrom-reactor storage facility not owned by the government.

Under Title II of the NWPA, which deals with DOE research and development activities, DOE is directed to establish a demonstration program, in cooperation with the industry, for dry storage of spent fuel at reactor sites. The objective of this program is to establish dry storage technologies that the NRC may approve for use by rule, without, to the extent practicable, the need for additional site-specific approvals. Within one year, DOE is to select at least one, but not more than three, reactor sites for demonstration. These demonstrations would be subject to NRC licensing.

MATERIALS LICENSES ADMINISTERED BY NRC*
(SEPTEMBER 1983)

Types of Licenses

Academic	400
Medical	2700
Industrial	5800
	8900**

Licensing Actions Taken in FY 1983

New Licenses	700
License Amendments	3900
License Renewals	1500
	6100

*In addition to the NRC licenses, some 13,000 licenses were administered by 26 states which have authority over certain materials under regulatory agreements with the NRC.

**Totals are approximate due to almost daily fluctuation in numbers.

applications other than the generation of electricity, or operation of a research reactor. Of these, about 400 are academic, 2700 medical, and 5800 industrial licenses. The NRC's licensing program is designed to ensure that activities involving such uses of radionuclides do not endanger the public health and safety. The agency took more than 6100 licensing actions during fiscal year 1983. Of these, 700 were on applications for new licenses, 3900 concerned amendments, and 1500 were license renewals. In addition to these NRC licenses, the 26 Agreement States administer approximately 13,000 licenses. These Agreement States have authority over such materials under regulatory agreements with the NRC (see Chapter 9).

Regionalization of these NRC licensing functions continued in 1983 (see *1982 NRC Annual Report*, p. 66). The Region I licensing office (Philadelphia) completed its second year, and Region III (Chicago) completed its fourth year of administering material licenses. In April 1983, additional licensing offices were established in Regions II (Atlanta), IV (Dallas), and V (San Francisco), to assume these same licensing functions. All five Regions are currently receiving training that will enable them to process more complex licensing cases, starting in April 1984. Transferring these licensing functions to the Regions should result in better coordination and more timely response.

In anticipation of this decentralization of the material licensing program, NRC staff produced 11 Regulatory Guides to help applicants prepare applications for licenses. Corresponding standard review plans were written to assist regional reviewers. The new and revised guides, and standard review plans, cover such requests as those for broad licenses, exempt distribution, facilities, general license distribution, gamma irradiators, nuclear pharmacies, well-logging, and others. These guides and standard review plans will to provide uniformity and efficiency in the application and review processes for new license, amendment, and renewal requests.

In an effort to upgrade the licensing process, the NRC contracted for analysis, development, establishment, and implementation of a Licensing Management System (LMS) for material licensing that would integrate data entry and analysis, data base management, and word processing functions into an automated information pro-

cessing system. The LMS functional requirements were completed in December 1982, and the preliminary system design and data base design were completed in April 1983. A contract was awarded in August 1983 for LMS final design, programming, testing, training and implementation. The LMS is scheduled to become operational during fiscal year 1985.

Industrial Licensing

NRC-licensed radioactive materials are used by industry in such areas as industrial radiography, manufacture of gauging devices, gas chromatography, and well-logging, as well as by members of the general public, in various consumer products. (A more detailed description of the activities covered by NRC industrial licensing may be found in the *1981 NRC Annual Report*, pages 63 and 64.)

Because gauging and gas chromatography devices comprise the largest category of licenses issued, there is a need for increased efficiency in reviewing these cases. In 1983, computerized procedures were developed for processing applications involving gauging and gas chromatography devices, helping NRC reviewers respond more rapidly with licensing decisions.

Actions Affecting Industrial Licensees. During fiscal year 1983, the NRC amended its regulations in two areas, in an effort to reduce regulatory burdens on industrial licensees without compromising public health and safety:

- 10 CFR Part 32 was amended to modify the recordkeeping requirements imposed on persons specifically licensed to distribute consumer products containing nuclear byproduct material. It is estimated that there will be an 80 percent reduction in the approximately 200 reports previously submitted annually to the Material Licensing Branch.
- 10 CFR Parts 30, 70 and 150 were amended to establish requirements to be followed in dealing with an "irretrievable well-logging source" (i.e., any radioactive sealed source that is pulled off or not connected to the wireline downwell, and for which all reasonable effort at recovery, as determined by the NRC, has been expended). This rule provided for the safe burial of these irretrievable sources, without overrestrictive and non-uniform regulatory requirements.

Medical and Academic Licensing

Physicians use NRC-licensed radioactive materials in their private offices and in medical institutions for the diagnosis and treatment of patients. In universities, colleges and other academic institutions, instructors and other staff use radioisotopes as part of their teaching and research programs. A more detailed description of these activities may be found in the *1982 NRC Annual Report*, pp. 67 and 68.

During the report period, 173 registration sheets were issued for radioactive sources and containment devices. These registration documents require a detailed safety review of the sources and devices, and the preparation of a safety analysis for use by NRC and Agreement State reviewers in the licensing process. A computerized registry system for approved sealed sources and devices is updated twice a year, using 500 reports to the NRC Regional offices and all Agreement States. During the report period, 100 special reports were produced for both NRC and other governmental users.

Actions Affecting Medical Licensees. During fiscal year 1983, the NRC amended its regulations in 10 CFR Part 35 to authorize licensee use of the following:

- A new reagent kit used to prepare technetium-99m albumin colloid for liver, spleen and bone marrow imaging.
- Technetium-99m pentetate as an aerosol for lung imaging, if certain equipment is used.
- A hand-held device that uses the radiation from a sealed source of iodine-125 to produce instantaneous images of bones or foreign objects.

Another amendment to 10 CFR Part 35 codified two license conditions. The amendment requires teletherapy licensees to install a radiation monitor in each treatment room and to have a complete inspection and servicing of the source exposure mechanism performed at the time of each source change, or at intervals not to exceed five years.

In a licensing action taken in fiscal year 1983, NRC authorized a manufacturer to distribute a new model of his nuclear-powered pacemaker. The new model differs from its predecessor in that it is "programmable," i.e., its settings may be changed to accommodate a patient's changing needs without a surgical procedure.

TRANSPORTATION OF RADIOACTIVE MATERIALS

The Federal Government regulates the transportation of radioactive materials primarily through the NRC and the Department of Transportation (DOT). These two agencies have divided their regulatory responsibilities, and documented them in a Memorandum of Understanding. Shipments that occur within the United States also come under regulation by the States, in certain circumstances. For international shipments, DOT is the designated U.S. Authority, and is responsible for implementing the International Atomic Energy Agency (IAEA) standards. NRC advises DOT on technical matters.

Regulation Revision

On August 5, 1983, the NRC published in the Federal Register a revised 10 CFR Part 71, "Packaging and Trans-

The transportation of radioactive wastes by motor vehicle was banned by New York City in 1976, leading to litigation involving the Department of Transportation. In August 1983, New York City asked the U.S. Supreme Court to overturn the ruling of the Second Circuit Court of Appeals, which had reversed the initial district court finding in the city's favor. Activity shown is at the Brookhaven National Laboratory on Long Island, N.Y.

portation of Radioactive Material." This rule was revised to achieve compatibility with the transport regulations of the IAEA, and became effective on September 6, 1983. DOT had previously published compatible regulations which were effective on July 1, 1983. (See *1981 NRC Annual Report*, p. 67.)

Transportation Litigation

In 1976, New York City banned motor vehicle transport of spent nuclear fuel. Brookhaven National Laboratory, located on Long Island, asked DOT to preempt the city rules and permit shipment of spent fuel from the Laboratory's research reactor to pass through portions of the city.

In 1978, DOT began rulemaking that culminated in a 1981 regulation overriding New York City's control over the interstate highway system. In 1981, New York City responded with a suit in the Southern District of New York (with New York State intervening on behalf of the city) against DOT. The district judge ruled, in January 1982, that DOT had violated the Hazardous Materials Transportation Act and the National Environmental Policy Act, in preempting State and local transportation bans. DOT then appealed to the U.S. Court of Appeals (2nd Circuit), and on August 10, 1983, the Court of Appeals ruled against the lower court, upholding DOT. On August 19, 1983, New York City asked the U.S. Supreme Court to overturn the Second Circuit Court of Appeals. (See *1978 NRC Annual Report*, p. 82.)

Spent Fuel Shipments

Several States and public interest groups have raised questions about the safety of the shipments of spent reactor fuel that began in late July 1983 from a General Electric facility in Illinois to the Point Beach Nuclear Station in Wisconsin; similar complaints were later lodged against shipments from the West Valley Facility in New York to Point Beach and to the Dresden Nuclear Station in Illinois. The return of the spent fuel from these locations to the nuclear utilities that own the fuel was being carried out to reduce storage costs, or, in the case of the West Valley shipments, as a result of a Federal court decision. The return of the spent fuel to Point Beach and Dresden is scheduled for completion in 1984. (See discussion earlier in this chapter, under "Fuel Cycle Actions.')

Representatives of the NRC met with officials of the States of Illinois, Ohio, Pennsylvania, and Wisconsin to discuss their concerns for safe transport, and to review applicable regulatory requirements for the shipments, including inspections there of. Site operating personnel inspect each shipment before the transport vehicle leaves the site; the NRC makes audit inspections to ensure that its requirements are being met; and DOT and State agencies make still other safety checks. There have been no significant security or health and safety problems resulting from of these shipments.

Spent Fuel Cask

The Transportation Certification Branch received a license application from Gesellschaft für Nuklear Service, mbH (GNS) for a new type of spent fuel transportation cask. The cask is made of nodular-graphite cast iron and has 14-inch thick walls. This cask is also under review for use at a reactor site to store spent fuel (see 1982 NRC Annual Report, page 65).

GNS plans to subject a full-scale prototype cask to the tests specified in NRC regulations. These tests will be conducted in West Germany, in early 1984.

Safeguards

CHAPTER 6

Under the provisions of the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974, the NRC regulates the safeguards its licensees provide, to assure protection of the public health and safety and the national defense and security. To accomplish this objective, the NRC formulates and enforces measures designed to prevent, deter, and respond to sabotage of nuclear facilities and to theft, diversion, or unauthorized use or possession of special nuclear material (SNM). Generally, safeguards for power reactors emphasize protection against radiological sabotage, whereas those for fuel cycle facilities stress protection against theft or diversion of SNM. (SNM and Strategic Special Nuclear Materials, or SSNM, are shorthand for complex technical definitions of various kinds of nuclear materials, different quantities thereof, and different degrees of enrichment thereof. In general, SSNM is highly enriched uranium or plutonium and SNM is less highly enriched.)

In fiscal year 1983, NRC safeguards measures were applied to 85 power reactors, 71 nonpower reactors, 21 fuel cycle facilities, and one spent fuel storage facility. They were also applied to transportation activities, consisting of 100 shipments of spent fuel, and six shipments of SNM involving five or more kilograms of highly enriched uranium.

NRC/IAEA Interaction. During 1983, the International Atomic Energy Agency (IAEA) routinely inspected the Exxon low-enriched fuel fabrication plant in Washington, the Rancho Seco reactor in California, and the Trojan reactor in Oregon. Also, the NRC submitted accounting data to the IAEA on a monthly basis throughout the year for these facilities as well as for the low-enriched uranium plants of Babcock and Wilcox at Lynchburg, Va., and of Westinghouse at Columbia, S.C.

In the continuing program to implement the U.S./IAEA Safeguards Agreement, three additional NRC-licensed facilities recently have been selected for the application of IAEA safeguards. Initial IAEA visits to these facilities, which are the Combustion Engineering Corporation's low-enriched uranium fabrication plant in Connecticut, the Arkansas-2 reactor in Arkansas, and the San Onofre-2 reactor in California, were scheduled for October 1983.

During June 1983, the NRC submitted an update of the eligible facility list for application of IAEA safeguards at licensed facilities to the Executive Branch for review and transmittal to the IAEA.

STATUS OF SAFEGUARDS IN 1983

Reactor Safeguards

Power Reactors. In October 1982, a five-member NRC staff committee was appointed to review safeguards requirements at power reactors in order to evaluate their impact on operational safety. Over a period of four months, the committee observed plant operating conditions at five power reactor sites, obtained the views of about 100 persons representing 16 nuclear utilities and industry organizations, and interviewed about 40 NRC employees, including resident inspectors and members of the Regional and Headquarters staff. The committee did not identify any substantive safety problems associated with NRC security requirements; however, it found that the potential for such problems existed, to varying degrees, at licensed facilities. The committee's report, published as NUREG-0992 in May 1983, contains five basic findings and a number of associated recommendations intended to minimize the potential impact of security on safety. A staff action plan for response to the recommendations is being implemented.

The NRC has placed increased emphasis on its program to evaluate the effectiveness of safeguards regulations at licensed power reactors. These assessments, known as Regulatory Effectiveness Reviews, are conducted independently of NRC's regular inspection and enforcement programs, and consist of on-site analyses of safeguards programs, as implemented by the licensees, to ensure that the intended level of protection has been achieved. During fiscal year 1983, assessments were conducted at Salem Units 1 and 2 (New Jersey) and at Turkey Point Units 3 and 4 (Florida).

Nonpower Reactors. A proposed regulation establishing new requirements for the protection of formula quantities of Strategic Special Nuclear Material (SSNM) at nonpower reactors was published in the *Federal Register* on July 27, 1983. This proposed regulation would amend 10 CFR 73.67 and, if adopted, would require licensees possessing SSNM to submit revised physical protection plans that demonstrate intended methods of compliance with the new requirements. The proposed regulation currently affects 13 licensees.

Inspection and Enforcement at Reactors. During the first three quarters of fiscal year 1983, the NRC expended

Table 1. Summary of Safeguards Inspection Visits - FY 1983[1]

	Number of Licensees Inspected	*Number of Inspection Visits*	*Percent of Visits Resulting in Findings of Noncompliance*	*Manhours of Inspection Effort*	*Number of Noncompliance*
FUEL FACILITIES					
Strategic (Forumula Quantity)	5	71	24	3,703	26
Nonstrategic (Less than Formula Quantity)	14	58	21	2,831	20
TOTAL	19	129	22	6,534	46
REACTORS					
Power					
Operating	79	146	32	6,981	116
Pre-Operating	10	14	N/A	1,561	N/A
TOTAL	89	160	30	8,542	116
Nonpower					
TOTAL	28	35	14	519	6
REACTOR TOTAL	117	195		9,061	122
SHIPMENTS					
Formula Quantity	3	6	0	53	0
Irradiated Fuel	3	3	0	10	0
TOTAL	6	9	0	63	0
OTHER	6	6	0	47	0
GRAND TOTAL	148	339	24	15,705	168

[1]Based on information available as of 9/23/83; complete through approximately 7/30/83. This occurs because inspection visits are analyzed and evaluated before entry into the data base; consequently, there is a 6-week to 2-month time lag.

Evaluations of the effectiveness of safeguards at licensed power reactors are conducted independently of NRC's regular inspection and enforcement programs. These assessments, called Regulatory Effectiveness Reviews (RER), consist of on-site analyses of the licensee's safeguards programs. A member of an RER team is shown, along with plant security personnel, checking out the intrusion detection system.

8,542 hours in onsite safeguards inspections at power reactors. These inspections revealed 116 items of noncompliance with safeguards requirements. (See Table 1 for a summary of inspection activity at reactors.)

Fuel Cycle Facilities

In 1983, safeguards requirements were in force at 29 licensed fuel facilities. The requirements at 21 of these consisted of detailed physical security and material control and accounting systems. Four of the 21 facilities had actual holdings of formula quantities of SSNM, requiring implementation of extensive physical security and material accountability measures. The remaining eight facilities did not have detailed material control and accounting systems, but were required to implement physical security systems.

The activities associated with SNM at these 29 fuel cycle facilities include full scale production, pilot plant operations, decommissioning efforts, and the storage of sealed items.

NRC licensing activity associated with these 29 facilities consisted of review and approval of changes to the in-place physical security and material control and accounting systems. The NRC received, and completed action on, approximately 170 licensing matters associated with these facilities during 1983.

In May 1983, the Commission placed in abeyance a hearing proceeding that the Natural Resources Defense Council had requested in 1980 regarding the Nuclear Fuel Services' high-enriched uranium facility at Erwin, Tenn. This action was taken after all the parties involved had submitted a joint motion to the Commission requesting an initial tightening of reinventory limits at the facility, with successive reductions of the limits to be made after one and after two years, depending on actual inventory difference performance. The facility's inventory difference performance since September 1982 continues to be within Commission-approved limits.

Inspection and Enforcement at Fuel Facilities. During the first three quarters of fiscal year 1983, the NRC conducted 129 inspection visits at 19 fuel facilities. These inspections required more than 6,500 man-hours and revealed 46 items of noncompliance. (See Table 1 for a summary of inspection activity at fuel facilities.)

Transportation

Spent Fuel Shipments. During fiscal year 1983, NRC approved 41 transport routes from the perspective of protection against sabotage. One hundred spent fuel shipments were made over these routes without incident. In conjunction with these route approvals, and in compliance with Public Law 96-295, NRC publishes a document (NUREG-0725, Revision 3) titled "Public Information Circular for Shipments of Irradiated Reactor Fuel," which contains all approved routes. The latest revision of this circular was published in July 1983.

Prohibitions Against Spent Fuel Shipments. In 1982, the Illinois State Legislature passed a law prohibiting

storage in the State or transportation into the State for storage of spent fuel, unless it originated in a State with which Illinois had a reciprocal agreement. Subsequently, a U.S. District Court judge in Chicago ruled that the law was unconstitutional. The State then appealed the District Court verdict to the U.S. Court of Appeals, which upheld the decision of the lower court. In 1983, Illinois appealed these decisions to the U.S. Supreme Court which declined to hear the appeal.

SSNM Shipments. One export shipment and five domestic shipments, each involving five or more kilograms of highly enriched uranium, were made during the report period.

Shipment Route Surveys. In fiscal year 1983, NRC safeguards teams continued to conduct field surveys of routes proposed for the shipment of spent nuclear fuel or of SSNM, working with more than 130 local law enforcement agencies. These teams analyzed 37 routes through 37 states, traveling approximately 4,500 total route miles. The NRC brochure entitled "Information Package on Spent Nuclear Fuel Shipments for Law Enforcement Agencies" was distributed to local officials and agencies during these surveys.

Transport Inspection and Enforcement. During fiscal year 1983, the NRC continued to inspect selected domestic shipments and the domestic segments of import and export shipments of SSNM. These shipments were inspected at points of origin, in transit, during intermodal transfer and temporary storage, and at destinations. No items of noncompliance were noted. (See Table 1 for a summary of transportation inspection activity.)

Contingency Planning and Threat Assessment

Safeguards contingency plans deal with threats, thefts, and sabotage relating to licensed SNM and nuclear facilities. In September 1983, the NRC staff completed a revision of its headquarters contingency plan in accordance with "Agency Procedures for the NRC Incident Response Plan" (NUREG-0845). Also, in September 1983, the staff developed and conducted a safeguards exercise that provided an opportunity to test the recently revised response procedures and the communications between NRC emergency response components.

In August 1983, the NRC Information Assessment Team (IAT) adopted a new charter and set of response procedures. The IAT mission is to assess threats to NRC-licensed material, facilities or activities; to weigh potential consequences of threatened acts; and to recommend appropriate action to NRC management. The new IAT charter reflects the increased responsibilities of Regional Offices under NRC's decentralization program.

As part of its continuing threat assessment and data analysis effort, the staff again updated its "Safeguards Summary Event List" (NUREG-0529) in August 1983 (Rev. 7). This list provides data on safeguards-related events involving licensed nuclear materials and facilities. The staff also completed semiannual threat reviews in February and August 1983. In these semiannual reviews, the staff evaluates the reasonableness of the NRC design basis threats published in 10 CFR 73.1(a) in light of the patterns and trends of actual safeguards events which have occurred in both the U.S. and foreign countries. Based on these reviews, the staff has concluded that available data do not warrant a change to the current threat statements. The "Communicated Threat Credibility Project" also continued to provide guidance and support to the NRC, DOE, the FBI and other concerned agencies, for investigation of communicated threats.

In August 1983, a review of the NRC/FBI Memorandum of Understanding was completed and, as a result, several points concerning the NRC/FBI interface were further clarified. However, no changes were required in contingency planning and incident response.

SAFEGUARDS REGULATORY ACTIVITIES AND ISSUES

Fuel Facilities Material Control and Accounting

Strategic Special Nuclear Material (SSNM). In September 1981, NRC published an advance notice of pro-

The NRC inspects certain domestic shipments of strategic special nuclear material (material more highly enriched in fissionable isotopes than ordinary nuclear fuel) and domestic segments of import and export shipments of such material. An alarm station operator is shown at her post.

posed rulemaking, inviting public comment on a regulatory approach featuring these goals: (1) provide for timely indication of possible loss of SSNM (e.g., highly enriched uranium and plutonium); (2) facilitate the recovery of lost material; and (3) provide long-term assurance that no significant loss has occurred. The public comment period on the Proposed Rulemaking ended in February 1982. Since that time, the NRC staff has completed a proposed Category I material control and accountability (MC&A) reform amendment, which is now being readied for publication. Reactors are not affected by this rule, since it applies only to fuel cycle facilities.

Low-Enriched Uranium (LEU). The NRC has been evaluating appropriate ways to allow for the difference in safeguards significance between SSNM and LEU, and to develop more cost-effective accountability requirements for LEU facilities, by permitting licensees greater flexibility in designing site-specific measures to comply with regulations. Accordingly, proposed amendments to the regulations were published for a 60-day comment period in December 1982. The staff is now preparing a final rule and associated acceptance criteria required for licensing actions.

Transportation

On July 14, 1983, the Commission issued proposed regulatory amendments that would implement the Convention on the Physical Protection of Nuclear Material, a part of the IAEA agreements originally proposed by the Secretary of State in 1974, and signed in 1980. The Convention, which provides for the security of international shipments of significant quantities of source or special nuclear material, was ratified by the Senate on July 30, 1981. The NRC proposed amendments call for: (1) the physical protection of transient shipments of SSNM of moderate and low strategic significance, irradiated reactor fuel and natural uranium; (2) advance notification to the NRC of the export of Convention-defined nuclear materials; (3) advance notification, and assurance of protection, to the NRC on transient shipments of Convention-defined nuclear materials between countries that are not parties to the Convention; and (4) advance notification, and assurance of protection, to the NRC on the importation of Convention-defined nuclear materials from countries that are not parties to the Convention. By adopting these proposed amendments, the United States will have implemented the provisions of the Convention, resulting in improved security for Convention-defined nuclear materials during international transport.

Spent Fuel Transportation. The NRC staff is continuing to develop a final rule for physical protection of irradiated reactor fuel shipments to replace the interim requirements issued in 1979. Research projects completed in 1981 and 1982 show that the quantity of radioactive material likely to be released as a result of sabotage is much less than was supposed when the interim rule was issued. The rule being developed would eliminate overly conservative requirements now applicable to spent fuel shipments.

High-Level Waste Transportation. A similar program is under way to analyze the safeguards requirements for transportation of high-level waste, since radioactive dispersal hazards could be similar to those from sabotaged spent fuel.

SAFEGUARDS RESEARCH, STANDARDS AND TECHNICAL ASSISTANCE

Approximately $5.5 million was spent in fiscal year 1983 on safeguards technical assistance and research contractual projects. Of this total, approximately $4.5 million was spent on technical assistance projects, and the remaining $1 million on research projects. Some of these projects are discussed below.

Technical Assistance

- *Nuclear Power Plant Vital Area Definition*. This continuing project provides for the systematic analysis of nuclear power plants to identify those areas and combinations of areas in which sabotage actions could result in radiological releases in excess of 10 CFR Part 100 limits. The analysis uses fault tree methodology and information obtained through the Final Safety Analysis Report and site visits to prepare detailed fault trees for each nuclear power plant. The NRC staff uses results of this project as an input for validation of the vital areas identified in the security plans of operating reactors. This vital area validation is part of the Regulatory Effectiveness Review program, described earlier in this Chapter.

- *Advanced Material Accounting System Simulation Model*. The Automated Material Accounting Statistics System (AMASS) described in earlier reports (see 1981 and 1982 Annual Reports, p. 77), was completed in fiscal year 1983, and has been successfully applied to evaluate inventory differences at five fuel cycle facilities and shipper-receiver differences at seven facilities. The year 1983 also saw the development of a second generation AMASS. This system, referred to as Augmented AMASS, has the additional capabilities for quantifying and resolving into four components the non-measurement error associated with an inventory difference (ID), and estimating uncertainties associated with limit of error computations. The Augmented AMASS system is

Training is provided for nuclear plant security officers in techniques and equipment related to crowd control.

currently scheduled to be used at four nuclear fuel cycle facilities to evaluate ID performance. It also is scheduled to be used at one facility to evaluate process monitoring data, in an assessment of the feasibility of using these data to meet detection requirements in the proposed Category I MC&A Reform Amendment, previously discussed.

- *Technical Assistance to Strengthen IAEA Safeguards*. This project provides specialized technical assistance to the NRC staff in the development of draft proposals to improve IAEA safeguards. Under the Nuclear Non-Proliferation Act of 1978, the United States is committed to providing continued strong support to strengthen IAEA safeguards, and the Commission has instructed the staff to support this U.S. initiative.

- *Nuclear Materials Management and Safeguards System*. Being developed in conjunction with DOE, this project supports the operation and maintenance of a national data base and information system for managing and safeguarding nuclear materials. The system is designed to achieve the following objectives: (1) the protection and control of and accounting for, nuclear materials flowing through government and commercial facilities and between these facilities, and (2) the fulfillment of international commitments derived from bilateral agreements, IAEA requirements for export/import reporting, and IAEA requirements under the US/IAEA Safeguards Agreement.

Safeguards Research

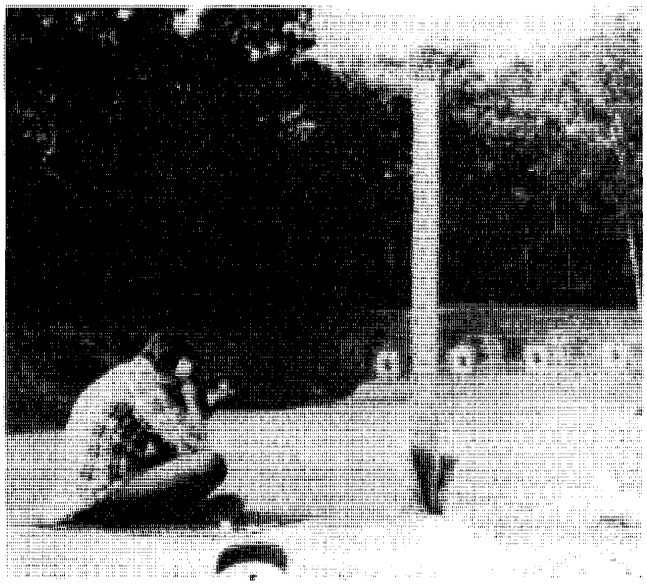
- *Human Factors*. During fiscal year 1983, the Office of Nuclear Regulatory Research (RES) undertook a study to develop a long-term research plan addressing human factors issues that affect safeguards at nuclear power plants. The focus is on the human performance of safeguards functions. The principal areas addressed are those associated with the quality of site security at operating NRC-licensed plants. These areas include personnel training considerations, organizational factors, human response capabilities, and use of security equipment. These subjects are to be examined in separate studies. The results will provide a technical basis for guidance to licensees in improving safeguards capabilities and in minimizing the impact of safeguards requirements on the safety of plant operations.

- *Research in Support of Licensing*. Two RES studies initiated in fiscal year 1982 to improve the technical

bases for safeguards licensing were continued in fiscal year 1983. These were: (1) research to improve modeling of potential system interactions and common mode failures resulting from sabotage at nuclear power reactors; and (2) testing of perimeter alarm systems under adverse weather conditions. Three additional research efforts were undertaken in fiscal year 1983 to: (1) calculate the dose rate from irradiated fuel elements at nonpower reactors; (2) develop a system to permit licensing staff to gain access to and process available site-specific data rapidly in response to a safeguards related event; and (3) quantify experimentally the magnitude and chemical/ physical form of radioactive material that may be released by sabotage of High Temperature Gas Reactor nonpower reactor spent fuel shipments, or shipments of vitrified high-level waste.

- *Research in Support of Material Control and Accounting Regulations*. During fiscal year 1983, experimental work was continued on a study to improve methods of estimating process holdup. Two other research studies were completed dealing with sample systems that could meet accountability requirements of the MC&A Reform Amendment. The final reports were published as NUREG/CR-2935, "Examples of MC&A Systems to Meet Prompt Accountability Specification," and NUREG/CR-3221, "MC&A Reform Amendment System Beta Variance Estimates and Performance Evaluation."

- *Standards Development*. RES staff completed two draft regulatory guides in support of the "Insider Safeguards Rule" package. In addition, the staff completed revision of eight regulatory guides on use of nondestructive assay techniques for accountability of SSNM. Work continued on two reference documents needed for implementation of the MC&A Reform Amendment: the "Handbook of Passive Nondestructive Assay of Nuclear Material" and the "Statistical Handbook for Nuclear Material Accountability."



Nuclear plant security officer is shown participating in required firearms qualifications test.

SAFEGUARDS DECENTRALIZATION

Licensing functions involving review of safeguards system changes that do not decrease the effectiveness of the program, as defined in 10 CFR 50.54(p) and 10 CFR 70.32 (c), (d), (e), and (g), have been transferred to Regions I and II, and were scheduled for the remaining NRC Regions effective October 1, 1983. The conducting of transportation route surveys was transferred to Region III effective October 1, 1983, and is scheduled for the remaining Regions on October 1, 1984.

Safeguards decentralization activities in 1983 focused on three general areas: (1) preparation of licensing review criteria, field policy guidance, and the delegation of authority; (2) formulation of training documents and materials and training of regional representatives; and (3) assessment of Regional Office performance of delegated licensing functions.

Waste Management

CHAPTER 7

Nuclear waste management activities in the NRC are managed and coordinated by the Office of Nuclear Material Safety and Safeguards (NMSS). These activities cover the regulation of all NRC-licensed source, byproduct and special nuclear material waste, including uranium mill tailings. Waste management functions include:

- Developing the criteria and framework for high-level waste regulation, including the technical bases for the licensing of high-level waste repositories.
- Licensing and regulating low-level waste disposal facilities and providing the technical support for such regulation.
- Providing national program management for licensing and regulating uranium recovery facilities and associated mill tailings. These operations include uranium mills, heap-leach facilities, ore-buying stations, solution mining, and byproduct uranium recovery.

Highlights of 1983

In 1983, NRC staff continued to focus on developing, improving and implementing regulations for the safe management and disposal of radioactive wastes. During the year, NRC completed the final portion of 10 CFR Part 60, containing the technical criteria for regulating geologic disposal of high-level waste. The technical rule was published in the *Federal Register* on June 21, 1983. (The procedural portion of 10 CFR Part 60 was issued as a rule in 1981.) The staff reviewed DOE's first Site Characterization Report (SCR) for the Basalt Waste Isolation Project (BWIP) at Hanford, Wash., and published a Site Characterization Analysis of this Report in March 1983 (see NUREG-0960).

In the area of low-level waste disposal, the NRC issued 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," as a final rule. A Technical Position Paper was issued to help licensees comply with changes in 10 CFR Part 20 regarding waste classification form and manifest and recordkeeping for low-level wastes.

Congressional suspension of portions of 10 CFR Part 40, concerning the implementation of the Uranium Mill Tailings Radiation Control Act of 1978, affected much of the uranium recovery licensing program. (See *Uranium Recovery and Mill Tailings* below; see also *1982 NRC Annual Report*, p. 83.) The EPA issued standards in October 1983, and an NRC task group is currently working to conform the NRC rule to the EPA standards by April 1984.

The enactment by Congress of the Nuclear Waste Policy Act of 1982 (Public Law 97-425) created the requirement for additional resources within the Division of Waste Management to carry out expanded NRC responsibilities in the high-level waste program area. Consequently, NMSS effected a major reorganization, better enabling the Division to carry out its responsibilities under the Act by providing greater flexibility in using resources.

The NRC Waste Management Review Group (see *1980 NRC Annual Report*, pp. 127-128) reviewed descriptive summaries and statements of work for 88 projects during the reporting period.

HIGH-LEVEL WASTE PROGRAM

Regulatory Development

In 1983, NRC completed the 10 CFR Part 60 regulations for the management and disposal of high-level waste in geologic repositories. These regulations specify the procedures and criteria NRC will use to determine whether a highlevel waste repository poses an unreasonable risk to the public health and safety. With the addition of the technical portion to the procedural portion of 10 CFR Part 60, NRC now has a comprehensive framework for licensing the disposal of high-level waste in geologic repositories. This completed the development of the regulation and fulfilled the requirement of Section 121(b) of the Nuclear Waste Policy Act, that NRC promulgate technical criteria for high-level waste disposal by January 1, 1984. This technical rule identifies the performance objectives and other technical criteria to be used in evaluating a license application. The portion of 10 CFR Part 60 published February 1981 describes the procedures to be followed in preparing and applying for a license to dispose of high-level waste. NRC staff is currently reviewing the procedural portion in light of the new requirements of the Nuclear Waste Policy Act.

Regulatory Guidance

During 1983, NRC staff continued developing regulatory guidance on acceptable methods to satisfy the requirements of 10 CFR Part 60 for DOE. In preparing staff technical positions on high-level waste issues, NRC has involved DOE and the technical community in helping to identify and resolve problem areas early. During 1983, NRC published five final technical positions on geochemistry, borehole and shaft sealing, quality assurance as applied to geotechnical investigations, waste package performance, and benchmarking groundwater transport codes.

The NRC is also participating in the development of Consensus Standards as follows:

- Informal participation with the DOE's Materials Characterization Board, at Argonne National Laboratory, to control the materials science investigations that are being conducted for DOE's waste form packaging programs.
- Participation in the development of American Nuclear Society draft standards for site characterization test methods. These standards cite acceptable methods of describing and analyzing geological and engineering characteristics of underground sites. Draft standards were distributed to the technical community for review.

Site Investigations

In November 1982, DOE submitted a Site Characterization Report for the Basalt Waste Isolation Project (BWIP) at DOE's Hanford Reservation in Washington to identify potential licensing issues at a candidate repository site, and to present plans for gathering information to resolve them. In turn, the NRC performed a detailed analysis of this report and published the draft Site Characterization Analysis of the Site Characterization Report for the Basalt Waste Isolation Project (NUREG-0960) in March 1983. This exercise illustrated the importance of early interaction with DOE, States, and tribes to identify and resolve site-specific issues.

The Nuclear Waste Policy Act of 1982 (NWPA) specifies that before sinking shafts at any candidate site, DOE must submit a Site Characterization Plan (SCP) to the NRC for review and comment. The NWPA requires the SCP to be submitted after the President has approved three sites for characterization. Under the Act, DOE is to recommend the three sites for characterization by January 1985. DOE is planning to submit SCPs for BWIP as well as for the Nevada Nuclear Waste Storage Investigation (NNWSI) and the salt site in 1985. In accordance with the Act, the NRC will review and comment on these SCPs and examine 10 CFR Part 60 to identify any changes needed to conform the SCP review process with the statutory scheme of the NWPA.

In June 1983, a Procedural Agreement between the NRC and DOE set procedures for consultation and exchange of information during the characterization of candidate sites for geologic repositories. Technical meetings on selected potential licensing issues will allow detailed review of data and information gathered from site-specific investigations. These meetings are open to the public, and provision is made for participation from the States and affected Indian tribes. To ensure that the NRC is operating from the most current data base, an NRC resident representative will be assigned to each site. During 1983, NRC on-site resident representatives were established for the BWIP and NNWSI sites. A representative is expected to be established for the salt investigation by January 1, 1984.

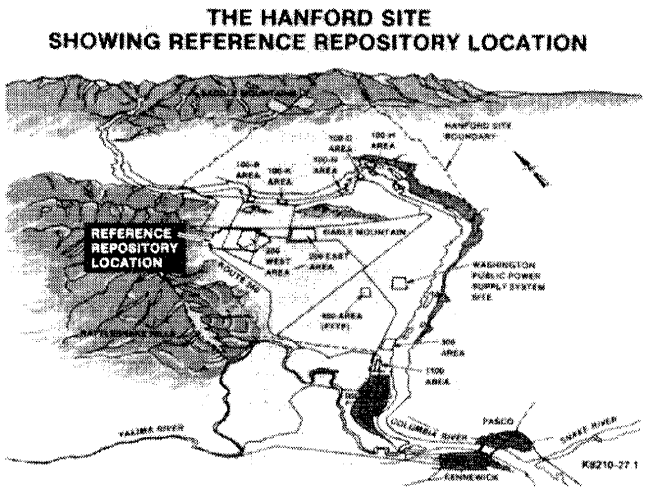
Nuclear Waste Policy Act

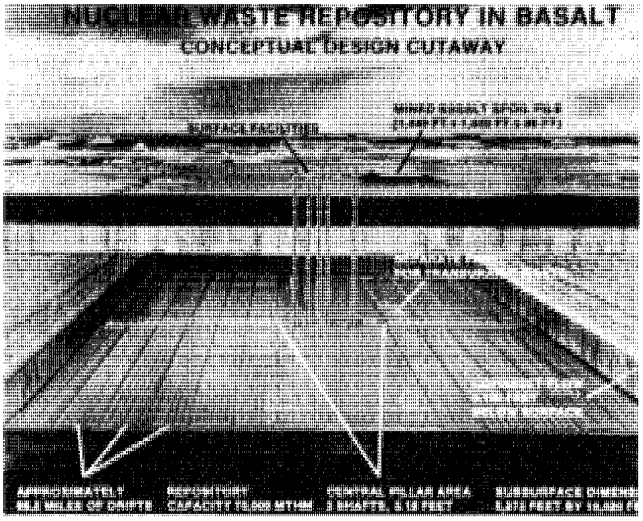
The Commission's principal statutory role in the high-level waste program is to provide an independent determination that DOE's performance of its responsibilities is adequate to protect the public health and safety and the environment. The Nuclear Waste Policy Act cited above, was signed into law on January 7, 1983; it reinforces this basic NRC role. Although the majority of actions required under the Act are to be performed by DOE, the Act creates additional responsibilities for the NRC, such as those cited above under "Site Investigations."

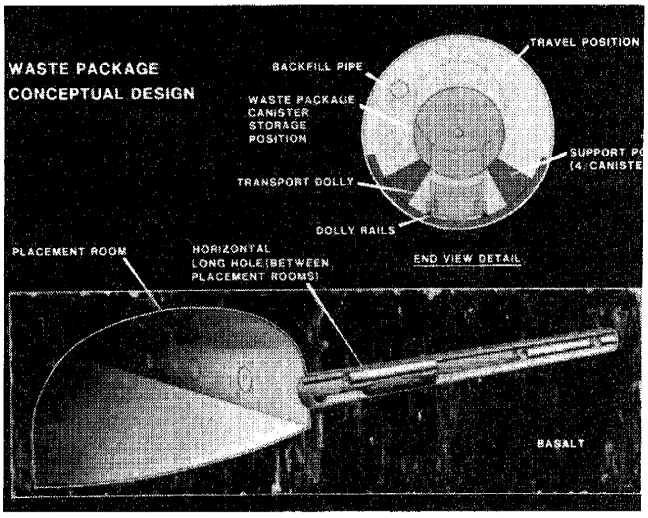
The primary implication of the NRC's role, as set forth under the new law, is that it must be technically prepared to respond to the program and schedules developed by DOE to meet the NWPA. For this reason, one of the first actions taken by the NRC in implementing the NWPA was to develop close communication with DOE, so that each agency's required activities and needed lead time could be identified early in the planning process. NRC has also taken steps to develop better communication by meeting with representatives of State governments, Indian tribes, and other organizations to review DOE's site-specific activities and their relationship to the national program.

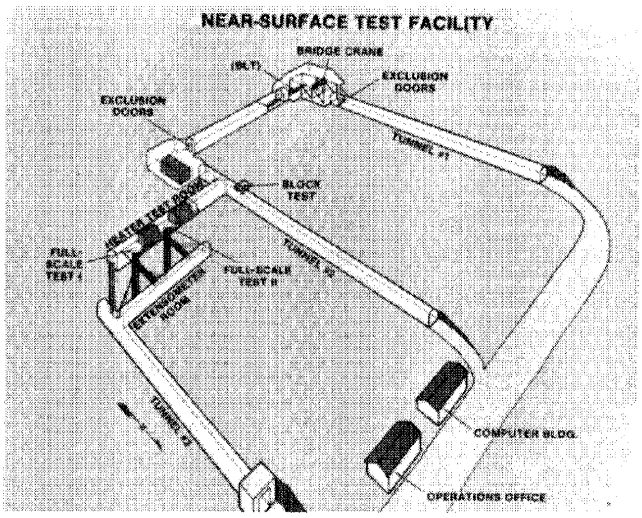
In 1983, NRC also completed the following actions to implement its responsibilities under NWPA:

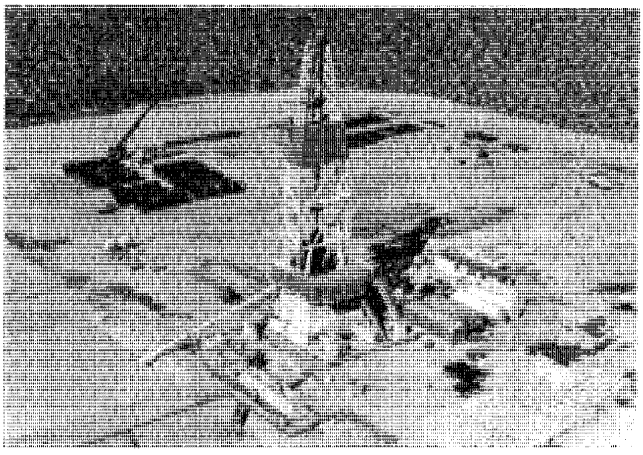
- Joint NRC/DOE *Federal Register* Notice on availability of Technical Assistance on Spent Fuel Storage and Disposal to Non-Nuclear Weapon States
- NRC Staff Comments on DOE's Draft Repository Siting Guidelines
- Development of proposed Criteria for Adequacy of Spent Fuel Storage
- NRC Staff Comments on Proposed EPA High-Level Waste Standards
- Commission approval of 10 CFR Part 60, Technical Criteria for Licensing of High-Level Waste Repositories
- Procedural Agreement with DOE on Site Characterization











The Department of Energy has submitted to the NRC a Site Characterization Report for the Basalt Waste Isolation Project (BWIP) at DOE's Hanford Reservation in Washington.

At top left is a map of the 10-square-mile area selected as a "reference repository" location for the project. Top right is an artist's conception of the repository showing the relationship of surface and subsurface facilities. Center right is a diagram of the Near-Surface Test Facility, developed as a full-scale laboratory for extensive study of the suitability of basalt for securing nuclear waste. The facility is a series of tunnels mined into Gable Mountain (at center of reference repository map). Above is a schematic of the waste package conceptual design for nuclear waste disposal in basalt. The design provides for a canister of nuclear waste placed on a raised dolly and moved into a horizontal storage position. The dolly is then lowered and the canister comes to rest on support posts. When the placement hole is filled to capacity, the ends of the hole would be plugged. After a monitoring period, backfill would be injected into the placement through a pipe. Shown at right is the rig that will be used to drill the exploratory shaft at the project site.

Work with Other Agencies

Throughout 1983, the NRC participated with other agencies in the following high-level waste management programs:

The Environmental Protection Agency (EPA) is responsible for developing a standard for the performance objectives for disposal of high-level waste. The EPA published the draft Standard (40 CFR 191 Draft 19) on December 29, 1982. NRC reviewed this standard, and provided comments to the EPA on May 10 and 11, 1983. To determine if the numerical values in the standard are reasonable and achievable, the NRC contractors assessed hypothetical sites corresponding to those being considered by DOE. These assessments were published in April 1983, in NUREG/CR-3235. Based on these assessments and other work, NRC found that the management, storage, and containment requirements of the proposed standards represented a reasonable approach for developing a high-level waste standard. The Commission noted that, with recommended changes, these goals can be achieved.

The NRC has obtained technical support from the U.S. Bureau of Mines and the U.S. Corps of Engineers in conducting site-specific reviews of BWIP and NNWSI. The staff also consulted with the U.S. Geological Survey on site characterization.

Waste Confidence Rulemaking

The NRC staff continued work on the generic rulemaking proceeding to reassess the Commission's confidence that radioactive waste produced by nuclear facilities will be safely disposed of, determine when such disposal will be available, and determine whether such wastes can be safely stored until they are disposed of (44 FR 61372; October 25, 1979). (See *1980 NRC Annual Report,* pp. 130-131.) This rulemaking was initiated in response to the decision of the U.S. Court of Appeals for the District of Columbia Circuit in *State of Minnesota vs. NRC,* but it also is a continuation of previous proceedings conducted by the Commission (42 FR 34391; July 5, 1977).

On May 16, 1983, the Commission published a draft decision on the proceeding, containing its findings on the issues involved, and issued a proposed rule amending 10 CFR Part 51, on consideration of environmental impacts associated with the post-operational storage of spent nuclear fuel. The Commission is currently reviewing public comments on the draft decision document and the proposed rule.

REGULATING LOW-LEVEL WASTE

Regulatory Development

In 1983, NRC made significant progress in the development of low-level waste regulations with the issuance of the final 10 CFR Part 61 rule, "Licensing Requirements for Land Disposal of Radioactive Waste." This rule became effective on January 26, 1983. Accompanying related changes to 10 CFR 20.311, on requirements to be met by waste generators when transferring waste for disposal, became effective on December 27, 1983.

Part 61 provides licensing procedures, performance objectives, and technical criteria for licensing facilities for the land disposal of radioactive waste. The rule establishes requirements for NRC licensees. (The development of this rule is described in the *1981 NRC Annual Report,* p. 86; and in the *1982 NRC Annual Report,* p. 81.)

In 1983, the NRC issued two technical position papers, one on waste classification, and one on waste form, to its licensees. Although the NRC staff is preparing Regulatory Guides in this same subject area, the technical position papers were issued to provide guidance to licensees in complying with the waste form and waste classification requirements of 10 CFR Part 20.

Low-Level Waste Licensing

As noted in earlier reports (see *1982 NRC Annual Report* p. 82), the NRC, the State of Washington and U.S. Ecology, the licensed operator of the low-level waste disposal facility at Hanford, Wash., have resolved the terms under which U.S. Ecology may accept special nuclear material (SNM). The NRC staff amended the SNM license in early 1983 and, since then, minor quantities of SNM have been buried at the site.

The disposal facility at Barnwell, S.C., accepted 1.2 million cubic feet of low-level waste in 1983. Approximately 10 percent of the waste received there is SNM.

There were no new licensing activities at the Sheffield, Ill., site. However, the NRC continued to analyze the health, safety, and environmental aspects of site closure. As reported in the *1982 NRC Annual Report* (p. 82), low levels of tritium (approximately 3 percent of the maximum permissible concentration) were detected off-site in January 1982. Following this, the NRC, the State, and the licensee, U.S. Ecology, developed and implemented a program to determine the extent and source of the tritium migration. In January 1983, an interagency technical working group comprised of representatives of the United States Geological Survey, NRC, U.S. Ecology, Illinois State Geological Survey, Illinois Department of Nuclear Safety, and the State Attorney General's Office determined that off-site tritium levels have not increased. During 1983, the operator, U.S. Ecology, continued negotiating with the State of Illinois to resolve the tritium issue. The NRC staff continued working with the operator to resolve the NRC technical requirements for site closure.

Assistance to Agreement States

During 1983, the NRC reviewed U.S. Ecology's site closure and decommissioning plan for its low-level waste

disposal facility at Hanford, Wash., and forwarded comments to the State of Washington. A site closure and decommissioning plan was required under both the State license for disposal of source and byproduct material and the NRC license for SNM. Minor technical assistance regarding low-level waste disposal was also provided to Texas and Colorado.

Other Activities

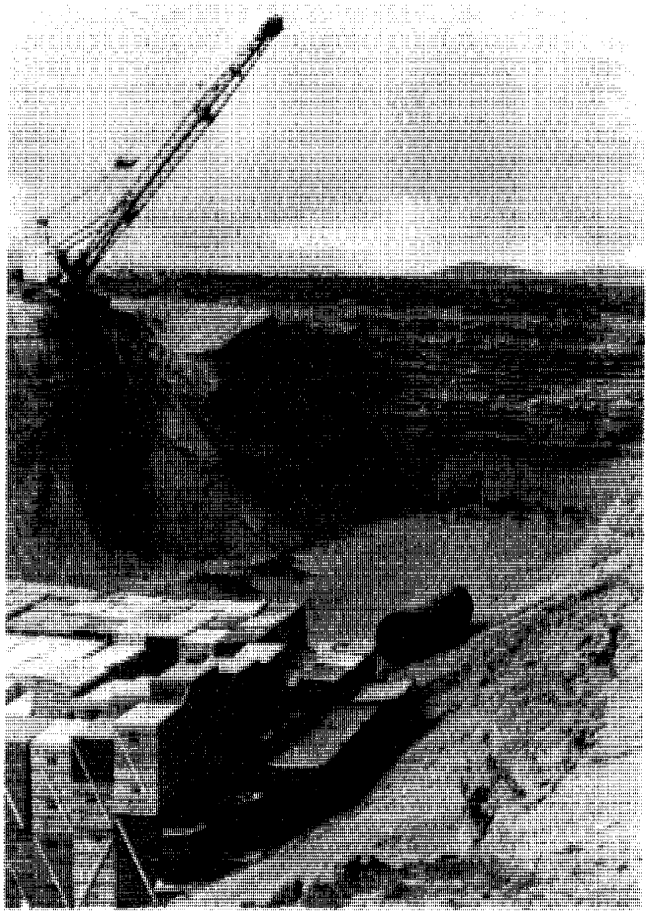
During 1983, the NRC continued the program, begun in 1981, to identify and characterize special waste packages for shippers of non-fuel cycle waste. Assessments were initiated for three generators: ICN Pharmaceuticals,' GE Vallecitos, and 3M Corporation. These efforts are expected to be completed in 1984.

An investigation was undertaken to determine the cause of an exothermic reaction that occurred in a dewatered resin bed at the Arkansas Power and Light Company's nuclear power station. The affected resin is being held on-site, pending the results of the investigation. Shipments of unaffected resin to disposal sites have been resumed and improved monitoring procedures have been implemented.

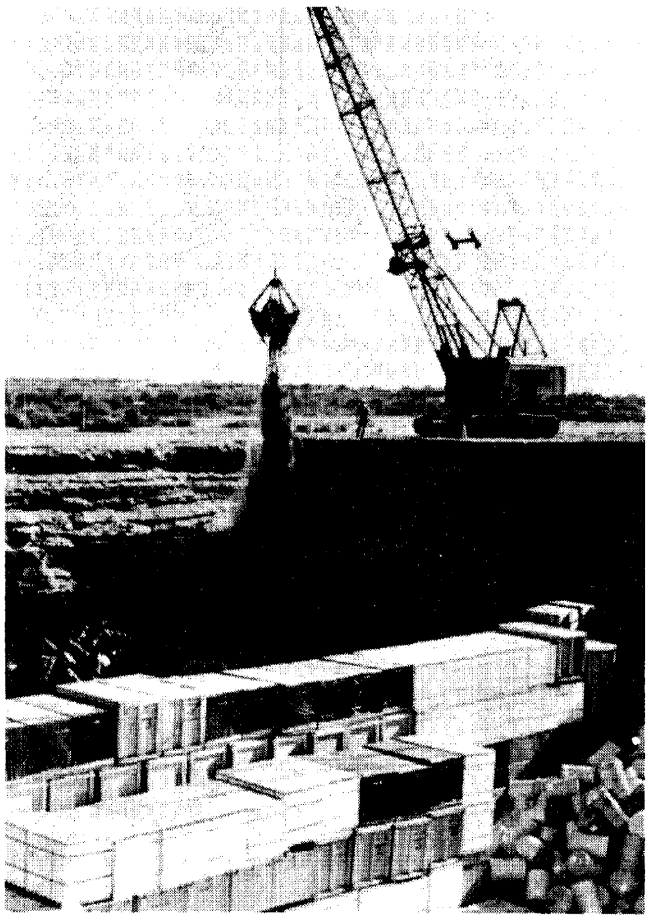
The tests referenced in the NRC technical position on waste form are being evaluated to assure their adequacy in determining whether waste shipments meet the stability requirements of 10 CFR Part 61.

URANIUM RECOVERY AND MILL TAILINGS

The NRC is responsible for ensuring that uranium recovery facilities are constructed, operated, and decommissioned in a manner that will protect the public health and safety and the environment. In October 1982, the Uranium Recovery Field Office (URFO) was opened in Denver, Colo., to improve NRC's responsiveness to the problems of uranium recovery regulation in the western states. By October 1983, the URFO was fully operational. The new office reports directly to the Region IV (Dallas) Administrator.



A dragline is used to excavate trench construction access ramp at the Hanford low-level waste disposal site. The horizontal stratigraphy allows the trench walls to hold firm.



Backfill is deposited to reduce the "void volume" of the low-level canisters. The stacked boxes contain low-level waste having low specific activity.

NRC Chairman Nunzio J. Palladino (second from left) cuts the ribbon officially opening the agency's Uranium Recovery Field Office in Denver, Colo., with an assist from Sen. Alan J. Simpson (R., Wyo.). At far left is John T. Collins, NRC Regional Administrator for Region IV (Dallas), and at far right is Dale Smith, Director of the Denver office. The ceremony took place on March 28, 1983.

Regulatory Development

During fiscal year 1983, the uranium recovery licensing program was affected by Congressional action prohibiting the use of certain portions of NRC's 10 CFR Part 40 regulations on source materials (see *1982 NRC Annual Report*, p. 83 for background). Congress mandated that the NRC suspend portions of its regulations on uranium milling and tailing disposal until the EPA promulgated its final standards under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). The EPA issued its standards in October 1983, and NRC has six months to conform its rule to the EPA standards. An NRC task group is currently working on this conformance activity.

During 1983, NRC staff continued work on regulatory guides on the following topics: site characterization techniques; methods for evaluating groundwater protection of tailings disposal sites; and the standard format and content for various applications and reports. Two final regulatory guides on occupational health and safety at uranium mills were published in 1983. Within the next few years, NRC plans to complete approximately 20 regulatory guides dealing with various aspects of tailings management.

Licensing Activities

Standard Review Plans (SRPs) for uranium recovery licensing were developed in 1983 to facilitate and to improve the consistency of the licensing process. The SRPs (in draft form) are currently being used by URFO on a trial basis. Comments from URFO regarding their use are expected by April 1, 1984.

In 1983, the URFO licensing staff issued one new license; began to review one additional license application; reviewed nine license renewals; completed four major license amendments; reviewed 10 additional amendments; and reviewed 274 minor or administrative amendments, operating facility safety and environmental data reports, and NRC inspection reports.

Of the 44 uranium recovery facilities licensed at the end of the reporting period, 15 were uranium mills; nine were heap-leach/ore buying stations or byproduct recovery facilities; 16 were research and development solution mining operations; three were commercial solution mining activities; and one was a facility with both uranium milling and commercial solution mining activities at the same site.

Technical Assistance to Agreement States on Uranium Recovery

During 1983, the Uranium Recovery Field Office was assigned responsibility for assisting Agreement States with their licensing actions when requested to do so, while the Headquarters office retained authority for resolving policy issues.

In support of the Agreement State programs, NMSS staff reviewed the licensing aspect of the regulatory programs of Washington in August, Texas in September, and New Mexico in November 1983. These reviews examined the States' programs for mills, commercial facilities, and research and development facilities.

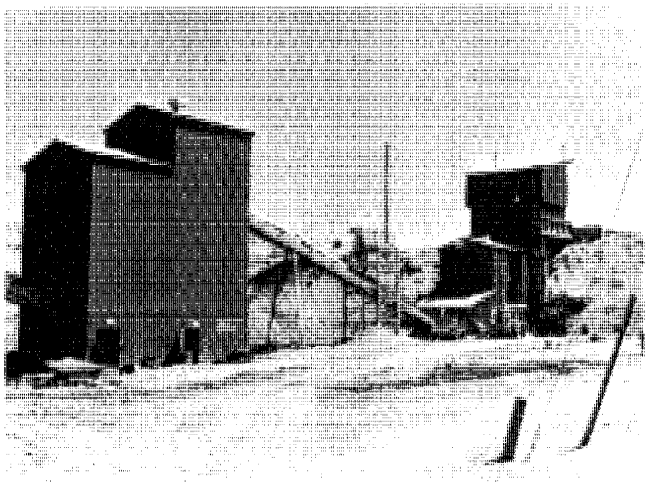
Remedial Action at Inactive Sites

NRC continued to review DOE's Uranium Mill Tailings Remedial Actions Program (UMTRAP) at inactive tailings sites as required by Title I of UMTRCA (see *1980 NRC Annual Report*, pp. 133-134).

In addition, NRC has reviewed and provided comments on draft environment assessments for sites at Ambrosia Lake, N.M.; Mexican Hat, Utah; Monument Valley, Utah; Naturita, Colo.; Spook, Wyo.; and Tuba City, Ariz. Comments have also been provided on the preliminary draft environmental impact statements for the Grand Junction site, and the draft statements for the Canonsburg and South Salt Lake City sites. The NRC provided concurrence on the final statement for the Canonsburg site, and a conditional concurrence for the final remedial action plan. This concurrence should allow DOE to initiate the first remedial action under the UMTRAP program in fiscal year 1984.

In 1983, over 100 radiological assessment reports prepared by NRC and the State of South Dakota on the Edgemont site were sent to DOE for use in the designation of vicinity properties at that site.

NRC has reviewed and provided comments on DOE's draft generic procedures for the designation and inclusion of vicinity properties in the remedial action program.



Uranium ore is fed through these primary and secondary crushers prior to processing at the Petrotomics Uranium Mill at Shirley Basin, Wyo.

During 1983, NRC also reviewed the draft UMTRAP Project Health and Safety Plan; the generic procedures for monitoring radon-222 in the vicinity of UMTRAP sites; and the procedures for the in-situ determination of radium-226, in soil based on above-ground gamma radiation exposure rates.

Inspection, Enforcement and Emergency Preparedness

CHAPTER 8

During Fiscal Year 1983, the Office of Inspection and Enforcement (IE) assumed a number of new responsibilities, while continuing to carry out its important activity in the areas of technical training, inspection program development, incident response and emergency preparedness. The Office, for example, took on the prime responsibility within the agency for Quality Assurance related items. IE continued the Performance Appraisal Team (PAT) inspections, Construction Appraisal Team (CAT) inspections, and Independent Design Inspection efforts. Plans for an expanded NRC Operations Center at a new location have been approved and the proposed move will take place in 1984. These subjects, and other activities of IE, are covered in this chapter under the following major subject headings: the Inspection Program, including vendor inspections and fuel faciltiies and materials licenses inspections, in addition to reactor plant inspections; the Appraisal Programs, including PAT and CAT activities; the Enforcement Program; Incident Response facilities and activities; and Emergency Preparedness.

Technical Training Program. NRC's Technical Training Center (TTC), located in Chattanooga, Tenn., has primary responsibility for the training of NRC employees in specialized reactor technology areas related to regulation, inspection, and enforcement. The TTC currently offers 71 different highly specialized technical training courses designed to give NRC inspectors the necessary technical background required to perform inspections at commercial nuclear power plants, fuel fabrication and byproduct utilization facilities, test and research reactors, and reactor manufacturing facilities. Although the courses are designed to provide specialized training to meet specific job requirements of NRC inspectors and engineers, participants come from all NRC offices. In addition, other government agencies, NRC contractors, and foreign nationals attend the programs when priorities permit.

In fiscal year 1983, the TTC presented a total of 1452 student weeks of instruction and added the following programs to the training curriculum: Quality Assurance Construction, Operations, and Modifications courses; Reactor Health Physics Technology courses; BWR and PWR Technical Managers courses; and B&W Technology courses. Training is conducted in conventional classrooms, scientific laboratories, nuclear power plants and reactor control room simulators at the NRC Technical Training Center and contractor locations throughout the United States.

INSPECTION PROGRAM

Quality Assurance

In 1983, organizational changes took place in the NRC which placed all regulatory responsibility related to quality assurance in the Office of Inspection and Enforcement. This move consolidated licensing, research and the inspection QA programs. Primary emphasis is being placed on preparing a report to Congress, mandated by the NRC FY 1983 Authorization Act, concerning means to improve the quality of nuclear power plants. The report is due to Congress in 1984.

Integrated Design Inspection Program

As part of the program to improve quality assurance at nuclear power plants, the NRC has developed and implemented Integrated Design Inspections (IDIs). The IDI provides a comprehensive examination of the design development and implementation for a selected sample on a given project. It encompasses the total design process, from the formulation of principal design and architectural criteria through the development and translation of the design and its revisions. The inspection concludes with on-site verification, on a sampling basis, of the design. The IDI integrates and augments selected activities of NRR, IE, the Vendor Inspection Program, and the regional affects. It is performed with a substantial amount of contractor assistance, and the results are conveyed to the appropriate regional and headquarters offices and used as input to the overall NRC assessment prior to issuance of the operating licensing.

Two IDIs have been performed to date at the Callaway (Mo.) and Byron (Ill.) Nuclear Power Plants. A third IDI is in progress at the Seabrook (N.H.) Nuclear Power Plant. An inspection report on the Seabrook IDI should be issued in early calendar year 1984.

Independent Design Verification Program

The Independent Design Verification Program (IDVP) was introduced into the process of reviewing nuclear

power plant operating licenses after a significant design problem was discovered at Diablo Canyon (Cal.) subsequent to low power licensing. The IDVP has normally involved a review of the design process, including a sample of design details, performed by an independent contractor hired by the applicant. The IDVP has often included elements of construction verification. The staff is embarked on an IE-directed program of inspections supplemented by its Integrated Design Inspection (IDI) Program to assure quality of design implementation by licensees. On January 1, 1984, IE will assume responsibility for the IDVP.

Operating Reactor Inspection Program

The operating reactor inspection program is developed by the Office of Inspection and Enforcement and is implemented by the regional offices. Table 1 shows the number and types of licensees inspected and the number of inspections performed during fiscal year 1983.

The program is performed by both region-based and resident inspectors. Region-based inspectors are specialists whose efforts include detailed inspections in such areas as plant operations, systems surveillance, maintenance, modifications, inservice inspection, fire protection, nondestructive testing, training, refueling, radiation protection, quality assurance, emergency planning, environmental protection, management systems, and security/ safeguards. Resident inspectors are generalists who concentrate on day-to-day operations, event followup, licensee management and staff performance. In addition, they coordinate on-site activities of various NRC offices and participate in emergency exercises. They also serve as the NRC contact with local officials, the press and the public.

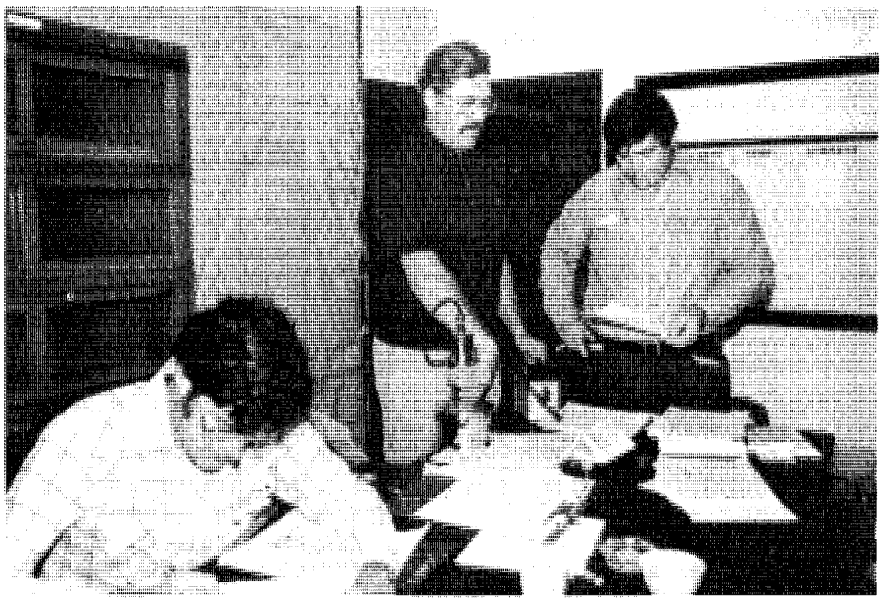
In 1983, NRC personnel monitored a number of the full-scale emergency preparedness exercises required annually. The exercises demonstrated that significant progress had been made in upgrading emergency preparedness.

Health physics and environmental protection efforts were devoted to followup on corrective actions by licensees as a result of the Health Physics Appraisals (see *1981 NRC Annual Report*, P. 90), licensee programs for minimizing routine radiation releases to levels as low as reasonable achievable (ALARA), and health physics-related TMI actions. Most licensees are developing formalized ALARA programs, and are also working toward meeting the TMI-related commitments.

Another NRC environment measurement program is the direct radiation monitoring network. Radiation detectors, called thermoluminescent dosimeters (TLDs), have been placed in the vicinity of all operating power reactors and those nearing construction completion. The TLDs are periodically replaced and analyzed to measure radiation present at that location. None of the TLD data analyzed to date has shown levels of radiation significantly above the natural background level.

Reactor Construction Inspection Program

The reactor construction inspection program is also carried out by regionbased specialists and resident inspectors. The region-based specialist and resident inspector address such things as welding and nondestructive examination, civil, mechanical, electrical and instrumentation engineering, preoperational testing, emergency preparedness, and environmental protection. The resident inspector applies more general experience in construction activities to assure that installations of equip-



NRC conducts technical training through more than 70 different specialized courses designed to give NRC inspectors the technical knowledge needed to perform inspections at commercial nuclear power plants, fuel fabrication and byproduct utilization facilities, test and research reactors, and reactor manufacturing facilities. NRC personnel from all offices participate, as do other government personnel, NRC contractor employees and foreign nationals.

Table 1. Inspections Conducted During FY 1983

Program	*Number of Licensees Inspected*	*Number of Inspections*
Power Reactor Construction	62	1,383
Operating Power Reactors	79	2,043
Other Reactors	41	70
Fuel Facilities	153	238
Materials	1,624	1,669
Vendors	131	275
Shipments	55	475

ment and structures are in accordance with design requirements and quality assurance procedures. The resident inspector has frequent contact with construction management personnel from the utility, architect engineer, constructor, vendors, and contractors. He reviews procedures, observes the work, and audits quality control. He may also participate in NRC hearings, licensing meetings and public discussions.

Supporting the region-based resident inspectors, NRC maintains a specially equipped mobile laboratory at its Region I (Philadelphia) office.

Vendor Inspection Program

The NRC vendor inspection program focuses on architect and engineering firms, nuclear steam system supplies and companies producing the piping, valves, pumps, electrical equipment and instrumentation for reactors and safety-related systems. More than 275 inspections of vendors were conducted during the report period, with emphasis on design verification, interfaces with plant site construction, and the development, verification, and use of computer codes.

These inspections have proven an efficient way to assess the quality assurance programs of vendors and also to assure that the generic aspects of discovered deficiencies are examined by the NRC.

The NRC also continued its efforts to recognize and use accreditation and inspection activities of third parties to supplement NRC direct inspections.

Fuel Facilities and Materials Licensee Inspection Program

The fuel facilities and materials licensee inspection program covers all safety- and safeguards-related activities at licensed fuel facilities —uranium mills, uranium conversion facilities, and fuel production plants, and materials licensees, firms dealing with source, byproduct, or special nuclear materials used in nuclear medicine, radiography, industrial testing, well-logging, and academic and other purposes, including handling and storage of radioactive wastes. Through State agreements, the NRC has delegated similar licensing responsibility to States. (See Chapter 9, "Cooperation With the States.") The program also involves inspections of nuclear fuel shipments, and shipments of other radioactive materials, as well as inspections of nuclear material exported from or imported into the United States. (See Chapter 10, "International Cooperation.")

During 1983, both the fuel facility and byproduct materials inspection programs were completed on a routine schedule. The number of operating fuel facilities declined during the period because of reduced demand for uranium concentrates and reactor fuel. Inspection of fuel facilities in a standby mode and those undergoing decommissioning has continued at the normal frequency.

Headquarters staff conducted assessments of the fuels and materials programs by accompanying inspectors at several types of facilities to determine the effectiveness of inspection procedures. Upgrading of inspection procedures was indicated and was near completion at the close of the report period.

In the interest of public health and safety, NRC personnel are monitoring the Department of Energy's West Valley Demonstration Project. The project will involve solidifying high-level liquid waste from decontamination of the West Valley, N.Y., reprocessing plant. Decontamination of the plant was nearly complete and testing of equipment to be used for treating high level radioactive waste had begun at the close of the report period.

During 1983, Wisconsin Electric Company (Point Beach facility) made 114 highway shipments of spent fuel

from the former reprocessing plant at West Valley, where the fuel had been shipped for storage in the 1970s. About 30 such shipments were also made by Commonwealth Edison (Dresden facility). Under a Federal court order in a case brought by the State of New York, it was required that these shipments be returned to the reactors from which they came. In addition to the shipments from West Valley, Wisconsin Electric also made 109 shipments from the Midwest Fuel Storage facility (Morris, Ill.) to Point Beach for storage.

All of the above spent fuel shipments generated intense public interest, including expressions of concern from several State governors. In response to those concerns, NRC inspectors from Regions I and III carried out Safeguards/Safety inspections of the shipments both at the point of origin and at final destination. (See discussion in Chapter 5.)

APPRAISAL PROGRAMS

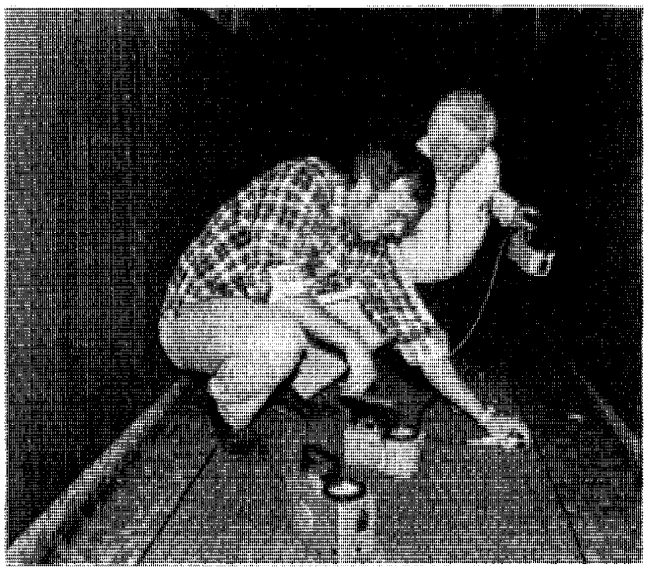
Systematic Assessment Of Licensee Performance

A program for the Systematic Assessment of Licensee Performance (SALP) is a component of the TMI Action Plan (NUREG-0660) aimed at improving both NRC regulatory efforts and licensee performance in the operation and construction of nuclear power facilities. In 1983, the regional offices made a major commitment to SALP, with assessments and licensee meetings at 85 nuclear power facilities. The program has been judged effective, both in drawing corporate officers' attention to weaknesses in their operations, and in helping NRC regional management plan and allocate inspection resources.

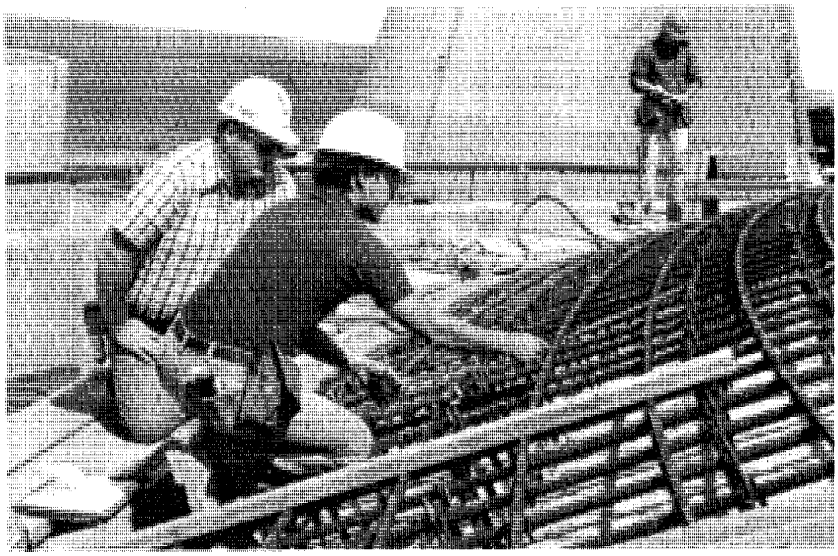
Appraisal Teams

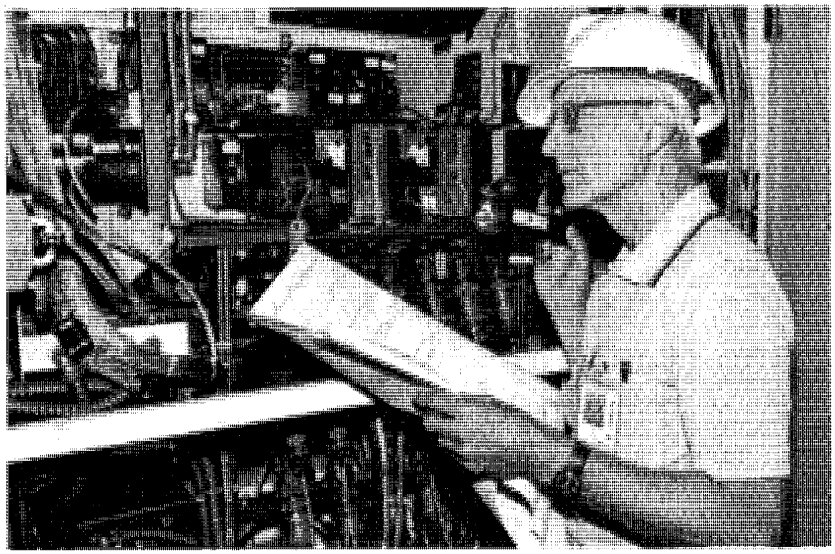
During 1982, the Performance Appraisal Team (PAT) inspection program was reduced, in recognition that similar evaluations are now carried out by the nuclear industry's Institute of Nuclear Power Operations (INPO). Independent NRC PAT inspections are now conducted at a few facilities each year, to provide an independent check on Regional Office effectiveness, and to judge the effectiveness of INPO. Members of the PAT periodically accompany INPO personnel during plant evaluations, and meetings are held several times each year to keep the NRC abreast of INPO activities.

In 1983, the Construction Appraisal Team (CAT) inspection program was continued with the goal of conducting four CAT inspections per year. INPO has developed criteria for evaluating nuclear plants under construction and the staff is evaluating the use of such criteria.

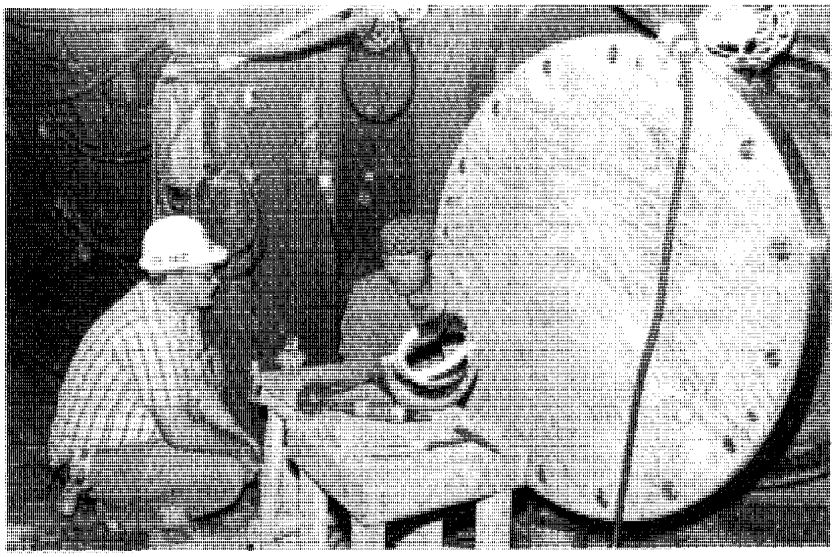


Radiation specialists from the Region III (Chicago) office and from the Ohio Disaster Services Agency inspected 12 businesses in the Hebron-Newark area for contamination which may have been tracked to these off-site locations by employees of the Shelwell nuclear materials plant. Of the 12 locations, three were found to have minor levels of contamination. At left, the inspectors are checking out a hot spot in an entrance-way carpet in a local restaurant. The carpeting was placed in a plastic bag and removed for decontamination. At right, the members of the NRC team review their survey findings in the mobile van set up by the State of Ohio on the perimeter of the plant site.





A Construction Appraisal Team (CAT) spent several weeks inspecting construction activity at the Perry nuclear power plant in Ohio during the report period. In the photo above, Howard Wong, an NRC reactor engineer in the Office of Inspection and Enforcement, measures the distance between reinforcing bars on the Unit 2 containment building. With him is Max Gildner, NRC resident inspector for the Perry facility. At left, Roger Rohrbacher, senior reactor engineer in the NRC Office of Inspection and Enforcement, inspects control room electrical equipment at the plant. Below, the resident inspector talks with a welder at Unit 2.



THE ENFORCEMENT PROGRAM

The purpose of the NRC's enforcement program is to protect public health and safety by ensuring that licensees comply with regulatory requirements. The program is carried out under the revised enforcement policy published last year (10 CFR Part 2, Appendix C, March 9, 1982). The policy calls for strong enforcement measures to encourage compliance and prohibits operations by licensees who fail to achieve adequate levels of protection.

The NRC uses three types of enforcement actions, described in detail in earlier annual reports (see the *1980 NRC Annual Report,* p.144). In summary, Notices of Violations are issued for all instances of noncompliance with NRC requirements. Civil penalties are issued in case of significant or repetitive noncompliance or when a Notice of Violation has not been effective. Orders to cease and desist operations, or to suspend, modify or revoke licenses are issued to cover extremely serious cases.

Certain headquarters enforcement functions have been regionalized. The regional administrators have always been authorized to issue Notices of Violation not involving civil penalties. They are also authorized to issue proposed civil penalties, with the concurrence of the Director of the Office of Inspection and Enforcement. The latter, however, remains responsible for all enforcement decisions and issues orders, including those imposing or proposing civil penalties.

Table 2 provides a listing and brief summary of the 72 civil penalty actions during fiscal year 1982. The amount of the proposed penalties totalled over $4.2 million. With some cases still pending and some of the penalties remitted or mitigated, a total of $3,055,650 in penalties had been collected at the close of the report period. Some of these were civil penalties proposed in fiscal year 1982.

Table 3 provides a description of the 10 enforcement orders issued during fiscal year 1983.

Bulletins and Information Notices

The NRC Office of Inspection and Enforcement issues Bulletins and Information Notices to licensees, including construction permit holders, to inform them of events that may have generic implications. Each of these issuances is based on events reported by licensees, NRC Inspectors, Agreement States, or others, where a preliminary evaluation indicates that the event may affect other licensees. A total of 81 NRC Information Notices were issued in fiscal year 1983, including two updates of previously issued Information Notices. (Table 4 lists all Information Notices issued in fiscal year 1983.) Information Notices provide information but do not require specific actions; they are rapid transmittals of information which may not yet have been completely analyzed by the NRC, but which licensees should be aware of. Licensees receiving an Information Notice are expected to review the information for applicability to their current and future licensed operations. If the information does apply, licensees are expected to take whatever action necessary to avoid the problem or hazard in the NRC Information Notice.

NRC Bulletins provide information about one or more similar events of significance and require that licensees take specific actions. The licensee reports back on actions taken or to be takn and provides information the NRC may need to assess the need for further action. Prompt response by licensees is required and failure to respond will normally result in NRC enforcement action. Prior to issuing a Bulletin, the NRC may seek comments from the nuclear industry. This technique has proven effective in generating faster and more informed responses from affected licensees. However, the nature of the problem and a need for timely action may limit such prior consultation. NRC Bulletins generally require one-time action and are not intended as substitutes for formally issued regulations or for imposed license amendments. In fiscal year 1983, the Office of Inspection and Enforcement issued nine Bulletins and one revision to a previously issued Bulletin. The subject of each of the Bulletins and the required licensee actions are summarized below.

(1) IE Bulletin 82-03 informed licensees of the degradation of the recirculation system piping, caused by stress corrosion cracking of welds, that was found in the Nine Mile Point Unit 1 Nuclear Generating Station (N.Y.). This represented a degradation of the reactor coolant pressure boundary and was therefore considered to have a high degree of safety significance. The bulletin, issued on October 14, 1982, required action by all operating BWR plants that were scheduled for refueling during the fall of 1982 or January 1983. These plants were required to (a) demonstrate the effectiveness of the detection capability of the ultrasonic methodology planned to be used to examine welds in the thick-wall recirculation system piping, (b) develop a sampling plan for the inspection to be conducted during the refueling outage and describe the basis for the plan, (c) provide results of the inspection, and (d) describe the corrective actions taken (if the inspections indicated the presence of cracks) prior to resuming power operation.

(2) Revision 1 to IE Bulletin 82-03 was issued on October 28, 1982 and clarified the definition of thick-wall recirculation piping.

(3) IE Bulletin 82-04, issued on December 3, 1982, informed construction permit (CP) holders and licensees about the potential generic safety issues regarding deficiences in primary contanment electrical penetration assemblies manufactured by Bunker Ramo Company. In summary, problems were identified with conductor terminations, with the conductors as they enter and exit the

Table 2. Civil Penalty Actions in FY 1983

Licensee	*Amount*	*Reason*
Consolidated X-Ray Service Dallas, TX EA 82-45	$4,000 proposed and imposed in FY82; $2,500 was imposed after a hearing and paid in FY83	Loss of radiography device in the public domain when it fell off the back of a truck. The radiography device was unlocked and had the key in the lock.
Nebraska Public Pwr District (Cooper) EA 82-46	$300,000 proposed in FY82; $112,000 was imposed and paid in FY83	Material false statement involving prompt notification system.
Sacramento Municipal Utility District (Rancho Seco) EA 82-50	$120,000 proposed in FY82; imposed and paid in FY83	Failure to recognize technical specification requirements and failure to properly evaluate alarms resulting in inoperable emergency diesel.
University of Michigan Ann Arbor, MI EA 82-51	$2,000 proposed in FY82; $1,500 was imposed in FY82 and paid in FY83	Failure to adequately evaluate radioactive material discharged to the environment resulting in airborne concentrations which exceeded 10 CFR Part 20 limits.
Duke Power Company (Oconee) EA 82-65	$44,000 proposed in FY82; imposed and paid in FY83	Failure to follow procedures and failure to follow NUREG-0737 requirements resulting in containment integrity violations. The civil penalty was increased due to the duration of the violation.
Iowa Electric Light & Pwr. (Duane Arnold) EA 82-90	$40,000 proposed in FY82; imposed and paid in FY83	Failure to test operability of emergency diesel; violation of a limiting condition for operation.
Consolidated Edison of NY (Indian Point) EA 82-91 & 100	$180,000 proposed and paid in FY83	Violation of technical specification requirements for operating pressure of boron injection tank. Card reader not terminated at access control point and security event not reported. Overexposure of two divers in the fuel pool from inadequate evaluation and surveys of radiation levels, improper transfer of fuel, inadequate instrumentation. The civil penalty for the security violation was increased due to the licensee's poor corrective action.
Illinois Power Company (Clinton) EA 82-93	$90,000 proposed and paid in FY83	Quality Control inspectors were sufficiently independent of cost and the licensee and contractor did not adequately document and implement a quality assurance program in the electrical area to comply with the requirements of 10 CFR Part 50, Appendix B. The civil penalty was increased due to multiple examples of the violation.
Arkansas Pwr & Light Co. (Arkansas One) EA 82-98	$5,000 proposed and paid in FY 83	Material false statement in response to IE Bulletin No. 83-06.
Carolina Pwr & Light Co. (Brunswick) EA 82-106	$600,000 proposed, imposed and paid in FY83	Failure to recognize technical specification requirements resulting in failure to perform numerous surveillance tests over a period of years.
GPU Nuclear (Oyster Creek) EA 82-108	$40,000 proposed and paid in FY83	Improper surveillance test and failure to return equipment to service following maintenance resulting in loss of isolation condenser and primary containment integrity violations.

Table 2. Civil Penalty Actions During FY 1983

(continued)

Licensee	*Amount*	*Reason*
Louisiana Power & Light (Waterford) EA 82-109	$20,000 proposed, imposed and paid in FY83	Safety-related piping and hangers were inadequately installed and improperly documented and these deficiencies were not identified prior to system turnover. The civil penalty was mitigated due to licensee-identification and reporting and corrective action.
Vermont Yankee Nuclear Power Corp. EA 82-112	$40,000 proposed and paid in FY83	Failure to recognize status of safety-related equipment and failure to report as required. Did not act as specified in the emergency plan.
Public Service Electric (Salem) EA 82-113	$40,000 proposed and paid in FY 83	Vital area barrier of insufficient strength.
Chemplex Company Rolling Meadow, IL EA 82-123	$500 proposed and paid in FY83	Inadequate control of radioactive material resulting in the loss or theft of the material.
GPU Nuclear (Three Mile Island) EA 82-134	$140,000 proposed in FY83; pending	Inadequacies in reactor operator retraining program. Material false statement (MFS) in licensed operator application for recertification. The maximum civil penalty was imposed for the MFS because it was submitted willfully.
St. Elizabeth Med. Ctr. Dayton, Ohio EA 82-125	$4,000 proposed and paid in FY83	Improper control of radioactive material resulting in the loss of the material.
Florida Power Corp. (Crystal River) EA 82-126	$50,000 proposed and paid in FY83	Inadequate compensatory measures for inoperable alam at protected area and vital area barriers. The civil penalty was increased due to multiple examples of the violation.
Tennessee Valley Authority (Browns Ferry) EA 82-130	$3,125 proposed and paid in FY83	Shipment of low specific activity radioactive waste with defective drums. The civil penalty was increased due to multiple examples of the violation.
Orion Chemical Company Provo, Utah EA 82-131	$500 proposed and paid in FY83	Refusal by the licensee to make available to an NRC inspector records of transfer. In addition, contamination was present in areas outside the licensee's premises, material receipt records were incomplete, and possession limits were exceeded.
Exam Company Tulsa, OK EA 82-133	6,400 proposed and paid in FY83	Failure to adequately survey resulting in the overexposure of a radiographer and an assistant radiographer.
Victoreen Inc. Cleveland, OH EA 82-135	$625 proposed and paid in FY83	Failure to provide shipping papers and labelling for a shipment containing radioactive material. The civil penalty was increased because the licensee failed to initiate prompt corrective action.

Licensee	*Amount*	*Reason*
Commonwealth Edison Co. (Braidwood) EA 82-136	$100,000 proposed, imposed, and paid in FY83	Licensee and its contractor did not adequately document and implement a quality assurance program to comply with the requirements of 10 CFR Part 50, Appendix B, and failed to report a quality assurance breakdown relative to the installation and inspection of mechanical safety-related equipment. The civil penalty was increased due to multiple examples of the violation.
Alabama Power Co. (Farley) EA 82-137	$40,000 proposed and paid in FY83	Failure to adequately follow procedures resulting in loss of containment spray system.
Commonwealth Edison Co. (Quad Cities & Dresden) EA 82-141	$100,000 proposed and paid in FY83	Failure to implement Quality Assurance recommendations involving failure of electromatic relief valves. The civil penalty was increased due to the duration of the violation.
Virginia Electric & Pwr (Surry) 82-143	$20,000 proposed and paid in FY83	Failure to restore system to operable condition following maintenance resulting in inoperable chemical addition system. The civil penalty was mitigated due to prompt identification and reporting.
Tennessee Valley Authority (Browns Ferry) EA 83-1	$40,000 proposed and paid in FY83	Visitor entered protected area without search, badging, registration, or escort.
Consumers Power Co. (Midland) EA 83-3	$120,000 proposed and $116,500 imposed and paid in FY83	Quality control inspectors were not documenting as nonconformances all of the deficiencies which they observed during their inspection, and the licensee and its contractor did not adequately implement a quality assurance program to comply with the requirements of 10 CFR Part 50, Appendix B. The civil penalty was increased due to the licensee's enforcement history and multiple examples of the violation. A $120,000 civil penalty was imposed and the licensee was given credit for a $3,500 overpayment on a previous civil penalty.
Commonwealth Edison Co. (Dresden) EA 83-4	$20,000 proposed and paid in FY83	Failure to follow procedures resulting in primary containment integrity violation. The civil penalty was mitigated due to prompt and extensive corrective action.
Energy Fuels Nuclear Denver, CO EA 83-5	$4,000 proposed and paid in FY83	Failure to adequately evaluate airborne concentrations resulting in the overexposure of workers.
Public Service Electric (Salem) EA 83-6	$20,000 proposed and paid in FY83	Failure to restore containment gaseous, particulate, and iodine radiation monitors to operation following modification. The civil penalty was mitigated due to prompt and extensive corrective action.
Philadelphia Electric Co. (Peach Bottom) EA 83-7	$140,000 proposed and paid in FY83	Failure to adequately follow procedures which resulted in violations of limiting conditions for operation concerning the number of operable steam line transmitters, one inoperable torus to reactor building vacuum breaker, and a violation of primary containment integrity.

Table 2. Civil Penalty Actions During FY 1983

(continued)

Licensee	*Amount*	*Reason*
Plateau Resources Ltd Grand Junction, CO EA 83-9	$4,000 proposed and paid in FY83	Failure to adequately evaluate airborne concentrations resulting in the overexposure of workers.
Pharmatopes, Inc. Cleveland, OH EA 83-10	$4,000 proposed and paid in FY83	Falsification of records. Test records indicated that certain radiation surveys and radioactive contamination wipe tests of incoming packages were performed when, in fact, the tests had not been performed.
Southern California Edison (San Onofre) EA 83-13	$120,000 proposed and paid in FY83	Violation of a limiting condition for operation involving operability of containment cooling system; failure to meet license requirements on operability of the post-accident sampling system; and failure to make a timely report of post-accident sampling.
Hospital Metropolitano San Juan, PR EA 83-14	$4,000 proposed and $2,500 was imposed in FY83; paid in FY84	Programmatic breakdown as indicated by twelve violations which included failure to utilize required equipment, failure to follow procedures, and failure to make proper survey.
Arkansas Power & Light (Arkansas One) EA 83-15	$20,000 proposed and paid in FY83	Failure to properly review and approve procedural changes during maintenance resulting in violation of a limiting condition for operation on the reactor building pressure indicators. The civil penalty was mitigated for prompt and extensive corrective action.
Niagara Mohawk Power Corp. (Nine Mile Point) EA 83-16	$100,000 proposed, imposed and paid in FY83	Quality Control inspectors were imposed and paidsigning off on work performed by trainees on the basis that the Quality Control inspector had actually performed the inspection.
Wisconsin Public Service (Kewaunee) EA 83-17	$60,000 proposed and $30,000 was imposed and paid in FY83	Failure to follow procedures resulting in violation of a limiting condition for operation involving all containment pressure sensing lines found capped inside containment. The civil penalty was initially increased due to the duration of the violation but was later mitigated for prompt and extensive corrective action.
Kansas Gas and Electric (Wolf Creek) EA 83-18	$40,000 proposed, imposed and paid in FY83	Failure to adequately control activities affecting the borated refueling water storage system and the auxiliary feedwater system prior to system turnover.
Commonwealth Edison Co. (Quad Cities) EA 83-19	$60,000 proposed and paid in FY83	Violation of a limiting condition for operation involving failure to maintain operability of one scram instrument channel in reactor protection system due to the failure to take corrective action on an annunciator in control room. The civil penalty was increased due to the duration of the violation.
Long Island Lighting Co. (Shoreham) EA 83-20	$40,000 proposed, imposed, and paid in FY83	Licensee's preoperational testing program, as implemented, did not assure that testing was performed in accordance with procedures or that test requirements had been satisfied.

Licensee	*Amount*	*Reason*
Gonzalez-Martinez Hospital Hato Rey, PR EA 83-21	$2,000 proposed, imposed, and paid in FY83	Unauthorized repairs on a teletherapy machine which compromised safety such that no physical restraints were in place to prevent inadvertent removal of the source.
Northern States Power Co. (Monticello) EA 83-22	$20,000 proposed and paid in FY83	Failure to follow procedures resulting in containment integrity violation. The civil penalty was mitigated due to prompt and extensive corrective action.
Public Service Electric (Salem) EA 83-84	$850,000 proposed and imposed in FY83; paid in FY84	Management control failures which resulted in an anticipated transient without scram occurrence.
Pennsylvania Pwr & Light (Susquehanna) EA 83-26	$60,000 proposed and paid in FY83	Failure to properly review and approve procedures resulting in inoperable standby gas treatment system. The civil penalty was increased because the condition went undetected and uncorrected for three shifts.
Commonwealth Edison Company (Zion) EA 83-29	$10,000 proposed, imposed, and paid in FY83	Unescorted access to protected area and vital area by individual requiring escort. The civil penalty was mitigated due to licensee identification and prompt and extensive corrective action.
Florida Pwr & Light Co. (Turkey Point) EA 83-31	$40,000 proposed and paid in FY83	Failure to perform adequate evaluations to ensure that the dose standards for workers exposed to radiation were not exceeded.
GPU Nuclear (Oyster Creek) EA 83-32	$40,000 proposed and paid in FY83	Inadequate closed circuit television coverage of portions of protected area barrier.
Advanced Medical Systems Geneva, OH EA 83-33	$4,000 proposed, imposed, and paid in FY83	Failure to adequately evaluate radiation doses and as a result a worker was overexposed.
Georgia Power Company (Hatch) EA 83-35	$40,000 proposed and paid in FY83	Failure to control repairs/modifications resulting in safety-related cable trays not restored to quality condition.
Virginia Electric & Pwr (Surry) EA 83-36	$40,000 proposed and paid in FY83	Serious weaknesses in three important areas of worker protection: internal dose monitoring, external dose monitoring, and procedural compliance. Inadequate evaluations were performed of airborne concentrations of radioactive material and inadequate evaluations were performed in determining the beta radiation dose to personnel in work areas. In addition, personnel failed to follow radiation protection procedures.
Standard Oil Co. (Indiana) Naperville, IN EA 83-37	$1,000 proposed and paid in FY83	Inadequate control of radioactive material resulting in the loss or theft of a source holder containing a 10-millicurie cesium-137 sealed source.
Maine Yankee Atomic Pwr Co. (Maine Yankee) EA 83-40	$40,000 proposed and paid in FY83	Failure to properly review and approve procedures resulting in a violation of a limiting condition for operation concerning an inoperable high pressure coolant injection system.

Table 2. Civil Penalty Actions During FY 1983

(continued)

Licensee	*Amount*	*Reason*
Duke Power Company (Oconee) EA 83-41	$180,000 proposed in FY83; penalty was fully remitted in FY84	Failures of management controls to verify safety system operability resulting in a violation of containment integrity. The civil penalty was increased due to prior notice and the licensee's enforcement history.
Jones & Laughlin Steel E. Chicago, IL EA 83-43	$1,000 proposed and paid in FY83	Failure to secure a Kay-Ray moisture gauge against unauthorized removal while it was in storage in an unrestricted area and failure to report the loss to the NRC in a timely manner.
Commonwealth Edison Company (Quad Cities) EA 83-44	$150,000 proposed and paid in FY83	Failure of management controls over safety-related activities. Control rod insertion sequence and normal shutdown procedures were not followed. The civil penalty was increased for multiple examples of the violation, enforcement history, and poor corrective action.
Mississippi Power & Light (Grand Gulf) EA 83-45	$40,000 proposed and $20,000 imposed and paid in FY83	Guard controlling access to a vital area was found asleep.
Philadelphia Electric (Peach Bottom) EA 83-46	$40,000 proposed and paid in FY83	Failure to follow procedures resulting in a violation of containment integrity.
Florida Power and Light (Turkey Point) EA 83-49	$100,000 proposed and paid in FY83	Failure to maintain auxiliary feedwater pumps in an operable condition. The civil penalty was increased due to the duration of the violation.
Branch Rad Laboratories Cranford, NJ EA 83-50	$3,000 proposed and paid in FY83	Failure to control access to high radiation area. The civil penalty was mitigated for prompt corrective action.
Commonwealth Edison Co. (LaSalle) EA 83-59	$60,000 proposed in FY83; imposed and paid in FY84	Failure to follow procedures when returning valves to service following surveillance. The civil penalty was increased for lack of effective preventive actions, and for multiple examples of the violation.
Dairyland Power Coop. (LaCrosse) EA 83-61	$40,000 proposed in FY83; pending	Violation of technical specification limiting condition of operation involving inoperability of safety-related equipment when a containment pressure sensing line was capped.
Calumet Testing Svs., Inc. EA 83-62	$4,000 proposed and paid in FY83	Failure to perform an adequate radiation survey after each radiographic exposure.
Texas Utilities Generating Co. Comanche Peak EA 83-64	$40,000 proposed in FY83; pending	Discrimination against member of the Quality Assurance/Quality Control organization.
Consumers Power (Palisades) EA 83-71	$20,000 proposed and paid in FY83	Failure to control access to the protected area. The civil penalty was mitigated due to prompt and extensive corrective action.
Commonwealth Edison Co. (Zion) EA 83-72	$40,000 proposed in FY83; imposed and paid in FY84	Failure to control access to protected area and vital area.

Licensee	*Amount*	*Reason*
George Washington University Washington, DC EA 83-73	$2,500 proposed in FY83; imposed and paid in FY84	Breakdown in management oversight and control of the radiation safety program. The civil penalty was increased due to poor corrective action.
Kay-Ray, Inc., Arlington Heights, IL EA 83-76	$1,800 proposed in FY83; paid in FY84	Radiation exposures in excess of regulatory limits.
University Hospitals of Cleveland EA 83-77	$2,000 proposed and paid in FY83	Failure to secure and control licensed material after it was removed from a patient.
Nuclear Metals, Inc. Concord, MA EA 83-79	$9,600 proposed in FY83; paid in FY84	Radiation exposures in excess of regulatory limits. The civil penalty was increased due to multiple examples of the violation.
Portland General Elec. Co. (Trojan) EA 83-85	$100,000 proposed in FY83; imposed in FY84; pending	Failure to comply with several fire protection requirements relating to separation of pending redundant trains of equipment.

modules, and with in-line butt splices. Specific inspections are required by the bulletin. For assemblies not yet installed, 100 percent inspection for the identified problems was required. For assemblies already installed, inspections on a sampling basis was permitted, with an expanded sample required if deficiences were found. Repair or replacement of defective assemblies is required.

(4) IE Bulletin 83-01, issued on February 25, 1983, informed CP holders and licensees of the failures of Westinghouse DB type circuit breakers with undervoltage trip attachments at the Salem Unit 1 plant (N.J.) and the resulting failure to accomplish an automatic reactor trip. This event is considered to have a very great safety significance. The bulletin required operating plants with Westinghouse DB type breakers using an under-voltage trip attachment in the reactor protection system to (1) perform a surveillance test of the undervoltage trip function within 24 hours, (2) review the maintenance program for conformance with the Westinghouse recommendations, (3) notify all licensed operators of the Salem event and review appropriate procedures with each operator, and (4) provide a report within seven days.

(5) IE Bulletin 83-02, like Bulletin 82-03, dealt with the problem of stress corrosion cracking in the welds of the BWR recirculation system piping. Bulletin 83-02, issued on March 4, 1983, informed licensees and CP holdersof the results of the inspections performed by plants that refueled during the fall of 1982. It required action by BWR plants scheduled for refueling outages during the period of February 1983 through January 1984. The actions were similar to those required by Bulletin 82-03 (See item (1) above) except the requirements to demonstrate the adequacy of the ultrasonic methodology was defined with greater specificity, and the minimum acceptable sampling plan was established.

(6) IE Bulletin 83-03, issued on March 11, 1983, informed licensees and CP holders about numerous incidents of failed check valves in systems important to safety. In particular, events at the Dresden and Quad Cities nuclear power stations were described during which check valve failures in the raw water cooling sytems for the diesel generators interrupted cooling water and resulted in the inoperability of the diesel generators. Licensees of operating plants were required to (1) review the In-Service Test program required by Section XI of the ASME Boiler and Pressure Vessel Code and modify it if necessary to include check valves in the diesel generator cooling water system, (2) include verification procedures to confirm the integrity of the check valve internals, and (3) provide a report to the NRC.

(7) IE Bulletin 83-04, issued on March 11, 1983, informed licensees and CP holders of additional failures of reactor system breakers in the reactor protection system that utilize an undervoltage trip attachment. For Bulletin 83-04, the breakers that had failed were General Electric Type AK-2. The bulletin required action of all PWRs except those that used Westinghouse DB type breakers (those licensees had been required to take action in response to IE Bulletin 83-01). The actions required were similar to those required by Bulletin 83-01.

(8) IE Bulletin 83-05, issued on May 13, 1983, informed CP holders and licensees of the results of NRC's investigation of allegations that the Hay-

Table 3. IE Orders Issued During FY 1983

Licensee	*Amount*	*Reason*
Isotope Measurements Labs, Inc., Northbrook, Illinois EA 81-32	February 22, 1983	Memorandum and Order Terminating Civil Penalty Proceeding **Reason:** Based on results of licensee's request for a hearing following issuance of Order Imposing Civil Penalties on October 22, 1981.
Midstate Testing Lab., Inc. Hammond, Indiana, EA 82-94	October 14, 1982	Order Revoking License **Reason:** Based on licensee's abandonment of its radiographic facility and its five radiographic exposure devices, three sealed radiographic sources, and a soil-moisture probe containing a radon-beta neutron source.
Arkansas Power & Light Co. (Arkansas Nuclear One) EA 82-98	January 18, 1983	Confirmatory Order Modifying License (Effective Immediately) **Reason:** To confirm corrective action previously proposed by licensee.
Radiognostic Imaging Affiliates of Va., Inc Nashville, Tennessee EA 82-105	October 26, 1982	Order to Show Cause and Order Further Modifying License (Effective Immediately) **Reason:** Based on licensee's response to an Order to Show Cause and Order Modifying License issued on August 27, 1982.
Carolina Power & Light Co. (Brunswick) EA 82-106	December 22, 1982	Confirmatory Order **Reason:** To confirm commitments made by licensee describing improvement program and implementation plan designed to ensure safety and operating efficiency; strengthen management control; reinforce discipline of operations, procedural compliance, and regulatory sensitivity; focus attention and resources on long-term needs; and ensure implementation of specific improvements.
Orion Chemical Co. Provo, Utah EA 82-131	October 26, 1982	Order Rescinding Order **Reason:** Based on licensee's response to an Order to Show Cause and Order Temporarily Suspending License (Effective Immediately) issued on Sepember 3, 1982.
American Testing Labs, Inc. Salt Lake City, Utah EA 83-47	June 10, 1983	Order to Sow Cause and Order Temporarily Suspending License (Effective Immediately) **Reason:** Based on licensee's willful noncompliance with NRC Requirements and willful materia false statements.
Pacific Armatechnica Corp. Santa Barbara, California EA 83-60	August 16, 1983	Order to Decontaminate (Effective Immediately) **Reason:** Based on use of licensed material at an authorized location.
Kay-Ray Incorporated Arlington, Heights, Illinois EA 83-76	August 15, 1983	Order Suspending License (Effective Immediately) and Order to Show Cause **Reason:** Based on several apparent overexposures of licensee employees.
Shelwell Service, Inc. Hebron, Ohio EA 83-96	September 20, 1983	Order to Show Cause and Order Temporarily Suspending License (Effective Immediately) **Reason:** Based on significant overexposures to at least three employees and contamination of onsite facilities and many offsite locations.

ward Tyler Pump Company (HTPC) failed to effectively implement its QA program. The bulletin required action by licensees and CP holders that intended to use HTPC ASME Code pumps or spare parts in systems important to safety. The actions required were to (1) provide a list of the affected pumps, (2) provide a summary of inservice test requirements, (3) conduct a pump performance test, including an endurance test having a minimum duration of 48-hours, and (4) provide results of the ASME Code hydrostatic pressure test. Users of spare parts were required to review and implement HTPC recommendations on replacement parts and pump assembly, and provide a summary of inservice test requirements.

(9) IE Bulletin 83-06, issued on July 22, 1983, informed reactor power and fuel facilities of potential generic safety problems resulting from nonconforming materials supplied by Tube-Line Corporation. Holders of operating licenses and construction permits were required to (1) determine if ASME Code materials had been furnished to their facility by Tube-Line, (2) either implement a program that demonstrates that the received materials were acceptable or replace the material, (3) provide a basis for continued operation for operating facilities that did not complete item (2) within 120 days, and (4) provide a report.

(10) IE Bulletin 83-07, issued on July 22, 1983, informed nuclear power reactor, fuel facilities, fuel cycle licensees, and Category B material licensees (processors and distributors) of apparently fraudulent materials provided by Ray Miller, Inc. The bulletin provided a comprehensive list of apparently fraudulent material provided to approximately 450customers of the Charleston, W. V. branch of Ray Miller, Inc. during the period 1975 through 1979. (The company ceased business in early 1980). The list was compiled by an NRC review of approximately 15,000 purchase orders. Reactor and fuel facilities wererequired to (1) review the NRC-provided list of customers that received fraudulent material to identify companies that were supplierso their facility, (2) determine if their facility received any of the fraudulent material, (3) determine whether the material had been installed or is still in stock, (4) evaluate the safety significance of fraudulent material installed in safety-related systems, and (5) discard, tag, or test apparently fraudulent material still in stock. For other material supplied by Ray Miller, Inc., still in stock (but not included in the list of apparently fradulent material), the licensees and CP holders were required to discard, tag, or test the material.

Bulletins are entered into regional office computerized tracking systems. Licensee responses to them are evaluated for adequacy and completeness, and and verified by direct observation during subsequent inspection. This verification is documented in NRC inspection reports. NRC Inspector verification is guided by written direction provided by the Office of Inspection and Enforcement.

While there is no requirement for regional office followup on Information Notices, such issuances are normally reviewed by resident inspectors for applicability to that plant, and discussed with licensee management, as appropriate.

The NRC inspector in the foreground is examining conditions under the spent fuel pool floor at Nine Mile Point Unit 2 in New York. IE Bulletin 82-03 informed licensees that stress corrosion cracking of welds found at the plant led to degradation of recirculation system piping. The phenomenon was judged to have a high degree of safety significance; operating boiling-water reactor plants were required to take preventive and/or corrective action. Among the actions required was a demonstration of the detection capability of ultra-sonic methods for examining welds in the thick-walled recirculation system piping.

Table 4. IE Information Notices Issued in FY 1983

Information Notice No.	*Subject*	*Date of Issue*	*Issued to*
80-35 Supp. 1	Leaking and Dislodged Iodine-125 Implant Seeds	10/6/82	Medical licensees holding specific licenses for human use of byproduct material in sealed sources
82-41	Failure of Safety/Relief Valves to Open at a BWR	10/22/82	All power reactor facilities holding an operating license (OL) or construction permit (CP)
82-42	Defects Observed in Panasonic Model 801 and Model 802 Thermoluminescent Dosimeters	11/5/82	All NRC licensees
82-43	Deficiences in LWR Air Filtration/Ventilation Systems	11/16/82	All power reactor facilities holding an OL or CP
82-44	Clarification of Emergency Plan Exercise Requirements	11/18/82	All power reactor facilities holding and OL or CP
82-45	PWR Low Temperature Overpressure Protection	11/19/82	All PWR facilities holding an OL or CP
82-46	Defective and Obsolete Combination padlocks	11/26/82	All facilities pursuant to 10 CFR Parts 50 and 70 and Part 95 applicable facilities
82-47	Transportation of Type A Quantities of Non-Fissile Radioactive Material	11/30/82	All NRC licensees
82-56	Robertshaw Thermostatic Flow Control Valves	12/30/82	All power reactor facilities holding an OL or CP
82-55	Seismic qualification of Westinghouse AR relay with latch attachments used in Westinghouse solid state protection system	12/28/82	All power reactor facilities holding an OL or CP
82-54	Westinghouse NBFD Relay Failures in Reactor Protection Systems	12/27/82	All power reactor facilities holding an OL or CP
82-53	Main Transformer at the North Anna Nuclear Power Station	12/22/82	All power reactor facilities holding an OL or CP
82-52	Equipment Environmental Qualification Testing Experience - Updating of Test Summaries Previously Published in IN 81-29	12/21/82	All power reactor facilities holding an OL or CP
82-51	Overexposure in PWR Cavities	12/21/82	All power reactor facilities holding an OL or CP
82-50	Modification of Solid State AC Undervoltage Relays Type ITE-27	12/20/82	All power reactor facilities holding an OL or CP
82-49	Correction for Sample Conditions for Air and Gas Monitoring	12/16/82	All power reactor facilities holding an OL or CP; research and test reactors; fuel facilities; Priority I materials
82-48	Failures of Agastat CR 0095 Relay Sockets	12/3/82	All power reactor facilities holding an OL or CP
83-01	Ray Miller, Inc.	1/26/83	All power reactor facilities holding an OL or CP
83-01, Supp. 1	Ray Miller, Inc	4/15/83	All power reactor facilities holding an OL or CP; fuel cycle licensees and Category B, Priority I material licensees

Information Notice No.	*Subject*	*Date of Issue*	*Issued to*
83-02	Limitorque H0BC, H1BC, H2BC, and H3BC Gearheads	1/28/83	All power reactor facilities holding an OL or CP
83-03	Calibration of Liquid Level	1/28/83	All power reactor facilities holding an OL or CP
83-04	Failure of ELMA Power Supply Units	2/18/83	All power reactor facilities holding an OL or CP
83-05	Obtaining Approval for Disposing of Very-Low-Level Radioactive Waste - 10 CFR	2/24/83	All production and utilization facities, including power, research and test reactors holding an OL
83-06	Nonidentical Replacement Parts	2/24/83	All power reactor facilities holding an OL or CP
83-07	Nonconformities with Materials Supplied by Tube-Line Corporation	3/07/83	All power reactor facilities holding an OL or CP
83-08	Component Failures Caused by Elevated DC Control Voltage	3/09/83	All power reactor facilities holding an OL or CP
83-09	Safety and Security of Irradiators	3/09/83	All irradiator licensees
83-10	Clarification of Several Aspects Relating to Use of NRC-Certified Transport Packages	3/11/83	All NRC-licensed reactor facilities and registered users of NRC-Certified transport packages
83-11	Possible Seismic Vulnerability of Old Lead Storage Batteries	3/14/83	All power reactor facilities holding an OL or CP
83-12	Incorrect Boron Standards	3/18/83	All power reactor facilities holding an OL or CP
83-13	Design Misapplication of Bergen-Paterson Standard Strut Restraint Clamp	3/21/83	All power reactor facilities holding an OL or CP
83-14	Dewatered Spent Ion Exchange Resin Susceptibility to Exothermic Chemical Reaction	3/21/83	All power reactor facilities holding an OL or CP
83-15	Falsified Pre-Employment Screening Records	3/23/83	All power reactor facilities holding an OL or CP
83-16	Contamination of the Auburn Steel Company Property with Cobalt-60	3/30/83	All material licenses
83-17	Electrical Control Logic Problem Resulting in operable Auto-Start of Emergency Diesel Generator Units	3/31/83	All power reactor facilities holding an OL or CP
83-18	Failures of the Undervoltage Trip Function of Reactor Trip System Breakers	4/01/83	All power reactor facilities holding an OL or CP
83-19	General Electric Type HFA Relay Contact Gap and Wipe Setting Adjustments	4/05/83	All power reactor facilities holding an OL or CP
83-20	ITT Grinnell Figure 306/307 Mechanical Snubber Attachment Interference	4/13/83	All power reactor facilities holding an OL or CP
83-21	Defective Emergency-Use Respirator	4/15/83	All power reactor facilities holding an OL or CP; research an test reactors; fuel cycle facilities and Priority I material licensees
83-22	Boiling Water Reactor Safety/Relief Valve Failures	4/22/83	All power reactor facilities holding an OL or CP
83-23	Inoperable Containment Atmosphere Sensing Systems	4/25/83	All power reactor facilities holding an OL or CP

Table 4. IE Information Notices Issued in FY 1983

(continued)

Information Notice No.	*Subject*	*Date of Issue*	*Issued to*
83-24	Loose Parts in the Secondary Side of Steam Generators at Pressurized Water Reactors	4/28/83	All power reactor facilities holding an OL or CP
83-25	Standby Gas Treatment System Heater High Temperature Trip Setpoint Adjustment	4/28/83	All power reactor facilities holding an OL or CP
83-26	Failure of Safety/Relief Valve Discharge Line Vacuum Breakers	5/03/83	All power reactor facilities holding an OL or CP
83-27	Operational Response to Events Concerning Deliberate Acts Directed Against Plant Equipment	5/04/83	All power reactor facilities holding an OL or CP
83-28	Criteria for Protective Action Recommendations for General Emergencies	5/04/83	All power reactor facilities holding an OL or CP
83-29	Fuel Binding Caused by Fuel Rack Deformation	5/06/83	All power reactor facilities holding an OL or CP
83-30	Misapplication of General Emergency Operating Procedures (EOP) Guidelines	5/11/83	All power reactor facilities holding an OL or CP
83-31	Error in the ADLPIPE Computer Program	5/19/83	All power reactor facilities holding an OL or CP; NSS suppliers, and AEs
83-32	Rupture of Americium-241 Source(s) Contained in a Well Logging Device	5/26/83	All NRC licensees holding a specific license to possess and use sealed sources containing byproduct SNM in well logging tools.
83-33	Nonrepresentative Sampling of Contaminated Oil	5/26/83	All power reactor facilities holding an OL or CP
83-34	Event Notification Information Worksheet	5/26/83	All power reactor facilities holding an OL or CP
83-35	Fuel Movement with Control Rods Withdrawn at BWRs	5/31/83	All BWRs holding an OL or CP
83-36	Impact of Security Practices on Safe Operations	6/09/83	All power reactor facilities holding an OL or CP
83-37	Transformer Failure Resulting from Degraded Internal Connection Cables	6/13/83	All power reactor facilities holding an OL or CP
83-38	Defective Heat Sink Adhesive and Seismically Induced Chatter in Relays Within Printed Circuit Cards	6/13/83	All power reactor facilities holding an OL or CP
83-39	Failure of Safety/Relief Valves to Open at BWR Interim Report	6/22/83	All power reactor facilities holding an OL or CP
83-40	Need to Environmentally Qualify Epoxy Grouts and Sealers	6/22/83	All power reactor facilities holding an OL or CP
83-41	Actuation of Fire Suppression System Causing Inoperability of Safety-Related Equipment	6/22/83	All power reactor facilities holding an OL or CP
83-42	Reactor Mode Switch Modifications	6/23/83	All BWR facilities holding an OL or CP
83-43	Improper Settings of Intermediate Range (IR) High Flux Trip Setpoints	6/24/83	All power reactor facilities holding an OL or CP
83-44	Potential Damage to Redundant Safety Equipment as a Result of Backflow Through the Equipment	7/01/83	All power reactor facilities holding an OL or CP

Information Notice No.	*Subject*	*Date of Issue*	*Issued to*
83-45	Environmental Qualification Test Of General Electric Company "CR-2940" Position Selector Control Switch	7/01/83	All power reactor facilities holding an OL or CP
83-46	Common-Mode Valve Failures Degrade Surry's Recirculation Spray Subsystem	7/11/83	All power reactor facilities holding an OL or CP
83-47	Failure of Hydraulic Snubbers as a Result of Contaminated Hydraulic Fluid	7/12/83	All power reactor facilities holding an OL or CP
83-48	Gaseous Effluent Releases of Radioactive Iodine-125 and Idone-131 in Excess of NRC Limits	7/14/83	NRC licensed byproduct material licensees, including medical and academic institutions, radio pharmaceutical suppliers, and industrial research
83-49	Sampling and Prevention of Intrusion of Organic Chemicals Into Reactor Coolant	7/25/83	All power reactor facilities holding an OL or CP
83-50	Failure of Class 1E Safety-Related Switchgear Circuit Breakers to Close on Demand	8/1/83	All power reactor facilities holding an OL or CP
83-51	Diesel Generator Event	8/5/83	All power reactor facilities holding an OL or CP
83-52	Radioactive Waste Gas System Events	8/9/83	All power reactor facilities holding an OL or CP
83-53	Primary Containment Isolation Valve Discrepancies	8/11/83	All power reactor facilities holding an OL or CP
83-54	Common Mode Failure of Main Steam Isolation Nonreturn Check Valves	8/11/83	All power reactor facilities holding an OL or CP
83-55	Misapplication of Valves by Throttling Beyond Design Range	8/22/83	All power reactor facilities holding an OL or CP
83-56	Operability of Required Auxiliary Equipment	8/26/83	All power reactor facilities holding an OL or CP
83-57	Potential Misassembly Problem with Automatic Switch Company (ASCO) Solenoid Valve Model NP 8316	8/31/83	All power reactor facilities holding an OL or CP
83-58	Transamerica Delaval Diesel Generator Crankshaft Failure	8/30/83	All power reactor facilities holding an OL or CP
83-59	Dose Assignment For Workers In Non-Uniform Radiation Fields	9/15/83	All power reactor facilities holding an OL or CP, research and test reactors, fuel cyc facilities, and material licensees.
83-60	Falsification of Test Results for Protective Coatings	9/22/83	All power reactor for faclities holding an OL or CP & nuclear fuel facility licensees
83-61	Alleged Use of Stand-Ins for Welder Qualification Tests	9/26/83	All power reactor facilities holding an OL or CP
83-62	Failure of Redundant Toxic Gas Detectors Position at Control Room Ventilation Air Intakes	9/26/83	All power reactor facilities holding an OL or CP
83-63	Potential Failures of Westinghouse Electric Corporation Type SA-1 Differential Relays	9/26/83	All power reactor facilities holding an OL or CP
83-64	Load Shielding Attached to Safety-Related Systems Without 10 CFR 50.59 Evaluations	9/29/83	All power reactor facilities holding an OL or CP

INCIDENT RESPONSE

Procedures

In February 1983, the NRC published final "Agency Procedures for the NRC Incident Response Plan" (NUREG-0845). These procedures describe the functions of the NRC during an incident and detail the kinds of actions that constitute an NRC response. Six individual supplements to NUREG-0845 — representing response procedures in each of the five regional offices and headquarters — also were compiled. In addition, NRC has participated with FEMA and other agencies in developing the Federal Radiological Emergency Response Plan (FRERP). This document identifies the authorities and responsibilities of each Federal agency having a significant role in a peace-time radiological emergency, and describes the manner in which each Federal agency will respond to such an emergency. In order to better coordinate the NRC and FEMA responses to a radiological emergency at a nuclear power plant, operational response procedures for the two agencies were developed and published as a joint document (NUREG-0981/FEMA 51). The NRC is also cooperating with FEMA in preparing an exercise to test the FRERP in March 1984. This Federal field exercise, the first of its kind, will involve the headquarters and regional components of 12 Federal agencies, a nuclear power utility, several state agencies, and local authorities.

Operations Center Upgrade

At all hours of the day and night, the NRC Operations Center is in direct contact by dedicated telephone lines with all of the operating commerical nuclear power plants and certain commercial nuclear fuel facilities in the United States. The Operations Center, located in Bethesda, Md., is the point of contact for receiving reports of significant events at licensed nuclear power plants and fuel facilities. The events telephoned into the Operations Center may have safety implications specific to that particular plant or may have generic safety implications for other plants.

In 1983, the Operations Center added specifically trained Operations Officers to the staff who are capable of performing initial events evaluation as soon as an event is received from a licensee. These Operations Officers are engineers and scientists who receive training in reactor systems and the Operations Center's procedures. Their reactor systems training is conducted at the NRC Technical Training Center in Chattanooga, Tenn., and includes a total of approximately 16 weeks of formal instruction in both boiling water and pressurized water reactors systems. Before being placed on shift in the continuously staffed Operations Center, each Operations Officer receives two weeks of training in the Operations Center's procedures and use of its specialized communications equipment. When not serving in the Operations Center, Operations Officers analyze events for generic safety significance.

The NRC Operations Center was subject to an extensive upgrading effort in fiscal year 1983. The effort included improved use of existing space and equipment; response team training and roles; technical team capabilities; and initial development of a central information management system. A functional design study, which included human factors considerations and improved response capability, is the basis for Operations Center upgrading. More extensive space and flexible design are provided in the new Operations Center, which will be operational by the spring of 1984. The new center will be a dedicated facility, strictly for NRC incident response purposes.

Progress has continued in the enhancement of technical team analytical capabilities, with particular emphasis placed on reactor safety. The results of reactor safety analyses are provided to protective measures team members, whose work on the Intermediate Dose Assessment System (IDAS) continues. This system will provide agency respondents with plant- and site-specific dose projections. IDAS will integrate assessments performed by licensees with independent staff evaluations and have the capability to assimilate environmental surveys. The capability will be accessible from the regional office and the site to ensure a consistent agency response to public inquiries. Full implementation of IDAS will take place when the upgraded Operations Center is completed.

Several exercises were held during fiscal year 1983. These exercises train response personnel and test new procedures and resources. Exercises range from a very limited regional office response to a licensee small-scale exercise, to the full-scale activation of all NRC resources, including participation by the NRC chairman, NRC headquarters and regional office staff, other Federal agencies, the licensee, and State and local government. There were three such full-scale exercises during the report period.

Regional Response Capability

Each of the five NRC regions has an Incident Response Center (IRC), a dedicated area from which the incident response activities at the regional office level are managed. Through IRC, primary communications can be established among the Regional Base Team, the NRC Operations Center in Bethesda, Md., the Site Team, and the nuclear plant site. (See the *1982 NRC Annual Report,* p. 102, for details.)

The regional-office level of response is based on predetermined classification of events and NRC response modes. For a more significant event, a Regional Base Team and a Regional Site Team are assembled. The base team monitors licensee performance, supports NRC

headquarters incident management, when appropriate, and coordinates response efforts until the site team arrives at the site of the event and is operational. The site team goes to the site and is responsible for coordinating the NRC's incident response activities there. By the end of 1983, all regional offices had tested their incident response capabilities by participating in at least one annual full-scale exercise at a nuclear plant site. The Regional Response Capability program was evaluated in each region by headquarters through an assessment program for which acceptable assessment criteria have been developed and implemented. Areas of concentration included procedures, equipment, information resources, training and exercises, regional organization and the Incident Response Center.

Immediate Notification Rule

On August 29, 1983, the NRC published in the *Federal Register* an effective rule regarding 10 CFR Part 50, "Immediate Notification Requirements of Significant Events at Operating Nuclear Power Reactors" (48 FR 39039). This rule is an amendment of an existing section of the Commission's regulations (50.72) which requires timely and accurate information from licensees following significant events at commercial nuclear power plants.

This rule is the basis for most of the telephone notifications to the continuously staffed NRC Operations Center. Experience with an earlier version of this rule, as well as public comments on the proposed revision of the rule, indicated that the rule should be amended to clarify reporting criteria and to require early reports only on matters relevant to the exercise of the Commission's responsibilities. The amended regulation clarifies the list of reportable events and provides the Commission with more useful reports regarding the safety of operating nuclear power plants.

EMERGENCY PREPAREDNESS

Support to Licensing Activities

The report period was a very active year for licensing activities. The staff was involved in the licensing process for a number of plants as the NRC center of expertise for the review and evaluation of proposed on-site emergency response plans for nuclear power plants applicants. The staff provided its evaluation of the adequacy of the on-site plans for inclusion in the Safety Evaluation Report and supplements thereto for each plant in near term licensing. The staff also took part in the licensing hearings before the Atomic Safety and Licensing Board Panels, and served on inspection teams performing appraisals of the applicant's implemented emergency preparedness programs and full-scale exercises.

Reviews of Non-Power Reactors

During fiscal year 1983, the staff initiated its review of the adequacy of emergency preparedness for non-power reactors. Using the "Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors" (NUREG-0849), the staff completed approximately 60 percent of the review and has started to perform appraisals of the licensee's implemented programs at sites with reactors rated at 2 MWe or greater, or where continued licensing and safe operation of the facility has been contested.

Emergency Response Facilities

In December 1982, the NRC clarified requirements and guidance for emergency response capability (in generic letter 82-33, Supplement 1 to NUREG-0737), especially requirements on location and operability of the permanent Emergency Response Facilities (ERFs) for all power reactor sites.

Members of the Region V (San Francisco) Emergency Response Team are briefed by Southern California Edison Co. officials during an emergency exercise at San Onofre Unit 2 on February 29, 1984.

Cooperation with the States

CHAPTER 9

NRC contacts with regional, State and local agencies for purposes other than inspection and enforcement or emergency planning are administered through NRC's Office of State Programs. (Certain aspects of NRC's State programs are being implemented by the Regional Offices under policies and procedures established by the Office of State Programs.) This chapter reports on activities in three major areas: the State Agreements Program; various liaison and cooperative programs; and financial protection and related concerns.

STATE AGREEMENTS PROGRAM

The Nuclear Regulatory Commission has agreements with 26 States by which those States have assumed regulatory responsibility over byproduct and source materials and small quantities of special nuclear material. At the end of 1983, Agreement States had issued about 13,200 radioactive material licenses; these represent about 64 percent of all the radioactive materials licenses in the United States. The Agreement States are shown on the map on the next page. (After the close of the report period—in November 1983—Utah Governor Matheson submitted a formal request for an agreement with NRC which, if approved, would become effective in early 1984.) The NRC State Agreements Program is implemented by the NRC Regional Offices in accordance with policies and procedures established by the Office of State Programs.

Review of State Regulatory Programs

The NRC is required by the Atomic Energy Act of 1954 to periodically review Agreement State radiation control programs and confirm that they are adequate to protect public health and safety and are compatible with NRC programs. The reviews follow the guidelines contained in a Commission Policy Statement published in the *Federal Register*, December 4, 1981. Any problems identified in these reviews are brought to the attention of State authorities with recommendations for corrective action. Twenty-two routine program reviews and one follow-up review were conducted in 1983. As part of the program review, the NRC technical staff accompanied State inspectors to State-licensed facilities to evaluate inspector performance and reviewed selected license and compliance casework in detail. One follow-up review of problem areas identified in a routine review was conducted in Nebraska in 1983 to assess the State's corrective actions. ntified in a routine review was conducted in Nebraska in 1983 to assess the State's corrective actions.

The overall results of the NRC reviews conducted during the report period indicate that the Agreement States continue to conduct effective regulatory programs. Periodic meetings are held with U.S. Department of Labor officials to exchange information and to keep them apprised of the status of Agreement State radiation control programs.

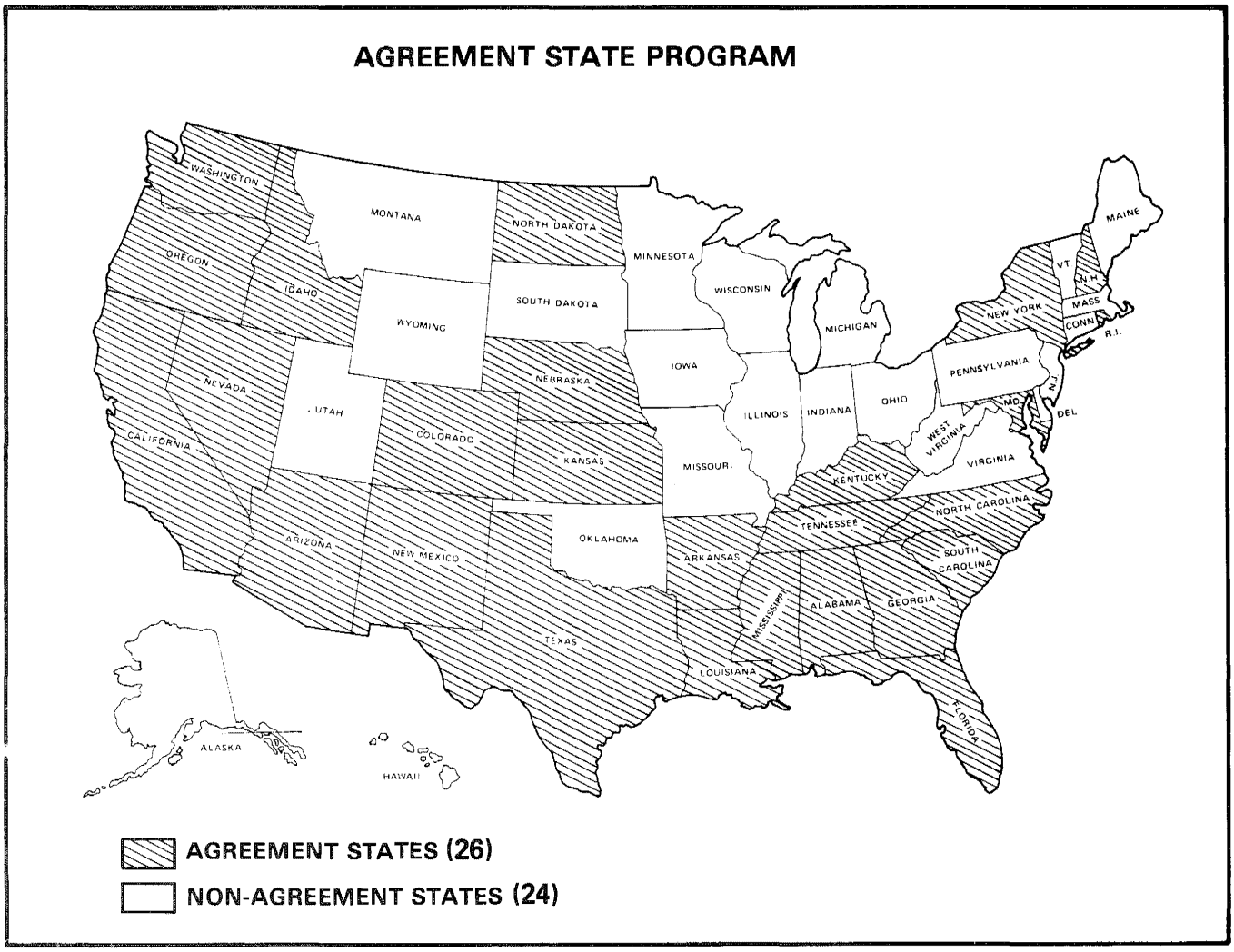
Special Study of the Agreement State Program

In January, 1983, the National Governors' Association (NGA) published a report of its study of the Agreement State program. The study had been contracted for by NRC and was the first examination of the program by a group outside of the government. (Notice of the availability of the report was published in the *Federal Register* and public comments were invited.)

The NGA report concluded that the program is one of the most successful State/Federal partnerships yet established and recommended its continuance and expansion. Some other recommendations contained in the report were:

- Authority should be sought for NRC to provide seed money to help States recover the costs of assuming Agreement State status.
- The Atomic Energy Act should be amended to authorize the regulation of radioactive materials not presently covered by the Act (naturally occurring and accelerator produced radioactive materials, or NARM).
- NRC's materials regulatory program should be subjected to a systematic performance review, using guidelines similar to those used for review of Agreement State programs.
- A certification or testing program should be established to examine the competence of industrial radiographers in radiation safety.

NRC staff plans to develop reports and recommendations for Commission consideration on seed money and



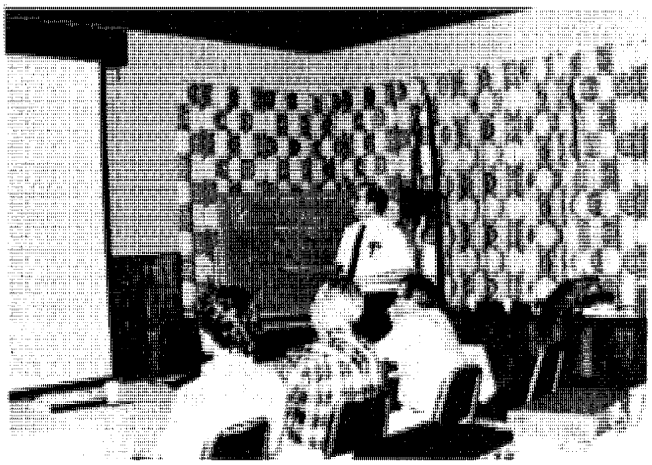
NARM regulation in fiscal year 1984. The Commission has directed the NRC staff to devise and implement a procedure to subject the NRC materials regulatory program to the same systematic review as that used for review of Agreement State programs. Together with State representatives, NRC staff is continuing to examine the available options for improving industrial radiography radiation safety performance.

NRC Technical Assistance to States

The NRC provided technical assistance to Agreement States during 1983 in the areas of licensing, inspection, enforcement and proposed statutes and regulations. Examples include assistance provided to Nebraska in the inspection of a broad academic license, to North Dakota in its evaluation of a license application for a dosimeter calibration facility, to Arizona in the evaluation of a broad license academic program, and to North Carolina in their evaluation of a license application for a large irradiator. In addition, the NRC filed an *amicus curiae* brief with a Texas appeals court regarding the importance of a State regulatory agency having authority to order the immediate suspension of licensee activities in order to protect health and safety. The issue was whether the Texas Department of Health must hold a hearing before suspending a license.

Training Offered by NRC

State radiation control personnel regularly attend NRC-sponsored courses to upgrade their technical and administrative skills and, thus, their ability to maintain high quality regulatory programs. In 1983, the NRC sponsored 16 short-term training courses, attended by 226 State personnel. Courses included health physics, industrial radiography safety, nuclear medicine procedures, orientation in licensing practices, inspection procedures,



NRC-sponsored courses—such as this one in inspection techniques—are regularly provided for State radiation control personnel.

biological effects of ionizing radiation, program management, teletherapy calibration, environmental monitoring and low level waste disposal site inspection. On-the-job training in licensing and compliance was provided to individual staff members in New Hampshire, Kentucky, New York, Maryland and Arizona.

Annual Agreement State Meeting

The annual meeting of Agreement State radiation control program directors, held in September 1983, covered a wide range of issues being faced by State personnel, including low-level waste, transportation, materials licensing and compliance, revision of regulations, health physicists' salaries and abnormal occurrences and incidents.

Regulation of Uranium Mill Tailings

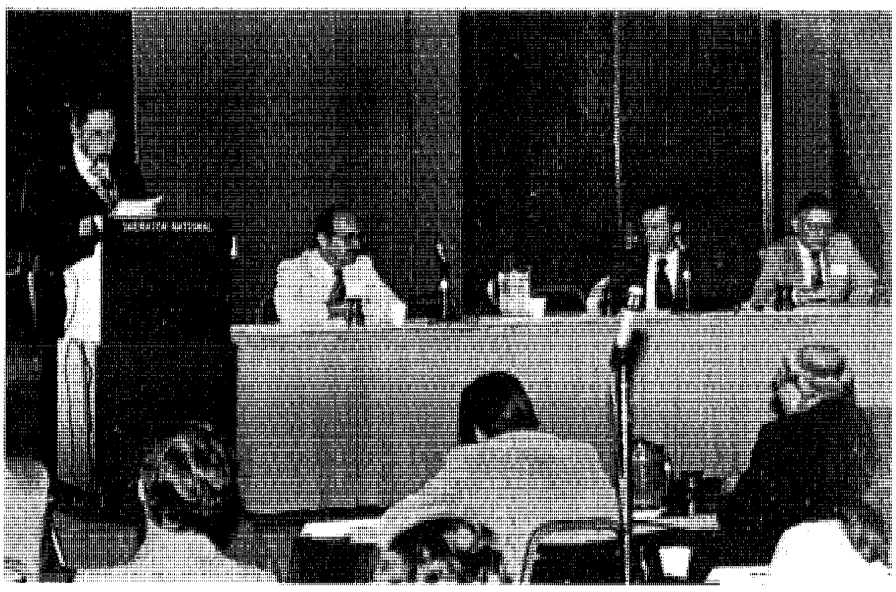
Washington, Colorado, Texas and New Mexico have active uranium milling operations. Pursuant to the Uranium Mill Tailings Radiation Control Act of 1978, as amended (UMTRCA), amended agreements with Washington, Colorado and Texas were consummated in 1982. An amended agreement with New Mexico will be pursued upon issuance of EPA and NRC regulations regarding uranium mill tailings as required by the UMTRCA.

As part of the periodic NRC review of the uranium mill tailings radiation control programs of these Agreement States, the geotechnical evaluations carried out by the States are reviewed by NRC geotechnical staff. Based on discussions with the State engineers, a review of their files, and a site visit, when appropriate, to the uranium milling facility, the NRC reviewer makes an assessment as to whether the State's procedures are compatible with NRC licensing guides. During fiscal year 1983, the NRC staff conducted assessments of the reviews of Uranium Mill Tailings Dams performed by the States of Washington, Colorado, and Texas.

Members of the NRC Dam Safety Committee have responded to requests from the Office of State Programs to assist in the training of Agreement State personnel. This training was directed to the field inspection of impoundments that retain uranium waste tailings and low-level radioactive waste systems. This year the training sessions were given in June 1982, near the Maxey Flats site in Kentucky.

Regulation of Low-Level Waste

A new regulation—Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61)—was promul-



NRC Chairman Nunzio J. Palladino addressed the annual meeting of Agreement State radiation control program directors. The meeting took place in September 1983 in Arlington, Va.

Illinois Geological Survey hydrologist Beverly Herzog and William B. Menczer, Region III (Chicago) Director of State and Government Affairs, are checking the tensiometers at the Infiltration Control Project in Sheffield, Ill. These devices measure soil moisture content at various depths to determine the effectiveness of trench covers at low-level radioactive waste burial sites.

gated on January 26, 1983. Related revisions to 10 CFR 20, dealing with waste manifest and form requirements, will become effective on December 27, 1983. Guidance has been provided to all Agreement States on the uniform implementation of the new requirements.

Technical assistance was provided to Washington, Nevada, South Carolinia, Texas, New Hampshire and California in their implementation of the new Part 61 provisions. The NRC is also assisting the Conference of Radiation Control Program Directors in developing suggested State regulations patterned after 10 CFR 61 for adoption by the Agreement States.

LIAISON AND COOPERATIVE ACTIVITIES

Low-Level Waste Compacts

In response to the Low-Level Radioactive Waste Policy Act, enacted in December 1980, the States continued their efforts to bring about workable interstate compacts that would provide for regional low-level waste disposal sites. As in the past, NRC supported the States in their efforts. Whenever possible, NRC Regional State Liaison Officers attended compact negotiating meetings as observers and as resource persons. In addition, they continued to meet with the newly formed Compact Commissions. Further, NRC set up workshops that allowed the compact groups and the unaffiliated States of California and Texas to understand more fully the implications on the new low-level waste disposal rule (10 CFR Part 61).

NRC has responded to the compact groups with comments and reviews of their compact language, when requested. NRC also participated in two national symposia on low-level waste compacts and provided Congressional testimony on the Northwest, Southeast and Central Compacts.

There are at least two major actions that remain to be taken by States. The first is the negotiation of interregional agreements between those regions with sites and those without sites for the interim disposal of waste after the cutoff date of January 1986, which is allowed under the Low-Level Radioactive Waste Policy Act. The second is the submission to Congress of the Rocky Mountain, Midwest and Northeast Compacts. Those that have been introduced during fiscal year 1983 are the Northwest, Southeast and Central Compacts.

Transportation Surveillance

During 1983 an analysis was conducted of the joint NRC/U.S. Department of Transportation (DOT) program to monitor the transport of radioactive material through and within the States during the period 1973-1982. The main objective of the analysis is to identify the most cost-effective inspection areas where enforcement actions might be taken by the States during their participation in the State Hazardous Materials Enforcement Development Program of DOT. Because this program involves all hazardous materials, the funding that can be allocated to radioactive material is, of necessity, only a small portion of the total funding. Based on lessons learned from the 1973-1982 surveillance program, these areas are low-level radioactive waste burial sites, airports and terminals that forward freight, and courier companies. Additional conclusions and recommendations are summarized in "State Surveillance of Radioactive Material Transportation, A Final Report" (NUREG-1015).

Memoranda of Understanding

NRC has entered into 15 Memoranda of Understanding (MOUs) with States since 1976, pledging cooperation in certain areas of mutual interest. The *1982 NRC Annual Report*, p. 106, reported on NRC's having signed two nearly identical MOUs with South Carolina and Washington, both regulators of major low-level radioactive waste disposal facilities. During 1983, under provisions of the MOU's, NRC-licensed low-level waste shippers were notified of several violations occurring in both States, and were advised by the NRC to comply with the State citations.

In November 1982, NRC entered into a Memorandum of Understanding with the Nebraska Department of Environmental Control providing for cooperation, and the avoidance of duplication, in the regulation of uranium milling in the State. Although Nebraska is an Agreement State, the Governor asked NRC to reassert its authority over the milling of uranium and the concentration of uranium from *in situ* mining in the State of Nebraska. The Nebraska Department of Environmental Control has authority under State law and the Federal Safe Drinking Water Act to regulate the water quality aspects of *in situ* uranium mining in Nebraska. The MOU provides for cooperation, sharing of information and avoidance of any duplication of effort.

State Liaison Officers

There are 51 Governor-appointed State Liaison Officers, representing all 50 States and the Commonwealth of Puerto Rico, who provide a contact for communication between the States and the NRC.

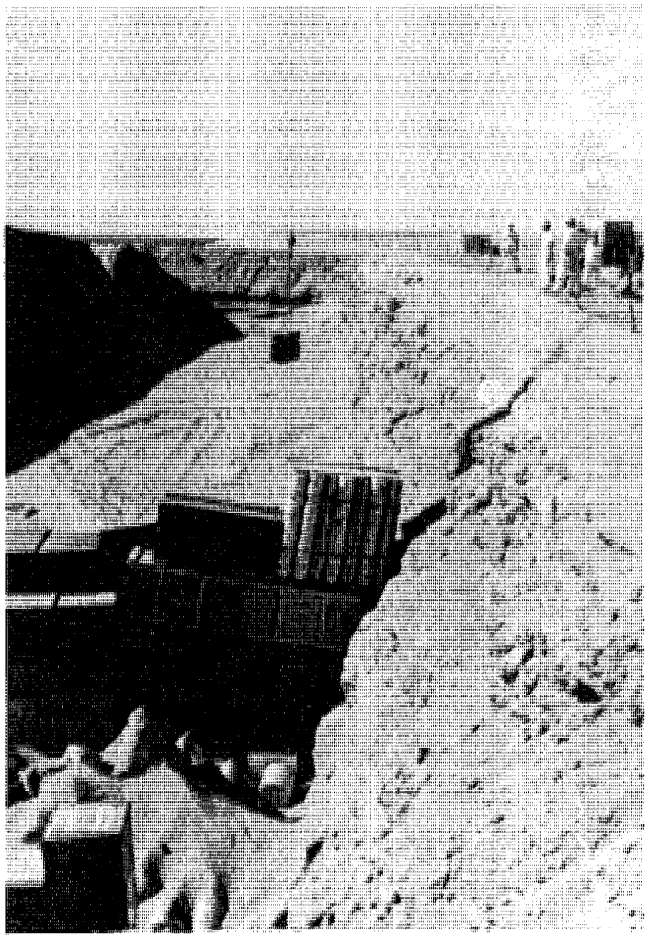
On a periodic basis, regional and national State Liaison Officers' meetings are conducted to keep the State Liaison Officers updated on major aspects of NRC's programs.

A regional meeting was held in NRC Region IV (Dallas) in April 1983. Subjects discussed at the regional meeting included regionalization, emergency preparedness, waste management, including low- and high-level waste, spent fuel shipments and notification, and other items of mutual regulatory interest.

INDEMNITY, FINANCIAL PROTECTION, AND NEED FOR POWER

The Price-Anderson System

NRC regulations implementing the Price-Anderson Act provide a three-layered system to pay public liability claims in the event of a nuclear incident causing personal injury or property damage.



Low-level nuclear waste disposal operations are shown at the Barnwell, S.C., facility (left) and a similar installation at Hanford, Wash.

The NRC has signed Memoranda of Understanding with both major waste disposal facilities defining various areas of cooperation.

The first layer requires all licensees of commercial nuclear power plants rated at 100 electrical megawatts or more to provide proof of financial protection in an amount equal to the maximum liability insurance available from private sources. Currently, this amount is $160 million.

The second layer provides a mechanism—payment of a retrospective premium— whereby the utility industry would share liability for any damages exceeding $160 million that result from a nuclear incident. In the event of such an incident, each licensee of a commercial reactor rated at 100 electrical megawatts or more would be assessed a prorated share of damages up to the statutory maximum of $5 million per reactor per incident. Presently, the secondary financial protection layer is $410 million (i.e., 82 power reactors rated in excess of 100 MW(e) licensed to operate x $5 million/reactor).

The third layer—Government indemnity—had equaled the difference between the $560 million limit of liability and the sum of the first and second layers. Government indemnity for reactors was phased out for large power reactors, however, on November 15, 1982 when the sum of the first and second layers totaled $560 million. The limit of liability for a single nuclear incident now increases without limit in increments of $5 million for each new commercial reactor licensed.

Price-Anderson Renewal Study

The staff has submitted to the Commission, for transmittal to the Congress, a detailed report concerning the need for renewal or modification of the Price-Anderson Act, which will expire on August 1, 1987. (For background, see the *1982 NRC Annual Report*, p. 107.) The report is divided into four sections with detailed subject reports appended to the main report.

Sections I through III include an examination of issues that the Commission was required by statute to study (i.e., condition of the nuclear industry, state of knowledge of nuclear safety, and availability of private insurance), and discussion of other issues of interest and importance to the Congress and to the public. Some of these issues are: (1) overview of the Price-Anderson system; (2) availability of private insurance; (3) causality and proof of damages (i.e., the problem of proving that a certain personal injury was caused by a nuclear incident); and (4) a proposal that would provide for removal of the limitation of liability but with annual liability limits. Section IV of the report provides for conclusions and recommendations to Congress.

Amendments to 10 CFR Part 140

In the *1982 NRC Annual Report* (p. 107), it was reported that the Commission had decided to remove Appendix A and other appendices from 10 CFR Part 140 and publish them as Regulatory Guides. Appendix A contains the Facility Form of nuclear energy liability policy furnished by certain licensees as evidence of financial protection. The Commission had decided that, because of the level of detail in the Facility Form policy and the fact that this policy was just one possible acceptable form (rather than the one required form), it would be more appropriate to publish Appendix A as a Regulatory Guide.

After further consideration, however, the Commission decided to modify its earlier position and to continue to publish Appendix A and the other appendices in 10 CFR Part 140, with certain clarifying statements added to Appendix A. The clarifying statements stated that the text of the Facility Form policy or amendatory endorsements to the policy were merely examples of contracts that the Commission considered acceptable as proof of financial protection, and that other versions of the text would also be considered. This new language removed the impression that the Commission would only accept contracts cast in the language in the text of the Facility Form as proof of financial protection.

Indemnity Operations

As of September 30, 1983, 135 indemnity agreements with NRC licensees were in effect. Indemnity fees collected by the NRC from October 1, 1982 through September 30, 1983 totaled $2,114,561. Fees collected since the inception of the program total $25,307,402. Future collection of indemnity fees will be lower since the indemnity program has been phased out for commercial reactor licensees. No payments have been made under the NRC's indemnity agreement with licensees during the 26 years of the program's existence.

Insurance Premium Refunds

The two private nuclear energy liability insurance pools—American Nuclear Insurers and the Mutual Atomic Energy Liability Underwriters—paid to policyholders the 17th 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 for either payment of losses or ultimate return to policyholders. The amount of the reserve available for refund is determined on the basis of loss experience of all policyholders over the preceding 10-year period. Refunds paid in 1983 totaled $3,250,246—approximately 38.7 percent of all premiums paid on the nuclear liability insurance policies issued in 1973 and covering the period 1973-1983. The refunds represent 52.7 percent of the premiums placed in reserve in 1973.

Property Insurance

The NRC staff is preparing a new property insurance rule based on comments received on the advance notice of

proposed rulemaking published June 24, 1982 and revisions of a draft proposed rule by the Commission. (For background see the *1982 NRC Annual Report*, p. 108). As indicated by property insurance reports from commercial reactor licensees submitted for the first time on April 1, 1983, over 64 plants are insured for $983 million, the current maximum amount of property insurance generally available at that time. Another nine plants carry at least $915 million. During 1983, four exemptions from excess property insurance requirements were granted to licensees of four small plants; one exemption request was denied.

Need for Power and Alternative Energy Sources

The NRC continues to encourage State evaluations of need for power at the construction permit stage which meet a standard such that reliance can be placed on them in NRC proceedings. (For background see the *1982 NRC Annual Report*, p. 109). NRC efforts to familiarize States with NRC procedures and to assist States in improving standards were not as great in 1983 as in previous years. This is both because of higher priorities for NRC funding and lack of new construction permit applications.

STATUS OF TMI-2 FACILITY

Financial Aspects of Cleanup

Funding by GPU. (For background, see the *1982 NRC Annual Report* pp. 109-110). There are several actual or potential sources of funds available to the operator of the Three Mile Island (TMI) plant—General Public Utilities Corporation (GPU)—for TMI-2 cleanup. As of early October 1983, approximately $30 million of unused insurance proceeds remained to meet cleanup funding. Based upon the pace of cleanup activity, it is projected that $14 million will remain at the end of 1983.

Revenues allowed through rates to be applied to cleanup expenditures are being collected by GPU's three operating subsidiaries. The cleanup allowances have been established by the Pennsylvania Public Utility Commission (PaPUC) for Metropolitan Edison Company and Pennsylvania Electric Company, and by the New Jersey Board of Public Utilities (NJBPU) for Jersey Central Power and Light Company. The combination of ratepayer funds in both States amounts to approximately $34 million annually to be applied to cleanup. As of late October, cleanup funds collected from ratepayers were being held in an escrow account in New Jersey, unavailable for actual expenditure on the cleanup. NRC was informed that release of the funds to GPU in New Jersey was dependent on NJBPU's review and appraisal of a September 1983 NRC report on GPU's management of the cleanup. Pennsylvania ratepayer funds are being spent on cleanup. GPU's revolving short-term credit agreement with a consortium of banks has been renewed through early 1985. Funds available from the banks may be used to pay cleanup expenditures on an interim basis pending refinancing by other permanent sources of cleanup funds. During 1983, GPU improved its cash flow position to an extent that borrowing under the revolving credit agreement fell substantially below the levels necessary in previous years and well below approved borrowing limits.

Proposals for Sharing Costs. The cost-sharing plan for financing the TMI-2 cleanup proposed by Pennsylvania Governor Richard Thornburgh in July 1981 continues to be the plan endorsed by a majority of the suggested contributors. Major efforts continued in 1983 by the suggested contributors to secure commitments from funding sources, particularly for 1983 and 1984. The Edison Electric Institute (EEI) introduced a cost-sharing plan in 1983 to its investorowned electric utility members nationally. Efforts continued throughout 1983 to achieve a minimum of $100 million in aggregate pledges from the members, aiming toward a goal of $150 million. By the end of October, 1983 pledges totalling $65 million had been obtained. According to the EEI Plan, individual pledges by utility companies would become binding only when the aggregate of all pledges reached $100 million. The Electric Power Research Institute, an industry organization, provided about $500,000 in 1983, in support of research relevant to the TMI-2 cleanup.

The Federal Government, through the Department of Energy (DOE), is a contributor to cleanup funding by virtue of its agreement to accept TMI's highlevel waste for permanent disposal and to fund research at TMI-2. DOE's 1983 contribution is expected to amount to approximately $13 million. There is support in Pennsylvania and New Jersey for annual State appropriations to the cleanup of approximately $5 and $2 million, respectively. GPU received such a contribution from Pennsylvania in 1983 and both States have approved the contribution in their 1984 budgets.

The NRC continues to monitor the financial condition of the GPU companies as well as their efforts to secure TMI-2 cleanup funds from a variety of sources. The Thornburgh Plan requires the participation of each source. A substantial shortfall by any major source could put the cleanup funding in jeopardy.

International Programs

CHAPTER 10

NRC's program for international activities was highlighted in fiscal year 1983 by the resumption of U.S. interaction with the International Atomic Energy Agency (IAEA), and by continuing concerns with matters related to improving worldwide nuclear health and safety, and ensuring against further nuclear explosives proliferation.

During fiscal year 1983, the NRC:

- Renewed bilateral arrangements with Israel and Taiwan, two of the Commission's 21 partners in international exchange of reactor safety information and regulatory cooperation.
- Arranged meetings for 375 visitors from 28 countries and four international organizations.
- Provided on-the-job training for 14 regulatory staff members from 10 foreign countries.
- Improved acquisition of reactor operating information from foreign countries and its utilization in the U.S. domestic nuclear safety program.
- Issued 328 export licenses and 69 amendments to existing licenses and consulted with the Executive Branch on 183 export-related actions.
- Continued to support domestic and international efforts to develop and operate the nuclear fuel cycle in ways that minimize the risk of nuclear proliferation.
- Worked closely with the Executive Branch to assist the International Atomic Energy Agency in strengthening international safeguards.

Bilateral Arrangements

In mid-1974, the NRC began a program for the exchange of technical information and cooperation in nuclear safety affairs with other countries. Limited at first to those countries which had made major commitments to light water reactor technology, the program was soon expanded to include countries with developing nuclear power programs as well as those with firm plans to enter the field. These arrangements are intended to establish official communications channels on reactor safety problems, and to provide a network for cooperation and a vehicle for U.S. assistance in health and safety matters, particularly in countries importing U.S. reactors and other equipment.

NRC now has bilaterial exchange arrangements with 21 nuclear regulatory authorities: Belgium, Brazil, the People's Republic of China, Denmark, Egypt, Finland, France, the Federal Republic of Germany, Greece, Israel, Italy, Japan, Korea, Mexico, the Netherlands, the Philippines, Spain, Sweden, Switzerland, Taiwan, and the United Kingdom. Two of these—Israel and Taiwan—were renewed in 1983. NRC also resumed active arrangement negotiations with both Argentina and Yugoslavia this fiscal year.

NRC's bilateral arrangements call for the exchange of regulatory information via technical reports, correspondence, newsletters, meetings, and training courses, and, in some cases, for cooperation in reactor safety research or for exchanges of personnel and/or joint nuclear programs. They cover a five-year period, and may be extended by written agreement.

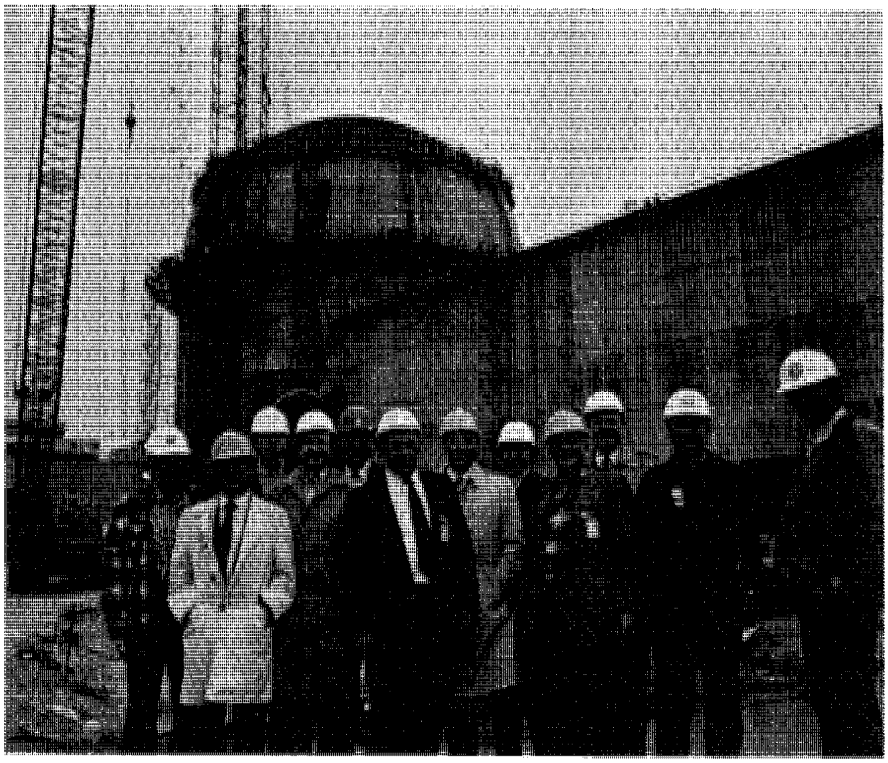
Foreign Visitors and Training Assignees

Delegations and individuals from 28 countries and four international organizations visited NRC in 1983 for discussions that frequently included visits to nuclear facilities and Department of Energy (DOE) national laboratories. These discussions examined safety and policy concerns experienced in the U.S. and abroad, including those dealing with pressurized thermal shock, steam generator integrity, operator licensing, probabilistic risk assessment, emergency preparedness, waste management, and evaluation of operational data.

On-the-job work/training experience continued to be of interest to foreign regulatory organizations. Assigned to work with NRC staff members were fourteen foreign regulatory staff members from ten countries: Belgium, Finland, France, Israel, Italy, Japan, Korea, the Philippines, Portugal, and Turkey.

Resumption of U.S. Participation in the IAEA

The reassessment of U.S. policy regarding participation in the International Atomic Energy Agency (IAEA) was completed early in 1983. Following an announcement by the U.S. Representative at the February meeting of the IAEA Board of Governors, U.S. Government agencies resumed full cooperation with the IAEA. NRC be-



Delegations and individuals from 28 countries and four international organizations visited the NRC in 1983 for information exchange and discussion. Visitors from France are shown on their tour of the South Texas Nuclear Project, a facility of the Houston Lighting & Power Co., in March of 1983.

came active again in working groups on nuclear safety and safeguards topics, technical assistance missions and personnel assignments in developing countries, and safety and safeguards training activities, including the placement of IAEA Fellows in NRC and its contractor organizations.

Cooperation with the OECD

In June 1983, Chairman Nunzio J. Palladino and Executive Director for Operations William J. Dircks attended a special meeting of heads of the nuclear regulatory authorities of the most advanced nuclear power countries of the 24-nation Organization for Economic Cooperation and Development (OECD). The meeting—which was held near Paris, France—was sponsored by the OECD Nuclear Energy Agency (NEA) and afforded the participants an opportunity for informal discussions of nuclear safety issues and continuing cooperation in joint research and licensing-related studies and consultations.

Under the Chairmanship of NRC Executive Director for Operations William J. Dircks, the OECD/NEA Committee on the Safety of Nuclear Installations (CSNI) and its five principal working groups carried out an active program of meetings and joint activities to exchange and evaluate incident reports and other licensing-relevant data, to discuss current safety issues, and to coordinate safety research efforts. A meeting on station blackout and decay heat removal, sponsored by the principal working group on transients and breaks, and a joint NEA-IAEA meeting on assessment of incidents in nuclear power plants, sponsored by the principal working group on operational experience and human factors safety, were among several CSNI technical meetings of special interest to NRC in 1983.

NRC staff also participated in non-CSNI efforts of the NEA in the areas of waste management, legal affairs, and radiation protection. In the latter area, Richard E. Cunningham, Director, Fuel Cycle and Material Safety, NMSS, NRC, was elected chairman of the Committee on Radiation Protection and Public Health, one of the principal standing committees of NEA.

COOPERATION WITH INTERNATIONAL ORGANIZATIONS

Technical Assistance

In 1983, NRC continued to cooperate with the IAEA in offering safety advice to developing countries initiating nuclear programs, though on a somewhat reduced scale because of the IAEA reassessment period. NRC staff consulted with Korean nuclear officials during visits to that country in response to requests to NRC for technical assistance on, among other concerns, seismic hazard levels, nuclear safety research, and material control and

accounting (safeguards) regulations. In cooperation with the IAEA, NRC staff members went to Brazil to advice their National Nuclear Energy Commission on fire protection standards for nuclear power plants, and Sri Lanka to help structure their safety assessment of future nuclear reactor projects.

Foreign nationals from Korea, Yugoslavia, Egypt, and the Philippines continued to visit the NRC and participate in certain training classes at the Technical Training Center in Chattanooga, Tenn. NRC staff members also lectured at an IAEA-sponsored course for foreign nationals held at the Argonne National Laboratory on the use of probabilistic risk assessment in safety assessments of nuclear power plants.

International Emergency Preparedness Cooperation

During the year, NRC continued to work closely with the Korean Ministry of Science and Technology to finalize the practical arrangements for the bilateral agreement signed last year (see *1982 NRC Annual Report*), which included provisions for NRC to render technical advice and assistance to the Korean regulatory authority in the event of an emergency at the Kori-I nuclear facility near Pusan. NRC's assistance in this area is envisioned to supplement, not replace, Korean domestic technical and analytical expertise, and does not relieve Korea of its responsibility for the safe operation of the facility. The NRC role would be to offer regulatory advice, if requested by its counterpart agency, on questions concerning U.S. equipment or U.S.-derived procedures at the foreign plant. Arrangements are under way to extend the emergency assistance provisions to all four of the country's U.S.-supplied nuclear units at the Kori site as they begin commercial operation. Consideration is also being given to establishing an arrangement of this type with other countries with U.S.-supplied facilities.

EXPORT-IMPORT ACTIONS

NRC Export License Summary for Fiscal Year 1983

During the fiscal year ending September 30, 1983, the NRC issued 328 export licenses and 69 amendments to existing licenses. Of the licenses issued, 62 were "major" licenses in three categories: special nuclear material, source material, and reactors. The remaining 266 export licenses included 48 for small quantities of special nuclear material, 28 for source material, 34 for byproduct material, and 156 for section 109 components and materials. Ten nations received shipments of special nuclear material under major export licenses during the year, EURATOM and Canada were approved for major quantities of source material, and a research reactor facility was approved for Bangladesh. No licenses were issued during the period for export of significant quantities of plutonium.

Among the international contacts during the report period was this meeting of the Advisory Committee on Reactor Safeguards (see Chapter 2) and the Reaktor-Sicherheitskommission (Reactor Safety Committee) of the Federal Republic of Germany, in October 1982 in Washington, D.C. The two groups discussed safety concerns of mutual interest, including radwaste management and disposal, use of probabilistic risk assessment, quantitative safety goals in the regulatory process, and consideration of "Class-9" (least likely but potentially most severe) accidents.

Export Consultations with Executive Branch

The NRC was consulted in 1983 by the Executive Branch on 181 export-related actions, including agreements for cooperation with Sweden and Norway, 18 nuclear technology transfers, 33 retransfer requests and other arrangements, and 130 Department of Commerce-licensed nuclear-related exports. The NRC followed its usual practice of examining whether the proposed actions conformed with statutory criteria and current Executive Branch policy. The Swedish and Norwegian Agreements for Cooperation are noteworthy in that they are the first agreements to incorporate provisions of the Executive Branch's new plutonium use policy which provided advance programmatic approval for the re-export and reprocessing in EURATOM of U.S.-origin spent nuclear fuel exported to Sweden or Norway.

Interagency Review Procedures

The NRC coordinated with the Executive Branch on revised interagency procedures for reviewing export-related actions (i.e., NRC licensed nuclear exports, Commerce Department-licensed nuclear-related exports, DOE-authorized retransfers and other subsequent arrangements involving international nuclear activities, and DOE-authorized nuclear technology exports). The revised procedures are important in that they clarify the interagency consultation requirements regarding requests to retransfer heavy water and nuclear reactor components, for which NRC is the original export licensing authority.

Reduced Enrichment Fuels

NRC continued monitoring DOE's Reduced Enrichment in Research and Test Reactor (RERTR) program (see *1981 NRC Annual Report*, p. 115 and the *1982 NRC Annual Report*, p.116) and, in 1983, issued two export licenses for reduced-enrichment fuel for use in foreign research reactors. Domestically, the NRC is cooperating with operators of U.S. research and test reactors licensed by the NRC in their study of technical and economic aspects of converting these reactors to low-enriched uranium (LEU). The findings of this study should be useful to the NRC in connection with the eventual relicensing of U.S. reactors converting to LEU, and in providing relicensing information to foreign operators undertaking reactor conversions.

INTERNATIONAL SAFEGUARDS

Safeguards

In addition to its review of the implementation of international safeguards in countries receiving U.S. exports, the NRC continued its participation in U.S. efforts to improve safeguards. The NRC staff reviewed its participation in U.S. interagency groups for strengthening IAEA safeguards and continued its cooperation with the Executive Branch in the following areas:

- Participation in the U.S. Program of Technical Assistance to IAEA Safeguards.
- Participation in the interagency working group on the U.S. Action Plan to Upgrade IAEA Safeguards.
- Cooperation with the IAEA and the Department of Energy in providing a training course on state systems of accounting for and control of nuclear material.
- Direct technical assistance to the IAEA Department of Safeguards.

Throughout 1983, the NRC and other U.S. agencies continued to assist the IAEA in the implementation of IAEA safeguards at U.S. facilities, pursuant to the U.S./IAEA Safeguards Agreement. The IAEA continued to apply safeguards at the Trojan (Ore.) and Rancho Seco (Cal.) power reactors, and the Exxon fuel fabrication facility in Richland, Wash. In addition, the Combustion Engineering fuel fabrication facility, the Arkansas 2 and San Onofre 2 (Cal.) power reactors, and the DOE Portsmouth Gas Centrifuge Enrichment Plant (Ohio) were selected by the IAEA for the application of safeguards pursuant to the Agreement, while the Babcock and Wilcox and Westinghouse fuel fabrication facilities were selected for reporting under the terms of the Protocol to the Agreement. For further information on these activities, see Chapter 6, "Domestic Safeguards."

Physical Protection

Proposed amendments to 10 CFR Parts 40, 70, and 73 to facilitate the implementation of the International Convention on the Physical Protection of Nuclear Material were published in the *Federal Register* for public comment.

Nuclear Regulatory Research

CHAPTER 11

The NRC's Office of Nuclear Regulatory Research (RES) provides research information needed as part of the basis for sound understanding of regulatory issues and for establishing effective regulatory policies and practices to evaluate licensee proposals and activities. This mission is carried out by developing risk-assessment methods for evaluating regulatory issues and applying these methods to broad problem areas; by improving the understanding of phenomena necessary to analyze safety, safeguards, and environmental impact; and by identifying and defining means of improving the level of health and environmental protection provided by NRC regulations.

The office also has responsibility for developing and coordinating NRC standards—the regulations and guides governing licensed activities of the U.S. nuclear industry. Regulations are set forth in Title 10, Chapter I, of the Code of Federal Regulations and are published in the *Federal Register*. Those produced by the NRC in 1983 are listed in Appendix 4. Regulatory guides are described in Appendix 5, which also contains a listing of those issued, revised, or withdrawn during fiscal year 1983.

OPERATING REACTOR INSPECTION, MAINTENANCE, AND REPAIR

Reactor Pressure Vessels

Thermal Shock. The eighth thermal shock test at Oak Ridge National Laboratory (ORNL) demonstrated that relatively small flaws in reactor pressure vessel walls will "run long" and become large, long flaws prior to running deep into the vessel wall when initially subjected to a severe thermal shock. This result has significance in the definition of the evaluation processes for pressurized thermal shock events. The ninth test, which will be conducted in 1984, will deal with the initiation and arrest performance of flaws residing in low-upper-shelf energy weld material when subjected to thermal shocks. The tenth test will examine the interaction of the stainless steel vessel cladding and flaws of various shapes existing in and through the cladding and in the ferritic steel of the pressure vessel wall, again when subjected to thermal shocks. (For descriptions of earlier tests, see *1982 NRC Annual Report*, p. 119.)

Pressurized Thermal Shock. Under certain postulated accident conditions, such as small-break loss-of-coolant accidents, main steam line breaks, steam generator overfilling scenarios, and associated instrument and component failures, a pressurized water reactor (PWR) pressure vessel could undergo a cooling rate nearly as severe as that caused by a large break, but without loss of the internal pressure. This combination of thermal stressing and the action of the internal pressure, called pressurized thermal shock (PTS), could pose a serious challenge to the integrity of the reactor pressure vessel. Researchers at ORNL continue to develop computer codes for use by the NRC licensing reviewers in calculating heat transfer, thermal and mechanical stresses, and fracture mechanics for deterministic and probabilistic evaluations of pressure vessel integrity under PTS conditions. Significant accomplishments during 1983 included the completion and implementation of three computer codes (OCA-II, OCA-P, and ORMGEN-ADINA-ORVERT) which provide for analysis of the structural response of PWR pressure vessels under a wide range of postulated PTS scenarios. In addition, the pressurized thermal shock test facility (PTSTF) was completed at ORNL in April 1983, and the first pressurized thermal shock experiment (PTSE-1) was scheduled for November 1983. PTSE-1 is planned to validate the accuracy of these newly developed computer codes. Two additional tests will follow to investigate the interaction of all vessel parameters and flaw configurations under PTS conditions.

Risk analyses are being applied to support the resolution of Unresolved Safety Issue (USI) A-49, "Pressurized Thermal Shock." In this program, the NRC is conducting an independent analysis of the likelihood and consequences of an overcooling transient driving a crack through the reactor vessel wall.

Elastic-Plastic Fracture Mechanics. Fracture of steel used in reactor pressure vessels and piping can occur in a brittle or ductile manner or in combination. The broad-based NRC research program dealing with the development of fracture mechanics methodology to allow the structural assessment of vessels and piping for each toughness state of their materials has been described in detail (see p. 229, 1979 report; p. 211, 1980 report; p. 121, 1981 report; and p. 120, 1982 report). In 1983, work continued at ORNL, the David Taylor Naval Ship Research and Development Center, the Naval Academy, Materials Engineering Associates, and Battelle Columbus Laboratories on the development of analytic methodologies, test

The David Taylor Naval Ship Research and Development Center at Annapolis, Md., is one of the research facilities where NRC research projects in steel fracture mechanics are conducted. The Center, shown here, sits at the mouth of the Severn River in Maryland, across from the U.S. Naval Academy.

procedures, and data bases for ductile or elastic-plastic fracture mechanics (EPFM). In late 1982, following the completion of the ductile tearing experiment (ITV-8A) at ORNL (see *1982 NRC Annual Report*, p. 120), work on the post-test evaluation of this experiment as well as the evaluation of the international round robin, which was conducted to examine the effectiveness of various EPFM analytic methodologies used to predict the results of the test, was completed. These evaluations verified that newly developed analytic techniques were effective predictive tools that could be used with high reliance in the licensing process. The analytic tools were used successfully in the resolution of Unresolved Safety Issue USI-A11, "Reactor Material Toughness," as presented in NUREG-0744, Vol. 1, Revision 1.

Fracture Toughness. Information is needed on how to maintain the structural integrity of operating reactor pressure vessels under the unique environmental conditions found in nuclear plants. These vessels undergo an aging phenomenon caused by reaction of the pressure vessel steel to the neutron flux from the reactor core. It is characterized by a gradual reduction in the pressure vessel steel's fracture toughness as time progresses. If this reduction in toughness were to become severe, a brittle fracture of the pressure vessel under postulated accident conditions would be possible. Research efforts to determine the relationship between irradiation and reduction in fracture toughness have been under way for a number of years. A significant step during 1983 was the start of a program to remove a number of sizeable pieces of steel from the wall of the reactor pressure vessel of the Gundremmingen-A nuclear power plant in the Federal Republic of Germany (FRG) during the decommissioning of that plant. When this material is received, it will be machined into a number of test specimens and tested to determine the actual long-term inservice degradation of the steel's fracture toughness caused by the known integrated flux rate during operation. These data will be used to validate the large set of irradiation-degraded fracture toughnesses that have, to date, been developed from small surveillance program specimens and large specimens irradiated under high-flux-rate, short time periods in test reactors.

For several years, work at ENSA, Inc., and at Materials Engineering Associates has been going on to determine the irradiation effect on the fracture toughness of several specific welds having the low level of upper-shelf toughness found in some of our older reactors (see *1982 NRC Annual Report*, p. 121). This effort was completed in 1983, and the data developed are being used in both licensing and safety evaluation procedures. After resolving the public comments that had been received on revisions to Appendix G, "Fracture Toughness Requirements," and Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50 (see *1981 NRC Annual Report*, p. 120), these rules were published in 1983.

Steam Generators

In January 1982, a special research facility was completed at Battelle Pacific Northwest Laboratories (PNL) to house a service-degraded steam generator removed

from the Surry 2 plant in Virginia. The purpose of this test bed facility is (1) to characterize and document the internal condition of the generator and correlate its condition with operation during service, and (2) to validate inspection and integrity methodologies for regulatory purposes. The previously developed tube integrity models that used artificially defected tubes will be validated by conducting burst tests of well-characterized servicedegraded tubes removed from the generator to verify the predictions of marginsto-failure under operating and upset conditions. Inservice inspection (ISI) techniques and methods will be validated by conducting *in situ*, nondestructive examination (NDE) of steam generator tubes followed by removal and destructive examination of the tubes for verification of NDE results. A statistically based ISI plan describing the required sampling of tubes and the frequency at which to inspect will be developed by using information on the distribution and nature of flaws in the steam generator tube array.

Research in 1983 concentrated on (1) the chemical decontamination of the lower portion of the steam generator, (2) the unplugging of previously plugged defective tubes and conducting a complete baseline eddy-current NDE examination of the tubes to establish their condition and a comparison to their ISI record, and (3) comprehensive characterization of the secondary-side conditions using remote signal techniques. France, Italy, Japan, and the Electric Power Research Institute (EPRI), the last acting for the United States nuclear utility industry, have joined the NRC in this program and contribute 40 percent of the total funding.

Piping

Environmentally Assisted Pipe Cracking. High stresses, a sensitized material condition, and the coolant environment have contributed to intergranular stress corrosion cracking (IGSCC) in boiling water reactor (BWR) piping. Argonne National Laboratory began a research program on the effects of variables on pipe cracking and an evaluation of the short-term and long-term effectiveness of remedies developed by the industry. In 1983, tests conducted on Type 316 nuclear-grade stainless steel pipe material which is used widely for repair, replacement, and new construction, verified that it is more resistant to IGSCC than the previously used high-carbon-content stainless steels. However, this work also showed that the material is more susceptible to transgranular chloride stress corrosion cracking than the materials in present use. Water chemistry also plays critical roles in proposed remedies such as hydrogen additions to suppress oxygen levels in the reactor coolant, and also in evaluating the susceptibility and crack growth rates of conventional materials. Studies during 1983 have shown that even with hydrogen additions, impurity levels will have to kept low (substantially below the levels permitted by the current water-quality specifications) in order to provide immunity to IGSCC. Also in 1983, development of a substantial data base was begun for environmentally assisted fatigue crack growth for stainless steels subjected to BWR environments. Other 1983 research concerned evaluations of induction heating stress improvement techniques for residual stress relief and the weld overlay technique for inhibiting crack growth and reinforcing slightly cracked pipes. This work showed that both techniques work effectively to induce compressive stresses in the pipe or uncracked ligament of the pipes and, hence, significantly reduce susceptibility to crack initiation. Results from the crack growth rate and residual stress distribution studies have been used by the American Society of Mechanical Engineers to revise Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the Boiler and Pressure Vessel Code.

Piping Fracture Mechanics. NRC's piping reliability programs on ductile fracture mechanics analysis techniques, fracture toughness data base development, and piping fracture tests continued in 1983. The interest in piping fracture mechanics was greatly increased during this reporting period as a result of incidents of stress corrosion cracking in large-diameter BWR piping. (See Chapter 2.) The programs were directed at developing and experimentally validating analytical techniques for determining the load-carrying capacity and failure mode of cracked piping. At the David Taylor Naval Ship Research and Development Center (DTNSRDC) in Annapolis, Maryland, a series of fracture tests were performed on small-diameter stainless steel BWR pipes. Use of equipment and capabilities developed during earlier tests on carbon steel piping (see *1982 NRC Annual Report*, p. 120) accelerated the program. Work on testing techniques and a fracture toughness data base for piping materials continued at DTNSRDC during 1983. The NRC also initiated a 3-to-5-year program on development and large-scale experimental verification of improved piping fracture mechanics analysis techniques. NRC continued coordination with foreign organizations engaged in piping research. One result of this effort was the agreement by Framatome of France to donate special thermally aged stainless steel piping to the NRC test program. Other organizations have also expressed interest in cooperating in the NRC program.

Pipe Rupture Investigations

Load Combinations. This program is investigating leak and rupture probabilities in PWR and BWR reactor coolant loop piping considering both direct and indirect mechanisms for causing pipe leaks and ruptures. Results to date suggest that Westinghouse and Combustion Engineering primary loop piping is extremely resistant to pipe rupture. Studies will continue on piping of other vendors.

NRC/EPRI Cooperative Pipe Tests. The objectives of this program are to evaluate the capacity of nuclear reac-

tor piping, to develop information for physical benchmarking, and to provide a better understanding of pipe damping. The first phase has been completed using a three-dimensional piping layout supported on independently controlled sleds.

Stiff Versus Flexible Piping. Various seismic design criteria and industry practices are being evaluated to determine how they affect overall piping reliability, and early findings have indicated that reliability in high-energy piping may be significantly improved by relaxing seismic criteria.

Pipe Programs. A piping review committee, composed of NRC staff, consultants, and industry representatives, is preparing recommendations as part of a one-year effort as to when and where changes can be made to NRC piping requirements.

Pipe-to-Pipe Impact. A simplified model for predicting the effects of pipe-to-pipe impact was developed, and a survey determining pipe spacing in a typical nuclear plant was completed. The survey will be used to ascertain the extent to which actual piping systems have been simulated during tests. The WIPS code for pipe-to-restraint impact was qualified.

Mechanical Piping Benchmarks. Principal objectives of this program are to revise the standard review plan position dealing with multiple-supported piping and to validate computer codes used to simulate dynamic response of piping. Conclusions to date based on both laboratory and in situ tests are that differences between experimental and predicted responses may be on the order of a factor of two or three or more.

Electrical and Mechanical Components

NRC awarded contracts to five national laboratories for generation of a technical data base to assess and analyze aging of components and structures in nuclear power plants. ORNL surveyed operating experience to identify aging trends. Sandia National Laboratories (SNL) conducted two workshops where experts discussed aging-related issues and concerns and provided opinions on the propensity for aging degradation.

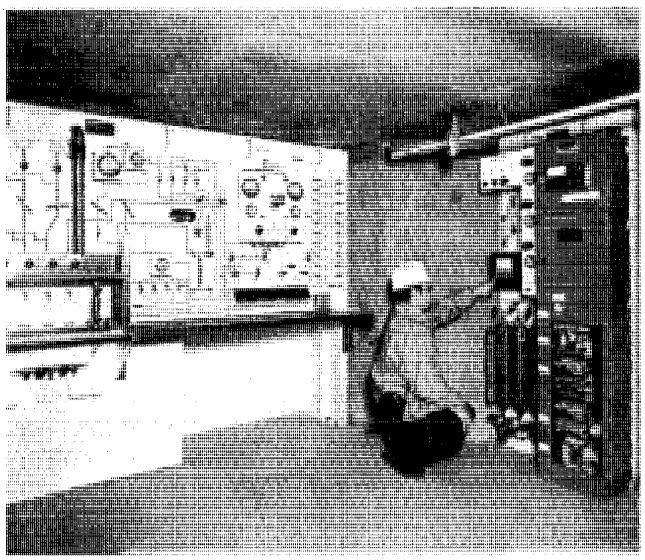
Nondestructive Examination

This program includes studies of in-service-inspection (ISI) effectiveness, techniques to improve the methods for reliably detecting and characterizing flaws during periodic inservice inspections, and studies of methods for continuously monitoring the integrity of operating reactors.

Flaw Inspection by Ultrasonic Testing. In the past several years, a new method for flaw characterization, called Synthetic Aperture Focusing Technique for Ultrasonic Testing (SAFT-UT) was developed for NRC at the University of Michigan. It provides a highly accurate three-dimensional image of flaws that may be present in the inspected component by computer processing of individual ultrasonic signals, permitting detection and characterization of the flaws with little dependence on operator skills. In 1983, a research project was initiated at Battelle Pacific Northwest Laboratories (PNL) to construct and evaluate a sturdy real-time SAFT-UT system for improved inspection of operating reactors. This system, nearing completion at year's end, will be validated and used in actual field inspections in 1984 and 1985.

In another program at PNL, the reliability of ISI is being evaluated. In 1983, the analysis of results from an extensive round robin inspection of flawed piping was completed. Extensive quantitative results on the probability of detecting different-sized cracks in different reactor piping materials and the reliability of sizing of these same cracks were reported. This information is vital in performing safety analyses of cracked reactor piping. Much of the information derived from conducting the round-robin exercise and from the analyses of the results was used in 1983 in the development of Inspection and Enforcement Bulletin 83-02, issued by the NRC to establish requirements for ISI teams to demonstrate their inspection capability before allowing inspection for IGSCC in BWRs.

Continuous On-Line Monitoring by Acoustic Emission. In the last several years, PNL has been developing methods, techniques, and analyses for the continuous monitoring of reactor integrity using acoustic emission (AE), a nondestructive testing method. In 1983, a large-scale cyclic and pressure test was successfully carried out



The instrumentation panels inside the post-accident sampling room at the Watts Bar Unit 1 nuclear power plant in Tennessee are shown. The licensee for the plant, scheduled for completion in 1984, is the Tennessee Valley Authority.

on a pressure vessel (approximately 5 feet in diameter, 20 feet long, 5 inches thick) in Mannheim, Federal Republic of Germany (FRG), in cooperation with the FRG to validate the instrumentation, analysis, and techniques developed in the laboratory. Also in 1983, in cooperation with the Tennessee Valley Authority, the Watts Bar-1 reactor was AE-monitored during hot functional testing, and this reactor was also instrumented for continuous on-line monitoring during full-power operation, which is to begin in 1984. This monitoring will allow for final improvement and validation of techniques for use on other operating reactors. A separate research program at the Argonne National Laboratory during 1983 established the high sensitivity of AE techniques for detecting small leaks from through-wall cracks. The feasibility also was shown of actual on-line AE monitoring for the detection, location, and evaluation of leaks.

Seismic Analysis

The Seismic Safety Margins Research Program (SSMRP) aims at developing a better methodology for assessing seismic safety of nuclear plants. During 1983, the estimation of seismic risk at the Zion plant was completed using this methodology. Studies to determine the sensitivity of risk to modeling assumptions were also completed. Work to simplify and validate the SSMRP methods continued in 1983 and a project to analyze the seismic risk at a BWR plant began.

Standard Problems for Structural Computer Codes. A program, initiated in 1982 and continued in 1983, checked analytical solutions for soil-structure interactions (SSIs) and structural responses to earthquakes of containment buildings and other Category I structures. Current methods of analyzing the safety of reinforced concrete containments were reviewed and published in NUREG/CR-3284. At the end of the year, uncertainties in the SSI process were identified and evaluated against experimental and actual earthquake data highlighted in a data sources bibliography report. Data used included the EPRI SIMQUAKE tests and the Miyagi-Ken-Oki earthquake recorded at the Fukushima nuclear power plant.

Seismic Category I Structures. Static and dynamic testing of small-scale (1/30) one- and two-story reinforced concrete box structures and the dynamic testing of a 1/10-scale, two-story structure were performed in 1983. Experiments using the larger-scale model will test the applicability of the 1/30-scale models.

Fire Protection

Research continued to develop characteristics of design basis fires and a computer code to predict the progressive environment inside a nuclear power plant enclosure in the event of a fire. Investigations of equipment response to fire environment were started, with the objective to determine fire damage thresholds of various kinds of safe-shutdown equipment.

Sandia National Laboratories (SNL) completed a report on six full-scale tests conducted by Underwriters Laboratories during March and April 1982 to evaluate 20-foot separation as a means of protection for redundant safety-related cables.

Decommissioning

The NRC continued to develop an information base for decommissioning LWRs and other nuclear facilities, with 10 reports published during the year. A regulation concerning decommissioning and the accompanying final generic environmental statement were still being developed at year's end. A related rulemaking action concerning residual radiation limits was also under development. On July 15, 1983, the Commission amended its regulations in 10 CFR Parts 30, 40, and 70, effective August 15, 1983, clarifying both a licensee's responsibility for nuclear materials and procedures for terminating specific licenses.

NRC research to help develop decommissioning standards and guides produced an analysis of the measurements of radioactive contamination at the defunct Humboldt Bay Nuclear Generating Unit near Eureka, Calif. Measurements of contamination at other facilities were completed, and analyses of samples were under way at year's end. Data needed to assess and evaluate methods, radiation exposure, and costs associated with ımissioning nuclear facilities are still being collec

Reactor Effluent Treatment Systems

Measurements were completed at the Brunswick Nuclear Generating Station in Southport, N.C., to determine radionuclide source terms for use with gaseous and liquid effluent models for LWR licensing. Reports analyzing these results and similar measurements completed at the Prairie Island Nuclear Generating Station in Red Wing, Minn., will be published in 1984.

Spent Fuel Storage

Research was continued at the Idaho National Engineering Laboratory to determine the effects of storing irradiated LWR fuel in a dry environment at low temperatures. Both defective and intact BWR and PWR assemblies stored in air and in nonoxidizing atmospheres are being used. Two reports were published during the year, covering (1) a technical description of the NRC long-term whole rod and crud performance test (NUREG/CR-2889), and (2) characterization of LWR spent fuel rods used in the NRC low-temperature whole rod and crud

performance test (NUREG/CR-2871). Two interim examinations were conducted on this test fuel in January and July of 1983. NRC sponsored an international workshop on fuel and cladding oxidation during dry storage in August 1983.

Revision 1 to Guide 3.15, providing the standard format and content of license applications for storage of unirradiated power reactor fuel and associated radioactive material, was issued in April 1983. A draft guide on spent fuel heat generation in an independent spent fuel storage installation (ISFSI) was issued for public comment in January 1983.

EQUIPMENT QUALIFICATION

Qualification of Electric Equipment

A rule on the environmental qualification of electric equipment for nuclear power plants, published in January 1983, became effective in February 1983. Work continued on developing the ancillary regulatory guide (Revision 1 to Guide 1.89).

Under a joint research program with the French, Sandia National Laboratories (SNL) completed the assigned studies on accelerated aging, and testing was initiated at Saclay to determine the optimum environmental testing methodology for polymer base materials. SNL continued its research on the identification and measurement of oxygen diffusion mechanisms governing dose rate effects in the radiation aging of electric equipment insulation. Research on the environmental qualification testing methodologies for electric cables, pressure switches, and solenoid valves was conducted at SNL and Franklin Research Center.

Qualification of Mechanical Equipment

This research program is attempting to provide technical bases for the confirmation of existing requirements and acceptance criteria for the dynamic (including seismic) and environmental qualification of mechanical and electrical equipment. Equipment studied in this effort includes purge and vent valves, solenoid-operated valves, and nonmetallic materials such as cable covering and hatch seals.

Dynamic Qualification of Equipment

Recommendations for fracture toughness criteria for thick-wall ferritic steel shipping containers were developed, as well as fabrication criteria for ferritic steel and modular cast-iron containers.

SEVERE ACCIDENTS

Severe Accident Sequence Analysis Program

The Severe Accident Sequence Analysis (SASA) research program focuses on possible sequences of events beyond design basis accidents to calculate how power reactors and operators can respond to prevent or mitigate adverse consequences to both the plant and the public. Four national laboratories were involved in the SASA research program in 1983—Idaho, Los Alamos, Sandia, and Oak Ridge.

Three labs are investigating PWR accident sequences, with Los Alamos and Idaho analyzing the "front end" (up to core damage) and Sandia the "back end" (core damage through containment damage). Oak Ridge is focusing on BWR severe accident analyses, both front and back ends, while Idaho is also considering BWR front-end transients using the RELAP-5 code.

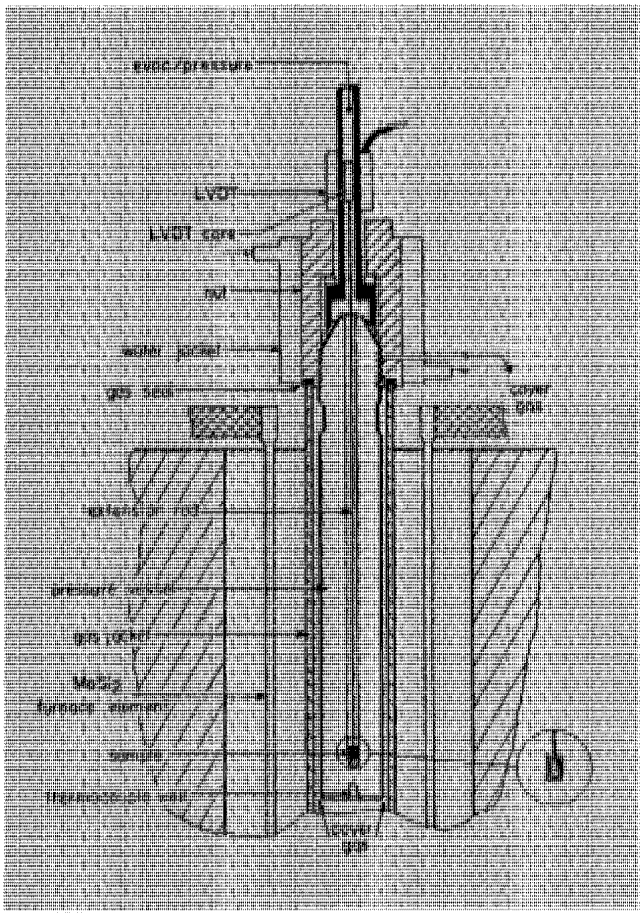
The Los Alamos program in 1983 included:

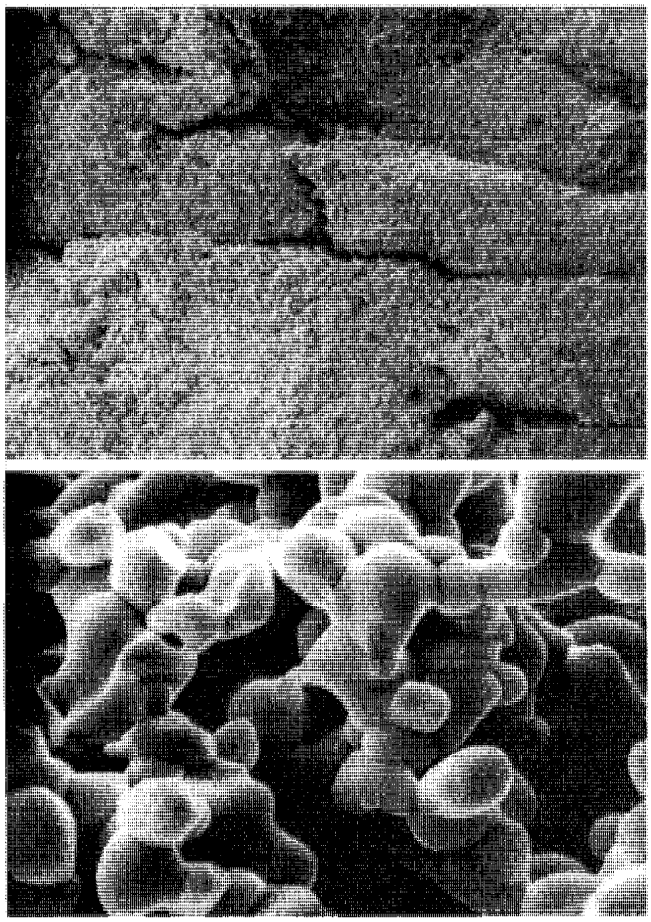
- Severe accident analyses for the Oconee plant designed by Babcock and Wilcox (B&W) using the TRAC code. Sequences analyzed to the point of core uncovery included (a) loss of AC power, loss of feedwater, and loss of high-pressure injection; (b) failure to scram, loss of main feedwater, and loss of high-pressure injection; (c) small-break loss-of-coolant accident (LOCA) and failure of emergency core-coolant system recirculation (FECCSR); and (d) interfacing systems LOCA.
- Analysis of feed-and-bleed calculations in support of Unresolved Safety Issue A-45, "Shutdown Decay Heat Removal Requirements."
- Analysis of unmitigated boron dilution events for B&W and Combustion Engineering (CE) plants.

The Idaho program included:

- Analysis of the initial phases for the loss of all AC power and loss of auxiliary feedwater accident sequence on the Bellefonte plant (PWR) using the RELAP-5 code.
- Analysis of the initial phases of the anticipated transient without scram (ATWS) accident sequences using RELAP-5 and CONTEMPT models for the Browns Ferry Unit One, a BWR Mark I containment design.

The Oak Ridge program included analyses of dominant severe accident sequences for the Browns Ferry Unit One plant. Studies were completed and reported on loss of decay heat removal sequences, small-break LOCA outside containment, and on the effects of small-capacity, high-pressure-injection systems on loss of all injection





Some aspects of research on fuel swelling and gas-release are diagrammed and depicted here. The research is being carried out at Purdue University under an NRC grant.

The diagram above is of the experimental apparatus, showing that the sample contains a green (unfired) uranium dioxide pellet sintered (fired) in the furnace under high gas pressure. A linear variable differential transformer (LVDT in the diagram) is used to measure continuously the changes in pellet length—and therefore of volume swelling—that occur when the gas pressure is reduced.

The picture above right shows large-scale cracking (at a magnification of 600x) on external surfaces of the pellet after gas release.

The picture lower right shows the spongy appearance of a part of a pellet (at a magnification of 600x) that was sintered at 1400°C for four hours. This microstructure is important for determining the gas release.

sequences. Work in progress includes accident sequence analyses for ATWS and fission product transport analyses for the loss of decay heat removal accident sequence on the Browns Ferry Unit One plant, MK-1 pressure suppression pool modeling, and BWR MARCH code modifications for containment analyses in ATWS studies.

The Sandia program included a PWR containment management study to consider containment integrity and radiological consequences from severe accidents. Structural analyses of Watts Bar, Maine Yankee, and Bellefonte containments were performed to study responses to static internal pressurization.

Behavior of Damaged Fuel

Severe Fuel Damage Test. A Severe Fuel Damage Test (SFD1-1) was successfully performed in the Power Burst Facility (PBF) at the Idaho National Engineering Laboratory (INEL) in September 1983. The 32-rod, 1-meter-long test fuel bundle underwent a heatup transient to the planned 2400K (3840F) maximum temperature. Before the high-temperature transient was performed, the bundle of fresh fuel rods was preconditioned for 4 full-power days to build up a fission-product inventory for the test, with a 1-week shutdown for buildup of the proper cesium-iodine ratio. This preconditioning produces measurable quantities of the most radiologically significant fission-product elements for determining the elemental release fractions and transport characteristics.

The test sequence and diagnostic instrumentation performed well, providing good measurements of cladding and steam temperatures, fission-product release, and hydrogen generation. The integrity of the test assembly was maintained, with no leakage of radioactive material to the external cooling loop. Analysis of the data and preparation of a quick-look report are under way. Post-test neutron

radiographs and tomographs (similar to CAT scans) of the fuel bundle will be performed along with postirradiation examination in a hot cell to characterize the fuel damage for use in verifying of the SCDAP fuel damage code and its phenomenological models.

Test 1-1 is the first of the PBF SFD tests to be performed under core uncovery conditions similar to those of the TMI-2 accident. The previous SFD scoping test used nonprototypically high water and steam flow rates, with resultant high oxidation and hydrogen production.

ACRR Experiment on Degraded Core Coolability. The Degraded Core Coolability-1 (DCC-1) experiment has been successfully performed in the Annular Core Research Reactor (ACRR) at Sandia National Laboratories. DCC-1 is the first in a short series of experiments on the limits under which coolability can be restored and maintained by reflooding severely damaged cores, as was done late in the accident sequence at TMI-2. The purpose of these experiments is to verify, for LWR-specific accident conditions, the relatively advanced coolability models that have been developed in liquid-metal fast-breeder reactor (LMFBR) safety research. The LWR-specific conditions of importance are the pressure range (100 to 2000 psi), very deep debris beds, variable inlet flow, and LWR-specific debris characteristics. Experiment DCC-1 used a bed of relatively fine LWR debris, characteristic of debris from the reflood quenching of molten fuel.

In the DCC experiments, the bed of crushed fuel with a broad particle size distribution is fission-heated in the ACRR to simulate the internal fission-product decay heating of the core debris in the actual accident. An array of thermocouples in the bed detects local dryout of the bed for a specific set of conditions by a rise in temperature of one or more thermocouples above saturation. Experiment DCC-1 was operated for 2 weeks in ACRR, and the full pressure range up to 2000 psi was mapped carefully for dryout limits and dryout zone growth and quenching. The experiment was successful, with no loss of test instrumentation throughout the 2-week period of the experiment. Preliminary results indicate that the increase in the bed dryout coolability limit with increasing pressure is much less than predicted by the current models. This result is not understood and is under extensive analysis. It may mean that pressurized cores have considerably lower coolability limits under reflooding than had been previously thought. The implications of this work apply to analysis of when it is safe to depressurize a damaged plant. Lower coolability limits correspond to longer times until depressurization is safe.

Severe Core Damage Property Experiments. Scientists at PNL completed some isothermal oxidation experiments at temperatures of 1600, 1700, and 1800C in steam atmosphere, in which oxidation rates appeared to follow lowertemperature behavior patterns. Viscosity measurements were also performed at temperatures to 2000C on mixtures of zircaloy and small amounts of uranium dioxide.

Severe Core Damage Analysis Computer Code. The severe fuel damage modeling project at INEL develops and maintains a mechanistic computer code called SCDAP. (See *1982 NRC Annual Report*, p. 125.) Several versions of SCDAP/MODO, as well as the development plan and detailed model designs for SCDAP/MOD1, were completed in 1983.

Sandia Laboratories in Albuquerque, N.M., carries out extensive NRC-sponsored research in various areas related to nuclear power plant safety. The Main Technical Area of the facility is shown, comprising scientific and technical laboratories, administrative buildings, specialty shops and environmental test facilities.

Hydrogen Generation and Control

In this program, means of preventing deflagrations and detonations and schemes for mitigating the effects of hydrogen burns in LWR plants are assessed. In 1983 such schemes as deliberate ignition, coupled with injections of water fogs and foams, deliberate flaring of hydrogen from high point vents, modification of containment atmospheres, passive igniter systems, and operability of igniters in a water-spray environment were evaluated.

Significant advancements toward a fuller understanding of the potential for flame acceleration and transition from deflagration to detonations were made in 1983. Recent activities by the industry point to the need for a better understanding of diffusion flames and their threat to equipment, and during 1984 significant efforts will be directed to this area.

Core Melt Technology

At the large-capacity melt facility (200 to 500 kg of fuel and structural material) at Sandia, a large pour of core simulant (uranium and zirconium) was carried out successfully and future tests were planned for various combinations of melt, concrete, and water. Methods also were developed for the sustained heating of such large melts and thermite pours were made onto beds, with and without water present. The design and construction of equipment to study similar, but pressurized, pours were completed.

Sandia continued to develop a generic (all reactor types) computer program (CONTAIN) to calculate the abnormal loads imposed on containments by severe accidents. The code considers all phenomena outside the primary system but within the containment complex and computes the character of the radiological source term in the event of containment failure. Models for LWR-engineered safety features (fan coolers, containment sprays, ice condensers, and sump-water heat exchangers) are operational and under test. Validation work in 1983 has included participation in the program on aerosol behavior and the Heissdampfreaktor large-scale thermal-hydraulic blowdown tests in West Germany. The first public version of the CONTAIN-MOD 1.0 code will be released in early 1984.

Fission Product Release and Transport

This program develops models and obtains experimental data to determine the radiological source term that might be released from nuclear plants during severe accidents. It includes studies on radionuclide release from the fuel, its transport and depletion within the reactor coolant system, and its depletion within the containment vessel.

The research is used in developing reactor siting policy, emergency planning and response requirements, probabilistic risk assessment consequence calculational methods, and equipment qualification.

Fission Product Release Models. The theoretical FASTGRASS/PARAGRASS computer models have been used for predicting the behavior of fission gas and volatile fission products in LWR fuel during accident conditions. At Argonne National Laboratory, a PARAGRASS update was designed for and implemented into the SCDAP computer code. Verification calculations were performed with available steady-state and transient experimental data.

Fission Product Experiments. At Oak Ridge National Laboratory, five tests concerning fission product release from LWR fuel were conducted, using spent fuel from the Peach Bottom BWR. One test was conducted at 2000C for 20 minutes with reduced steam flow to allow the cladding to melt before complete oxidation occurred. Another experiment showed that iodine remained more volatile as a function of time than had been predicted, and that irradiation is significant in reactions of iodine with water.

Radioactive Source Term. Physical processes that affect the release of radionuclides from nuclear power plants under accident conditions are becoming more thoroughly understood, and can provide a basis for reevaluating source terms to the environment. Improved characterization of source terms would provide a basis for formulating impacts on and changes to licensing practice, emergency planning, safety goals, and indemnification policy. Radioactive source term calculations are being performed by Battelle Columbus Laboratories for five different types of plants and a number of accident sequences. In the case of the PWR Surry plant, transport and deposition of radionuclides were found to be quite dependent on the accident sequences and the corresponding thermal-hydraulic conditions.

Aerosol Transport Tests. The NRC is a participant in an internationally sponsored project called Aerosol Transport Tests (ATT) being conducted in Sweden at the Marviken facility. The objective of the tests is to provide a large scale demonstration of the transport and behavior of aerosols in primary systems. The reactor vessel is five meters in diameter. Shakedown tests revealed some problems that needed to be addressed prior to starting the transport tests.

Containment Failure Mode

The focus of this research program is to conduct experiments that can be used to check the ability to predict leakage from different containments. Experiments on small models (1/32 scale) of steel containments were performed in 1983. A large model (1/10 scale) was fabricated and will be pressurized to failure in early 1984. A program assessing the leakage characteristics of major penetrations such as equipment hatches, access openings, and main steam lines was initiated in 1983. NRC published

NUREG/CR-3234, outlining options for experiments on electrical penetration assemblies.

The capability of steel containment shells to resist buckling under earthquakelike conditions was studied (NUREG/CR-3135). In addition, experience gained from leakage tests on containments was summarized and will be used in the revision of Appendix J to 10 CFR Part 50.

Fission-Product Control

Most engineered-safety-feature (ESF) systems are likely to be functional for postulated accidents substantially more severe than current design basis accidents. However, there may be a substantial variation in the effectiveness of fission product removal of various ESF systems under conditions exceeding their design basis. A program is in progress to facilitate review and evaluation of ESF-system behavior under severe accident conditions. In 1983 this work focused on ice beds and suppression pools, and a report on studies of fission product scrubbing within ice compartments was published (NUREG/CR-3248).

Accident Source Term Research. In January 1983, the NRC established the Accident Source Term Program Office (ASTPO) in the Office of Nuclear Regulatory Research to focus research programs on developing severe accident source terms with a firm scientific basis and to translate any revised source term estimates into regulatory changes. The objectives of the programs are to (1) develop a systematic method for estimating source terms, (2) develop and confirm a data base for the estimates, (3) identify and prepare guidance on regulatory changes for Commission review, and (4) coordinate any regulatory changes among NRC offices and outside agencies, for example, the Federal Emergency Management Agency and Department of Energy.

The NRC accident source term reassessment program consists of four elements. In Element 1, source terms are developed and estimated for a postulated set of severe accident sequences at selected plants representing the varied types of reactor and containment designs found in the U.S. In Element 2, data are developed to validate the source term methods used, including computer models. In Element 3, two specific groups have been contracted to assess this research. The first peer review group consists of technical experts who meet periodically to assess the research as it proceeds. The second, broader-based peer review will be conducted by a panel of scientists from the American Physical Society (APS). In Element 4, the NRC staff will evaluate the methodology, the predicted consequences, and the calculated risks to determine the significance of the reassessment of source terms and to recommend regulatory changes.

Following APS review, ASTPO will publish the reassessment of the technical basis for source term methodology as a draft document (NUREG-0956) for public comment. A final report is scheduled for early 1985.

THERMAL-HYDRAULIC TRANSIENTS

Best-estimate systems codes, component codes, and evaluation model computer codes provide three basic computer tools for analyzing nuclear power plant safety. Best-estimate systems codes offer a way to apply the results from reactor safety research to evaluations of accidents because their scope encompasses whole reactor coolant systems. Component codes consider specific portions of a reactor coolant system but in greater detail. Evaluation model codes provide what are thought to be conservative analyses for use in independent audits of licensing calculations.

NRC experimental programs cover integral systems and separate effects tests needed to support the improvement and assessment of these computer codes. These experiments and computer codes assist in resolving licensing issues. During 1983, work was performed to improve the usability of the codes, assessment of the codes using experimental data, and application of the codes in support of licensing issues.

Separate Effects Experiments

FLECHT-SEASET. In 1982, a natural circulation system effects test facility was constructed to investigate single-phase, two-phase, and reflux natural circulation. Scheduled tests and data analysis were completed early in 1983. A flow blockage model development task was added to the program this year. (This program is run jointly by the NRC, Westinghouse and EPRI).

Thermal Fluid Mixing Tests. A joint EPRI/NRC program continued this year. Tests performed by Creare, Inc., in a 1/2-scale planar test section were started in 1983 for use in developing and evaluating thermal fluid mixing and heat transfer models in response to the pressurized thermal shock question.

Model Development. Most NRC model development occurs at universities and is aimed at supplementing separate effects experiments, helping to interpret data from larger test programs, and developing correlations based on a new understanding of the phenomenology (see *1981 NRC Annual Report*, p. 124). A program at the University of Maryland was undertaken to achieve a better understanding of various system transients (e.g., loop oscillations, natural circulation interruption) common to Babcock and Wilcox (B&W) reactors. This program will support the larger Multiloop Integral Systems Test (MIST) program (see Integral Systems Tests below).

Steam Generator Response. Under a joint program (See *1982 NRC Annual Report*, p. 124), NRC, Westinghouse, and EPRI continued to study the response of a large-scale steam generator to abnormal transient conditions, using the Westinghouse MB-2 steam generator.

Integral Systems Tests

The NRC has been the major source of support for the Loss-of-Fluid-Test (LOFT) and Semiscale PWR test facilities at the Idaho National Engineering Laboratory, although approximately 10 percent of LOFT support has come from foreign countries. Since early 1983, the LOFT facility has been operated by DOE for a consortium of which NRC is a member. A third facility—the Full Integral Simulation Test (FIST) BWR test facility—is supported almost equally by the NRC, EPRI, and the General Electric Company (GE). During 1983, the Integral Systems Test (IST) program sponsored with B&W plant owners, B&W, and EPRI was initiated.

LOFT. This large-scale integral systems test facility is used to simulate reactor accidents. It is the only such system powered by a nuclear core. Results from LOFT tests are used to assess computer codes used to predict the behavior of commercial nuclear plants. Four tests were performed in 1983. The first involved a loss of all feedwater with cooling accomplished by a "feed and bleed" procedure. The high-pressure injection acted as the "feed" and flow through the power-operated relief valve acted as the "bleed." Effective cooling resulted from this technique, aided by a higher-than-expected heat transfer in the dry steam generator. The next two tests were small hot-leg breaks, one with pumps running and the other with pumps shut off. The break flows in both tests were equivalent, indicating some flow stratification in the hot leg, and the core was never uncovered. The last test was a large break in the cold leg with an initial power of 15 kw/ft, the highest power yet run in the series of LOFT large-break tests. Although the initial power determines the magnitude of the temperature peak during initial blowdown, the mode of pump operation (running, coastdown, or decoupled) affects the extent of the early rewetting and therefore the subsequent temperature variation during the reflood period.

Semiscale. During 1983 several tests and system hardware improvements were completed on the Semiscale test facility. (For a description of the facility, see *1980 NRC Annual Report*, p. 198). The tests included a loss-of-off-site-power series and a steam generator tube rupture series. The primary coolant system feed and bleed study performed in 1982 was expanded in 1983 to include results and analyses from the loss-of-off-site-power test series.

The system was modified to permit injection of primary coolant system water into the secondary side of the steam generator to simulate the rupture of steam generator tubes. Flow control permits simulation of virtually any number of tubes rupturing. Tests involving steam generator tube rupture were begun in 1983 and will be completed in 1984.

BWR FIST Facility. The Fully Integrated Simulation Test (FIST) facility in San Jose, Calif., is an improved version of the two-loop test apparatus (see *1980 NRC Annual Report*, p. 199) to simulate various BWR transients. FIST is sponsored jointly by NRC, EPRI, and GE. It is of sufficient height to use a single, full-sized, electrically heated fuel bundle operating at typical BWR pressures and temperatures. During 1983, the first phase of testing was completed with tests simulating large- and small-break LOCAs, ATWS, and other BWR transients with multiple failures. The BWR-TRAC computer code (see Code Assessment below) was assessed using pretest predictions of FIST tests.

IST Program. The Integral Systems Test (IST) program was initiated in 1983 to conduct integral tests representative of plants manufactured by B&W. The program will include the Once Through Integral Systems Test (OTIS) facility, which will simulate raised-loop B&W plants, and the Multiloop Integral Systems Test (MIST), which will represent lowered-loop B&W plants.

2D/3D Program. Under this joint research program with Germany and Japan to study PWR LOCAs, (see *1982 NRC Annual Report*, p. 124) the Japanese Atomic Energy Research Institute (JAERI) completed the Core I test series in the Slab Core Test Facility and is installing new test vessel internals for the Core II test series to start in April 1984. The JAERI also completed 20 tests in the Cylindrical Core II Test Facility. A preliminary data analysis shows that the electrically heated, 1/21-scale reactor core is effectively cooled and quenched by a two-phase flow mixture during the reflood process after a large-break LOCA. Typically, peak clad temperatures are less than 900°C, and the entire core is quenched in 3-10 minutes. The Federal Republic of Germany continued constructing the Upper Plenum Test Facility (UPTF) at Mannheim and plans to complete the construction by June 1985. The UPTF will offer the opportunity to study, in full scale, deentrainment of liquid in the upper plenum, emergency core cooling bypass, and the countercurrent flow limitation phenomenon in hot legs during small-break LOCAs.

Code Assessment and Applications

Code Improvement. Work continued on several best-estimate codes during 1983: (1) TRAC-PF1/MOD1, used to analyze system transients that require a complete simulation of PWR plant controls and balance-of-plant systems, and capable of analyzing LOCAs since it contains models similar to its predecessors, i.e., TRAC-PD2 and TRAC-PF1 codes, was completed early in 1983. (2) TRAC-BD1/MOD1, used to analyze the same aspects of BWRs, also was completed in 1983. (3) Development of the fast-running BWR version of TRAC, TRAC-BF1, was started in 1983. (4) The COBRA-TF code to analyze flow blockage and rod-swelling effects upon the cooling of a fuel assembly will be completed early in 1984.

Code Assessment. Independent assessment of best-estimate systems codes provides information essential for evaluating margins of safety (see *1980 NRC Annual Re-*

port, p. 206). Assessment of TRAC-PF1, TRAC-BD1, and RELAP5/MOD1 was completed in 1983 and assessment of TRAC-PF1/MOD1, TRAC-BD1/MOD1, and RELAP/MOD2 was started.

Code Applications. These computer codes continued to be used to address licensing concerns. TRAC-PF1 and RELAP-5 were used to perform calculations in support of the evaluation of pressurized thermal shock. TRAC-BD1 was used to evaluate BWR ATWS. Best-estimate calculations of large-break LOCAs were performed using TRAC-PF1 and TRAC-BD1 to support potential revisions of Appendix K to 10 CFR Part 50.

Plant Analyzer and Data Bank

The plant analyzer includes calculational tools to easily and accurately analyze plant transients. This is, in effect, the end product of this research area. Two concepts are currently being pursued: (1) make use of existing codes such as TRAC and RELAP-5 but make them faster and easier to use and (2) investigate new computing techniques to speed calculations. Speed and ease of use are essential if the calculational tools developed under this research area are to provide maximum benefit.

During 1983, research into new computing techniques showed significant potential for speeding the calculations. An effort was also started to improve the displays of computed results and to allow the interaction with the calculation (i.e., change conditions in the middle of the calculation). The plant data bank was also developed as a tool to store plant descriptions and to aid in converting these descriptions into input for the codes.

ADVANCED REACTORS

NRC's advanced reactor safety technology research program (see *1981 NRC Annual Report*, p. 128) on liquid metal fast breeder reactors (LMFBRs) and high-temperature gas-cooled reactors (HTGRs) produced the following results in 1983.

Liquid Metal Fast Breeder Reactors

The Argonne National Laboratory's COMMIX-1A code was applied to the invessel analysis of the Clinch River Breeder Reactor (CRBR) during natural circulation and with the decay heat removal system in operation as part of the construction permit review. Brookhaven National Laboratory's Super System Code (SSC) was used to evaluate the thermal-hydraulic behavior of CRBR and the response of the plant to accidents such as pipe break and station blackout in support of CRBR licensing. Los Alamos continued to analyze accident consequences in CRBR using the SIMMER II code. The analysis demonstrated that CRBR can be made to withstand a core-disruptive accident.

Tests on the chemical interactions between liquid sodium and CRBR-type containment concretes were completed at Sandia National Laboratories (SNL). With resolution of CRBR licensing issues, the program has been redirected to understanding the effect of sodium and sodium-concrete reaction products on the chemistry of fission products.

Three separate effects experiments were performed in the Annular Core Research Reactor (ACRR) at SNL on the process of molten fuel removal from the core during the transition phase of an LMFBR core-disruptive accident. This fuel-removal process limits the energetics of possible fuel recriticalities during such accidents, and its evaluation was a key element in the CRBR licensing review. The PLUGM fuel-removal model was developed from the results of these and earlier transition phase (TRAN) experiments. The Japanese will be joining in the continuing TRAN experimental program.

Three separate effects experiments were performed in the ACRR to complete the joint NRC/West German program on the disruption of clad pellets of irradiated fuel under LMFBR loss-of-flow (LOF) accident conditions. The SANDPIN model for the fission-gas-driven swelling, cracking, and disruption of irradiated fuel under LMFBR LOF conditions was developed from the results of these and earlier experiments. A joint NRC/West German follow-on program of ACRR experiments has been started on the sodium-vapor flow-driven upward streaming and freezing and possible blockage formation by molten cladding and fuel during the initiation phase of LMFBR LOF accidents.

High-Temperature Gas-Cooled Reactors

In addition to its programs related to the Fort St. Vrain reactor in Colorado, NRC research has been addressing potential safety and licensing issues for a new generation of commercial HTGR plants. NRC's most significant undertaking in this regard has been the development of a methodology for making a preliminary evaluation of HTGR siting source terms that will improve the staff's understanding of severe accident phenomenology of a basically generic HTGR lead-plant design. The results of this study, released in 1983, form a basis for new detailed planning during 1984 for development of "HTGR-specific" licensing tools and further research into safety margins for new generation HTGRs.

RISK ANALYSIS

Since publication of the Reactor Safety Study (WASH-1400) in 1975, several follow-on probabilistic as-

sessments have been conducted on various U.S. plant designs and containments. These have ranged in scope from estimates of core melt probability to estimates of risks to the public. The NRC has recognized since 1975 that the probabilistic risk assessment (PRA) methodology had to be used with care because of the large uncertainties inherent in the analysis, and programs to enhance the PRA methodology have been carried on from the outset. While progress is being made and the program has provided useful insights on nuclear reactor safety, there remain significant uncertainties associated with the overall results of PRAs. The Commission has recognized the need to consolidate the information gained by both government and industry over this time period to assess the adequacy and uncertainty associated with the methodology and insights gained as well as their usefulness in regulatory decisionmaking. Thus, the plan for evaluating the Safety Goal Policy Statement calls for the Office of Nuclear Regulatory Research to prepare a reference document summarizing the status of PRA information available to date. Work was initiated to prepare this report in 1983. It will be available for broad peer review early in 1984.

The following sections provide a discussion of the 1983 activities to improve the PRA methodology, to gain insights on the principal contributors to reactor risk and cost-effective ways to reduce this risk, and to develop a program aimed at providing assurance that the risk is maintained at or below reasonably acceptable levels.

Risk Methodology and Data Development

Work in the area of risk methodology in 1983 included improving the computer-aided fault tree modeling technique used in the Interim Reliability Evaluation Program (IREP) and completing improvements in the SETS computer code. Common cause failure methods and surveillance testing requirements methods were refined and applied to a reactor shutdown system. Work was done to identify the risk importance of systems, test and maintenance activities, and human actions on selected PRA accident sequences. Guides were prepared for estimating production cost increases from nuclear plant outages and for conducting value-impact analyses using PRA techniques.

The NRC continued to collect and analyze maintenance data from selected power plants, including component failure histories, causal information, and time trends, to provide a data base for certain types of plant equipment. Summaries of component failure data reported in licensee event reports (LERs) were updated for instrumentation and control circuits and newly developed for inverters. Initiating event data were expanded to include data for all U.S. operating reactors.

Reactor Risk

Experimental Reliability and Risk Analysis Programs. The final two Phase II IREP studies (Millstone Point Unit 1 and the Calvert Cliffs Unit 1) were completed in 1983. The important risk contributors included accidents that were initiated by loss of off-site power, LOCAs, and ATWS. As in the previous studies (see *1982 NRC Annual Report*, p. 130), these studies showed that support system failures were important as were selected operator and test and maintenance actions. It was also found that consideration of operator recovery action influences accident sequence frequency estimates, the list of accident sequences dominating core melt, and the set of dominant risk contributors.

The emphasis in the IREP studies was on internal events analysis. External events such as seismic, fire, and flood were not addressed, and common-cause failures were addressed only in special cases. Methods have been developed to assess effects of these risk contributors; however, there is still a need to substantially improve the treatment of common cause failures, to evaluate methods effectiveness, and to integrate methods for coordinated use in PRA. This precipitated the Risk Methodology Evaluation and Integration Program (RMEIP), for which planning was completed in 1983, and which will use a thorough PRA as the "test bed" for trial, evaluation, comparison, and integration of methods and computer codes. The effort will include a comprehensive treatment of PRA uncertainties.

Accident Precursors. The accident precursor program is an effort to determine the following from LERs:

- Identify important sequences that could have led to severe core damage.
- Search for elements or precursors of severe core-damage accidents which are not predicted or poorly predicted in current PRAs.
- Analyze operational events to estimate the frequencies and trends of system failures, function failures, and overall frequency of severe core damage as an alternative data source to compare with PRA estimates.

The initial effort included development of a methodology and a trial use of the program's examination of LERs submitted during the inclusive calendar years 1969-1979. A companion draft report of LERs generated in 1980 was distributed for comment in late 1983. Numerous individual and peer group reviews of the initial report were initiated soon after publication. In February 1983 EPRI sponsored a precursor study workshop which brought together many of the reviewers, the contractor (ORNL), and NRC sponsors of the program. The workshop provided an excellent forum for exchange of technical views. Future work will be directed toward reflecting peer comments in the analyses performed and on

extracting the maximum information possible regarding the nature of the occurrences identified as important, particularly information pertaining to dependencies between failures.

Risk Analysis Supporting Regulatory Considerations of Severe Accidents

Accident Sequence Evaluations. In 1983, the accident sequence evaluation program (ASEP) continued to develop updated generic severe accident sequence information for use in various regulatory activities. The objectives are to develop a reliable source of PRA information and to support research on modeling and quantification by providing insights from identified dominant accident sequences. An interim report, to provide the NRC regulatory activities with a snapshot of ASEP research progress, summarized dominant accident sequences from existing PRAs, listed accident sequence insights and accident-progression and human-error uncertainties, and revised some past PRA accident sequence core melt frequencies. These outputs are used in NRC rulemaking activities on severe accidents (as discussed below in "Severe Accident Risk-Reduction Analysis").

Computer Code Development to Support Risk Assessment. Work continued in 1983 on computer codes used in risk studies to predict the physical processes occurring during severe LWR accidents. As a result of critical reviews of the MARCH code (released in 1980), work was undertaken to modify the code, and in late 1982 a revised version (MARCH-2) was released to some NRC contractors for review. It is expected that the code will be released to the public in early 1984.

During 1983, work began in earnest to develop the longer-term replacement code for the present generation of "risk codes" (MARCH, MATADOR, and CRAC). This code (MELCOR) will use advanced programming techniques to produce a highly modular structure that will permit the incorporation of new phenomenological models, and allow quantitative uncertainty analysis for accident processes. This capability is important for obtaining a better quantitative measure of the uncertainty associated with PRA predictions of risk and for setting priorities concerning the various phenomena and related research efforts.

The results of a major NRC study of the relative risks posed by nuclear power plants were highlighted in several NRC licensing cases and in the NRC's report to the Congress on nuclear casualty insurance (Price-Anderson Act). A better understanding of siting, risk, and emergency planning issues has resulted. The NRC's Calculation of Reactor Accident Consequences (CRAC) code was revised and a users' manual for CRAC-2 was completed and distributed to users worldwide in 1982 (See *1982 NRC Annual Report*, p. 130). CRAC-2 was applied to the emergency planning issue to demonstrate that early evacuation of relatively small areas (2-to-3-mile radii) and providing shelter elsewhere could significantly reduce the potential for early health effects from nuclear power plant accidents in the event of large releases of radioactive materials. Continuing studies of the respiratory protection potential of household materials (i.g., towels) demonstrated the possibility of reducing inhalation doses by factors of three to one hundred. This information is currently being reviewed for possible inclusion as a recommended emergency protection measure. Staff studies of the cost/benefit of predistribution of potassium iodide as a measure to reduce thyroid exposure for the United States population showed that such a program would not be cost-effective.

The current lack of treatment of condensation of water vapor discharged into the atmosphere during severe accidents was identified as a possibly significant omission, and a new research program was initiated to investigate the phenomenon. In addition, an international comparison of accident consequence models that highlighted the different approaches and assumptions taken by different countries was completed, and it was concluded that the final risk results were not influenced dramatically by the differences in the consequence models.

Severe Accident Risk-Reduction Analysis. During 1983, NRC's analysis of the value and cost of risk reduction associated with the prevention and mitigation of severe accidents continued in several conceptual areas. A detailed value/impact study of alternative decay heat removal systems was published in June 1983 (NUREG/CR-2883). Draft reports of similar work for filtered-vent containment systems were circulated for review.

Parallel to these studies of individual design features are value-impact studies of a broader spectrum of severe accident prevention and mitigation features. In this work, analyses of the individual features are being combined with studies of other features (and combinations of features) performing the same function. During 1983, updated data were collected from programs supporting these analyses on such issues as accident sequence likelihoods and characteristics (from the accident sequence evaluation program discussed above) and accident source terms. These data will be used in 1984 to support assessment of the present level of risk of LWRs and the cost-effectiveness of possible design changes to reduce risk. Completion of these analyses is timed to support Commission decisions in late 1984 on the need to backfit existing LWRs to better cope with very severe accidents.

Risk analysis techniques are being applied to Unresolved Safety Issues A-44, "Station Blackout," and A-45, "Shutdown Decay Heat Removal Requirements," and have also played a major role in developing the rule in response to USI A-9, "Anticipated Transients Without Scram." (See also Chapter 2.)

Reliability Assurance Research Program. During 1983, the importance of the NRC's new reliability assurance research program (RARP) was emphasized by a

failure at a Salem Nuclear Generating Station unit to automatically scram. The program, which evaluates and transfers portions of reliability assurance (RA) approaches, elements, and methods, recognizes that many RA-related requirements and practices are in place at nuclear plants although they are not in all cases, part of a systematic program structure, nor are they all complete.

Reliability assurance requirements are complementary to (and enhance) requirements associated with quality assurance and quality control, component and system testing, maintenance programs, operating procedures, training, operating experience reporting and data analysis, and reliability analysis techniques that identify and quantify principal causes of system failure. Thus, the RARP will involve the assessment of current practice to determine what changes, if any, are needed to ensure system reliability through the use of effective reliability management practices, performance specifications, and auditable measures of compliance, including meeting performance specifications.

There are three phases to RARP. The first phase involved an initial survey (completed in 1983) of current nuclear industry practice, and the identification and screening of candidate RA approaches. The second phase, involving the development, application, and evaluation of promising RA approaches, is expected to be completed in 1984. In the third phase, feasible, cost-effective RA approaches will be selected, and potential regulatory requirements will be developed and recommended for NRC consideration. An NRC/industry cooperation steering group is being formed to foster technical cooperation and ensure early distribution and review of both technical and policy issues.

Transportation Safety Research

Efforts in 1983 under the transportation safety research program described in the *1982 NRC Annual Report* (see p. 131) included an assessment of package loading parameters associated with severe marine and air accidents. The marine-accident studies focused on the mechanical and thermal forces generated in ship collisions and fires. Several actual collisions, taken from the U.S. Coast Guard data base of ship accidents, were used to validate analytical models that assess ship-into-ship penetration depths in collisions as a function of impact locations and angle.

To verify the phenomena observed following interactions between explosives and spent fuel, a review of research information was conducted by the Army's Ballistic Research Laboratory. Its conclusions will be used in addressing the proposed rule change relaxing safeguards measures for spent fuel shipments.

A draft guide containing fracture toughness criteria for thin-wall steel shipping containers was issued in June 1983. This guide identifies criteria acceptable to the staff for meeting some of the NRC regulations.

10 CFR Part 71, "Packaging and Transportation of Radioactive Material," became effective September 6, 1983, superseding the previous Part 71. The purpose of the regulation change was to make the United States regulations for transport of radioactive material compatible with current International Atomic Energy Agency regulations and with applicable transportation regulations of most of the countries in the free world. The change was coordinated with and made compatible with revision of Department of Transportation regulations in 49 CFR. Among other things, the revised regulations will make shipments of radioactive materials that comply with both NRC and DOT regulations acceptable in international commerce.

Fuel Cycle Safety

The NRC continued its efforts to improve methods used to determine the characteristics of radioactive material that could be released in accidents at fuel cycle facilities, and to document them in a user-oriented handbook. Research in 1983 continued to focus on developing computer models that simulate fuel cycle facility fires. The models describe the fire-induced generation of radioactive material aerosols and combustion products, their transport throughout the facility's ventilation system, and the quantities released to the environment. Computer code predictions were compared to the experimental results from a series of full-scale tests conducted at the fire test facility at Lawrence Livermore National Laboratory.

Consumer Products

Suspension of Exemption for Radioactive Cloisonné Jewelry. In January 1983, the New York State Department of Health announced that it had found that some pieces of cloisonne jewelry were radioactive. The radiation came from uranium used to produce golden-yellow and beige colors in the brightly colored glass enamel of the jewelry. Surveys conducted by the States and the NRC indicated that about 10 percent of the jewelry tested contained uranium and that the uranium content of the enamel ranged from 3 to 7 percent by weight. The NRC regulations permit the use of glass enamel frit containing no more than 10 percent of source material by persons exempt from NRC regulation. All radioactive cloisonné, jewelry is believed to be imported.

Although the use of such jewelry does not constitute an immediate or significant health hazard, the NRC believes the use of the jewelry could constitute an unnecessary exposure to radiation. The NRC plans to reevaluate the exemption that permits the use of uranium in glass enamel and the use of the glass enamel on an end product such as jewelry.

During the reevaluation, the NRC has suspended the exemption pertaining to glass enamel and glass enamel

frit. This prohibits further importation of radioactive cloisonne jewelry into the United States for commercial distribution. However, the suspension does not apply to persons who receive, possess, use, or transfer radioactive cloisonne jewelry imported or ordered for importation before the suspension date. The suspension will be terminated after final NRC action following reevaluation of the exemption or on June 30, 1985, whichever comes first.

Radioactive Consumer Products Reports. Licensed distributors of smoke detectors and other consumer products containing small quantities of radioactive material are now required to report essentially every 5 years the numbers of products distributed, instead of reporting annually as was previously required. The rulemaking action was completed in early 1983 to reduce the administrative burdens of the requirement without significantly reducing the value of the reports.

HUMAN FACTORS

NRC's human factors research concentrates on human factors systems engineering; plant personnel staffing, training, and qualifications; plant procedures; and human reliability to support regulatory needs in applying human factors engineering to nuclear facilities. Key human factors research and standards programs in 1983, including emergency preparedness, are described below.

Human Engineering

This program provides research needed to develop a technical basis for NRC evaluation of man-machine relationships in central control rooms and at local information and control stations. Research is being conducted to assess and recommend human factors standards and guidelines for new or improved designs so as to improve the operator and maintenance personnel man-machine interface. Significant accomplishments included completion of a comprehensive baseline task analysis of control room crew activities at eight nuclear power plants covering 44 normal, off-normal, and accident sequences. Human engineering design guidelines for cathode ray tube displays were developed from laboratory analyses and experiments. A methodology for allocating man-machine functions at nuclear power plants was developed. Nine publications dealing with the research under this program were issued in 1983.

Licensee Personnel Qualifications

This program provides the research necessary to assess, develop, or confirm the technical basis for the criteria used by the NRC to establish and evaluate the qualifications of licensee personnel to safely operate a nuclear facility and reduce operator-related risk. These qualifications include education, training, examination, experience, and requalification. Criteria for safety-related operator actions were identified and based on personnel response time data obtained from a variety of transient and accident sequences that occurred and/or were simulated at both PWRs and BWRs. The system-approach-to-training method was developed for assessment of entry level qualifications and training programs for nuclear power plant personnel. Four publications dealing with the research under this program were issued in 1983.

Plant Procedures

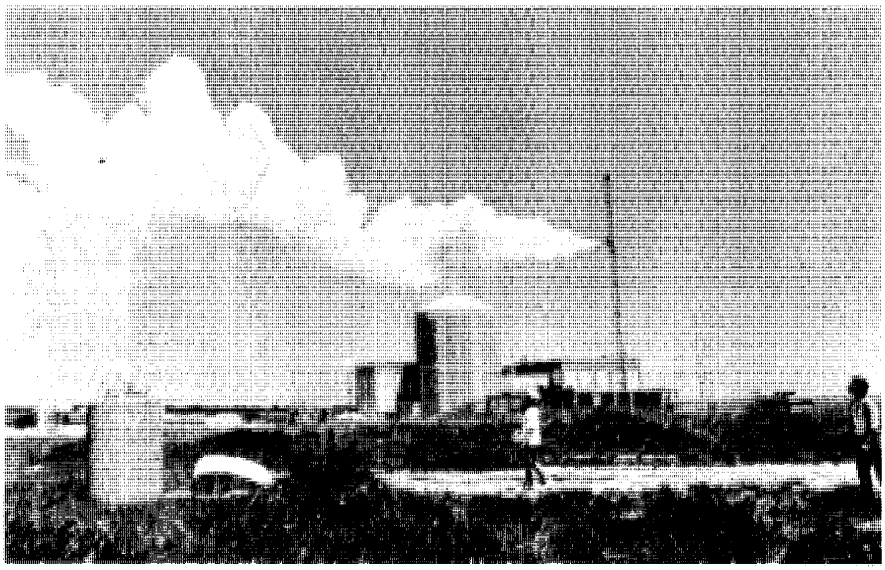
This research program provides information needed to develop the technical basis for the methods and criteria used by the NRC to assess and upgrade, where needed, plant operating procedures necessary for the safe operation of nuclear power plants. The plant procedures investigated include operating, emergency, maintenance, and surveillance and testing procedures. Methods for reviewing and evaluating emergency procedure guidelines for nuclear power plants were developed, and checklists for evaluating maintenance, test, and calibration procedures were produced. Four publications dealing with the research under this program were issued in 1983.

Human Reliability

This program provides research necessary to support NRC human reliability evaluations, especially for the probabilistic risk assessment (PRA) program. It also provides methods and techniques for employing human performance data in the design and evaluation of man-machine safety systems. The products of this research support Section II.C, "Reliability Engineering and Risk Assessment," of the TMI Action Plan (NUREG-0660). Major research products in 1983 were completion of methods and application techniques to conduct a human reliability analysis at a nuclear power plant. Human error data, storage and retrieval, and techniques for evaluating factors affecting human reliability were analyzed for both operational and maintenance tasks. Eleven publications dealing with the research under this program were issued in 1983.

Emergency Preparedness

This program provides research to develop a technical basis for monitoring, assessing, developing, upgrading, or clarifying emergency preparedness for nuclear power plants and certain fuel cycle and material licensees. Research included evaluation of radiation monitoring instruments and human factors in emergency preparedness. Two publications dealing with research under this program were issued in 1983.



A radar-tracked balloon is launched to assist in monitoring the atmospheric dispersion of tracer materials released from a tower during SEADEX I field tests. The tests were conducted near the Kewaunee nuclear power plant on the shores of Lake Michigan in Wisconsin.

Revision 1 to Regulatory Guide 2.6, on emergency planning for research and test reactors, was issued in March 1983.

Atmospheric Dispersion. The atmospheric dispersion research program is designed to provide information for the evaluation of real-time dispersion models and on the optimum measurements needed to characterize the movement of effluents through the atmosphere. The analyses of data collected during the NRC-sponsored field tracer test at the Idaho National Engineering Laboratory (INEL) has been completed. Analyses of data collected during another field test on the Lake Michigan shoreline in Wisconsin (see *1982 NRC Annual Report*, p. 140) is continuing, as is the evaluation of dispersion models using the INEL test data. Four reports concerning atmospheric dispersion were issued this year.

Other Human Factors Activities

- Continued support and coordination of man-machine interface research at the Halden reactor project of the Organization for Economic Cooperation and Development.
- Submitted final rule package to Commission on fitness for duty, amending 10 CFR § 50.54.
- Developed advanced notice of proposed rulemaking to modify Appendix A to 10 CFR Part 50 to add criterion for human factors.
- Developed proposed rule for 10 CFR Parts 30, 40, 70, and 72 on emergency preparedness for fuel cycle and byproduct material licensees.
- Developed proposed rule that responds to two petitions for rulemaking related to frequency of emergency preparedness exercises.

INSTRUMENTATION AND CONTROL

NRC research in instrumentation and control evaluates the safety of plant control, protection, and other related systems; performance and failure modes of individual instruments and electrical system hardware; diagnostic needs and equipment capabilities; and technological advances in safety systems.

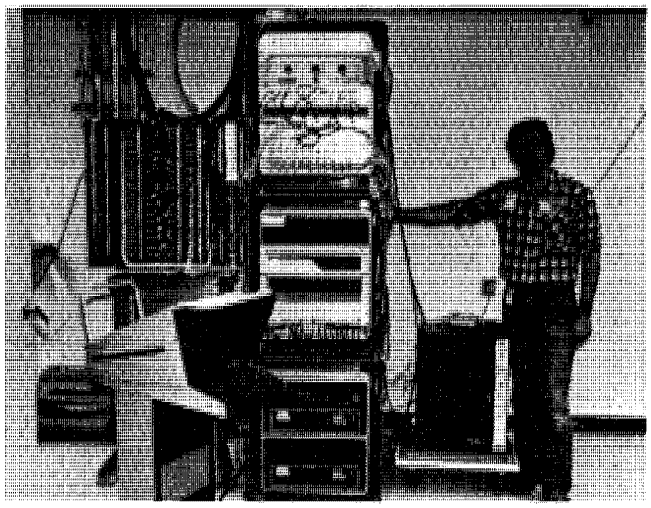
At INEL, efforts were initiated in 1983 to assess the safety implications of advanced instrumentation and control technology and to evaluate the test frequencies of engineered-safety-feature actuation systems and reactor trip systems. At Lawrence Livermore National Laboratory, a project was begun to evaluate the adequacy of protection of solid-state devices against electromagnetic interference. At Argonne National Laboratory, an assessment of the use of solid state motor controllers in nuclear power plants was initiated.

The continuing Oak Ridge National Laboratory (ORNL) study of the safety implications of control and associated support systems initiated a failure modes and effects analysis for a B&W reactor (Oconee Unit 1). This study is being performed to support resolution of an important unresolved safety issue (USI A-47, "Safety Implications of Control Systems"). (See also Chapter 2.) A Brookhaven National Laboratory project is developing criteria and methodology to establish the technical basis for regulatory guidance on the graded classification of instrument and control systems important to safety. Interim evaluation guidelines were developed by INEL for computer-based systems important to safety, and analog and digital devices isolating safety and nonsafety systems were tested in an INEL study. A Sandia National Laboratories (SNL) study assessed the state of the art of LWR alarm and annunciator systems, including analysis of methods for upgrading annunciator systems.

An evaluation was made by INEL of the instrumentation needs to implement Regulatory Guide 1.97, identifying potential problem areas. As part of a component assessment program to identify potential failure modes of instrument and electrical system hardware, SNL evaluated the use of terminal blocks and pressure transducers in nuclear power plants.

In the continuing ORNL project on noise surveillance and diagnostic techniques, an automated on-line surveillance system for monitoring neutron, pressure, and temperature noise signals was used through the second fuel cycle startup at an operating PWR (Sequoyah Unit 1).

Revision 3 to Regulatory Guide 1.97, on instrumentation for LWRs to assess plant and environs conditions during and following an accident, was issued in May 1983. Regulatory Guide 1.151, on instrument sensing lines, was issued in July 1983.



In the photo above, an automated on-line noise surveillance system is demonstrated at the Sequoyah Unit 1 facility in Tennessee. Below is a computer laboratory at the Oak Ridge National Laboratory which is used in the study of plant dynamics and control, as part of NRC research on the safety implications of control systems.

EXTERNAL EVENTS

Man-Related Phenomena

The NRC's siting and environmental research program was phased out in 1983. Activities during this phaseout included documentation of technical support work for the development of demographic criteria for nuclear power plant construction permits and final reports on investigations into the feasibility of establishing standoff distances from nuclear power plants to external hazards. Other environmental research projects completed in 1983 included a study of pathogenic microorganisms in cooling towers and studies of the effect of heated discharge water on populations of wood-boring shipworms.

One program, continued because of its safety significance, deals with aquatic biofouling in safety-related and fire protection systems that circulate raw cooling water at nuclear power plants.

Natural Phenomena

Geology and Seismology. The NRC research program in geology and seismology proceeded along the lines established in 1982. The purpose of this work is to better define seismic hazards in the Eastern United States, to qualify these hazards, and reduce uncertainties in their estimation. The three items that contribute most to uncertainty in seismic hazard estimations are seismic zoning (location and magnitude of earthquakes), attenuation of seismic waves, and site-specific response.

Seismic networks and geological and geophysical studies are used to establish seismic zones and to define relationships between crustal structure and tectonics. Continued emphasis is given to developing an understanding of earthquake source parameters, propagation characteristics, and site-specific spectra studies. The NRC continued to upgrade the seismic networks by replacing older stations with digital instruments and by placing additional strong-motion seismographs.

Studies of the Charleston, S.C., area are continuing, and a public meeting and a scientific meeting concerning the Charleston earthquake of 1886, and its implications for the seismicity of the Eastern United States were held this year. These meetings were organized with U.S. Geological Survey participation.

New geophysical and geological programs to investigate the Ramapo fault and the Central Virginia seismic zone are in progress. Both of these areas are considered critical in determining the cause of seismicity in the Eastern United States. They have been well mapped geologically, and their seismicity has been monitored for a long time. The NRC program is now using seismic exploration methods to determine the critical structure at hypocentral depths. *In situ* stress measurements are also

conducted to correlate stress directions with fault plane solutions and with mapped fault directions.

Similar but less intensive investigations are being carried out in the Moodus, Conn., and Giles County, Va., seismic zones. *In situ* stress will be measured at Moodus to determine possible sense of motion on well-defined faults. In Giles County, a postulated seismogenic structure at considerable depth below the surface is being investigated with seismic reflection techniques. Geological and geophysical investigations of the Nemaha ridge and of the New Madrid area were phased down during this year because the level of information now available reduces the cost-effectiveness of further studies. Other studies are being performed in order to define seismic source parameters, propagation/attenuation of seismic waves, and site-response characteristics. A probabilistic study aiming to define seismic hazards in the Eastern United States was continued during the year.

Hydrology. The research program provides information to evaluate hydrogeologic siting factors and mitigative strategies with respect to ground-water interdictive techniques that might be necessary in the event of a severe accident and to develop more realistic hydrologic models for facility operation and siting. The continuing research efforts to monitor hurricane surges along the Florida coast, to study the geologic and hydrologic phenomena affecting radionuclide transport at West Valley, N.Y. (1982-1983 accomplishments reported in NUREG/CR-3207), and to evaluate models of ultimate heat-sink cooling ponds have all shown steady progress. (See *1982 NRC Annual Report*, p. 140.)

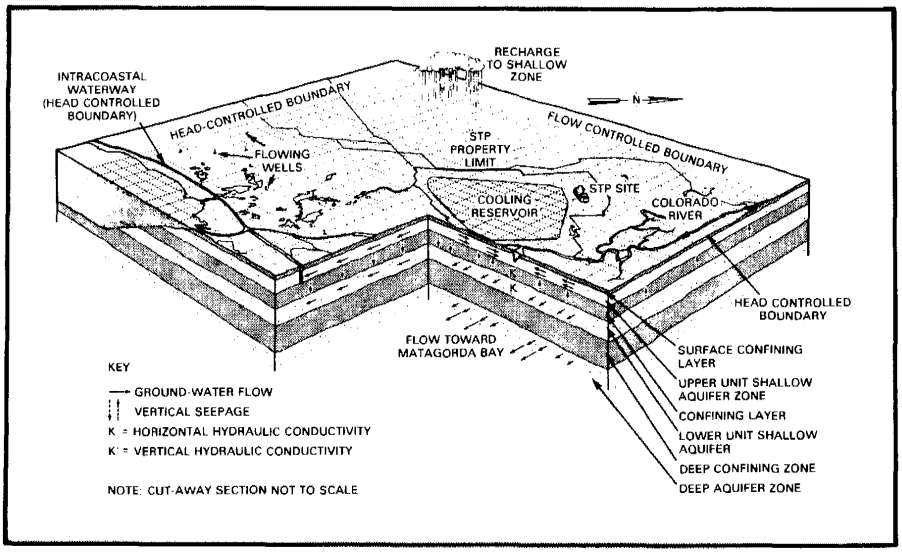
Other major efforts include hydrological research to evaluate both unsaturated ground-water flow and transport through fractured rocks (Phase I results reported in NUREG/CR-3206) and saturated ground-water flow and transport through fractured rocks. A new field method for determining rock permeability in three dimensions is reported in NUREG/CR-3213 and computer-based numerical modeling for radionuclide transport in ground water is the subject of NUREG/CR-3076. Related research into the effectiveness of borehole sealing methods and materials is also progressing well (results through May 1983 are reported in NUREG/CR-3473). Research was started on stochastic hydrogeologic analysis techniques and models. Guidelines for analysis and generation of stochastic parameters to characterize the site hydrogeology will be developed.

A draft guide on ground-water modeling at uranium mill tailings sites and a draft guide on ground-water monitoring for *in situ* uranium solution mines were issued. Work on guidance for hydrogeologic characterization programs for *in situ* uranium solution mines was started.

Meteorology. NRC research on severe and extreme atmospheric phenomena obtains information on the magnitude, frequency of occurrence, and the geographical distribution of meteorological phenomena for use in assessing risks to the public from such phenomena as they may induce failures at nuclear facilities. Work was inspected on the "regionalization" of the design basis tornado, based on meteorological, demographic, and topographical factors that affect tornado occurrences, severities, and reportings. A report describing a methodology for assessing tornado probability (NUREG/CR-3058) has been issued.

RADIATION PROTECTION AND HEALTH EFFECTS

In 1983, the NRC radiation protection and health effects research program supported the development of regulatory requirements that ensure that individuals at licensed activities are not subjected to unacceptable risks of health damage.



The diagram shows the key features of a conceptual ground-water model used by the Pacific Northwest Laboratory to evaluate strategies for the mitigation of contamination.

Radiation Protection Standards

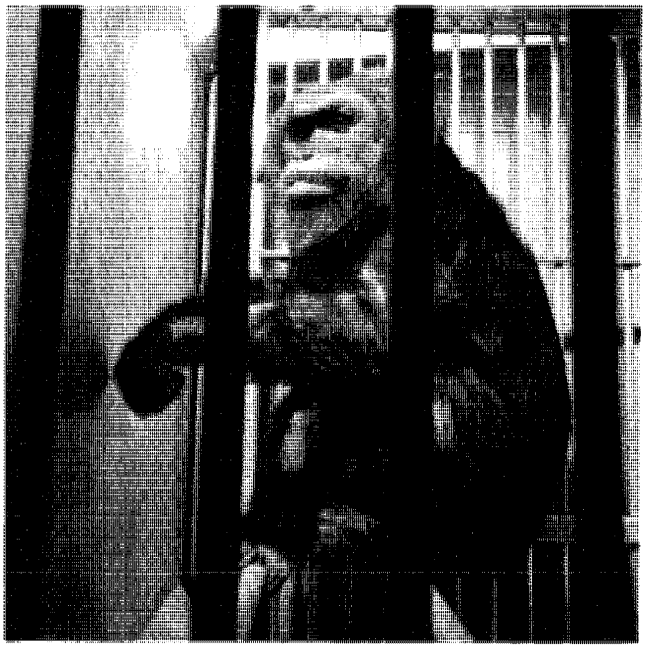
The NRC staff continued development of a major revision of 10 CFR Part 20, "Standards for Protection Against Radiation" (see *1982 NRC Annual Report*, p. 138). Since this proposed rule would affect all categories of licensees, discussions have been held with several hundred persons in an effort to foresee technical and administrative problems in implementing the revision and to develop viable alternatives where necessary.

Radiation Protection Standards For Decommissioning

During the past several years, the NRC staff has been developing data and information on the technology, safety, and costs of decommissioning facilities and sites used in NRC-licensed activities. In 1983, a separate action was initiated to specify generic residual radioactivity limits that must be met before the facilities and land may be released for unrestricted use and the license terminated. Proposed rule changes to 10 CFR Part 20 are scheduled for publication in 1984.

Medical Radiation Protection Standards

Final regulations were published to (1) permit exceptions from certain regulatory requirements for the use of Tc-99m pentetate sodium as an aerosol in lung function studies, and (2) add the lixiscope imaging device to the Group VI list of allowable medical uses of byproduct material. A pamphlet containing guidelines for a patient treated with radioiodine was published in collaboration with the Society of Nuclear Medicine. The staff continued to develop a major revision of the regulations governing human uses of byproduct material (see *1982 NRC Annual Report*, p. 138).



Experiments using other primates often provide data of greater relevance to human beings than those using other mammalian orders. Shown here, at the Lawrence Berkeley Laboratory, is a macaque monkey that has been injected with a radioisotope to determine its uptake and retention in the body's organs. The data from such experiments will be used to develop improved metabolic models for calculating radiation dose in humans.

Environmental Radiation Protection Standards

On April 6, 1983, the Environmental Protection Agency (EPA) published in the *Federal Register* [48 FR 15076] proposed standards for controlling emissions of airborne radioactive materials. These standards were developed by EPA in response to the requirements of the 1977 Amendments to the Clean Air Act. The standard proposed by EPA for non-fuel-cycle NRC-licensed operations is 10 millirems per year to the whole body or any organ. The NRC staff found that the proposed EPA standard was unduly low compared to recommended radiation protection standards. This view was presented at EPA hearings on April 28, 1983, and in written comments submitted to EPA. Similar views have been expressed by the National Council on Radiation Protection and Measurements, the Department of Energy, and several segments of the nuclear industry.

Metabolism and Internal Dosimetry

A status report (NUREG/CR-3313) was issued on a study of aerosol characteristics that may modify the biological fate, patterns of radiation dose, and predicted health consequences of airborne radioactivity. Preliminary modeling efforts based on inhalation data of UO_2 + PuO_2, (U, Pu)O_2, or "pure" PuO_2 indicate that retention, distribution, and excretion patterns are dependent on characteristics of the aerosol. This study will determine whether values for aerosols in the workplace and the environment will be significantly different from those derived by extrapolation from laboratory studies.

Efforts continued in 1983 to determine the value for the neutron quality factor to be used in establishing the maximum permissible dose for occupational exposures (see *1982 NRC Annual Report*, p. 137). Preliminary results indicate that at high doses, neutron-relative biological values vary significantly among the major causes of death. The values are generally lower for genetic damage than for somatic damage, and show the highest levels and greatest range in life-shortening studies.

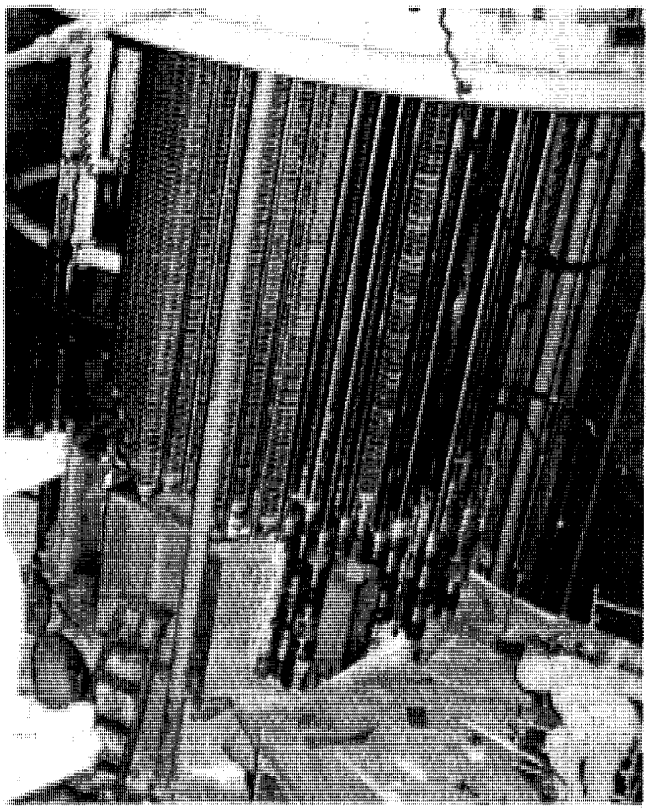
Other continuing projects during 1983 included medical evaluation of workers formerly exposed to thorium to provide data for regulations governing occupational exposure to thorium, and inhalation studies (with beagles) to provide data on the biological characterization of radiation exposure and dose estimates for inhaled effluents from uranium mills.

Health Effects and Risk Estimation

The final report on the effect of genetic immune disorders in mice on the sensitivity to radiation-induced cancer was published (NUREG/CR-3362). The study found enhanced sensitivity in several strains of genetically deficient mice, suggesting that some humans with pre-existing disease states might also be more susceptible to radiogenic cancer.

A study of female radium dial painters who were exposed to radon daughters in early adult life was initiated. Since the personal habits (primarily smoking) and exposure conditions of this group are very different from those of miner populations on which present estimates of radon daughter health risks are based, this study should provide insight on the merit of applying present risk estimates to the general public.

Continuing projects during 1983 included the development of models for early mortality and morbidity resulting from inhalation of radionuclides that could be released in potential accidents; a study of the effectiveness of chronic versus acute radiation exposures in cancer induction; and a study of the effectiveness of I-131 in inducing thyroid cancer in children.



Temporary lead shielding is used to reduce occupational radiation exposure at the Zion nuclear power plant in Illinois. The shielding is installed on a scaffold constructed next to the reactor head. The scaffold provides a secure platform to enable the workers to replace control rod drive mechanisms. The shielding reduces radiation dose rates to about one-third of unshielded intensity, thus allowing an experienced crew to stay on a job three times as long before reaching their daily exposure limit. Increased worker efficiency results in a reduction of total worker dose as well as reduction in maintenance costs.

Occupational Radiation Protection

Research on occupational radiation protection also provides information needed to help ensure an adequate degree of radiation protection for workers in NRC-licensed facilities and activities. Application of the results from this research, through NRC regulations, guidance, and standards, promotes consistency with national and international advances in radiation protection methodology.

Control of Radionuclide Intake. NUREG-0941, "The NRC's Limit on Intake of Uranium Ore Dust," was prepared by the staff and published in April 1983. In 1960 the Atomic Energy Commission (AEC) adopted an interim limit on intake by inhalation of airborne uranium ore dust. The 1983 report concludes that the AEC underestimated the time that thorium-230 would remain in the human lung. The AEC assumed that thorium-230, as a daughter product of uranium, is eliminated from the lung with the same biological half-life as uranium, i.e., 120 days. This report concludes that the biological half-life is on the order of one year. Correcting the underestimate would cause a reduction in the permitted airborne concentration of uranium ore dust. However, research performed for the NRC determined that the particle size of uranium ore dust in uranium mills is so large that relatively few particles are deposited in the pulmonary region of the lung where they would be subject to long-term retention. The two effects are of about the same magnitude but in opposing directions. Thus, present NRC limits on uranium ore dust intake limit are believed to provide a level of protection consistent with that for other airborne radioactive materials.

A draft guide on applications of bioassay for tritium was published for comment in July 1983. A companion document, NUREG-0930, was prepared by the NRC staff to provide the scientific background for the quantitative aspects of the guide and also to provide guidance for assessing internal radiation exposure from tritium in various chemical forms.

Worker Perspectives on Radiation Risks. NUREG/CR-3118 (3 volumes), prepared by Battelle Columbus Laboratories for NRC, provides for making a comparison between the radiation-induced cancer risks calculated for radiation workers and risks of chemically induced cancer as determined from actual experience of workers in four nonnuclear industries: nickel, fibrous glass, mineral wool, and selected chemical workers. The results appear to support the premise that workers receiving radiation doses at five rems per year, every year, incur a cancer risk approximately equal to that experienced by workers ex-

posed to average levels of carcinogenic substances in the four groups studied. The average radiation worker (0.5 rem per year) is estimated to incur a cancer risk significantly lower than workers in these other industries. This study will contribute to the next revision of Regulatory Guide 8.29, which provides instruction on risks of occupational radiation exposure.

Health Physics Measurements Improvement. Pacific Northwest Laboratory (PNL) has completed laboratory and field work needed to compare the beta response of various survey instruments and dosimeters used by licensees to measure beta doses. A report to be published in 1984 will include beta field spectra taken at licensed facilities and guidance for improved measurement accuracy.

A final rule amending 10 CFR Part 35, "Human Uses of Byproduct Material," published in January 1983, codifies licensing conditions requiring the installation of radiation monitors in teletherapy rooms, the use of portable survey instruments, and periodic inspection and servicing of all licensed teletherapy units. The requirements are intended to help prevent overexposures of technicians and patients in the event of malfunction of the source exposure mechanism. The new requirements have been established because several malfunctions have been reported to the NRC.

The first round for testing the performance of bioassay laboratories, a jointly funded NRC/DOE project, was completed. The purpose of this project is to evaluate a draft ANSI standard for bioassay laboratory performance. The test specimens distributed to project participants contained different amounts and types of radioactive materials in simulated urine samples and in simulated human phantoms for *in vivo* counting. Preliminary results show that many of the analyses, particularly for more radiotoxic nuclides such as uranium and plutonium, are not within the acceptable ranges of accuracy stated in the initial draft standard. Evaluation of results from the first round will be used in a second round of tests during 1984 to determine the sources of inaccuracies and also the extent to which the ANSI standard may need to be revised.

Two reports published in 1983 provide important new information concerning limitations of some types of neutron dosimeters and preferred calibration methods. The reports recommend continued use of thermoluminescent albedo dosimeters calibrated with a moderated Cf-252 source and corrected for variations in the neutron spectrum. These recommendations will contribute to the next revision to Regulatory Guide 8.14 on personnel neutron dosimetry.

Personnel Dosimetry. The National Bureau of Standards (NBS), under contract to the NRC, established a National Voluntary Laboratory Accreditation Program for personnel dosimeter processors. As part of this program, the University of Michigan will provide proficiency testing services to processors whose performance will be compared against American National Standard N13.11-1983, "Personnel Dosimetry Performance—Criteria for Testing." The NBS will perform on-site appraisals of processors to evaluate quality control. It is believed that implementation of this program can significantly improve the measurement and recording of occupational doses. A proposed rule to require NRC licensees to use accredited dosimeter processors is being considered by the NRC.

Respiratory Protection. Los Alamos National Laboratory developed recommendations for testing respirator filters for reuse following an NRC-funded study on the comparability and interchangeability of aerosols used in performing quantitative fit-testing of respirator wearers and in testing respirator filters before reuse is permitted. Results indicate that the most commonly employed aerosol used in fit-testing may also have suitable characteristics for testing filters for reuse. A newly developed respirator meeting special needs for use in the Three Mile Island cleanup (see Chapter 3), was tested under NRC's technical assistance contract with Los Alamos, and a protection factor was assigned.

Radiation Protection and ALARA Implementation. Regulatory Guide 8.30, published in June 1983, describes health physics surveys in uranium mills acceptable to the NRC staff for protecting mill workers. The guidance can also be applied, in part, to other types of uranium recovery facilities and conversion facilities which use some processes similar to those in uranium mills.

Regulatory Guide 8.31, published in May 1983, contains information on ensuring that occupational radiation exposures at uranium mills will be as low as is reasonably achievable (ALARA). The guidance can be applied to other types of uranium recovery facilities having a similar potential for exposing workers to uranium and its daughter elements.

NUREG/CR-3254 defines the concept of maintaining occupational radiation exposures ALARA and describes the elements necessary for specific licensees to carry out an effective ALARA program. Practical examples of cost-benefit and optimization analysis are provided. The report, published in June 1983, provides a basis for updating Regulatory Guide 8.10.

WASTE MANAGEMENT

NRC's waste management research assesses, tests, and improves measurement and prediction methods; confirms data bases; and develops regulatory standards to support the licensing of facilities and methods for the disposal and management of high-level nuclear wastes, low-level wastes, and wastes from uranium recovery operations.

High-Level Waste

The NRC's high-level-waste (HLW) research program involves studies of waste forms, container materials, and repository engineering, as well as the study of the geology, hydrology, and geochemistry of repository sites and the development of regulatory standards for the licensing of HLW repositories. In 1983, the technical criteria for HLW repositories (Subpart E of 10 CFR Part 60) were completed, and major efforts continued to understand the long-term behavior of both waste forms and waste containers.

Development of geochemical information to identify and understand the processes that affect the behavior of radionuclides that may escape the waste packages included initiation of a study of a natural geothermal system and continued study of the mineral chemistry of backfill and of the radionuclide movement in host rock. These efforts are aimed at dealing with the uncertainties in assessment of long-term repository performance.

Low-level Waste

NRC's low-level-waste (LLW) research continued to address the chemical and mechanical stability of low-level wastes and the basis for a regulatory guide on management of low-level wastes. Also continued in 1983 were projects concerning the solidification and disposal of wastes from the decontamination of reactor heat exchangers and of other operating wastes; the mobility of various radionuclides associated with low-level wastes, and improved models to predict pathways for their potential migration to the environment; and the management of LLW sites (see *1982 NRC Annual Report,* p.138). Research on the behavior of radionuclides in soils is being expanded to assess the ability to model a variety of site types, especially those characteristic of the more humid Eastern United States.

Uranium Recovery

In 1983 the NRC began to phase out its uranium recovery research program. Radon containment research was completed. Continuing in 1983 and planned for completion in 1984 are studies on the installation of riprap ("rock armor") and other materials for long-term protection of stabilized mill tailings; tailings dewatering technology; interim stabilization of tailings retention systems; underground leachate movements; and the behavior of leaching solutions during *in situ* solution mining.

REGULATIONS AND GUIDES

NRC Standards are primarily of two types:

- Regulations, setting forth in Title 10, Chapter 1, of the Code of Federal Regulations requirements that must be met.
- Regulatory Guides, describing, primarily, methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations.

When NRC proposes new or amended regulations, they are normally published in the *Federal Register* to allow interested citizens time for comment before they are adopted. This is required by the Administrative Procedure Act. Following the public comment period, the regulations are revised, as appropriate, to reflect the comments received. Once adopted by the NRC, they are published in the *Federal Register* in final form with the date they become effective. After that publication, rules are codified and included annually in the Code of Federal Regulations.

Some regulatory guides describe techniques used by the staff to evaluate specific situations. Others provide guidance to applicants concerning the information needed by the staff in its review of applications for permits and licenses. Many NRC guides refer to or endorse national standards (also called "consensus standards" or voluntary standards) that are developed by recognized national organizations, often with NRC participation. NRC makes use of a national standard in the regulatory process only after an independent review by the NRC staff and after public comment on NRC's planned used of the standard has been reviewed.

The NRC encourages comments and suggestions for improvements in regulatory guides and, before staff review is completed, issues them for comment to many individuals and organizations along with the value/impact statements which indicate the objectives of each guide, along with its expected effectiveness and impact.

To reduce the burden on the taxpayer, the NRC has an arrangement with the U. S. Government Printing Office to act as a consigned sales agent for certain of its publications, including regulatory guides. Draft guides issued for public comment continue to receive free distribution, but the active guides are sold. NRC licensees receive pertinent draft and active guides at no cost.

IAEA REACTOR SAFETY STANDARDS

The NRC continued to coordinate U.S. technical activities associated with the IAEA Nuclear Safety Standards program to develop safety codes of practice and safety guides for nuclear power plants. The codes and guides provide a basis for national regulation by developing countries of the design, construction, and operation of these plants. In 1983, four safety guides were forwarded through the Senior Advisory Group and Technical Review Committees to the Director General of the IAEA. Working groups prepared two draft guides, and all of the planned IAEA safety guides were undergoing review at year's end with the NRC research staff coordinating the reviews within the U.S. (see *1980 NRC Annual Report*, p. 196).

NATIONAL STANDARDS PROGRAM

The national standards program is conducted under the aegis of the American National Standards Institute (ANSI). ANSI acts as a clearinghouse to coordinate the work of standards development in the private sector.

The NRC staff is active in the national standards program, particularly with respect to setting priorities so that regulatory views are known regarding the standards that can be most useful in protecting the public health and safety. NRC participation is based on the need for national standards to define acceptable ways of implementing the NRC's basic safety regulations.

Approximately 225 NRC staff members serve on working groups organized by technical and professional societies.

Proceedings and Litigation

CHAPTER 12

This chapter constitutes a report on proceedings involving the Atomic Safety and Licensing Board Panel and the Atomic Safety and Licensing Appeal Board; also included are some of the more significant decisions of the Commission itself. (See "The Licensing Process," Chapter 2.) The second half of the chapter is a judicial review of the report period covering litigation involving the NRC, cases pending and closed.

ATOMIC SAFETY AND LICENSING BOARD PANEL

The Atomic Energy Act of 1954 requires that a public hearing be held on every application for a construction permit for a nuclear power plant or related facility. Boards composed of three administrative judges drawn from the Atomic Safety and Licensing Board Panel (ASLBP) perform the Commission's hearing function and render initial decisions on a variety of licensing and enforcement matters. These hearings are the Commission's principal public forum for individuals and organizations to voice their interest in a particular licensing or enforcement issue and to have their concerns adjudicated by an independent tribunal.

On September 30, 1983, the panel included 24 permanent and 31 part-time administrative judges drawn from various professions. There were 20 lawyers, 18 environmental scientists, 7 engineers, 7 physicists, 1 medical doctor, 1 economist and 1 chemist. (See Appendix 2 for the names of Panel members.) The Commission appoints administrative judges to the panel based upon recognized experience, achievement and independence in the appointee's field. Judges are assigned to cases in which their professional expertise will assist the board in resolving the issues to be litigated. Generally, boards consist of a lawyerchairman, a nuclear engineer or reactor physicist and an environmental scientist.

The hearing on a particular application for a nuclear facility license may be divided into several phases: health, safety, common defense and security aspects of the application, as required by the Atomic Energy Act; environmental considerations as required by the National Environmental Policy Act (NEPA); and emergency planning requirements. These matters, as well as especially complex technical issues, are frequently treated by Boards in separate initial decisions.

Administration

As cases have become more intensely and actively litigated, and the issues to be decided have grown increasingly complex, the effective logistical management of the hearing process has become especially important. In this effort, the boards are supported by 25 full-time and two part-time employees, including management personnel, a legal counsel, law clerks, a librarian, legal secretaries and docket personnel. The law clerks in particular have provided invaluable assistance through legal research and writing that has permitted the boards to devote a greater portion of their time to the completion of the live, trial phase of licensing proceedings. Three clerks completed their tenures with the panel in fiscal year 1983, while two new clerks entered on duty.

Administrative support for the boards and the panel is furnished by uniform word processing equipment, a joint ASLBP/ASLAP library, the LEXIS automated legal research system, a completely reorganized docket room, and a computerized travel and timekeeping system. A computerized Hearing Status Report established last year now has a virtually complete data base and is capable of generating valuable case management information.

A new initiative in fiscal year 1983 was the computerization of the record in the *Indian Point* (N.Y.) special proceeding. Virtually the entire 18,000 pages of transcript, written testimony and exhibits were made accessible by full-text word search in a private LEXIS library. Thus, in writing its decision, the board was afforded instant access to all references to a particular issue or subject within some 12 linear feet of written material. That kind of access means faster issuance of decisions; more thorough, complete, and documented decisions; and a highly improved capacity to expedite decision review by the Appeal Board and the Commission.

The Caseload

During the fiscal year ending September 30, 1983, Licensing Boards conducted 64 proceedings involving nuclear power plants and other nuclear facilities with a construction value well in excess of $100 billion. Twenty-seven percent of the proceedings were completed. Some 340 days of hearings were held, comprising 279 days of trial and 61 days of prehearing conferences. Seventeen proceedings were closed while 14 new cases were opened and one was received on remand. The operation of six

nuclear power plant units was authorized. Hearings concerning three additional units were completed during the fiscal year, and decisions on those cases were in preparation as of September 30, 1983.

Hearing Procedure

The heavy ASLBP caseload, combined with increasing public awareness and involvement in the licensing process, has made effective hearing management essential to the timely completion of licensing decisions. Using the procedural tools available under Commission regulations, Licensing Boards have i ncreasingly endeavored to assure that issues for hearing are soundly based and well-defined. Prehearing conferences are utilized extensively for the purposes of reviewing and refining proposed contentions, defining the scope of relevant discovery, and developing realistic hearing schedules. The discovery process itself is closely monitored in order to eliminate unnecessary or duplicative efforts and to assure the early resolution of potentially time-consuming disputes. As a result of this active management, nearly three-quarters of the contentions filed in operating license proceedings were resolved prior to hearing. Contentions requiring a hearing were reduced by more than 20 percent in fiscal year 1983 and the average age of cases on the docket declined by 11 percent. As a result, it continues to be true that no operating license has been delayed by the hearing process. Most importantly, however, these efficiencies have been achieved through hearing management practices that insure the fundamental fairness to all parties mandated by law.

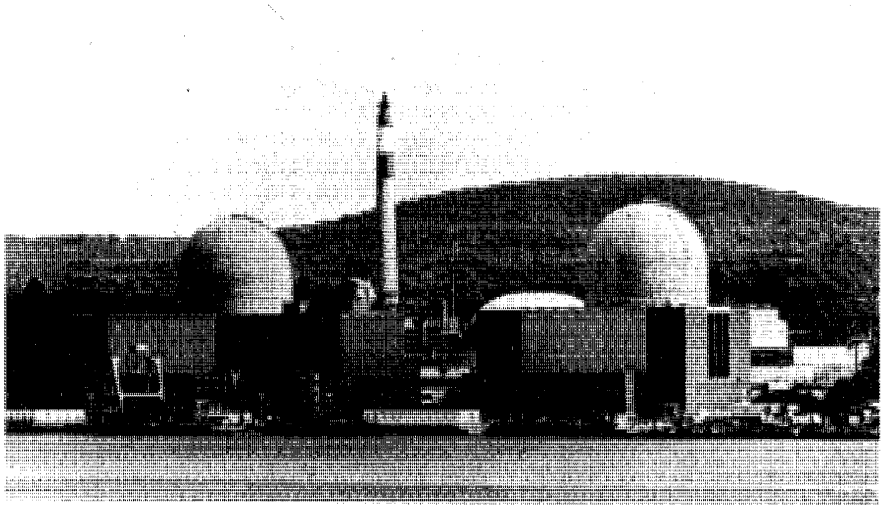
Indian Point

The complex and intensely litigated *Indian Point* (N.Y.) special proceeding came to a close in fiscal year 1983 after 60 full days of hearings. Appointed by order of the Commission to evaluate the risks of operation of the Indian Point reactors in the heavily populated New York Metropolitan area, the Licensing Board in this case heard from more than 250 witnesses, received over 3,000 pages of written testimony and compiled a 15,000-page transcript. Using the computerized facility discussed above to assure a thorough and accurate review of this massive record, the board was able to speed the completion of its decision significantly. Issuance of the board's recommendations to the Commission was imminent at the close of the fiscal year.

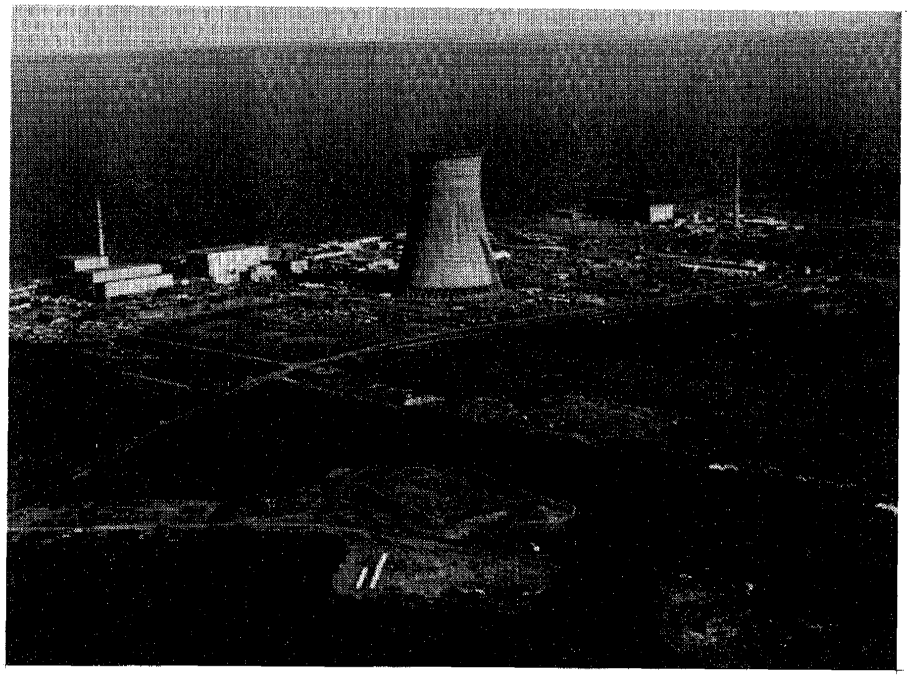
Shoreham

Substantial progress was also made during the fiscal year in another heavily contested case, the *Shoreham* (N.Y.) operating license proceeding. After more than 100 days of hearings, the Licensing Board in Shoreham issued a Partial Initial Decision on September 21, 1983, in which it decided all matters pending before it except certain contentions related to the failure of emergency diesel generators. The board decided all contested issues in favor of the applicant with the exception of portions of two contentions over which it retained jurisdiction. The board found, however, that the pendency of those two issues would not prevent issuance of a low-power operating license should the remaining diesel generator questions be resolved in favor of the applicant. These matters remained pending at the close of the fiscal year.

Because of the number and complexity of the issues involved in the Shoreham proceeding, the ASLBP for the first time split a case between two Licensing Boards. A separate board was established solely to hear those issues related to off-site emergency planning for the Shoreham facility. Preliminary work by this second board had just begun as the fiscal year closed.



The subject of considerable regulatory and judicial attention, the Indian Point nuclear facility in New York comprises three units: Unit 1 in the center (with stack); Unit 2 at left; and Unit 3 at right. Unit 1 is no longer in operation. The other units have been operating for nine and seven years, respectively, but, because of the heavy population density of the area, continued operation has been contested.



The Nine Mile Point Unit 2 nuclear facility is located on the shores of Lake Ontario in New York. The 1,080 MWe boiling water reactor is scheduled to begin operations in 1986.

Operating License Proceedings

In October 1982, the Licensing Board authorized issuance of a full-power operating license for the *Enrico Fermi* (Mich.) Plants, finding no merit in intervenor allegations that site security and quality assurance were inadequate during construction. The board denied an untimely petition by Monroe County, Mich., to intervene in the proceeding.

In December of 1982, the Licensing Board in *Palo Verde* (Ariz.) issued an Initial Decision resolving all matters in dispute in favor of issuance of a full-power operating license for Palo Verde, Units 1, 2 and 3. At the same time, however, the board granted a late-filed request to intervene from petitioners who alleged a serious potential reduction in the productivity of agricultural lands in the vicinity of the Palo Verde plants caused by salt deposition from the facility's cooling towers. To consider this issue, the board reopened the record with respect to Units 2 and 3, and authorized the issuance of a full-power operating license only for Unit 1.

In March 1983, the Licensing Board issued a major Partial Initial Decision in the *Limerick* (Pa.) proceedings. It found that the supplementary cooling water system to be constructed for the plant would not have a significant adverse impact on Delaware River fish or recreational activities, but that noise from operation of the intake pump station could have a serious impact on the proposed Point Pleasant Historic District. Accordingly, the board required that noise measurements be made, and that appropriate mitigation measures be undertaken.

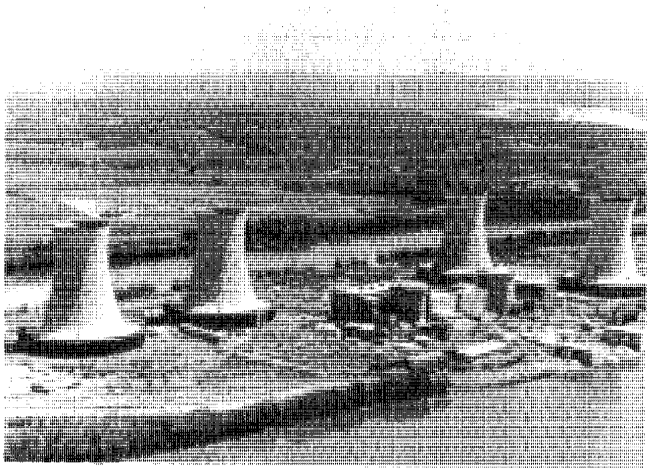
Further decisions authorizing the issuance of operating licenses were issued in *Waterford* (La.) and *Nine Mile Point* (N.Y.).

Operating License Amendments

Of some 16 operating license amendment cases pending during 1983, three were concluded. Two involving the *Point Beach* (Wis.) Plant were closed in February 1983 with the publication by the board of its Initial Decision authorizing issuance of the license amendment without the imposition of any conditions other than those previously agreed to by applicant and Staff. A third proceeding involving the *Dresden/Quad Cities* (Ill.) plant was terminated without prejudice at the request of the licensee.

Civil Penalties

Two cases involving the imposition of civil penalties upon licensees were completed by the panel's administrative law judges during fiscal year 1983. In *Isotope Measurements*, the presiding judge approved a settlement agreement requiring the licensee to pay a $4,000 fine and to cease and desist from receiving radioactive material from any supplier not authorized to distribute it in accordance with NRC regulations. In *Consolidated X-Ray*, the presiding judge upheld the imposition of a monetary penalty, but reduced the amount from $4,000 to $2,500. He found that an absence of management culpability qualified the licensee for a remission of the penalty.



Unit 1 of the Three Mile Island nuclear power plant (Pa.) has been shut down since the accident at Unit 2 in March 1979. Possible restarting of the reactor has been the subject of a special proceeding. The Unit 1 reactor is housed in the building at the center-left and the unit includes the two cooling towers at the left.

ATOMIC SAFETY AND LICENSING APPEAL BOARDS

Atomic Safety and Licensing Appeal Boards, consisting of three members each, perform review functions for the Commission in facility licensing proceedings and others the Commission may specify. Unless the Commission decides to review an Appeal Board decision, that decision becomes the final agency order and is subject only to judicial review in a Federal court of appeals. The board for each proceeding is selected from among the members of the Atomic Safety and Licensing Appeal Panel (ASLAP) by the panel chairman. (See Appendix 2 for membership of the panel.)

An Appeal Board is the only Commission body to which parties disagreeing with Licensing Board decisions can appeal as a matter of right. The appeals coming before the boards raise a wide variety of technical and legal issues. Fiscal year 1983 was no exception in this respect. In the course of the year, the Appeal Boards handed down numerous decisions, memoranda and orders. Nearly 50 of these were of sufficient significance to be published in the volumes of Nuclear Regulatory Commission issuances. These volumes contain, among other issuances, the permanent collection of the NRC licensing decisions available for reference to the members of the bar and other interested segments of the public. The more significant of these published decisions are highlighted below.

TMI-1 Restart Proceeding

The special proceeding to determine whether Unit 1 of the Three Mile Island (Pa.) facility should be permitted to resume operation occupied considerable attention of the several Appeal Boards for that proceeding over the course of the year. This proceeding alone was the subject of nine separate published decisions, in addition to numerous procedural and other memoranda and orders. These published opinions decided a wide range of matters, including questions concerning the sufficiency of the plant's design and needed modifications to the plant in view of the lessons learned from the accident involving Unit 2, the adequacy of emergency response plans to protect the general public in the event of a radiological emergency at the plant, and the impact of that plant's operation on the environment. The Appeal Board's findings generally were that all of the plant's systems, structures and components that it examined met the reliability requirements for operation and that the environmental review was sufficient. The Appeal Board, however, did not resolve the question whether Unit 1 was ready for operation, recognizing that other factors over which the Commission itself had jurisdiction had to be considered in making that judgment. Subsequently, in response to the request of several intervenors, the Appeal Board reopened the record of the proceeding and returned the proceeding to the Licensing Board to consider various specified matters related to the fitness of the plant's management to operate the unit.

Diablo Canyon

The *Diablo Canyon* (Cal.) operating license proceeding also occupied substantial time of the Appeal Board. Although the record had closed early in 1979, the TMI-2 accident that year and the discovery of design errors in the Diablo plant led to the need for further proceedings. In connection with those proceedings, the Appeal Board issued rulings on a number of safety, emergency planning, environmental and procedural matters. Among these were motions by the intervenors and the Governor of California to order reopening of the record to consider the adequacy of the applicant's quality assurance program related to the *design* of the plant. In an opinion in which it considered the supporting affidavits in detail, the Appeal Board granted the motions and announced that it would take the further evidence itself. Subsequently, the intervenors and the Governor sought a similar on-the-record review of the quality assurance program pertaining to the *construction* at the plant. The Appeal Board held a hearing on those motions in the vicinity of the site to take evidence on the need for such a review. A ruling on the motions was pending at the close of the fiscal year.

Health, Safety and Environmental Issues

There were other appeals that also raised significant health, safety or environmental problems. Several such

appeals involved questions concerning the emergency response plans for the plant. In *Zimmer* (Ohio), the Appeal Board agreed with the Licensing Board that the emergency response plans for that facility did not, among other things, provide adequately for the evacuation of schools close to the plant. The Licensing Board's decision to conduct further hearings following further development of the plans was thus affirmed by the Appeal Board. In *Fermi* (Mich.), the Appeal Board held that the lack of a final county emergency response plan, standing alone, did not preclude completion of hearings on an application for a full power operating license for the plant. Hearings could be held, according to the board, and a decision on a full power operating license reached, at such time as the plans are sufficiently developed to support a conclusion that adequate protective measures can and will be taken in the event of a radiological emergency.

Questions concerning the adequacy of the emergency response plans for the facility were also among the issues under appeal in *Waterford* (La.). Intervenors complained, in part, about the lack of detailed procedures implementing the emergency response plans for the plant. The Appeal Board, however, ruled that although such details had to be in place and reported to the agency prior to issuance of an operating license for the facility, their absence at the time of the hearing did not preclude the licensing board from making the "reasonable assurance" finding necessary for license authorization.

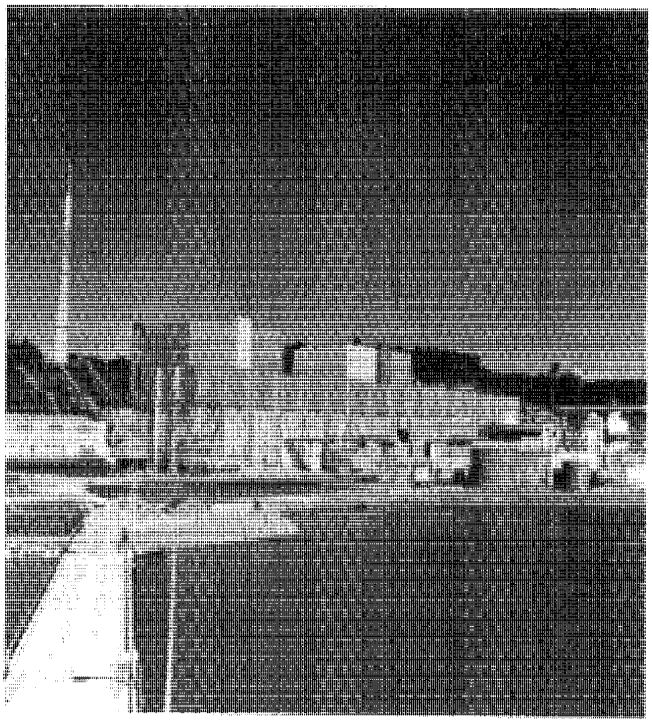
In *San Onofre* (Cal.), the Appeal Board considered seismic as well as emergency planning issues. It found no error in the Licensing Board's consideration of these matters and affirmed that board's authorization of full power operating licenses, for Units 2 and 3 of the plant, subject to specified license conditions.

Point Beach (Wis.) involved an appeal concerning the repair by the use of a sleeving technique, as part of a demonstration project, of six degraded steam generator tubes of Unit 1 rather than their removal from service. In that repair method, the defective portions of the tubes are bridged by a sleeve insert. The Appeal Board found that the sleeving of the tubes neither posed an undue risk to the public health and safety nor had a significant effect on the environment. In a subsequent opinion, the Appeal Board affirmed a Licensing Board decision authorizing the issuance of a license amendment that allows such repairs.

The adequacy of the utility company's quality assurance and quality control program for the construction of the plant was the principal issue in *Callaway* (Mo.). The Appeal Board in that proceeding affirmed the Licensing Board's finding that there had been no general breakdown in quality assurance procedures and that there was reasonable assurance the plant could be operated safely.

Byron (Ill.) raised the question whether the NRC staff could be compelled to disclose detailed information about allegations that are the subject of ongoing inspections and investigation. The staff had appealed from a Licensing Board direction that it do so, complaining that such disclosure had the potential to compromise the inspection and investigation it was conducting into the allegations. The Appeal Board, however, let the Licensing Board decision stand on the ground that the staff had failed to buttress adequately its claim of serious compromise of its ongoing inspection and investigation. Subsequently, under an arrangement agreed to by the Licensing Board, the staff disclosed the information to the board in an *in camera* proceeding.

And in *Peach Bottom* (Pa.), Appeal Board consideration of the environmental effects of fuel-cycle releases for Unit 3 of that plant, as well as for the Three Mile Island, Unit No. 2 (Pa.) and Hope Creek (N.J) facilities, finally came to an end. (See *1982 NRC Annual Report*, p. 145.) In that decision, the Appeal Boards for this consolidated proceeding concluded that on the basis of the evidentiary record, the health effects of those annual releases are not sufficiently significant to tip the National Environmental Policy Act (NEPA) cost-benefit balances against operation of these facilities.



Peach Bottom Units 2 and 3 are shown. Unit 3 of the nuclear plant in Pennsylvania was the subject of an Appeal Board determination that the health effects on the environment of its fuel-cycle releases were not so great as to require action under the National Environmental Policy Act.

Sua Sponte Review

Under Commission practice, Appeal Boards review, on their own initiative (i.e, *sua sponte*), the Licensing Board decisions and the underlying record on every safety and environmental issue considered by the Licensing Board, even where no appeal has been taken on a particular issue.

In *Rancho Seco* (Cal.), the Appeal Board considered additional information from the licensee and the NRC staff pertaining to the plant's ability to respond safely to feedwater transients. This information had been requested following a *sua sponte* review of the Licensing Board's decision in the proceeding. It was found sufficient to resolve most, but not all, of the Appeal Board's concerns. The remaining questions still awaited the submission of further information and determination at the end of September. The Appeal Board also undertook *sua sponte* review of safety or environmental issues in a number of other Licensing Board decisions including *Susquehanna* (Pa.) (validity of a limiting condition for operation that restricts increases in unidentified leakage in the unit's reactor coolant system); *Summer* (S.C.) (two Licensing Board decisions, one dealing with seismic matters and the other resolving remaining matters, leading to authorization of an operating licenses); *Palo Verde* (Ariz.) (availability of an adequate supply of condenser cooling water for the facility); *La Crosse* (Wis.) (three licensing board decisions concerned with the conversion of the plant's provisional license to a full-term operating license); *Vallecitos* (Cal.) (adequacy of the seismic and geologic design bases for the General Electric Test Reactor); and *Offshore Power Systems* (a manufacturing license proceeding for eight standardized floating nuclear plants).

Procedure and Practice

Appeal Boards are frequently confronted with important issues related to the efficient conduct of licensing proceedings. Some of the more significant and frequently recurring questions in this area are reflected in the following Appeal Board decisions.

Under the Commission Rules of Practice, members of the public who desire to become parties to a licensing proceeding are supposed to file petitions to intervene within the time set out in a notice published by the Commission advising of the proposed licensing action. Occasionally, members of the public, for various reasons, file their petitions after the specified deadline and sometimes long after the hearing has commenced. The question these petitions generally raise is whether they meet the Commission's criteria for allowing late intervention. In *Grand Gulf* (Miss.) and *Fermi* (Ill.), the Appeal Board agreed with the Licensing Board that the untimely petition should be denied. A similar result obtained in the instance of a late petition in the *Shoreham* (N.Y.) operating license proceeding. This petition was unusual in that the petitioner, a citizens group that included many who work on projects involving nuclear power, sought intervention to support a license grant, in contrast to the customary intervenor who opposes the application.

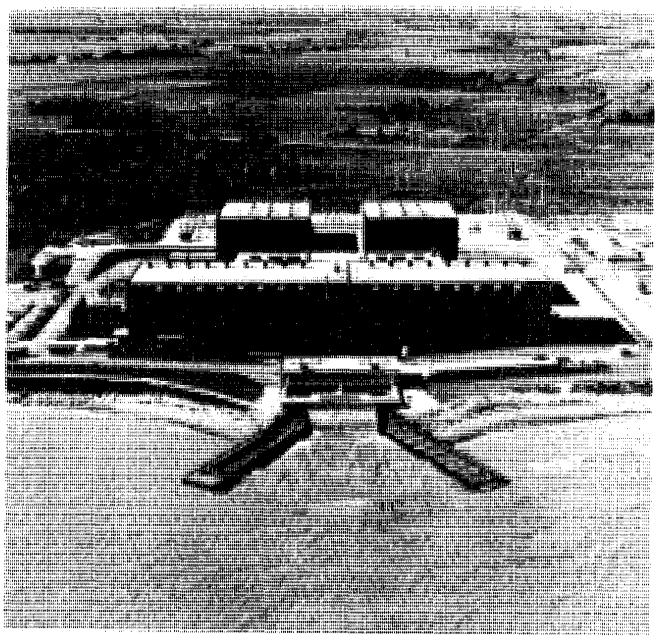
In *Skagit/Hanford* (Wash.), the Appeal Board disagreed with the Licensing Board's rejection of an intervention petition filed by an organization that claimed to represent the fishing interests of four Columbia River Indian Tribes. The petition had been filed late, but the Licensing Board denied intervention on the different ground that the organization lacked a proper interest in the proceeding. The Appeal Board disagreed and ordered that the tribes be admitted as a party to the proceeding if they raised at least one acceptable issue for litigation.

Commission practice also precludes, with limited exceptions, the review of interlocutory licensing board rulings, i.e., rulings which do not finally dispose of a major portion of a case. Most of the requests for such review during fiscal year 1983 were denied by the Appeal Board. Examples include *Seabrook* (N.H), *Perry* (Ohio), *North Anna* (Va.), and *Palo Verde* (Ariz.).

In *Limerick* (Pa.), the Appeal Board accepted referral of an interlocutory ruling by the licensing board that the latter lacked jurisdiction to act on a request to reopen the record of the proceeding. The Appeal Board disagreed with the ruling and returned the case to the Licensing Board for disposition of the request on the merits.

In *Three Mile Island* (Pa.), an issue of procedure concerned whether an intervenor's request for subpoenas compelling the attendance of two named NRC staff members at a scheduled hearing should be granted. The Appeal Board found that "exceptional circumstances" existed warranting the issuance of one of the subpoenas but not of the other.

The *Point Beach* (Wis.) proceeding raised still another type of issue concerning the Commission's hearing procedures—in this instance, a party's obligation to fulfill its hearing responsibilities. Here, the Appeal Board affirmed the Licensing Board's dismissal of an intervenor



The Commission's hearing procedures were at issue in the Point Beach proceeding. The nuclear facility is located on the shores of Lake Michigan in eastern Wisconsin.

from the proceeding who willfully failed to attend a scheduled prehearing conference and who also failed to present at least one acceptable contention for litigation. Although it recognized that dismissal was a serious step that generally should be reserved for the most severe failure of a participant to meet its obligation, the Appeal Board agreed with the Licensing Board that dismissal was warranted in the circumstances here.

Appeal Boards are also asked from time to time to stay the effect of Licensing Board decisions, or even their own, pending review of the subject decision or some other development. One such request involved the *Comanche Peak* (Tex.) proceeding. In that case, the Appeal Board had earlier denied a staff appeal from a Licensing Board decision directing the staff to reveal the identity of eight individuals referred to in a staff investigation report of allegations concerning improper construction work at the plant. The staff then sought a stay from the Appeal Board of its decision pending the staff's attempt to obtain Commission review. The Appeal Board denied the request. The staff, thereafter, requested a stay from the Commission which granted it to preserve the *status quo* while the Commission considers the disclosure question.

COMMISSION DECISIONS

Some of the Commission's more significant decisions during fiscal year 1983 are discussed below. The Commission's actions on export licensing cases are discussed in Chapter 10.

Zimmer Nuclear Power Station

In CLI-82-33, the Commission evaluated prior findings by NRC and non-NRC officials which indicated that the Zimmer (Ohio) facility had not implemented an adequate quality assurance (QA) program (resulting in a facility of indeterminate quality); that current re-verification efforts of past construction had revealed additional deficiencies; and that ongoing rework activities were being initiated prior to completion of related re-verification efforts, creating the risk that additional rework of the same deficient item would be necessary. Given this past pattern of QA deficiencies and the importance of necessary construction verification and corrective rework, the Commission issued an immediately effective show cause order suspending all safety-related construction at the Zimmer facility pending a showing by the applicant of reasonable assurance that future construction and related activities would be appropriately managed to ensure compliance with 10 CFR Part 50, Appendix B (QA Criteria) and other Commission requirements.

Colorado State Agreement Reaffirmed

In CLI-82-34, the Commission rejected the Sunflower Coalition's petition that it reconsider its March 30, 1982 approval of an amended agreement with the State of Colorado under section 274 of the Atomic Energy Act. The amended agreement allowed Colorado to regulate uranium mill tailings. In support of its petition, the Sunflower Coalition argued that: (1) the Colorado plan was inadequate because it lacked a civil penalty provision; (2) the Colorado Radiation Control Act did not permit judicial review of uranium licensing decisions, which is required by the Atomic Energy Act; and (3) the Colorado plan generally failed to comply with the requirements of applicable State and Federal statutes and regulations. As to the first claim, the Commission noted that while it believed a civil penalty authority to be useful, it did not find that such authority was indispensable for the protection of the public health and safety. Thus, the absence of this particular type of enforcement authority did not render the Colorado program inadequate. As to the second claim, the Commission concluded that the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) only required that judicial review be available for the written determination required by the Atomic Energy Act with respect to in-State uranium mill tailings licensing actions. Since judicial review for such determinations was available under the State's Administrative Procedure Act, the fact that the State statute governing radiation control matters did not independently provide for review was not a basis for finding that the requirements of UMTRCA were not satisfied. As to the third claim, the Commission concluded that the Sunflower Coalition merely reasserted previously rejected arguments and failed to present new information warranting a different result. Finally, the Commission noted that under the UMTRCA, an agreement is not to be terminated or revoked for minor technical failures or single incidents of State inaction, but only in exceptional circumstances. Thus, the power to terminate is properly employed as a remedy of last resort.

Clinch River Breeder Reactor

In CLI-83-1, the Commission affirmed its earlier decision (CLI-82-23) permitting pre-construction site-preparation activities at the Clinch River Breeder Reactor site in Tennessee. In doing so, the Commission clarified the nature of exigent and other extraordinary circumstances warranting an exemption under 10 CFR 50.12 for site-preparation activities. In evaluating requests for exemptions, the Commission announced that it would consider the totality of the circumstances in determining whether to grant an exemption, and would evaluate any asserted exigent circumstances in the context of that overall determination. Based on prior Commission decisions, exigent circumstances were found to exist where: (1) further delay would deny the public currently needed benefits that

would have been provided by timely completion of the facility but were delayed due to external factors (e.g., changes in government policy) and would also result in additional, otherwise avoidable costs; and (2) no timely alternative relief is available. Moreover, the Commission stressed that the necessary showing of exigency varies directly with the environmental impacts of the proposed site-preparation activities. Thus, where the environmental impacts of the proposed activities are insignificant, the grant of an exemption may be appropriate to minimize the potentially severe consequences of a delay in site preparation activities, even where uncertainties exist as to need for prompt action.

San Onofre—Emergency Medical Services for the Public

In CLI-83-10, the Commission determined that in light of the scope and timing of medical treatment required and the assumptions underlying its emergency planning medical services requirements, adequate emergency medical services could be provided to the public following an accident by using existing local or regional facilities in conjunction with arrangements made specifically for injured and contaminated on-site personnel and emergency workers. As construed by the Commission, the purpose of its emergency medical planning requirement—set forth in 10 CFR 50.47(b)(12) providing for pre-arranged medical services for contaminated injured individuals—was to ensure advance planning and arrangements for immediate or near-term emergency care following an accident. Long-term medical care did not, in the Commission's view, require advance arrangements and could reasonably be handled on an *ad hoc* basis. The Commission also determined that the scope of medical services to be provided must focus on the special hazards from radiation. Radiation injuries to the public fell into two categories—traumatically injured and contaminated persons, and persons potentially exposed to dangerous levels of radiation. The Commission then decided that only the injured/contaminated group would need the type of immediate or near-term medical intervention contemplated by the emergency planning regulation. Thus, an emergency plan was adequate where it identified medical facilities capable of handling injured/contaminated persons and where the arrangements for injured/contaminated on-site personnel were available for use by similarly injured/contaminated members of the public. Contaminated and injured members of the public were expected to be few. As to the exposed group, the Commission concluded that the nature of potential radiation injuries did not in most cases require immediate, emergency medical care and thus could be handled on an *ad hoc* basis. Therefore, an emergency plan was adequate on this point where it identified existing facilities capable of diagnosing and treating radiation exposure.

Shoreham Nuclear Power Station

In CLI-83-13, the Commission rejected the proposition that a licensing proceeding must be terminated as a matter of law where a local government declares that it will not adopt or implement a local emergency plan for use in response to an accident at a nuclear plant within its jurisdiction. Rather, where the utility-applicant offered its own offsite emergency plan to fill the void, the agency is obligated to consider the utility plan and has the authority to determine whether the plan is sufficient, on its own, to meet the prerequisites for the issuance of an operating license.

Uranium ore is segregated and stored until processing at the Atlas Uranium Mill in Moab, Utah.

In CLI-83-17, the Commission decided that existing uncertainty about whether the agency's offsite emergency preparedness requirements can be met for full-power operation would not, in and of itself, bar the grant of a license for low-power operation. The Commission's regulations authorize the issuance of a low-power license in the absence of NRC or FEMA approval of an off-site emergency plan so long as other prerequisites, including an adequate level of off-site emergency preparedness, are met. This scheme is based on the different off-site risks associated with fuel loading and low-power operation than those associated with full-power operation and the requirement that emergency planning requirements were a condition to the grant of a full-power license. Since offsite emergency planning is an issue to be resolved at the full-power license stage, the Commission concluded that the better practice would be to avoid premature consideration of the issue at the low-power authorization stage.

JUDICIAL REVIEW

Between December 1982 and November 1983, 21 actions against the Commission were initiated: 9 in the Circuit Courts of Appeals, 11 in the Federal District Court, and 1 in the Court of Claims. During the same period, 35 cases were closed in whole or in part. The more significant litigation involving the Commission either resolved during fiscal year 1983 or pending at the close of the fiscal year is summarized below.

Pending Cases

Brown v. NRC (D.C. Cir. No. 82-1549) On May 17, 1982, California Governor Brown challenged the NRC's Appeal Board decision approving the seismic design bases for the Diablo Canyon nuclear facility. The court on July 6, 1982, granted the NRC's motion to hold the case in abeyance pending the NRC's completion of administrative proceedings for either a low-power or full-power license for this facility. In the interim, the Commission is advising the court at 60-day intervals of the status of these proceedings.

Brown v. NRC (D.C. Cir. No. 81-2034)

San Luis Obispo Mothers for Peace, et al. v. NRC (D.C. Cir. No. 81-2035)

San Luis Obispo Mothers for Peace, et al. v. NRC (D.C. Cir. No. 83-1073)

On September 21, 1981, petitioners, the former Governor of California (No. 81-2034) and joint intervenors in the Diablo Canyon proceeding (No. 81-2035), challenged the Commission's issuance of a low-power license for Diablo Canyon Unit 1. The court consolidated these cases on October 8, 1981, and on December 8, 1981, granted the NRC's motion to hold the case in abeyance pending completion of the administrative proceedings. On January 20, 1983, Joint Intervenors in the Diablo Canyon operating license proceeding petitioned the D.C. Circuit for review of that portion of the Commission's Order of December 23, 1982, that denied their request for a hearing on PG&E's application for a low-power license extension (No. 83-1073). The Commission noted in its Order that the licensing proceeding was ongoing, that this request would ordinarily be treated as a motion to reopen, and that such a motion was presently under consideration. Petitioners contend that this Order denies their right to a hearing on a license amendment. This case has been consolidated with Nos. 81-2034 and 81-2035 and is now held in abeyance. In the interim, the Commission is advising the court at 60-day intervals on the status of the administrative proceedings.

General Public Utilities Corp, et al. v. U.S. (E.D. Pa. No. 81-4950); 3rd Cir. No. 83-1017

On December 2, 1981, the owners and operators of the Three Mile Island Unit 2 nuclear facility sued the United States, alleging damages in excess of $4 billion resulting from the accident at the facility. Plaintiffs' theories of liability are that the United States, in its role as a regulator, violated statutory, regulatory or other self-imposed requirements, and failed to warn GPU of defects in the equipment, analyses, procedures and training, or, alternatively, failed to direct GPU to correct certain deficiencies. These omissions, in plaintiffs' view, resulted in the TMI Unit 2 accident. On March 5, 1982, the United States moved to dismiss because of a lack of subject matter jurisdiction and because the complaint failed to state a claim upon which relief could be granted. On November 24, 1982, the District Court denied the motion todismiss on both the discretionary function and the misrepresentation exemptions to the Tort Claims Act. However, the District Court certified an immediate appeal on these issues to the Third Circuit. The Third Circuit has yet to decide the case.

Lorion v. NRC (D.C.Cir. No. 82-1132)

Ms. Lorion filed a petition on February 8, 1982, to review the NRC's decision denying her request that Turkey Point Unit 4 be shut down for a steam generator inspection. Ms. Lorion alleged that the Commission acted unlawfully (1) in treating her letter requesting such action as a petition under 10 CFR 2.206, and (2) in denying her request. The NRC argued that Ms. Lorion had suffered no harm and that the Commission's actions were consistent with its regulations and all other legal requirements. On July 26, 1983, the D.C. Circuit upheld the NRC's action in treating Ms. Lorion's letter under 10 CFR 2.206 but *sua sponte* held that the courts of appeals lack subject matter jurisdiction to review denials by the NRC of requests under 10 CFR 2.206 for enforcement action against NRC licensees. 712 F.2d 1472. The court stated that jurisdiction to review such denials properly lies in the district court. This holding conflicts with decisions in the

Second, Third, Sixth, and Seventh Circuits, and previous decisions in the D.C. Circuit itself. The NRC's Petition for Rehearing with a Suggestions for Rehearing *en banc* was denied on September 22, 1983. A petition for *certiorari* to the Supreme Court has been filed by the licensee.

New England Coalition on Nuclear Pollution, et al v. NRC (D.C. Cir. No. 82-1581)

Petitioners are commenters in the financial qualifications rulemaking and, in some cases, participants in NRC proceedings who profferred financial qualifications contentions. On July 25, 1982, they challenged the NRC's final rule which eliminated financial qualification reviews for public utility licensees. See 47 *Fed. Reg.* 13750 (March 31, 1982). As of December 1983, the D.C. Circuit had not issued its decision.

Philadelphia Newspapers, Inc. v. NRC (D.D.C. No. 83-1330) *on appeal* (D.C. Cir. No. 83-1698)

On May 9, 1983, Philadelphia Newspapers, Inc. ("Philadelphia Inquirer"), sued the NRC, claiming that the Commission could not close a meeting on TMI under Exemption 10 of the Sunshine Act, and, even if it did, the public interest required that the meeting be open to the public. The court granted a temporary restraining order enjoining the Commission from closing the meeting, which was subsequently cancelled. Following oral arguments on Philadelphia Newspapers' request for a preliminary injunction and cross-motions for summary judgment, the court granted NRC's motion for summary judgment. In doing so, the court held that the proposed TMI meeting fell within Exemption 10 and that the NRC did not act arbitrarily or capriciously in deciding that the public interest did not require the meeting to be open. On June 23, 1983, plaintiff appealed. D.C. Circuit has yet to decide the case.

Rockford Newspapers, Inc. v. NRC, et al. (N.D. Ill. No. 83 C-20074)

Joseph W. Johnston v. NRC, et al. (N.D. Ill. No. 83-C-3615)

On May 25, 1983, Rockford Newspapers, Inc., and the ACLU moved for a Temporary Restraining Order (TRO) to prevent the Licensing Board in the Byron operating license proceeding from holding an *in camera* hearing to protect identities of two informants who were expected to testify about quality control at Byron. The TRO was denied on the grounds that the Licensing Board had not yet scheduled *in camera* hearings. The court suggested, however, that if the Board did decide to go *in camera*, then the closed proceeding should not be held until it could rule on the motion for the TRO. The case was dismissed when the intervenors decided against having the informants testify in person, and the Licensing Board closed the record in the hearing. On August 16, 1983, the ACLU essentially re-filed the lawsuit seeking a declaratory judgment that the Sunshine Act applies to proceedings before NRC Licensing Boards. The District Court has yet to decide this case.

Rockland County and New York Public Interest Research Group v. NRC (D.C. Cir. No. 83-1837)

On August 9, 1983, Rockland County and the New York Public Interest Research Group (NYPIRG) filed a petition in the D.C. Circuit to review the Commission's June 10, 1983, order declining to initiate enforcement action against the Indian Point licensees for emergency preparedness deficiencies. Petitioners also argue that the Commission's decisions of December 22, 1982, and February 3, 1983, violated the procedures and standards in 10 CFR 50.54(s)(2). Petitioners seek, among other things, a court order overturning the three Commission decisions and requiring a shutdown until emergency preparedness deficiencies are cured. The petitioners failed to advise the D.C. Circuit, however, that the Second Circuit had already sustained the Commission's December 22 and February 3 decisions. The Commission has moved the D.C. Circuit to transfer the case to the Second Circuit on the ground that the latter Circuit is more familiar with the Indian Point situation (709 F.2d 766). As of December 1983, the D.C. Circuit had not ruled.

Union of Concerned Scientists v. NRC (D.C. Cir. No. 82-2053) (Emergency Planning)

On September 10, 1982, the Union of Concerned Scientists challenged NRC's July 1982 amendments to the emergency planning rules to permit (1) issuance of initial licensing decisions without the results of emergency preparedness exercises and (2) staff authorization of low power operating licenses without any review of offsite emergency preparedness. 47 *Fed. Reg.* 30232 (July 13, 1982). The Attorney General of Massachusetts has intervened in the lawsuit. In October, UCS filed a petition for rulemaking in which it asked, in effect, that the NRC reconsider the exercise portion of the rule. Subsequent discussions confirmed that the exercise rule was the focus of the UCS lawsuit. See 47 *Fed. Reg.* 51889 (November 18, 1982). The parties agreed to hold this case in abeyance until March 1983 to allow the NRC time to act on the UCS petition. The NRC denied the petition on April 12, 1983 (48 *Fed. Reg.* 16691). The case was returned to the D.C. Circuit and, as of December 1983, the parties were awaiting the scheduling of oral argument.

Union of Concerned Scientists v. NRC (D.C. Cir. No. 82-2000) (Environmental Qualifications)

On August 26, 1982, petitioner filed this lawsuit to review the Commission's final rule which suspends the June 30, 1982 deadline for documentation and completion of environmental qualification of safety-related equipment as required by the Commission in its decision of May 27, 1982. Petitioner contends that this suspension violated the Atomic Energy Act and was promulgated without notice and opportunity for comment in violation of the Administrative Procedure Act (APA). On June 30, 1983, the court ruled that the hearing and notice requirements of the Atomic Energy Act (AEA) are not subject to the "good cause" exception of the APA. In the court's view, the NRC cannot act pursuant to the exception because a

statute, the AEA, requires notice and hearing (711 F.2d 370). However, in response to the NRC's request for rehearing, the court has directed the NRC to brief the interrelationship of the AEA and the APA on rulemaking. UCS is also seeking substantial fees under the Equal Access to Justice Act.

Union of Concerned Scientists v. NRC (D.C. Cir. No. 83-1242) (Environmental Qualifications)

On March 7, 1983, the UCS filed a petition for review of the final rule on environmental qualification of electrical equipment, 48 *Fed. Reg.* 2729 (January 21, 1983). The briefing schedule was held in abeyance pending the decision in *UCS v. NRC*, No. 82-2000. Now that that case has been decided (711 F.2d 370), UCS and NRC were, as of December 1983, negotiating an appropriate briefing schedule.

Closed Cases

Alabama Power Company v. NRC (U.S.S.Ct. No. 82-1788)

After the Eleventh Circuit's Feb. 2, 1983, denial of rehearing of its December 6, 1982, order upholding the NRC's decision to place antitrust conditions on the Farley plant's license (692 F.2d 1362), Alabama Power applied to U.S. Supreme Court Justice Powell for a stay of the 11th Circuit's mandate and a stay of the NRC's June 30, 1981, order imposing the antitrust license conditions. On April 7, 1983, Justice Powell denied the application for stay. On October 3, the Supreme Court denied the utility's petition for *writ of certiorari*.

Bellotti v. NRC (D.C. Cir. No. 82-1932)

On January 18, 1982, the NRC modified the license for Boston Edison Company's Pilgrim Station and imposed civil penalties for severe management control problems. The staff-ordered modification required the submission of a plan to correct these significant management deficiencies and contemplated that the correction process would occur over time with substantial staff review. On August 13, 1982, Francis X. Bellotti, Attorney General of Massachusetts, challenged the Commission's July 30, 1982, Order denying him a hearing in the Pilgrim enforcement matter. In that Order, the Commission decided that Section 189a of the Atomic Energy Act does not provide a non-discretionary right to a hearing on all issues related to an enforcement problem and that the Attorney General did not raise an issue within the scope of the NRC action. In a September 23 decision (amended on October 7, 1983) the D.C. Circuit affirmed the NRC decision. The majority opinion found that the NRC had the authority to set the scope of proceedings under Section 189a and had not abused its discretion in limiting the hearing in this case to whether the order should be sustained. Because the Attorney General did not raise an issue within the scope of the hearing offered, he was not entitled to be heard. In a strong dissent, Judge Wright was critical of the agency's decision as contrary to the intent of Section 189a.

City of West Chicago v. NRC, et al., 701 F.2d 632 (Nos. 82-1575, 82-1684) (7th Cir. 1983)

The City of West Chicago filed this lawsuit on October 14, 1981, in the District Court to enjoin an NRC license amendment for Kerr-McGee's thorium ore milling facility in West Chicago. The City also asked the court to require the NRC, within a time certain, to rule on a pending Kerr-McGee decommissioning plan and to complete its environmental impact statement for the facility. On April 5, 1982, the District Court granted the NRC's motion to dismiss this lawsuit because of a lack of subject matter jurisdiction. 542 F. Supp. 13. The City appealed to the Seventh Circuit on April 23, 1982 (No. 82-1684). This appeal was consolidated with *City of West Chicago v. NRC* (7th Cir. No. 82-1575). In No. 82-1575, filed on April 8, 1982, the City sought review of the NRC's denial of its petition for a formal hearing on the license amendment allowing Kerr-McGee to demolish certain structures at its West Chicago Rare Earth Facility and to receive contaminated soil from the West Chicago area. On March 1, 1983, the Seventh Circuit upheld the Commission's order of February 11, 1982, and the district court's dismissal for lack of jurisdiction. The court affirmed each procedural and substantive ruling regarding the NRC action on Kerr-McGee's facility, including the NRC conclusion that there was no statutory, regulatory, or constitutional requirement for a formal adjudicatory hearing.

Coalition for the Environment v. NRC (D.C. Cir. No. 77-1905) (Callaway)

Lloyd Harbor Study Group v. NRC (D.C. Cir. 73-2266) (Shoreham)

Nelson Aeschliman v. NRC (D.C. Cir. No. 73-1776 & 1867) (Midland)

Natural Resources Defense Council v. NRC (D.C. Cir. No. 74-1385) (Vermont Yankee)

New England Coalition on Nuclear Pollution v. NRC (1st Cir. No. 76-1525) (Seabrook)

These lawsuits challenged the grant of construction permits for the Callaway, Shoreham, Midland, and Seabrook facilities and the grant of an operating license for Vermont Yankee to the extent these licenses were based on the Commission's uranium fuel cycle rule ("Table S-3"). These cases were held in abeyance pending the D.C. Circuit's decision in the fuel cycle rulemaking cases. *Natural Resources Defense Council v. NRC* (D.C. Cir. No. 74-1586 and consolidated cases). The D.C. Circuit invalidated the NRC's rules in that case on April 27, 1982. The Supreme Court granted *certiorari*, reversed the D.C. Circuit, and affirmed the Commission's rules (*Baltimore Gas and Electric Co v. NRDC*, 76 L.Ed.2d 437 (June 30, 1983)). Following this decision, all these cases were dismissed.

Natural Resources Defense Council v. NRC (D.C. Cir. Nos. 74-1586, 77-1448, 79-2131) (S-3)

State of New York v. NRC (D.C. Cir. No. 79-2110) *on certiorari, Baltimore Gas ond Electric Co v. NRDC*, U.S.S.Ct. No. 82-524

Nuclear Regulatory Commission v. NRDC, U.S.S.Ct. No. 82-545

Commonwealth Edison Co. v. NRDC, U.S.S.Ct. No. 82-551

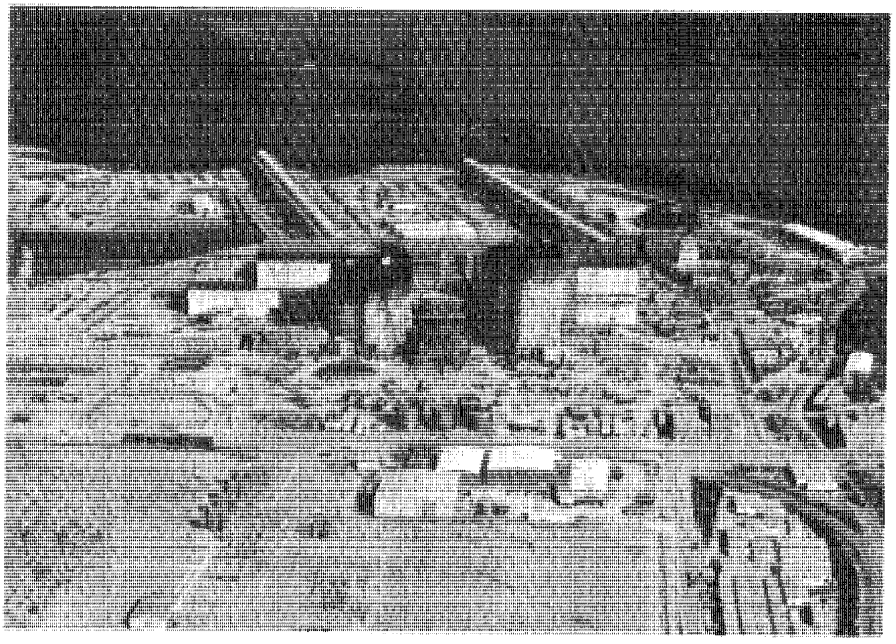
These consolidated cases challenge three related versions of the Commission's uranium fuel cycle rule, which addressed the environmental impacts of off-site fuel cycle activities for the operation of a nuclear power plant. The rule sets out a table of values ("Table S-3") to be used in individual licensing proceedings as a starting point for evaluating the contribution of fuel cycle activities to the environmental impact of light water power reactors. The D.C. Circuit's consideration of these cases follows the Supreme Court's remand in *Vermont Yankee Nuclear Power Corp v. NRC*, 435 U.S. 519 (1978).

On April 27, 1982, the D.C. Circuit invalidated the NRC's original, interim and final fuel cycle rules. 685 F.2d 459. The Supreme Court granted certiorari and on June 6, 1983 reversed the court of appeals and upheld all three versions of the fuel cycle rule. 76 L.Ed.2d 437, 103 S.Ct. 2246.

People Against Nuclear Energy v. NRC, No. 81-1131, 678 F.2d 222 (D.C. Cir. 1982), *reversed sub nom. Metropolitan Edison Company v. People Against Nuclear Energy* No. 81-2399, 75 L.Ed.2d 534, 103 S.Ct. 1556 (1983)

On February 3, 1981, petitioners sought review of the Commission's decision not to consider contentions regarding psychological stress in the Three Mile Island Unit 1 restart proceeding. They contended that the Commission violated the Atomic Energy Act and NEPA in not hearing evidence on the issue, and in not supplementing the pre-accident environmental impact statement for the reactor. In a short order in January 1982, the D.C. Circuit reversed the NRC. The D.C. Circuit subsequently explained in a May 14, 1982, opinion that NEPA required the evaluation of the psychological effects of restarting TMI-1 (678 F.2d 222). The court also held that "health and safety" under the Atomic Energy Act does not include psychological health. On November 1, 1982, the Supreme Court granted the NRC's petition for *certiorari* (74 L.Ed.2d 276, 103 S.Ct. 292).

On April 19, 1983, a unanimous Supreme Court decision reversed the D.C. Circuit and held that the NRC was not required to consider, in its determination whether to allow the restart of TMI-1, petitioners' claims that the risk of an accident at TMI would cause harm to their psychological health. 75 L.Ed.2d 534, 103 S.Ct. 1556. Justice Rehnquist, writing for the Court, held that the National Environmental Policy Act (NEPA) required the assessment only of effects on the physical environment. Other statutory goals, such as the promotion of human health and welfare, were broadly stated *ends* which Congress had chosen to pursue through the *means* of environmental protection. The Court stated that for an effect to require evaluation under NEPA, there had to be a reasonably close causal relationship between a change in the physical environment and the effect at issue. The Court held that while the NRC had evaluated the risk of a nuclear accident, risk itself was not an effect on the environment and did not require a NEPA analysis. The Court found that the causal chain between renewed operation of TMI-1 and the psychological health damage alleged by the petitioners included two links—risk and the perception of risk—which lengthened the chain beyond the reach of NEPA. The Court observed that it was irrelevant that the petitioners' claim was made in the wake of the TMI accident. In the court's view, NEPA was directed to the future effects of future actions, and did not create a scheme for remedying past actions.



The Marble Hill nuclear plant in Indiana was the subject of a lawsuit brought against the Commission regarding the lifting of a suspension without a hearing. The licensee has more recently announced that construction of the facility will not be completed as planned.

Rockland County v. NRC (2d Cir. Nos. 83-4003, 83-4037)

On January 6, 1983, Rockland County sought review of the Commission's December 23, 1982, order allowing continued operation at Indian Point. The court consolidated the appeals brought by Rockland County, the Union of Concerned Scientists and the New York Public Interest Research Group, which challenged the Commission's December decision and the February 1983 order reaffirming that decision. On May 27, 1983, the Second Circuit dismissed Rockland County's suit for failure to exhaust administrative remedies and sustained the Commission on the merits as to other petitions. (709 F.2d 766.) The court concluded that the Commission has broad discretion in enforcement matters, and is not precluded under its regulations (10 CFR 50.54(s)(2)), from relying on such factors as past and prospective progress in remedying deficiencies and the probability of an accident during the pendency of the corrective actions in deciding against certain types of enforcement actions. Rockland has petitioned the U.S. Supreme Court to take the case on *certiorari*.

Save the Valley v. NRC (6th Cir. No. 82-3148)

On March 5, 1982, petitioner Save the Valley sued to overturn the Commission's denial of its request for a hearing concerning the enforcement decision to allow resumption of concrete construction at the Marble Hill facility. The NRC's position was that Section 189a of the Atomic Energy Act does not require an adjudicatory hearing on the lifting of a suspension and that the NRC acted reasonably in declining to grant a discretionary hearing in this case. On June 7, 1983, the Sixth Circuit upheld the NRC's action. 714 F.2d 142 (Table). The court held that 189a of the Atomic Energy Act does not require a hearing on rescission of an earlier suspension order, and that the NRC did not abuse its discretion in not granting a hearing under 10 CFR 2.206.

Sholly v. NRC, 651 F.2d 780 (D.C. Cir. 1980), *denial of reconsideration en banc*, 651 F.2d 792 (D.C. Cir. 1981), *vacated and remanded*, 75 L.Ed.2d 423 (1983), vacated, 706 F.2d 1230 (Table) (1983)

Petitioner in this lawsuit sought an injunction against the venting of krypton-85 from the TMI-2 reactor building. In orders dated June 26, 27 and 28, the D.C. Circuit denied the requests for injunctive relief. In a companion case seeking essentially the same relief, *PANE v. NRC* (3d Cir. Nos. 80-1994 & 1995), the Third Circuit on July 10 transferred the cases to the D.C. Circuit for disposition.

On November 19, 1980, the D.C. Circuit declared illegal the Commission's refusal to hold hearings in connection with its approval of venting the Three Mile Island containment. The D.C. Circuit concluded that even where a license amendment involves no significant hazards consideration, an interested person who requests a hearing is entitled by Section 189a of the Atomic Energy Act to a hearing before the amendment becomes effective. The court also held that the TMI-2 accident had essentially negated any authority in the TMI-2 operating license so that any action not authorized by the Commission's February 11 order establishing post-accident conditions for TMI-2 was a license amendment subject to Section 189a hearing requirements. The utility sought rehearing *en banc*. Four members of the court dissented from the denial of rehearing *en banc*, urging reconsideration of the panel's holding that the Commission may not dispense with an opportunity for a hearing prior to granting an amendment to a nuclear power plant operating license upon determining that the contemplated amendment entails no significant hazards consideration. The Supreme Court granted *certiorari* on May 26, 1981.

On February 22, 1983, the Supreme Court vacated the D.C. Circuit's judgment in *Sholly* and remanded the case for consideration of the questions of mootness. Should the cases not be moot, the Supreme Court directed the D.C. Circuit to consider the significance of Pub. L. No. 97-415 ("Sholly amendments") in resolving the issues raised. The D.C. Circuit entered an order on April 4, 1983 holding that the portion of the *Sholly* opinion which held that a hearing on a license amendment requested pursuant to Section 189a of the Atomic Energy Act must be conducted before the amendment becomes effective will be moot as soon as the NRC promulgates standards for determining when an amendment involves no significant hazards consideration. The D.C. Circuit, noted, however, that "the NRC is still under a statutory mandate to hold a *post hoc* hearing, if requested by the parties."

Management and Communication

CHAPTER 13

During fiscal year 1983, NRC continued to stress regionalization in hiring policies and organizational shifts to reflect the broader responsibilities being placed on the regional offices. The headquarters itself remained situated in eight buildings in the District of Columbia and Maryland.

STRENGTH AND STRUCTURE

Personnel Management

The Office of Management and Budget (OMB) allocated a ceiling to the agency of 3,303 staff years of effort by individuals with permanent, full-time appointments, and the equivalent of an additional 120 staff years for individuals with other types of appointments, such as temporary employees and consultants. This gave the NRC a total ceiling of 3,423 staff years of which it used 3402 staff years.

Commission and Director Changes

Commissioner John F. Ahearne's term ended on July 1, 1983, and on August 5 Frederick M. Bernthal was appointed to bring the Commission back to its full strength of five members.

Principal staff changes during the year were as follows:

In February 1983, Herzel H. E. Plaine was appointed General Counsel, succeeding Leonard Bickwit who resigned. The same month saw Ben B. Hayes appointed Director, Office of Investigations. He succeeded James A. Fitzgerald who was serving as Acting Director. In March, Clemens J. Heltemes, Jr. was appointed Director, Office for Analysis and Evaluation of Operational Data. His predecessor, Carlyle Michelson, retired. The following month John B. Martin was appointed Regional Administrator of NRC's Region V office near San Fransisco, Cal., succeeding Robert H. Engelken, who retired. Thomas E. Murley was appointed in June 1983 as Regional Administrator, Region I, Philadelphia, Penna. He succeeded Ronald C. Haynes, whose death earlier in the year had saddened the agency.

Recruitment

Personnel recruitment during the first eight months of fiscal year 1983 focused on the reassignment of NRC headquarters staff personnel to regional offices, with some 79 headquarters staffers selected for reassignment to the regions. In May, 1983, the agency resumed outside hiring, primarily for technical positions in regional offices. As the year ended, most vacancies continued at the regional offices, although the headquarters was also recruiting for new positions connected with the NRC's implementation of the Nuclear Waste Policy Act.

Training and Development

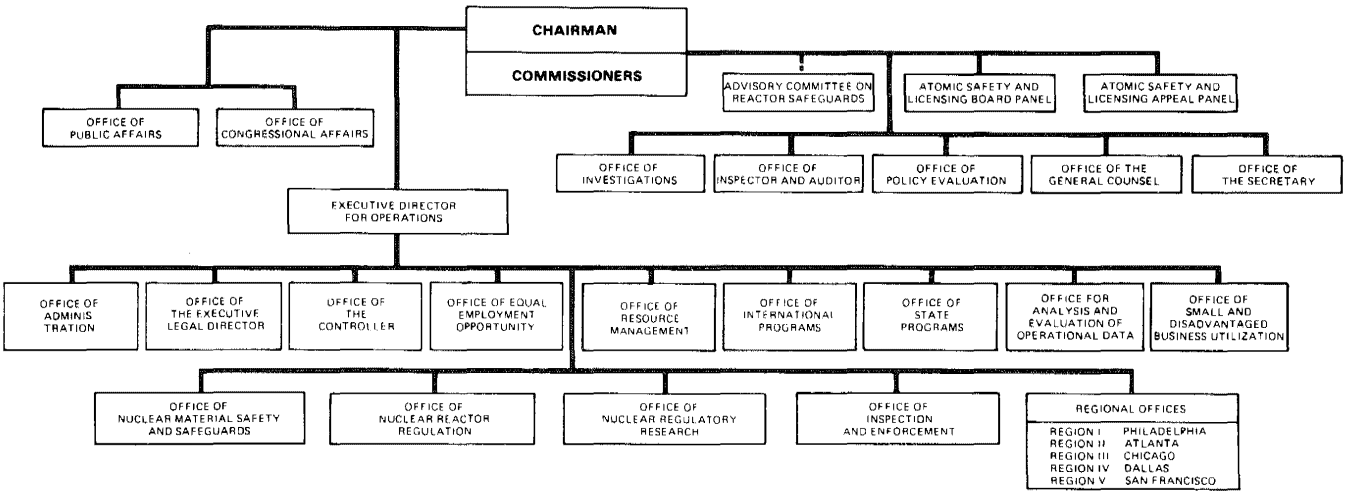
As appropriate, new NRC employees continued to receive training that would orient them to NRC operations, while onboard professional employees were offered courses to help them stay current with technological and policy developments and maintain their or improve job skills and performance, training. A good deal of retraining also was provided for employees affected by reassignments and organizational or mission changes, particularly for the regional-office emphasis discussed above.

ORGANIZATIONAL CHANGES

Fiscal year 1983/1984 staffing levels, together with a new role for NRC in Quality Assurance dictated that the Office of Inspection and Enforcement (IE) reorganize. Thus, four I&E divisions were merged into two, as follows: the Division of Reactor Programs was redesignated the Division of Quality Assurance, Safeguards, and Inspection Programs, the Division of Engineering and Quality Assurance was redesignated the Division of Emergency Preparedness and Engineering Response, and the Reactor Training Center was redesignated the Technical Training Center to reflect broader responsibilities.

An Accident Source Term Program Office (ASTPO) was established in the Office of Nuclear Regulatory Research, responsible for ensuring that research results related to source term are implemented in policy and regulatory practices. The new group's responsibilities are carried out primarily through discussions with the technical com-

NRC ORGANIZATION



munity, industry groups, public interest organizations, and other government agencies.

The Division of Engineering, Office of Nuclear Reactor Regulation, made several organizational changes to more effectively use available resources and adjust to a declining headquarters workload. Three Assistant Directorates, those for Environmental/Technical, Materials and Qualifications Engineering, and Components and Structures Engineering, were merged into a two-directorate alignment consisting of an A/D for Components and Structures Engineering and an A/D for Materials Chemical and Environmental Technology.

Decentralization of NRC Activities

Late in 1981, the Commission concluded that there would be advantages to bringing regulatory functions as close as practicable to the people and facilities affected by them. Consequently, the Commission developed policy goals calling for expansion of the NRC regional office operations. The NRC organizational structure was changed in October 1981, to bring the regional offices under direct control of the EDO, and the new DEDROGR post was created to assist the EDO in managing regional operations.

Throughout 1982 and 1983, the scope of regional activity was carefully expanded.

During 1983, effective interaction with the NRC Advisory Committee on Reactor Safeguards (ACRS), the regulated industry and the public benefitted the NRC in its decentralization effort. The Commission published and sought public comments on a policy statement on regionalization. In addition, NRC staff held public meetings in each of its five regions to explain the policy and plans and to get face-to-face feedback from meeting attendees. As a result of oral and written comments, the policy was revised to accommodate valid concerns of the respondents, the ACRS, the Commission and the Congress.

The revisions to the policy statement that was published in 1983 involved activities associated with operating reactor license amendments and license fee management. The Commission had decided that:

(1) Regionalization is essentially complete except for a pilot program of certain technical reviews of operating reactor license amendments. The Commission will review the pilot program at the end of 2 years and decide if such technical reviews will be conducted in the future in the regions.

(2) Licensing authority and NRR project managers will not be transferred to the regions except that limited licensing authority and the project manager for Fort St. Vrain will remain in Region IV.

(3) Nonpower reactor licensing will not be decentralized.

(4) License fee management will not be decentralized.

By the end of 1983, the Commission's policy goals had been achieved. Except as modified by the decisions discussed above, essentially all of the regulatory functions planned for the regions had been transferred to them. These functions included the implementation stages of licensing program for several categories of materials licenses and for reactor operator licenses. The regions also conducted technical reviews and wrote safety evaluations

Table 1. NRC Headquarters Functions Transferred to Regional Offices

	Function	*FY 1982*	*FY 1983*	*FY 1984*
1.	Operating Reactor licensing technical review (NRR)	260 All regions	100 All regions	500[b]
2.	Licensing authority for operating power reactors[a] (NRR)	—	Region IV: 1 reactor	Region IV: 1 reactor
3.	Administer reactor operator license examinations[c] (NRR)	Region III, II,III	Region I,	All regions
4.	Uranium mill tailings (NMSS)	—	Region IV	Region IV
5.	Authority to issue materials license (NMSS)	5 types of high volme licenses Region I, III	5 types of high volume licenses, All regions	10 types of high volume licenses, All regions
6.	Review safeguards license amendments which do not decrease effectiveness for reactors and SNM facilities (NMSS)	—	Regions I, II	All regions
7.	Conduct transportation route surveys and review contingency plans for spent fuel and Category 1 SNM shipments (NMSS)	—	—	Region III
8.	Perform closeout surveys and terminations of uranium fuel fabrication licenses (NMSS)	—	All regions	All regions
9.	Maintain oversight of 10 CFR 70 licenses for advanced fuel (Pu) plants that have initiated decontamination and decommissioning activities (NMSS).	—	All regions	All regions
10.	Issue proposed civil penalties.[e] (IE)	All regions	All regions	All regions
11.	Issue orders and make 10 CFR 2.206 decisions consistent with the transfer of licensing authority from IE, NRR, and NMSS (IE, NRR, and NMSS)	—	Region IV	Region IV
12.	Review License Amendments of Emergency Plans for Operating Reactors	—	All regions	All regions
13.	Observe and appraise the annual emergency preparedness exercises for operating reactors. (IE)	All regions	All regions	All regions
14.	Provide legal assistance TO Regional Administrators of functions to review severity level III violations, proposed civil penalties and orders, 2.206 decisions, material licenses and mill tailings licenses. (ELD)	All regions	All regions	All regions
15.	Provide state agreement officer (SP)	Regions II, IV IV, V	Regions I, II IV, V	Regions I, II
16.	Continue state liaison functions	All regions	All regions	All regions
17.	Performance budget formulation/execution and management information reporting activities	All regions	All regions	All regions
18.	Perform various administrative support services.	—	All regions	All regions

[a] NRR issues the license amendments. The regions conduct certain technical reviews.
[b] Will continue in FY 1985 with a similar number of technical reviews.
[c] NRR will provide for contract examiner assistance.
[e] With IE concurrence.

of some 100 additional licensing actions pending for operating power reactors. Opened in October 1982, the NRC Denver Field Office in Region IV continued to administer uranium recovery licensing. Limited authority for issuing license amendments for the Fort St. Vrain reactor in Colorado, transferred to Region IV (Dallas) in December remained in Region IV throughout 1983. The various headquarters' activities that have been transferred to the regions, including those highlighted above, as of the end of 1983, are listed in Table 1.

As the NRC gains further experience in conducting decentralized operations, changes in the mix of headquarters and regional operations may occur from time to time. As in the past, both before and during the 1981-1983 phase of decentralization, the guiding principle of providing effective regulation through effective use of agency resources will continue to govern developments in this area.

Fort St. Vrain. Licensing responsibility for all of the Fort St. Vrain nuclear power plant licensing actions—except those involving generic issues or exemptions to regulations—was delegated to Region IV (Dallas) in December 1982. A total of seven license amendments had been issued from the Region IV office at the close of the report period. One exemption and one confirmatory order had also been issued.

Fort St. Vrain, located in Platteville, Colo., is licensed for operation by the Public Service Company of Colorado, and is the only High Temperature Gas-Cooled reactor plant in the United States.

Officials of Consumers Power Co., licensee for the Midland nuclear power facility in Michigan, met with Region III (Chicago) and Headquarters staff personnel in early February 1983 to discuss the utility's "Construction Completion Program" for the plant. Listening to a company spokesman are members of the general public and NRC officials. In the front row, left to right, are James G. Keppler, Region III Regional Adminstrator; James Sniezek, Deputy Director, Office of Inspection and Enforcement; and A. Bert Davis, Deputy Regional Administrator for Region III.

EMPLOYEE - MANAGEMENT RELATIONS

Incentive Awards

NRC managers recognized high quality work performed by staff members during 1983 with 160 special achievement awards, 191 high quality performance increases, 81 certifications of appreciation, 2 meritorious executive rank awards, 37 SES bonuses, 3 distinguished service awards, 16 meritorious service awards, and 2 equal employment opportunity awards.

Labor Relations

The July 14, 1981, Three-year Collective Bargaining Agreement negotiated between the NRC and the National Treasury Employees Union (NTEU) provides for limited reopener negotiations mid-way in the term of the Agreement. These negotiations began on June 2, 1983, and NRC management began preparing, as well, for the comprehensive negotiations that will attend the termination of the full Agreement in July 1984. In addition, approximately 190 greivances and 17 unfair labor pratice compliants were handled during the year. Negotiations were held on some 60 issues during the year.

Personnel Directives

Management directives on personnel matters which were published as chapters in the NRC Manual, included one outlining policies and procedures for the NRC Incentive Awards Program and others covering Employee Benefits, Employee Health Services, Labor-Management Relations and Organization Management. The NRC Employee Handbook summarizing NRC's organization, functions, and personnel policies was revised and republished.

INSPECTION AND AUDIT

The NRC's Office of Inspector and Auditor (OIA) continued to pursue agency goals concerning the efficiency of NRC operations, and issued 18 audit reports and memoranda toward improving various NRC programs and activities. OIA also issued 11 follow-up reports, and 16 reports of investigation; reviewed 24 OI investigations; and referred 14 matters to the Department of Justice for review and possible action.

Highlights of some of the significant audit reports issued during 1983 follow.

Reactor Safeguards

An April 6, 1983 audit report evaluating the NRC safeguards program for nuclear power plants dealt principally with the safeguards licensing program carried out by NMSS but also addressed the NMSS interface with IE, with the regions, and NRR. OIA concluded that NMSS needs to improve the safeguards licensing review process, IE needs to improve the reactor safeguards inspection program and to get inspectors on site earlier in the reactor construction process, and both NRR and NMSS need to improve the interfaces between of safety and safeguards requirements. The report also provided licensee comments on NRC's safeguards requirements and OIA comments on regionalization of the reactor safeguards program.

Reactor Operator Licensing

An OIA April 19, 1983 report evaluating the NRR program for licensing nuclear power plant operators identified four problems with that program; most operator licensing examinations were performed by contractors; NRR had not performed requalification examinations, as directed by the Commission, and was not in a position to do so; pilot tests of regionalizing the operator licensing function were not, in fact, true tests of regionalization (and NRR had not provided guidance and policy direction to the regions); and NRR did not have a management information system capable of providing basic data needed to manage the operator licensing program. The report made recommendations to resolve these problems.

Regionalization Report

An OIA report dated September 12, 1983 documented the results of an OIA survey of NRC regionalization efforts, including the agency's planning for regionalization, the guidance and direction provided to the Regions, and the regional budgets and resources. The report concluded that greater central management and coordination of regionalization efforts were needed.

Operational Data

A survey audit of NRC's Office for Analysis and Evaluation of Operational Data (AEOD) concluded that AEOD was generally doing a good job of analyzing and evaluating operational data and feeding back the lessons of experience to NRC licensing operations, and of coordinating the overall operational data review program within NRC and between NRC and the nuclear industry. The report recommends, however, that NRC establish a formal tracking and follow-up system for AEOD recommendations, improve communication and coordination between AEOD and other NRC offices, more clearly define AEOD's and other offices' operational data responsibilities, and assure that the sequence coding and search system becomes operational.

NRC inspection team leader Don Sreniawski, right, confers with Ken Cole of the Ohio Disaster Services Agency during off-site radiation surveys in the Hebron-Newark, Ohio area.

Implementation of the Policy and Planning Guidance

In April 1983, OIA issued its second audit report on NRC's Policy and Planning Guidance (PPG) with generally favorable commentary. The audit showed that OIA believes the NRC staff has incorporated PPG into agency management systems, that NRC managers are familiar with PPG issues and generally supportive of its concept and intent, and that appropriate PPG elements are found in NRC's budget formulation process, the regional and program office operating plans, and in the Senior Executive Service (SES) and non-SES supervisory performance appraisals.

Integrated Safeguards Information System

In 1982, OIA conducted a follow-up audit of an NRC proposal to establish an Integrated Safeguards Information System (ISIS—see *1981 NRC Annual Report*, p. 170) which resulted in a report dated January 7, 1983. The audit focused on an NMSS staff response to OIA's original

ISIS report, including an ISIS Request for Procurement (RFP) which consisted of only one module—Materials Accounting (MAC). The follow-up concluded that the staff had not shown that the MAC project would cost less than NRC's current system and recommended that the Commission rescind its approval of the RFP. A subsequent NRC decision not to proceed with the MAC project effectively saved approximately $734,000 that was budgeted for MAC in fiscal year 1983 and 1984, and eliminated the need for projected budget requests of $10-$18 million for fiscal year 1985 and beyond.

Contracting for Consulting Services

An OIA audit to assess NRC management controls over consulting contracts and compliance with applicable laws and regulations resulted in an October 1982 report concluding that controls for managing consulting service contracts were adequate and that data required by the Federal Procurement Data Center were properly controlled and accurately reported.

FUNDING AND BUDGET MATTERS

NRC resource charts and financial statements appear at the end of this chapter. These charts show allocations of personnel and funds to the various NRC activities for fiscal year 1983 and those project for fiscal year 1984.

Total staffing remains essentially level from 1983 to 1984; however, there are increases and decreases in all programs. The inspection staff increases to accommodate the inspection workload associated with 14 more reactors becomming fully operational. Waste management staff increases because of additional workload associated with the Nuclear Waste Policy Act. These increases are mostly offset by decreases to the remaining programs. The licensing program decrease is attributed to reduced casework; the Research program decreases along with fewer contracts to administer.

NRC total funding increases in 1984. This increase is primarily due to higher pay costs. The changes by program reflect the staff changes described above and increased contractual effort in the inspection program for assistance in quality assurance reviews and inspections of reactors in operations. Some of the above increases are offset by the close out of the CRBR and LOFT projects.

Project Management

The NRC project management concept places primary emphasis and responsibility on project managers, who are assigned for each commercial project or interagency task and are responsible for the activities on their projects: contractual work, financial and cost aspects, administration and coordination, as well as technical results. They may call upon the rest of the NRC staff, as needed, to insure their individual projects are completed in a timely and useful manner. Thus, a single individual is the central axis for any one project, with full authority and responsibility for project results. Most projects are designed initially to be integrated into larger research programs, licensing efforts, or other technical support areas. This concept was extended in 1983, with more NRC personnel serving as project managers.

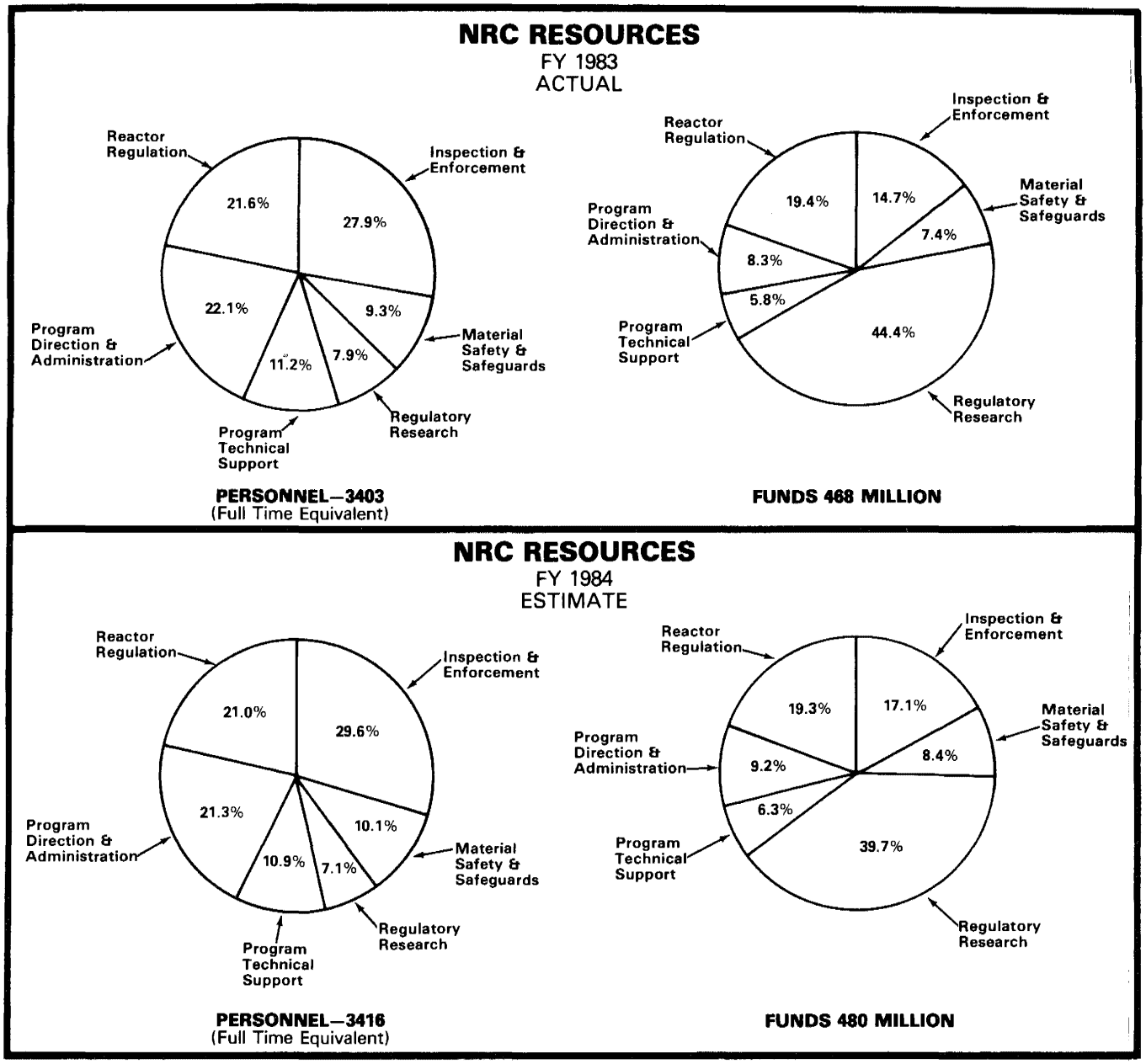
The project management training program commenced in 1982 has continued and been expanded to train professional staff members in this broad-range activity. Both formal and informal courses are now offered to the NRC staff on a regular, recurring basis. Recently a short course in placment of work under interagency agreement to DOE was added to the program.

NRC continues to investigate a broad range of contracting sources, with commercial firms, universities, government centers, and the DOE national laboratories all viewed as potential contractors for NRC work. DOE continues to be the single most used source, and NRC has working agreements with DOE for reimbursable tasking performed at the national laboratories.

To insure that NRC projects are well developed and within the financial constraints imposed, each program office is required to coordinate its contractual program and individual projects with other potential users and interested offices. This review and coordination process is key to insuring only well thought-out projects are performed which will yield maximum benefit in meeting NRC objectives. To facilitate this function, a Waste Management Review Group (WMRG) and a Human Factors Review Group (HFRG) comprised of senior members from each participating office examine every contractual project within their subject areas. This review process commences early in the formulation stage and includes a final review just before the projects are placed with an outside source for execution. Projects which survive these board examinations are further subject to a review by a Senior Contract Review Board (SCRB) which examines all NRC projects larger than $500,000 in one year, or $1,000,000 over a three-year period. Each of these groups may question any aspect of a project, technical or administrative. During 1983 the charter of the Senior Contract Review Board was rewritten to strengthen the technical review section and one additional member was added.

An NRC-DOE Interagency Task Force continues to meet with DOE and maintain cooperative contact and resolve any problem that develops between the two agencies. This offers the managers of both agencies a channel for the discussion of mutual problems — and has been beneficial in clarifying aims, strategies, and goals.

NRC bulletins in the 1400 series continue to guide NRC project managers. These are complemented by the internal NRC procurement regulations produced by the Division of Contracts, and the NRC Manual Chapter 1102 which governs work performed by the DOE national



laboratories. The Manual Chapter 1102 continues to be reviewed annually and is revised, as necessary, to reflect the latest changes in management's thinking. One recent change is the identification of licensee fee recoverable work separately from non-fee recoverable work. This entails more administrative costs on about 20 percent of the NRC projects; but allows NRC management to accurately bill licensees and applicants for all contractual support costs in a more timely manner.

Contracting and Reimbursable Work

NRC programs are supported by substantial amounts of contractual effort for confirmatory research and technical assistance. As discussed previously under the Project Management section, this includes reimbursable arrangements with other Federal agencies and contracts with commercial sources. In 1983, approximately $263 million, or about 56 percent of the NRC's operating funds were applied to such efforts. The DOE's share was approximately $225 million for work performed in its national laboratories and other facilities. (See other sections for description of the research and technical assistance programs included in this work.) Contracts with commercial firms for technical assistance and research work as well as general purchases, rents, and utilities are administered through the Division of Contracts, Office of Administration. Such contracts totaled about $39 million during 1983.

Office of Resource Management

During 1983 the Office of Resource Management continued to be responsible for the preparation of budgets, the administration of accounting and finance activities, and the management of the NRC data automation and word processing functions. Various management analysis studies were furnished senior NRC officials and overall NRC management systems such as the Manual Chapter procedures and the organization and functions procedures were continued. The preparation of the Annual Report, many informational documents, and other management information functions were continued during 1983. Emphasis was placed on analysis of costs a licensee will incur as a result of proposed NRC regulatory requirements. Other cost and program analyses were also performed to assess impacts on a broad range of activities.

A major area of growth in word processing was experienced during 1983. An ADP steering group formed in 1982 assessed the needs for intra and interagency communications and assisted in determining requirements and overall agency ADP policy. Equipment standardization and compatibility was stressed and acquisitions of new equipment were placed. Overall, NRC substantially increased its ability to use newer, more efficient word and data processing techniques and equipment and the communications process was greatly enhanced. It is expected this trend will continue into 1984 with even greater emphasis on word processing and the telecommunications transfer of data and transcripts.

The use of small, microcomputers to perform many of the functions previously either not automated or done on larger computers was increased during 1983. Personal-sized computers were furnished NRC offices and have been used to increase the flexibility and efficiency of data preparation and analysis. Again, this trend is expected to continue in 1984 with even more functions being envisioned for use on these computers. An NRC ADP users group established in 1982 is expected to continued to guide and advise in such work.

NRC LICENSE FEES

The Commission continued to collect fees for the processing of applications, permits, licenses and approvals and routine health and safety and safeguards inspections, and in fiscal year 1983, those fees totaled $16.8 million. (All license and inspection fees are sent to the Department of the Treasury as miscellaneous receipts.) Table 2 shows a breakdown of these collections.

The total collected since fees were first imposed (1968 through September 1983), is $160.7 million. Of this amount, $6.5 million has been refunded to licensees because of a 1974 Supreme Court decision against annual fees.

The current schedule of fees, adopted March 23, 1978, provides that fees assessed for construction permits and operating licenses for power reactors will be based on the full professional staff-hour and contractual costs expended to complete the review—not to exceed certain upper limits established by the Commission. During fiscal year 1983, the Commission did not issue any construction

Table 2. FY 1983 License Fee Collections

Fees	*Materials*	*Facilities*	*Total*
Applications	$106,087		$106,087
Construction Permits		1,806,412	1,806,412
Manufacturing License		1,477,500	1,477,500
Operating Licenses		1,702,180	
Approvals		386,720	
Amendments	313,812	2,673,800	2,987,612
Renewals	486,226		486,226
Inspection Fees	826,904	6,767,150	258,759
Special Projects	874	257,885	258,759
TOTALS	1,733,903	15,071,647	16,805,550

Table 3. Cost of CP and OL Issuances in FY 1983

	Issue Date	*Licensing Cost*	*Inspection Cost*	*Total Cost*	*Fees Paid*
Construction Permits					
None Issued					
Manufacturing License					
Offshore Power Systems	12/17/82	2,500,231	24,408	2,524,639	1,477,500
Operating Licenses					
San Onofre 3	11/15/82	341,000	255,000	596,000	302,800
McGuire 2	3/3/83	515,000	320,000	835,000	302,800
St. Lucie 2	4/6/82	1,666,600	462,100	2,128,700	1,024,500

permits. (Fees collected and reflected in Table 2 were residual from past actions). One manufacturing license and three operating licenses were issued which were subject to the full cost requirement.

Table 3 provides information relating to costs of issuance and fees paid for the facilities named.

Proposed Notice of Rulemaking

On November 22, 1982, the NRC published in the *Federal Register* (47 F. R. 52454) for public comment a Notice of Proposed Rulemaking which proposes a revision of the schedules for fees covering inspections and the review of various applications (for permits, licenses, amendments, etc.). The revisions would more completely recover NRC costs for such services. Items covered in the proposed revision include the elimination of ceilings or upper limits on fees charged for review of facility and fuel cycle applications, and of the existing system that classifies reactor amendments and approvals into one of six fee classes and major fuel cycle amendments into major, minor, or administrative amendments. Fees for facility amendments, approvals, and major fuel cycle amendments would be based on the costs of actual staff hours and contractual services expended on the reviews. In place of present fixed fees, inspection fees for facility and major fuel cycle licensees, radioactive waste burial and storage facility licensees will also be based on staff hours and contractual services. Fees covering Part 55 reviews for requalification and replacement examinations of reactor operators would be based on actual professional staff hours and contractual services costs required to administer the examinations, and would be billed to the utility employing the operators. Where these fees are so determined, a new billing procedure is proposed whereby applicants will be billed for the review costs at six-month intervals. Inspections subject to fees based on the full cost method will be billed quarterly.

PUBLIC COMMUNICATION

Public Information

Media Workshops. The five regional offices of the Nuclear Regulatory Commission conducted a third series of one-day educational seminars on the fundamentals of nuclear power and the risks of exposure to radiation for reporters and editors from national wire services, broadcast networks, news magazines and daily newspapers. The seminars were held in Miami, Fla., January 14; Los Angeles, Cal., February 22; Kansas City, Mo., May 12; Cleveland, Ohio, October 26; and New Orleans, La., November 7.

Public Announcements. Press releases announcing Commission programs, rulemaking, public hearings, proposed fines against licensees and other agency activities were distributed to the news media, scientific community, universities and the general public.

Headquarters Public Document Room

The Nuclear Regulatory Commission maintains a public document (library) system throughout the United States for the purpose of making available significant documents pertaining to commercial nuclear facilities and materials for inspection and reproduction by the public.

The principal Public Document Room (PDR) is located at 1717 H Street, N.W., Washington, D.C. The PDR collection consists of approximately 1,229,000 documents, receiving an average of 344 new items each day. During an average month, the PDR services 1,115 users, provides 1,102 documents in response to letters from the public and retrieves 6,558 files containing multiple documents or microfiche in response to on-site requests from the public. More than 2.4 million pages of documents and 22,981 microfiche cards were purchased by the public

The Advisory Committee on Reactor Safeguards (ACRS) was established by Congress to review and report to the Commission on safety studies and license applications (see Chapter 2). The ACRS maintains a fellowship program enlisting graduate and post-doctoral nuclear scientists and engineers to assist in its work for one-year, once renewable, terms. ACRS Fellow Jan Preston confers here with ACRS Chairman Jesse C. Ebersole.

from the on-site contractor operated reproduction facility during fiscal year 1983.

The types of documents available at the PDR are reports; written records of meetings (transcripts and/or meeting summaries); existing or proposed regulations, copies of licenses and/or their amendments; technical, legal and limited administrative correspondence. The majority of these documents relate to the design, construction, operation and inspection of nuclear power plants and to the use, transport and disposal of nuclear materials, including waste.

Reference librarians are available to assist users in defining search strategies, explaining reference tools, and locating and retrieving documents in specific files. Daily accession listings and other indexes are also available for the use of patrons. In cases where indexes are not appropriate or where documentation cannot easily be drawn together, librarians or trained users can perform on-line computer searches of the PDR's machine-readable data base, which contains descriptive citations of all records submitted to the facility after October 1978 and of principal licensing documents dated earlier.

Persons wishing to use or obtain additional information regarding the holdings, file organization, reference, reproduction services and procedures of the PDR may call (202) 634-3274 or write to the U.S. Nuclear Regulatory Commission, Public Document Room, Washington, D.C. 20555. A "Public Document Room Users' Guide" and "Public Document Room File Classification System" guide are available upon request. In addition, orientation sessions are provided for individuals or groups interested in using the facility and training sessions are scheduled regularly for users in how to search the PDR automated bibliographic retrieval system (on-line card catalog).

Rick Hasselberg, right, a full-time instructor in the NRC Reactor Training Center in Chattanooga, Tenn., talks to television reporters during a break in a News Media Seminar. The seminar, which took place in Cleveland, Ohio, in October 1983, was sponsored jointly by the Public Affairs Offices of Region I (Philadelphia) and Region III (Chicago). Such seminars, designed to give news people a better basic understanding of nuclear reactors, radiation and related matters, are held periodically in all five NRC regions.

LOCAL PUBLIC DOCUMENT ROOMS

Through its local public document room (LPDR) program, the NRC makes document collections available to the public near the sites of proposed and operating nuclear power plants. These collections contain information regarding the licensing, construction, operation, inspection, and regulation of nearby nuclear facilities. They include documents dealing with such matters as health and safety, safeguards, and environmental and antitrust considerations. LPDR collections usually are located in university or public libraries that have copying facilities and are open to the public during the evening and on weekends. Currently, there are more than 130 LPDRs in operation. (See Appendix 3 for a list of LPDR locations.)

Annual site visits to LPDR libraries are made to assure that collections are properly maintained and readily ac-

cessible to the public. The "awareness" program begun in 1982 to inform the public about the existence and availability of documents at the local level was expanded in 1983. The program includes publication of a quarterly newsletter, announcements in local newspapers and library bulletins, and evening workshops at individual LPDR libraries. The workshops are open to the public, and trained NRC staff provides instruction in identifying, locating, and retrieving information. A toll-free telephone number (1-800-638-8081) is available to library staffs and individuals who need rapid, convenient answers to questions about such topics as collection content, search strategies, use of reference tools and indices, and locating and retrieving information at LPDR sites. The LPDR Branch staff in Bethesda, Md., operates this telephone service.

Other ongoing programs include providing financial assistance and micrographic support to LPDR libraries. Financial help is needed to defray the cost of maintaining collection and reference services provided for the NRC. Microfiche reader-printers and storage cabinets, as well as selected NRC documents on microfiche, are provided LPDR libraries in order to broaden the scope of collection content without unnecessarily adding to the libraries' limited shelf space. Information available at LPDRs in a microfiche format includes NUREGs, Regulatory Guides, NRC issuances, and the NRC's rules and regulations updated monthly.

NRC/GPO Sales Program

The NRC/GPO Sales Program commenced in 1979. Its purpose is to make NRC publications available to the public as expeditiously as possible. After four years of operation, the NRC/GPO Sales Program is processing in excess of 3,000 requests monthly for copies of NRC publications. Sales of individual publications averages $19,000 per month.

Subscription service is available for 31 NRC publications. Some of these are the Rules and Regulations, including the Medical Parts which can be obtained separately, Regulatory Guides, Summary Status Reports, and the Weekly Information Report. The NRC publications program has a total of 20,402 subscribers and provides about $2.2 million in revenue for the Federal government.

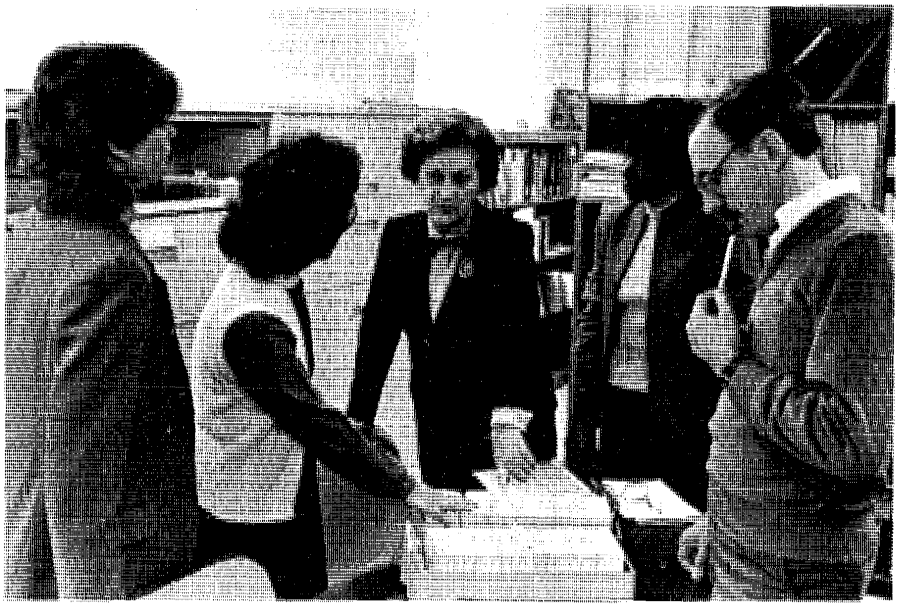
REFORM '88 Activities

During its review of pamphlets and recurring periodicals for the REFORM '88 Publications and Audiovisuals Initiative, the NRC eliminated 14 documents and consolidated two others. Additional cost reduction actions were initiated for 44 more NRC publications so that some cost reduction actions were applied to 60 of 66 of NRC's pamphlets and recurring periodicals. Nine new publications were added to the NRC list of pamphlets or recurring periodicals during fiscal year 1983.

OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION/CIVIL RIGHTS

Small and Disadvantaged Business Utilization Program

In cooperation with the Division of Contracts, the following procurement preference and dollar thresholds were adopted:



A special "Library Orientation for Regional Library Assistants" was held in March 1983 at the NRC Headquarters Library in Bethesda, Md. Here participants are briefed on the technical codes and standards collection in the library. From left to right are Connie Latigo, from Region IV (Dallas); Eileen Chen, from the Headquarters library staff; Mary Johns, from Region III (Chicago); Earline Scott, from Region II (Atlanta), and Mike Perkins, from Region I (Philadelphia).

NRC EMPLOYMENT PROFILE

	SEPTEMBER 30, 1983				SEPTEMBER 30, 1982			
	MEN		WOMEN		MEN		WOMEN	
	NON-MINORITY	MINORITY	NON-MINORITY	MINORITY	NON-MINORITY	MINORITY	NON-MINORITY	MINORITY
EXECUTIVE	5	0	0	0	5	0	0	0
SES	187	6	4	0	187	3	3	0
GS-18	1	0	0	0	1	1	0	0
GS-17	6	0	2	0	3	0	1	0
GS-16	26	1	1	0	13	1	2	0
GS-15	586	38	15	2	535	32	13	0
GS-14	681	100	38	9	599	79	25	5
GS-13	301	37	81	14	308	40	42	14
GS-12	68	11	57	16	130	21	63	6
GS-11	40	7	53	17	52	9	61	17
GS-10	70	27	528	177	118	34	560	172
OTHER*	20	9	1	0	25	8	0	0

*Employees whose salaries are set wage board, scientific & technical schd., or admin. determination.

- $32,000,000 for total prime contracts greater than $10,000.
- $ 9,353,000 of this total for prime contract awards to small business.
- $ 2,600,000 for Section 8(a) awards.
- $ 1,295,000 for prime contract to small and disadvantaged business.
- $ 2,194,000 for subcontracts awarded to small business.
- $ 202,000 for subcontract awarded to small and disadvtanged business.

During the year, 45 interviews were conducted with firms wanting to do business with NRC, and 17 follow-up meetings were arranged with NRC technical personnel.

Other actions in this area are discussed in Chapter 11, Regulatory Research, and summarized under Contracting and Reimbursable Work, earlier in this chapter.

Civil Rights Program

The NRC Affirmative Action Plan was approved by the Equal Employment Opportunity Commission. Hiring goals were established for each Office and Region.

Fifteen new EEO Counselors were appointed for Headquarters and five for Regional Offices, raising the total to 18 in Headquarters and 10 in the regions (two for each of the regional offices). The USDA Graduate School conducted two four-day courses to train 27 agency employees in EEO counseling and discrimination complaint processing.

Federal Women's Program

A videotape, for training purposes, on the "Prevention of Sexual Harassment in the Workplace" was produced during the report period. Training was offered to all NRC employees, in supervisory and nonsupervisory positions. The videotape was shown by the FWP Manager to Federal government employees attending the Federally Employed Women, Inc., National Training Program and has been made available to other Federal agencies.

NRC, had various programs to celebrate National Women's History Week. Speakers included Jeanne Schramm, an actress who portrayed Susan B. Anthony; Sandra Jaco, Vice President of American Express, who spoke on "Taking Your Business on the Road;" and, Richard Brinker, Financial Planner of E. F. Hutton, who discussed financial management for women. The Federal Women's Program Advisory Committee conducted a lunchtime presentation of "Preparing SF-171's."

FY 1982/1983 NRC Financial Statements

Balance Sheet (in thousands)

	September 30, 1983	*September 30, 1982*
Assets		
Cash:		
Appropriated Funds in U.S. Treasury	$ 165,961	$ 215,300
Other (Notes 1 & 3)	11,560	14,187
	177,521	229,487
Accounts Receivable:		
Federal Agencies	127	124
Miscellaneous Receipts - Note 2	1,920	2,165
Other	50	36
	2,097	2,325
Plant:		
Completed Plant and Equipment	20,621	16,352
Less — Accumulated Depreciation	5,710	3,877
	14,911	12,475
Advances and Prepayments:		
Federal Agencies	–0–	–0–
Other	4,286	4,452
	4,286	4,452
Total Assets	$ 198,815	$ 248,739

	September 30, 1983	*September 30, 1982*
Liabilities and NRC Equity		
Liabilities		
Funds held for Others - Notes 1 & 3	$ 11,560	$ 14,187
Accounts Payable and Accrued Expenses:		
Federal Agencies	39,297	83,293
Other	20,416	18,040
Accrued annual leave of NRC Employees	11,271	10,055
Deferred revenue - Note 3	–0–	1,365
Total Liabilities	82,544	126,940
NRC Equity: Balance at October 1	121,799	115,217
Additions:		
Funds Appropriated-Net	465,274	465,700
Non Reimbursable Transfer From Other Gov't Agencies	277	68
	587,350	580,985
Deductions:		
Net cost of Operations	451,301	442,617
Funds returned to U.S. Treasury - Note 2	19,778	16,569
	471,079	459,186
Total NRC Equity	116,271	121,799
Total Liabilities and NRC Equity	$ 198,815	$ 248,739

Note 1. As of September 30, 1983, includes $4,457,017.01 of funds received under cooperative research agreements involving NRC, DOE, Euratom, France, Federal Republic of Germany, Japan, Austria, the Netherlands, Belgium, and the United Kingdom.

Also included is $6,356,752.00 of funds received from deferred revenue billings. These funds will be refunded and/or recorded as earned revenue after the cost of processing the applications has been finalized and accordingly, are not available for NRC use. See Note 3.

Note 2. These funds are not available for NRC use.

Note 3. On March 24, 1978, 10 CFR 1 was revised. Contained therein by category of license are maximum fee amounts to be paid by applicants at the time a facility or material license is issued. Also, After the review of the license application is complete, the expenditures for professional manpower and appropriate support services are to be determined and the resultant fee assessed. In no event will the fee exceed the maximum fee for that license category, which generally has been paid. This could involve the refunding of a significant portion of the initial amount paid. Therefore, the revenue is recorded in a deferred revenue account at the time of billing and is removed from this account and recorded in Funds Held for Others when the bill is paid. The balance in the Deferred Revenue account consists of deferred revenue on billings issued but not collected. See Note 1.

Note 4. Represents current year cost of plant and equipment acquisitions for use at DOE facilities.

FY 1982/1983 Statement of Operations (in thousands)

	Fiscal Year 1983 (October 1, 1982, thru September 30, 1983)	*Fiscal Year 1982 (October 1, 1981, thru September 30, 1982)*
Personnel Compensation	$ 136,038	$ 127,157
Personnel Benefits	14,719	11,868
Program Support	267,253	261,556
Administrative Support	38,324	39,538
Travel of Persons	8,847	7,995
Equipment (Technical) — Note 4	3,922	7,428
Construction — Note 4	–0–	–0–
Taxes and Indemnities	11	8
Refunds to Licensee	–0–	1
Representational Funds	1	2
Reimbursable Work	75	361
Increase in Annual Leave Accrual	1,216	1,465
Depreciation Expense	1,840	1,530
Equipment Write-offs and Adjustments	27	63
Total Cost of Operations	472,273	458,972
Less Revenues:		
Reimbursable Work for Other Federal Agencies	73	379
Fees (deposited in U.S. Treasury as Miscellaneous Receipts - Note 2):		
Material Licenses	1,482	2,462
Facility Licenses	16,567	11,819
Other	2,850	1,695
Total Revenue	20,972	16,355
Net Cost of Operations before prior Year Adjustments	451,301	442,617
Prior Year Adjustment	–0–	–0–
Net Cost of Operations	$ 451,301	$ 442,617

U.S. Government Investment in the Nuclear Regulatory Commission

(From January 19, 1975 through September 30, 1983—in thousands)

Appropriation Expenditures:	
Fiscal Year 1975 (January 19, 1975 through June 30, 1975)	$ 52,792
Fiscal Year 1976 (July 1, 1975 through September 30, 1976)	226,248
Fiscal Year 1977 (October 1, 1976 through September 30, 1977)	230,559
Fiscal Year 1978 (October 1, 1977 through September 30, 1978)	270,877
Fiscal Year 1979 (October 1, 1978 through Septebmer 30, 1979)	309,493
Fiscal Year 1980 (October 1, 1979 through September 30, 1980)	377,889
Fiscal Year 1981 (October 1, 1980 through September 30, 1981)	416,867
Fiscal Year 1982 (October 1, 1981 through September 30, 1982)	441,902
Fiscal Year 1983 (October 1, 1982 through September 30, 1983)	514,613
Total Appropriation Expenditures	$2,841,240
Unexpected Balance of Appropriated Funds in U.S. Treasury September 30, 1983	165,961
Transfer of Refunds Receivable from Atomic Energy Commission, January 19, 1975	429
Funds Appropriated-Net	$3,007,630
Less:	
Funds returned to U.S. Treasury - Note 2	122,295
Assets and Liabilities transferred from other Federal Agencies without Reimbursement	1,673
Net Cost of Operations from January 19, 1975 through September 30, 1983	2,767,391
Total Deductions	2,891,359
NRC Equity at September 30, 1983 as shown on Balance Sheet	$ 116,271

Appendix 1

NRC Organization

(As of December 31, 1983)

COMMISSIONERS

Nunzio J. Palladino, Chairman
Victor Gilinsky
Thomas M. Roberts
James K. Asselstine
Frederick M. Bernthal

The Commission Staff

General Counsel, Herzel H.E. Plaine
Office of Policy Evaluation, John E. Zerbe, Director
Office of Public Affairs, Joseph J. Fouchard, Director
Office of Congressional Affairs, Carlton C. Kammerer, Director
Office of Inspector and Auditor, George Messenger, Acting Director
Secretary of the Commission, Samuel J. Chilk
Office of Investigations, Ben B. Hayes, Director

Other Offices

Advisory Committee on Reactor Safeguards, Jeremiah J. Ray, Chairman
Atomic Safety & Licensing Board Panel, B. Paul Cotter, Jr., Chairman
Atomic Safety & Licensing Appeal Panel, Alan S. Rosenthal, Chairman

EXECUTIVE DIRECTOR FOR OPERATIONS

Executive Director for Operations, William J. Dircks
Deputy Executive Director for Operations, Jack W. Roe
Deputy Executive Director for Regional Operations and
Generic Requirements, Victor Stello, Jr.
Assistant for Operations, Thomas A. Rehm

Program Offices

Office of Nuclear Reactor Regulation, Harold R. Denton, Director
Office of Nuclear Material Safety and Safeguards, John G. Davis, Director
Office of Nuclear Regulatory Research, Robert B. Minogue, Director
Office of Inspection and Enforcement, Richard C. DeYoung

Staff Offices

Office of Administration, Patricia G. Norry, Director
Executive Legal Director, Guy H. Cunningham
Office of Resource Management/Controller, Learned W. Barry
Office of International Programs, James R. Shea, Director
Office of State Programs, G. Wayne Kerr, Director
Office for Analysis and Evaluation of Operational
Data, Clemens J. Heltemes, Jr., Director
Office of Small and Disadvantaged Business
Utilization/Civil Rights, William B. Kerr

Regional Offices

Region I Philadelphia, PA, Thomas E. Murley, Regional Administrator
Region II Atlanta, GA, James P. O'Reilly, Regional Administrator
Region III Chicago, IL, James G. Keppler, Regional Administrator
Region IV Dallas, TX, John T. Collins, Regional Administrator
Region V San Francisco, CA, John B. Martin, 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, and 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 directs and coordinates the Commission's operational and administrative activities among the program and support staff offices described below, and also coordinates the development of policy options for Commission consideration. The EDO reports directly to the Chairman.

The Office of Nuclear Reactor Regulation licenses nuclear power, test and research reactors under a two-phase process. A construction permit is granted before facility construction can begin and an operating license is issued before fuel can be loaded. NRR reviews license applications to assure that each proposed facility can be built and operated without undue risk to the health and safety of the public and with minimal impact on the environment. NRR monitors operating reactor facilities during their lifetime through decommissioning.

The Office of Nuclear Material Safety and Safeguards. The Office of Nuclear Material Safety and Safeguards is responsible for the licensing and regulation of facilities and materials associated with the processing, transport, and handling of nuclear materials, and the disposal of nuclear waste as well as the regulation of uranium recovery facilities. NMSS reviews and assesses safeguards against potential threats, thefts, and sabotage for licensed facilities, including reactors, 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 Regulatory Research plans and conducts a comprehensive research and standards program that is deemed necessary for the performance of the Commission's licensing and regulatory functions and that is responsive to current and future NRC needs. The program covers areas such as facility operation, engineering technology, accident evaluation, probabilistic risk analysis, and siting, health, and waste management.

The Office of Inspection and Enforcement develops and oversees programs of inspection of nuclear facilities and materials licensees to determine whether facilities are constructed and operations are conducted in compliance with license provisions and Commission regulations; to identify conditions that may adversely affect the protection of nuclear materials and facilities, the environment, or the health and safety of the public; and to provide a basis for recommending issuance or denial of licenses. It develops and oversees a program of investigation of accidents, incidents, and allegations of improper actions that involve nuclear material and facilities; enforces NRC regulations and license provisions; and manages and directs all NRC actions related to emergency preparedness, including evaluation of State and local emergency plans performed by the Federal Emergency Management Agency (FEMA). It performs audits of its programs as carried out by NRC regional offices.

THE COMMISSION STAFF

The Office of the Secretary provides management, administrative and limited logistical support to the Commission. The office forecasts Commission action on continuing issues; prepares the Commission's agenda; records Commission meetings and staff requirements emanating from Commission meetings; manages the Commission staff paper system; records and serves documents in adjudicatory matters; receives and distributes public comments in rulemaking proceedings; processes and controls Commission correspondence; maintains the Commission's official records; manages the NRC historical program; operates the principal NRC Public Document Room, in Washington, DC; provides personnel, travel, supply, reproduction and limited logistic services; and monitors and reports to the Commission on the status of requirements placed on the staff as a result of Commission decisions and initiates follow-up actions to hold overdue responses to a minimum.

The Office of General Counsel serves the Commission in a variety of legal capacities. The Office assists the Commission in the review of Appeal Board decisions, petitions seeking direct Commission relief, and rulemaking proceedings, and drafts legal documents necessary to carry out the Commission's decisions. The General Counsel provides a legal analysis of proposed legislation affecting the Commission's functions and assists in drafting legislation and preparing testimony. The General Counsel also represents the Commission in court proceedings, frequently in conjunction with the Department of Justice.

The Office of Policy Evaluation plans and manages activities involved in performance of an independent review of positions developed by the NRC staff which require policy determinations by the Commission. The Office also conducts analyses and projects which are either self-generated or requested by the Commission.

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. Develops policy, procedures and standards for these activities.

The Office of Inspector and Auditor investigates to ascertain the integrity of all NRC operations; investigates allegations of NRC employee misconduct, equal employment and civil rights complaints, and claims for personal property loss or damage; conducts the NRC's internal audit activities; and hears individual employee concerns regarding Commission activities under the agency's "Open Door" policy. The office develops policies governing the Commission's financial and management audit program and is the agency contact with the General Accounting Office on this function. Refers criminal matters to the Department of Justice and maintains liaison with law enforcement agencies.

The Office of Public Affairs plans and administers NRC's program to inform the public of Commission policies, programs and activities and keeps NRC management informed of public affairs activities of interest to the Commission. OPA reports directly to the Chairman.

The Office of Congressional Affairs provides advice and assistance to the Commission and senior staff on congressional matters, coordinates NRC's congressional relations activities, and maintains liaison for the Commission with congressional committees and members of Congress. OCA reports directly to the Chairman.

SUPPORT STAFF

The Office of Administration directs the agency's programs for organization and personnel management; security and classification; technical information and document control; facilities and materials license fees; contracting and procurement; rules, proceedings and document services, administration of Freedom of Information Act and Privacy Act requests; management development and training; telecommunications, transportation services, management of space and other administrative housekeeping services.

The Office of Resource Management develops and maintains NRC's financial and manpower management programs, including policies, procedures and standards of accounting, budgeting cost analysis, resource planning and analysis, and automatic data processing systems development and support. Provides management information for other offices and issues special reports for the NRC to Congress, other government agencies and the public. Assists NRC offices in statistical matters and in the budget process, keeping the EDO and Commission informed on programs and issues of significance. Maintains liaison with OMB, the Congress and other government agencies, and the private sector, as appropriate.

The Office of the Executive Legal Director provides legal advice and services to the Executive Director for Operations and staff, including representation in administrative proceedings involving the licensing of nuclear facilities and materials, and the enforcement of license conditions and regulations; counseling with respect to safeguards matters, contracts, security, patents, administration, research, personnel, and the development of regulations to implement applicable Federal statutes.

The Office of International Programs plans and implements programs of international nuclear safety cooperation, creating and maintaining relationships with foreign regulatory agencies and international organizations; coordinates NRC export-import and international safeguards policies; issues export and import licenses; and coordinates responses by NRC to other agencies related to export-import actions and issues.

The Office of State Programs directs programs relating to regulatory relationships with State governments and organizations and interstate bodies, manages the NRC State Agreements program, administers the indemnification program and performs financial qualification reviews of applicants and licensees. The office also verifies that applicants are not in violation of the antitrust laws.

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 inspection activities. The office oversees action taken in response to the feedback and assesses the overall effectiveness of the agencywide operational safety data program, serving as a focal point for interaction with the ACRS and industry groups involved in operational safety data analysis and evaluation.

The Office of Small and Disadvantaged Business Utilization/ Civil Rights develops and implements the NRC's program in accordance with the Small Business Act, as amended, insuring that appropriate consideration is given to labor surplus area firms and women-owned businesses. Develops and recommends NRC policy providing for equal employment opportunity and develops, monitors and evaluates the affirmative action program to assure compliance with the policy. Serves as contact with local and national public and private organizations.

OTHER OFFICES

Advisory Committee on Reactor Safeguards. A statutory committee of 15 scientists and engineers advises the Commission on the safety aspects of proposed and existing nuclear facilities and the adequacy of proposed reactor safety standards, and performs 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 the ACRS Fellowship Program.

Atomic Safety and Licensing Board Panel. Three-member licensing boards drawn from the Panel—made up of lawyers and others with expertise in various technical fields—conduct public hearings and make such intermediate or final decisions as the Commission may authorize in proceedings to grant, suspend, revoke or amend NRC licenses.

Atomic Safety and Licensing Appeal Panel. Three-member appeal boards selected from the Panel exercise the authority and perform the review functions which would otherwise be carried out by the Commission in certain licensing proceedings. Licensing board decisions are reviewable by an appeal board, either in response to an appeal or on its own initiative. The appeal board's decision also is subject to review by the Commission on its initiative or in response to a petition for discretionary review.

Appendix 2

NRC Committees and Boards

Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards (ACRS) is a statutory committee established to advise the Commission on the safety aspects of proposed and existing nuclear facilities and the adequacy of proposed reactor safety standards, and to perform such other duties as the Commission may request. The Committee conducts a continuing study of reactor safety research and submits an annual report to Congress. It also administers the ACRS Fellowship Program. As of December 31, 1983, the members were:

MR. JEREMIAH J. RAY, Chairman, retired Chief Electrical Engineer, Philadelphia Electric Company, Philadelphia, Pennsylvania
MR. JESSE EBERSOLE, Vice Chairman, retired Head Nuclear Engineer, Division of Engineering Design, Tennessee Valley Authority, Knoxville, Tennessee
DR. ROBERT C. AXTMANN, Professor of Chemical Engineering, Princeton University, Princeton, New Jersey
DR. MAX W. CARBON, Professor and Chairman of Nuclear Engineering Department, University of Wisconsin, Madison, Wisconsin
DR. WILLIAM KERR, Professor of Nuclear Engineering and Director of the Office of Energy Research, University of Michigan, Ann Arbor, Michigan
DR. HAROLD W. LEWIS, Professor of Physics, Department of Physics, University of California, Santa Barbara, California
DR. CARSON MARK, retired Division Leader, Los Alamos Scientific Laboratory, Los Alamos, New Mexico
MR. CARLYLE MICHELSON, retired Principal Nuclear Engineer, Tennessee Valley Authority and retired Director, Office for Analysis and Evaluation of Operational Data, U.S. Nuclear Regulatory Commission, Washington, DC
DR. DADE W. MOELLER, Professor of Engineering in Environmental Health and Director, Office of Continuing Education, School of Public Health, Harvard University, Boston Massachusetts
DR. DAVID OKRENT, Professor, School of Engineering and Applied Science, University of California, Los Angeles, California
DR. FORREST J. REMICK, Assistant Vice-President for Research and Graduate Studies and Professor of Nuclear Engineering, The Pennsylvania State University, University Park, Pennsylvania
DR. PAUL G. SHEWMON, Professor and Chairman of Metallurgical Engineering Department, Ohio State University, Columbus, Ohio
DR. CHESTER P. SIESS, Professor Emeritus of Civil Engineering, University of Illinois, Urbana, Illinois
MR. DAVID A. WARD, Research Manager of Nuclear Engineering, E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, South Carolina

Atomic Safety and Licensing Board Panel

PANEL MEMBERS:

CHIEF ADMINISTRATIVE JUDGE B. PAUL COTTER, JR., ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
DEPUTY CHIEF ADMINISTRATIVE JUDGE—Executive Robert M. Lazo, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
DEPUTY CHIEF ADMINISTRATIVE JUDGE—Technical, Frederick J. Shon, ASLBP Physicist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE GEORGE C. ANDERSON, Marine Biologist, University of Washington, Seattle, WA
JUDGE CHARLES BECHHOEFER, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE PETER B. BLOCH, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE LAWRENCE BRENNER, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE GLENN O. BRIGHT, ASLBP Engineer, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE A. DIXON CALLIHAN, Retired Physicist, Union Carbide Corporation, Oak Ridge, TN
JUDGE JAMES H. CARPENTER, ASLBP Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE HUGH K. CLARK, Retired Attorney, E.I. duPont deNemours & Company, Kennedyville, MD
JUDGE RICHARD F. COLE, ASLBP Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE FREDERICK P. COWAN, Retired Physicist, Brookhaven National Laboratory, Boca Raton, FL
JUDGE DONALD P. DESYLVA, Marine Biologist, University of Miami, Miami, FL
JUDGE MICHAEL A. DUGGAN, Economist, University of Texas, Austin, TX
JUDGE GEORGE A. FERGUSON, Physicist, Howard University, Washington, DC
JUDGE HARRY FOREMAN, Medical Doctor, University of Minnesota, Minneapolis, Minnesota
JUDGE RICHARD F. FOSTER, Environmental Scientist, Sunriver, OR
JUDGE JOHN H. FRYE III, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE JAMES P. GLEASON, Attorney, Silver Spring, MD
JUDGE ANDREW C. GOODHOPE, Retired Administrative Law Judge, Federal Trade Commission, Wheaton, MD
JUDGE HERBERT GROSSMAN, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE CADET H. HAND, JR., Marine Biologist, University of California, Bodega Bay, CA

JUDGE JERRY HARBOUR, ASLBP Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE DAVID L. HETRICK, Nuclear Engineer, University of Arizona, Tucson, AZ
JUDGE ERNEST E. HILL, Nuclear Engineer, Lawrence Livermore Laboratory, Livermore, CA
JUDGE ROBERT L. HOLTON, Marine Biologist, Oregon State University, Corvallis, OR
JUDGE FRANK F. HOOPER, Marine Biologist, University of Michigan, Ann Arbor, MI
JUDGE HELEN F. HOYT, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE ELIZABETH B. JOHNSON, Nuclear Engineer, Oak Ridge National Laboratory, Oak Ridge, TN
JUDGE WALTER H. JORDAN, Retired Physicist, Oak Ridge Laboratories, Oak Ridge, TN
JUDGE JAMES L. KELLEY, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE JERRY R. KLINE, ASLBP Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE JAMES C. LAMB III, Sanitary Engineer, University of North Carolina, Chapel Hill, NC
JUDGE JAMES A. LAURENSON, ASLBP/Administrative Law Judge, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE GUSTAVE A. LINENBERGER, ASLBP Physicist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE LINDA W. LITTLE, Environmental Biologist, L. W. Little Associates, Raleigh, NC
JUDGE M. STANLEY LIVINGSTON, Retired Physicist, AEC National Accelerator Laboratory, Santa Fe, NM
JUDGE EMMETH A. LUEBKE, ASLBP Physicist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE MORTON B. MARGULIES, ASLBP Administrative Law Judge, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE KENNETH A. MCCOLLOM, Electrical Engineer, Oklahoma State University, Stillwater, OK
JUDGE GARY L. MILHOLLIN, Attorney, Catholic University of America, Washington, DC
JUDGE MARSHALL E. MILLER, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE PETER A. MORRIS, ASLBP Physicist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE OSCAR H. PARIS, ASLBP Environmental Scientist, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE HUGH C. PAXTON, Retired Physicist, Los Alamos Scientific Laboratory, Los Alamos, NM
JUDGE PAUL W. PURDOM, Retired Environmental Engineer, Decatur, GA
JUDGE DAVID R. SCHINK, Oceanographer, Texas A&M University, College Station, TX
JUDGE IVAN W. SMITH, ASLBP Administrative Law Judge, U.S. Nuclear Regulatory Commission, Bethesda, MD
JUDGE MARTIN J. STEINDLER, Chemist, Argonne National Laboratory, Argonne, IL
JUDGE QUENTIN J. STOBER, Biologist, University of Washington, Seattle, WA
JUDGE SEYMOUR WENNER, Retired Administrative Law Judge, Postal Rate Commission, Chevy Chase, MD
JUDGE JOHN F. WOLF, Attorney, Retired Department of Justice, Chevy Chase, MD
JUDGE SHELDON J. WOLFE, ASLBP Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD

STAFF:

DANIEL F. BROWN, Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
CHARLES J. FITTI, Executive Secretary, U.S. Nuclear Regulatory Commission, Bethesda, MD
JAMES E. HARD, Technical Advisor for Engineering, U.S. Nuclear Regulatory Commission, Bethesda, MD
CAROLE F. KAGAN, Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
ELVA W. LEINS, Assistant Executive Secretary, U.S. Nuclear Regulatory Commission, Bethesda, MD
DAVID R. LEWIS, Legal Intern, U.S. Nuclear Regulatory Commission, Bethesda, MD
RUTHANNE G. MILLER, Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
LUCINDA E. MINTON, Attorney, U.S. Nuclear Regulatory Commission, Bethesda, MD
MICHAEL A. PARSONT, Technical Advisor for Environmental Matters, U.S. Nuclear Regulatory Commission, Bethesda, MD
DAVID L. PRESTEMON, Legal Counsel to the Panel, U.S. Nuclear Regulatory Commission, Bethesda, MD

Atomic Safety and Licensing Appeal Panel

An Atomic Safety and Licensing Appeal Board, established effective September 18, 1969, was delegated the authority to perform the review function which would otherwise be performed by the Commission in proceedings on applications for licenses or authorizations in which the Commission had a direct financial interest, and in such other licensing proceedings as the Commission might specify.

In view of the increase in the number of proceedings subject to administrative appellate review, the Atomic Safety and Licensing Appeal Panel was established on October 25, 1972, from whose membership three-member appeal boards could be designated for each proceeding in which the Commission had delegated its authority to an appeal board. At the same time, the Commission modified its rules to delegate authority to appeal boards in all proceedings involving the licensing of production and utilization facilities (for example, power reactors).

Pursuant to subsection 201 (g)(1) of the Energy Reorganization Act of 1974, the functions performed by appeal boards were specifically transferred to the Nuclear Regulatory Commission. The Commission appoints members to the Appeal Panel, and the Chairman of the panel (or, in his absence, the Vice Chairman) designates a three-member appeal board for each proceeding. The Commission retains review authority over decisions and actions of appeal boards. The appeal board panel, on October 1, 1983 was composed of the following persons:

FULL-TIME MEMBERS:

ALAN S. ROSENTHAL, Appeal Panel Chairman, U.S. Nuclear Regulatory Commission, Bethesda, Md.
DR. JOHN H. BUCK, Appeal Panel Vice Chairman, U.S. Nuclear Regulatory Commission, Bethesda, Md.
GARY J. EDLES, Appeal Panel Member, U.S. Nuclear Regulatory Commission, Bethesda, Md.
DR. REGINALD L. GOTCHY, Appeal Panel Member, U.S. Nuclear Regulatory Commission, Bethesda, Md.

CHRISTINE N. KOHL, Appeal Panel Member, U.S. Nuclear Regulatory Commission, Bethesda, Md.
THOMAS S. MOORE, Appeal Panel Member, U.S. Nuclear Regulatory Commission, Bethesda, Md.
HOWARD A. WILBER, Appeal Panel Member, U.S. Nuclear Regulatory Commission, Bethesda, Md.

PART-TIME MEMBERS:

MICHAEL C. FARRAR, Vice-President, Environmental & Health Programs, American Paper Institute National Forest Product Association, Washington, D.C.
DR. W. REED JOHNSON, Professor of Nuclear Engineering, University of Virginia, Charlottesville, Va.

PROFESSIONAL STAFF:

JOHN CHO, Counsel, Appeal Panel, U.S. Nuclear Regulatory Commission, Bethesda, Md.
LYNN M. CLANCY, Law Clerk, Appeal Panel, U.S. Nuclear Regulatory Commission, Bethesda, Md.
THOMAS G. SCARBOROUGH, Technical Advisor, Appeal Panel, U.S. Nuclear Regulatory Commission, Bethesda, Md.

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 the NRC staff and renders expert opinion regarding medical uses of radioisotopes. The ACMUI also advises the NRC staff, as required, on matters of policy. Members are employed under yearly personal services contracts. As of December 31, 1983, the members were:

RICHARD E. CUNNINGHAM, Chairman, ACMUI, Director, Division of Fuel Cycle and Material Safety, U.S. Nuclear Regulatory Commission, Silver Spring, Md.
DR. VINCENT P. COLLINS, Medical Director, Houston Institute for Cancer Research, Diagnosis and Treatment, Houston, Tex.
DR. FRANK H. DE LAND, Chief, Nuclear Medicine Department, Veterans' Administration Hospital, Lexington, Ky.
DR. SALLY J. DE NARDO, Director, Nuclear Hematology-Oncology, Department of Nuclear Medicine, University of California-Davis Medical Center, Sacramento, Cal.
DR. JACK K. GOODRICH, Radiology Associates of Erie, Erie, Pa.
DR. MELVIN L. GRIEM, Professor and Director, Chicago Tumor Institute, University of Chicago, Chicago, Ill.
DR. B. LEONARD HOLMAN, Chief, Clinical Nuclear Medicine, Department of Radiology, Peter Bent Brigham Hospital, Boston, Mass.
DR. EDWARD W. WEBSTER, Director, Department of Radiation Physics, Massachusetts General Hospital, Boston, Mass.
DR. DAVID H. WOODBURY, Director, Nuclear Medicine Section, Wayne County General Hospital, Eloise, Mich.
DR. JOSEPH B. WORKMAN, Associate Professor of Radiology, Duke University Medical Center, Durham, N.C.

Advisory Panel for the Decontamination of Three Mile Island Unit 2

The Advisory Committee for the Decontamination of Three Mile Island, Unit 2, was established in October 1980. Its purpose is to obtain input and views from the residents of the Three Mile Island area and affording Pennsylvania government officials an opportunity to participate in the Commission's decisional process regarding cleanup plans for Three Mile Island, Unit 2. The Panel consists of the following members representing agencies of the Commonwealth of Pennsylvania, local government authorities in the vicinity of the Three Mile Island facility, the scientific community and persons having their principal place of residence in the vicinity of the facility.

JOHN E. MINNICH, Chairman, Dauphin County Commissioners, Harrisburg, Pa. (Resigned: October 28, 1983)
THOMAS B. COCHRAN, Senior Staff Scientist, National Resources Defense Council, Washington, D.C.
ELIZABETH MARSHALL, York, Pa.
ARTHUR E. MORRIS, Mayor of Lancaster, Pa.
ROBERT G. REID, Mayor, Borough of Middletown, Pa.
GORDON ROBINSON, Associate Professor, Department of Nuclear Engineering, Pennsylvania State University, University Park, Pa.
JOEL ROTH, Member, TMI Alert, Harrisburg, Pa.
DEWITT C. SMITH, JR., Director, Commonwealth of Pennsylvania Emergency Management Agency, Harrisburg, Pa.
THOMAS SMITHGALL, Real Estate Broker, Lancaster, Pa.
ANN TRUNK, Middletown, Pa.
HENRY J. WAGNER, JR., Head, Division of Nuclear Medicine and Radiation Health, Johns Hopkins University, Baltimore, Md.
NEILL WALD, Medical Doctor, Department of Radiology, University of Pittsburgh, Pittsburgh, Pa.

Appendix 3

Local Public Document Rooms

Most documents originated by NRC, or submitted to it for consideration, are placed in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C., for public inspection. In addition, documents relating to licensing proceedings or licensed operation of specific facilities are made available in local public document rooms established in the vicinity of each proposed or existing nuclear facility. The locations of these local PDRs and the name of the facility for which documents are retained, are listed below. (NOTE: Updated listings of local PDRs may be obtained by writing to the Local Public Document Room Branch, Division of Rules and Records, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.)

ALABAMA

- Mrs. Maud S. Miller
  Athens Public Library
  South Street
  Athens, Ala. 35611
  Browns Ferry Nuclear Plant
- Mr. Robert Lange
  Houston Love Memorial Library
  212 W. Burdeshaw Street
  Dothan, Ala. 36302
  Farley Nuclear Plant
- Ms. Betty Ritchie
  Scottsboro Public Library
  1002 South Broad Street
  Scottsboro, Ala. 35768
  Bellefonte Nuclear Plant

ARIZONA

- Ms. Billie McBirnie
  Phoenix Public Library
  Science and Industry Section
  12 East McDowell Road
  Phoenix, Ariz. 85004
  Palo Verde Nuclear Plant

ARKANSAS

- Ms. Marifran Bustion
  Tomlinson Library
  Arkansas Tech University
  Russellville, Ark 72801
  Arkansas Nuclear One

CALIFORNIA

- Ms. Margaret J. Nystrom
  Humboldt County Library
  636 F Street
  Eureka, Calif. 95501
  Humboldt Bay Nuclear Plant
- Mrs. Fontayne Holmes
  West Los Angeles Regional Library
  11360 Santa Monica Boulevard
  Los Angeles, Calif. 90025
  UCLA Research Reactor
- Ms. Ann Douthett
  San Clemente Public Library
  242 Del Mar
  San Clemente, Calif. 92672
  San Onofre Nuclear Plant
- Ms. Sara Thompson
  Stanislaus County Free Library
  1500 I Street
  Modesto, Calif. 95354
  Stanislaus Nuclear Plant
- Ms. Diana Gin
  Business & Municipal Department
  Sacramento Public Library
  828 I Street
  Sacramento, Calif. 95814
  Rancho Seco Nuclear Plant
- Mr. Chi Su Kim
  Gov. Documents and Maps Department
  California Polytechnic State University
  Robert E. Kennedy Library
  San Luis Obispo, Calif. 93407
  Diablo Canyon Nuclear Plant
- Mrs. Betty Zimmerman
  Nuclear Regulatory Commission
  Region V, Office of Public Affairs
  Suite 300
  1450 Maria Lane
  Walnut Creek, Calif. 94596
  GETR Vallecitos

COLORADO

- Ms. Shirley Soenksen
  Greeley Public Library
  City Complex Building
  919 7th Street
  Greeley, Colo. 80631
  Fort St. Vrain Nuclear Plant

CONNECTICUT

- Mrs. Helen Pribram
  Russell Library
  123 Broad Street
  Middletown, Conn. 06457
  Haddam Neck Nuclear Plant
- Ms. Judy Liskou
  Waterford Public Library
  49 Rope Ferry Road
  Waterford, Conn. 06385
  Millstone Nuclear Plant

FLORIDA

- Ms. Heidi Abbott
  Crystal River Public Library
  668 N.W. First Avenue
  Crystal River, Fla. 32629
  Crystal River Nuclear Plant
- Mrs. R. Scott
  Indian River Community College
  Charles S. Miley Learning Resources Center
  3209 Virginia Avenue
  Ft. Pierce, Fla. 33450
  St. Lucie Nuclear Plant
- Ms. Renee Pierce
  Miami-Dade Public Library
  Holmstead Branch
  700 North Holmstead Blvd.
  Holmstead, Fla. 33030
  Turkey Point Nuclear Plant
  (Emergency Plan Only)
- Miss Esther B. Gonzalez
  Environmental and Urban Affairs Library
  Florida International University
  Miami, Fla. 33199
  Turkey Point Nuclear Plant

GEORGIA

- Mrs. Wynell Bush
  Appling County Public Library
  301 City Hall Drive
  Baxley, Ga. 31563
  Hatch Nuclear Plant
- Mrs. Juanita Smith
  Burke County Library
  412 Fourth Street
  Waynesboro, Ga. 30830
  Vogtle Nuclear Plant

ILLINOIS

- Mrs. Jeanne L. Hayes
  Byron Public Library
  218 W. Third Streets
  Byron, Ill. 61010
  Byron Nuclear Plant
  (Selected Documents Only)
- Ms. Cheryle Rae Nyberg
  University of Illinois Law Library
  504 East Pennsylvania Avenue
  Champaign, Ill. 61820
  Clinton Nuclear Plant
  (Selected Documents Only)
- Mrs. Betsy Taubert
  Vespasian Warner Public Library
  120 West Johnson Street
  Clinton, Ill. 61727
  Clinton Nuclear Plant
- Ms. Susan Clark
  The Memorial Library Center
  Zion-Benton Public Library District
  2400 Gabriel Avenue
  Zion, Ill. 60099
  Zion Nuclear Plant
- Mr. Earl Shumaker
  Government Publications
  Department
  Founder's Memorial Library
  Northern Illinois University
  Dekalb, Ill.
  60115 Byron Nuclear Plant
  (Selected Documents Only)
- Ms. Deborah Trotter
  Morris Public Library
  604 Liberty Street
  Morris, Ill. 60450
  Dresden Nuclear Plant
- Ms. Evelyn Moyle
  Jacobs Memorial Library
  Illinois Valley Community College
  Rural Route 1
  Oglesby, Ill. 61348
  LaSalle Nuclear Plant
- Mrs. Marie Hoscheid
  Moline Public Library
  504 17th Street
  Moline, Ill. 61265
  Quad Cities Nuclear Plant
- Mr. Richard Gray
  Rockford Public Library
  215 N. Wyman Street
  Rockford, Ill. 61101
  Byron Nuclear Plant
- Mrs. Karen Stott
  Savanna Township Public Library
  326 Third Street
  Savanna, Ill. 61074
  Carroll Nuclear Plant
- Ms. Nancy Barbour
  Wilmington Public Street
  201 S. Kankakee Street
  Wilmington, Ill. 60481
  Braidwood Nuclear Plant

INDIANA

- Mr. Philip Baugher, Director
  Westchester Public Library
  200 W. Indiana Avenue
  Chestertown, Ind. 46304
  Bailly Nuclear Plant
- Mrs. Charlene Peters
  Madison-Jefferson CountyPublic
  Library
  420 West Main Street
  Madison, Ind. 47250
  Marble Hill Nuclear Plant

IOWA

- Ms. Janice Horak
  Cedar Rapids Public Library
  428 Third Avenue, S. E.
  Cedar Rapids, Ia. 52401
  Duane Arnold Nuclear Plant

KANSAS

- Ms. Sue Hatfield
  Gov. Doc. Librarian
  Emporia State University
  William Allen White Library
  1200 Commercial Street
  Emporia, Ks. 66801
  Wolf Creek Nuclear Plant

KENTUCKY

- Ms. Beverly Schneider
  Campbell County Public Library
  4th & Monmouth Streets
  Newport, Ky. 41071
  Zimmer Nuclear Plant
  (Selected Documents Only)
- Ms. Kathy Bullard
  Louisville Free Public Library
  4th and York Streets
  Louisville, Ky. 40203
  Marble Hill Nuclear Plant
  (Selected Documents Only)

LOUISIANA

- Mr. Jimmie H. Hoover
  Government Documents
  Department
  Troy H. Middleton Library
  Louisiana State University
  Baton Rouge, La. 70803
  River Bend Nuclear Plant
- Mr. Ken Owen
  University of New Orleans
  Earl K. Long Library
  Louisiana Collection, Lakefront
  New Orleans, La. 70148
  Waterford Nuclear Plant

MAINE

- Mrs. Barbara Shelton
  Wiscasset Public Library
  High Street
  Wiscasset, Me. 04578
  Maine Yankee Nuclear Plant

MARYLAND

- Ms. Mildred Ward
  Calvert County Library
  Fourth Street
  Prince Frederick, Md. 20678
  Calvert Cliffs Nuclear Plant

MASSACHUSETTS

- Mrs. Marilyn O'Brien
  Library/Learning Resource Center
  Greenfield Community College
  1 College Drive
  Greenfield, Mass. 01301
  Yankee Rowe Nuclear Plant
- Ms. Grace Karbott
  Plymouth Public Library
  11 North Street
  Plymouth, Mass. 02360
  Pilgrim Nuclear Plant

MICHIGAN

- Ms. Marybeth Wallick
  Charlevoix Public Library
  107 Clinton Street
  Charlevoix, Mich. 49720
  Big Rock Point
- Mrs. Lelane Hardie
  Reference Department
  Kalamazoo Public Library
  315 South Rose Street
  Kalamazoo, Mich. 49007
  Palisades Nuclear Plant
- Mrs. Averill Packard
  Grace Dow Memorial Library
  1710 West St. Andrews Road
  Midland, Mich. 48640
  Midland Nuclear Plant
- Ms. Janice Murphy
  Ellis Reference & Information
  Center
  Monroe County Library System
  3700 South Custer Road
  Monroe, Mich. 48161
  Fermi Nuclear Plant

- Ms. Bea Rodgers
  Maude Preston Palenske Memorial Library
  500 Market Street
  St. Joseph, Mich. 49085
  D.C. Cook Nuclear Plant

MINNESOTA

- Mr. Thomas Smisek
  Environmental Conservation Library
  Minneapolis Public Library
  300 Nicollet Mall
  Minneapolis, Minn. 55401
  Monticello Nuclear Plant
  Prairie Island Nuclear Plant

MISSOURI

- Mrs. Evelyn Hillard
  Daniel Boone Regional Library
  Callaway County Public Library
  709 Market Street
  Fulton, Mo. 65251
  Callaway Nuclear Plant

- Ms. Jerry Ewing
  Olin Library of Washington University
  Skinker & Lindell Boulevards
  St. Louis, Mo. 63130
  Callaway Nuclear Plant

MISSISSIPPi

- Mr. William McMullin
  Corinth Public Library
  1023 Fillmore Street
  Corinth, Miss. 38834
  Yellow Creek Nuclear Plant

- Ms. Gayle Keefe
  Hinds Junior College
  McLendon Library
  Main Street
  Raymond, Ms. 39154
  Grand Gulf Nuclear Plant

NEBRASKA

- Mrs. Lucile Lechliter
  Auburn Public Library
  1118 15th Street
  Auburn, Neb. 68305
  Cooper Nuclear Plant

- Mr. William E. Kendra
  W. Dale Clark Library
  215 South 15th Street
  Omaha, Neb. 68102
  Ft. Calhoun Nuclear Plant

NEW HAMPSHIRE

- Ms. Nancy Merrill
  Exeter Public Library
  Front Street
  Exeter, N.H. 03833
  Seabrook Nuclear Plant

NEW JERSEY

- Miss Elizabeth Fogg
  Salem Free Public Library
  112 West Broadway
  Salem, N.J. 08079
  Salem Nuclear Plant

- Miss Joanne L. Owens
  Pennsville Public Library
  190 S. Broadway
  Pennsville, N.J. 08070
  Hope Creek Nuclear Plant

- Ms. Lois J. Brown
  Ocean County Library
  101 Washington St.
  Toms River, N.J. 08753
  Oyster Creek Nuclear Plant

NEW YORK

- Mr. Sol Becker
  Public Health Library
  New York City
  Department of Health
  125 Worth Street
  New York, N.Y. 10013
  Columbia University Research Center

- Mr. Peter Allison
  Social Science/Documents Center
  New York University
  Elmer Holmes Bobst Library
  70 Washington Sq. S
  New York, N.Y. 10012
  Indian Point Nuclear Plant
  (Selected Documents Only)

- Mr. Thomas Larson
  Penfield Library
  State University of NY at Oswego
  Oswego, N.Y. 13126
  Nine Mile Point Nuclear Plant
  FitzPatrick Nuclear Plant

- Ms. Cynthia Dana
  Rochester Public Library
  Business & Social Science Division
  115 South Avenue
  Rochester, N.Y. 14610
  Ginna Nuclear Plant

- Ms. Cathy McGowan
  Shoreham-Wading River Public Library
  Route 25A
  Shoreham, N.Y. 11786
  Shoreham Nuclear Plant

- Mr. Oliver Swift
  White Plains Public Library
  100 Martine Avenue
  White Plains, N.Y. 10601
  Indian Point Nuclear Plant

NORTH CAROLINA

- Ms. Linda Hickman
  Olivia Rainey Library
  Wake County Public Library
  104 Fayetteville Street
  Raleigh, N.C. 27601
  Shearon Harris Nuclear Plant

- Ms. Emma Myles
  Brunswick County Library
  109 West Moore Street
  Southport, N.C. 28461
  Brunswick Nuclear Plant

- Ms. Dawn Hubbs
  Atkins Library
  University of North Carolina at Charlotte
  UNCC Station, N.C. 28223
  McGuire Nuclear Plant

OHIO

- Ms. Vera Ehaus
  Clermont County Public Library
  180 South Third Street
  Batavia, Ohio 45103
  Zimmer Nuclear Plant

- Ms. Shirley Morgan
  Perry Public Library
  3753 Main Street
  Perry, Ohio 44081
  Perry Nuclear Plant

- Mrs. Julia Baldwin, Librarian
  Government Document Collection
  William Carlson Library
  University of Toledo
  2801 West Bancroft Avenue
  Toledo, Ohio 43606
  Davis-Besse Nuclear Plant

OKLAHOMA

- Mr. Jewru Bandeh
  Tulsa City-County Library
  400 Civic Center
  Tulsa, Okla 74103
  Black Fox Nuclear Plant

OREGON

- Ms. Kay F. West
  Arlington City Hall
  Arlington, Ore. 97812
  Pebble Springs Nuclear Plant

- Mr. Jim Takita
  Library Association of Portland
  Social Science & Science Dept.
  801 S.W. 10th Ave.
  Portland, Ore 97205
  Trojan Nuclear Plant

PENNSYLVANIA

- Ms. Nancy Luezinger
  B.F. Jones Memorial Library
  663 Franklin Avenue
  Aliquippa, Pa. 15001
  Beaver Valley Nuclear Plant
  Shippingport Light Water Breeder Reactor

- Mr. Lawrence Peterson
  Government Publications Section
  State Library of Pennsylvania
  Commonwealth and Walnut Street
  Harrisburg, Pa. 17105
  Peach Bottom Nuclear Plant
  Three Mile Island Nuclear Plant
  Fulton Nuclear Plant

- Mr. Phil Hearne
  Dauphin Library System
  101 Walnut Street
  Harrisburg, Pa. 17101
  Three Mile Island Nuclear Plant
  (Transcripts Only)

- Mr. Jacques Peterman
  Free Library of Philadelphia
  Government Publications Dept.
  19th and Vine
  Philadelphia, Pa. 19103
  Three Mile Island Nuclear Plant
  Limerick Nuclear Plant
  (Transcripts Only)

- Ms. Julia Albright
  Pottstown Public Library
  500 High Street
  Pottstown, Pa. 19464
  Limerick Nuclear Plant

- Ms. Diane Smith
  Pennsylvania State University
  Pattee Library
  Room C207
  University Park, Pa. 16802
  Susquehanna Nuclear Plant &
  Three Mile Island Nuclear Plant
  (Transcripts Only)

- Mr. Ernest Fuller
  Saxton Community Library
  911 Church St.
  Saxton, Pa. 16678
  Saxton Nuclear Experimental Facility

- Ms. Elaine Homick
  Reference Department
  Osterhout Free Library
  71 South Franklin Street
  Wilkes-Barre, Pa. 18701
  Susquehanna Nuclear Plant

- Mr. David Van de Streek
  Pennsylvania State University Library
  York Campus
  1031 Edgecomb Avenue
  York, Pa. 17403
  Three Mile Island Nuclear Plant
  (Transcripts Only)

PUERTO RICO

- Mrs. Rosaio Cabrera
  Public Library, City Hall
  Jose de Diego Avenue
  P.O. Box 1086
  Arecibo, P.R. 00612
  North Coast Nuclear Plant

- Mrs. Amalia Ruiz De Porras
  Etien Totti Public Library
  College of Engineers, Architects & Surveyors
  Hato Rey, P.R. 00936
  North Coast Nuclear Plant

SOUTH CAROLINA

- Ms. Ava Black
  Barnwill County Library
  Hagood Avenue
  Barnwell, S.C. 29812
  Barnwell Reprocessing Plant

- Ms. Maureen Harris
  Clemson University
  R. M. Cooper Library
  Clemson, S.C. 29631
  Oconee Nuclear Plant
  (Selected Documents Only)

- Ms. Jane Mason
  Hartsville Memorial Library
  220 N. Fifth Avenue
  Hartsville, S.C. 29550
  H. B. Robinson Nuclear Plant

- Mrs. Mary Mallaney
  York County Library
  138 E. Black St.
  Rock Hill, S.C. 29730
  Catawba Nuclear Plant

- Ms. Joyce McCall
  Oconee County Library
  501 W. South Broad Street
  Walhalla, S.C. 29691
  Oconee Nuclear Plant

- Ms. Sarah McMaster
  Fairfield County Library
  Garden and Washington Streets
  Winnsboro, S.C. 29180
  Summer Nuclear Plant

- Ms. Mary Toll
  South Carolina State Library
  1500 Senate Street
  Columbia, S.C. 29201
  Catawba Nuclear Plant
  (Selected Documents Only)

TENNESSEE

- Ms. Patricia Maroney
  Chatanooga-Hamilton County Library
  1001 Broad Street
  Chattanooga, Tenn. 37402
  Sequoyah Nuclear Plant
  Watts Bar Nuclear Plant

- Ms. June Presley
  Kingsport Public Library
  Broad and New Streets
  Kingsport, Tenn 37660
  Phipps Bend Nuclear Plant

- Ms. Carol Goris
  Lawson McGhee Public Library
  500 West Church Street
  Knoxville, Tenn. 37902
  Clinch River Breeder Plant

- Mr. John Thweatt
  Tennessee State Library and Archives
  403 Seventh Avenue, North
  Nashville, Tenn. 37219
  Hartsville Nuclear Plant

- Mrs. Carol Cooper
  Oak Ridge Public Library
  Civic Center
  Oak Ridge, Tenn. 37830
  Clinch River Breeder Plant

TEXAS

- Miss Willie K. Farmer
  University of Texas at Arlington
  701 S. Cooper
  Arlington, Tex. 76019
  Comanche Peak Nuclear Plant
  (Selected Documents Only)

- Ms. Nancy Byrd
  Austin-Travis County Collection
  Austin Public Library
  810 Guadalupe Street
  P.O. Box 2287
  Austin, Tex. 78710
  South Texas Nuclear Plant
  (Selected Documents Only

- Mrs. Mary Ingram
  Bay City Public Library
  1900 5th Street
  Bay City, Tex. 77414
  South Texas Nuclear Plant
- Ms. Peggy Oldham
  Glen Rose-Somervell Public Library
  Barnard & Highway 144
  Glen Rose, Tex. 76043
  Comanche Peak Nuclear Plant
- Mr. John R. Deosdade
  San Antonio Public Library
  Business, Science and Technology Department
  203 S. St. Mary Street
  San Antonio, Tex. 78205
  South Texas Nuclear Plant (Selected Documents Only)

VERMONT

- Mrs. Junia Bryant
  Brooks Memorial Library
  224 Main Street
  Brattleboro, Vt. 05301
  Vermont Yankee Nuclear Plant

VIRGINIA

- Mr. Gregory Johnson
  Alderman Library
  Manuscripts Department
  University of Virginia
  Charlottesville, Va. 29901
  North Anna Nuclear Plant
- Ms. Mary Ann Manrique
  Louisa County Courthouse
  P.O. Box 160
  Louisa, Va. 23093
  North Anna Nuclear Plant
- Ms. Sandra Peterson
  Swen Library
  College of William & Mary
  Williamsburg, Va. 23185
  Surry Nuclear Plant

WASHINGTON

- Mrs. Lois McCleary
  W. H. Abel Memorial Library
  125 Main Street South
  Montesano, Wash. 98563
  WPPSS 3 and 5 Nuclear Plants
- Ms. Joan Hamilton
  Richland Public Library
  Swift and Northgate Streets
  Richland, Wash. 99352
  WPPSS 1, 2 and 4 Nuclear Plants
  Skagit Nuclear Plant

WISCONSIN

- Mrs. Kathy Pletcher
  Library Learning Center
  University of Wisconsin
  2420 Nicolet Drive
  Green Bay, Wis. 54301
  Kewaunee Nuclear Plant
- Ms. Dolores Hendersin
  LaCrosse Public Library
  800 Main Street
  LaCrosse, Wis. 54601
  LaCrosse BWR Nuclear Plant
- Ms. Gertrude Kaminsky
  Joseph Mann Library
  1516 Sixteenth Street
  Two Rivers, Wis. 54241
  Point Beach Nuclear Plant

Appendix 4

Regulations and Amendments - Fiscal Year 1983

The regulation of the Nuclear Regulatory Commission are contained in Title 10, Chapter 1, of the Code of Federal Regulations. Effective and proposed regulations concerning licensed activities, and certain policy statements relating thereto, which were published in the Federal Register during fiscal year 1981, are described briefly below.

REGULATIONS AND AMENDMENTS PUT INTO EFFECT

Export of Australian-Origin Nuclear Material and Equipment - Part 110

On October 6, 1982, NRC published an amendment to its regulations to require persons holding export licenses to notify the Commission in certain circumstances before shipping nuclear material or equipment of Australian-origin. The amendment is effective immediately.

Delegation to Commission Secretary - Part 2

On October 28, 1982, NRC published amendments to Part 2, effective immediately, to allow the Commission's Scretary to perform certain functions previously performed by the Commission itself. Specifically, these amendments will allow the Secretary to rule on certain requests for hearings to refer certain requests for hearings to the Atomic Safety and Licensing Board Panel, and to take action on minor procedural matters.

Regional Licensing Program; Fort St. Vrain Nuclear Generating Station Part 50

On December 8, 1982, NRC published an amendment to Part 50, effective December 1, 1982, to provide information concerning the further implementation of NRC's regional licensing program. The amendments state that authority and responsibility for implementing selected parts of NRC's nuclear reactor licensing program pertaining solely to the Fort St. Vrain Nuclear Generating Station have been asssigned and delegated to the Regional Administrator of Region IV and specifies where communications and applications should be sent.

Nomenclature Changes To Implement Executive Order 12356 - Parts 2 and 9

On December 16, 1982, NRC published amendments to Part 2 and Part 9, effective immediately, to incorporate references to Executive Order 12356, "National Security Information," and its Implementing Directive that were issued by the Information Security Oversight Office.

Partial Regionalization of the Operator Licensing Function - Part 55

On December 22, 1982, NRC published an amendment to Part 55 effective December 17, 1982, to provide information concerning the further implementation of NRC's regional licensing program. This amendment states that authority and responsibility for the issuance of licenses for operators and senior operators of licensed nuclear reactors located in Regions II and III have been assigned and delegated to the Regional Administrator of these regions and specifies locations for filing of applications and submission of reports.

Licensing Requirements for Land Disposal of Radioactive Waste - Parts 2, 19, 20, 21, 30, 40, 51, 61, 70, 73 and 170

On December 27, 1982, NRC published amendments to its regulations that set out licensing procedures, performance objectives and technical requirements for the licensing of facilities for the land disposal of low-level radioactive waste. Part 20 was amended effective immediately. Part 61 and amendments to Parts 2, 19, 21, 30, 40, 51, 70, 73 and 170 were effective January 26, 1983.

Filing of Copies of Changes to Emergency Plans and Procedures - Part 50

On December 28, 1982, NRC published an amendment to Part 50 to reduce the number of copies of changes to nuclear power plant emergency plans and procedures from 13 to 3. The amendment, effective immediately, reduces the regulatory burden on the affected licensees.

Reporting of Changes to the Quality Assurance Program - Part 50

On January 10, 1983, NRC published amendments to Part 50, effective March 11, 1983 to require each holder of a nuclear power plant or fuel reprocessing plant construction permit or operating license (1) to inform the Commission in writing of quality assurance program changes that affect the description of the quality assurance program described or referenced in its Safety Analysis Report and accepted by the Commission, and (2) to clarify the requirement concerning implementation of the accepted quality assurance program.

Modification of Indemnity Agreements - Part 140

On January 10, 1983, NRC published amendments to Part 140, effective February 9, 1983, to modify requirements for entering into indemnity agreements, by deleting the opportunity for public intervention and comment.

Teletherapy Room Radiation Monitors and Inspection and Servicing of Teletherapy Source Exposure Mechanisms - Part 35

On January 18, 1983, NRC published amendments to Part 35, effective March 4, 1983, to ensure adequate inspection and servicing of teletherapy equipment and ensure prior warning to the operator to avoid serious injury in the event of a malfunction of a teletherapy source exposure mechanism.

Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants - Part 50

On January 21, 1983, NRC published an amendment to Part 50, effective February 22, 1983, to clarify and strengthen the criteria for environmental qualification of electric equipment important to safety for nuclear power plants.

Physician's Use of Radioactive Drugs - Part 35

On February 4, 1983, NRC published an amendment to Part 35, effective March 7, 1983, to provide an exception from certain regulatory requirements for technetium-99m pentetate used for lung function studies. The amendment removes unnecessary restrictions on the physician in patient treatment while continuing to provide an adequate level of radiation protection for the patient and the worker.

Codes and Standards for Nuclear Power Plants; Winter 1981 Addenda - Part 50

On February 7, 1983, NRC published amendments to Part 50, effective March 9, 1983, to incorporate by reference the Winter 1981 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Adoption of these amendments permits the use of improved methods for construction and inservice inspection of nuclear power plants.

Regional Licensing Reviews - Parts 50 and 70

On February 9, 1983, NRC published amendments to Parts 50 and 70, effective immediately, to require licensees to submit reports of plan changes which do not decrease safeguards effectiveness to NRC regional offices. The amendments reflect current NRC practices and assigned responsibilities under the NRC regional licensing program.

Consumer Products Containing Small Quantities of Radioactive Material; Modified Reporting and Recordkeeping Requirements - Part 32

On March 24, 1983, NRC published an amendment to its regulations, effective June 30, 1983, to modify the reporting and recordkeeping requirements imposed on persons specifically licensed to distribute consumer products containing byproduct material. The amendment is intended to reduce the number of reports submitted to the Commission and will not affect the safety properties of the products distributed.

Applicability of License; Conditions and Technical Specifications in an Emergency - Part 50

On April 1, 1983, NRC published an amendment, effective June 1, 1983, to clarify that all Part 50 licensees may take reasonable action that departs from a license condition or technical specification in an emergency when this action is needed immediately to protect the public health and safety.

Notice and State Consultation - Parts 2 and 50

On April 6, 1983, NRC published an interim final rule, effective May 6, 1983, amending Parts 2 and 50. Comments were requested on the amendments which (1) provide procedures under which normally NRC would give prior notice of opportunity for a hearing on applications it receives to amend operating licenses for nuclear power reactors and testing facilities and prior notice and reasonable opportunity for public comment on proposed determinations about whether these amendments involve no significant hazards considerations, (2) specify criteria for dispensing with such prior notice and reasonable opportunity for public comment in emergency situations, and (3) furnish procedures for consultation on any such determinations with the State in which the facility involved is located.

Standards for Determining Whether License Amendments Involved No Significant Hazards Consideration - Part 50

On April 6, 1983, NRC published an amendment, effective May 6, 1983, to its regulations to specify standards for determining whether requested amendments to operating licenses for certain nuclear power reactors and testing facilities involve no significant hazards considerations. The Commission specifically requested comments on this amendment published as an interim final rule.

Regional Licensing Program; Further Implementation - Parts 30, 40 and 70

On April 14, 1983, NRC published amendments to its regulations, effective April 1, 1983, concerning the domestic licensing of source, byproduct, and special nuclear materials. The amendments provide information about the expansion of NRC's decentralized licensing program, informing present or prospective licensees of current NRC practices and organization.

Changes in Physical Security Plans; Licensees Possessing or Using Special Nuclear Material of Moderate and Low Strategic Significance - Part 70

On May 17, 1983, NRC published an amendment to its regulations, effective June 16, 1983, to allow licensees possessing or using special nuclear material of moderate and low strategic significance to make minor modifications to their physical security plans without prior approval by the Commission, provided the changes do not decrease the effectiveness of the plan.

Fracture Toughness Requirements for Light-Water Nuclear Power Reactors - Part 50

On May 27, 1983, NRC published amendments to its regulations which specify fracture toughness requirements for light-water nuclear power reactors and its requirements for reactor

vessel material surveillance programs. The new rules clarify the applicability of these requirements to all plants, modify certain requirements, and shorten and simplify these regulations by more extensively incorporating by reference appropriate National Standards.

Access to and Protection of National Security Information and Restricted Data Parts 25 and 95

On June 1, 1983, NRC published amendments to its regulations, effective June 27, 1983, to modify the requirements for submitting reports on classification/declassification actions. The amendments add a specific marking to classified documents released to International Atomic Agency (IAEA) representatives, maintain records concerning visits involving classified information and update the regulations in accordance with the requirements of Executive Order 12356 and its Implementing Directive.

Amendment to the Timetable for the Publication of a Revised Access Authorization Fee Schedule - Part 25

On June 16, 1983, NRC published an amendment to its regulations, effective immediately, changing the date of publication for the annual access authorization fee schedule from December to July. The change will enable NRC to comply more promptly with Office of Personnel Management revised cost adjustments.

Disposal of High-Level Radioactive Wastes in Geologic Repositories Technical Criteria - Part 60

On June 21, 1983, NRC published an amendment to its regulations effective July 21, 1983, for disposal of high-level radioactive wastes in geologic repositories, as required by the Nuclear Waste Policy Act of 1982. The criteria address siting, design, and performance of a geologic repository, and the design and performance of the package which contains the the waste within the geologic repository. Also included are criteria for monitoring and testing programs, performance confirmation, quality assurance, and personnel training and certification.

Group Licensing For Certain Medical Uses; Albumin Colloid - Part 35

On June 22, 1983, NRC published an amendment to its regulations, effective immediately, to permit licensed and appropriately trained physicians to use a new reagent kit to prepare radiopharmaceutical technetium-99m labeled albumin colloid. The action follows the recent approval of interstate distribution of this reagent kit by Food and Drug Administration.

Group Licensing for Certain Medical Uses - Part 35

On June 28, 1983, NRC published an amendment to its regulations, effective imemdiately, to add a device used for instantaneous imaging to its list of devices that may be used by licensed physicians. The hand held device uses the low energy radiation from an iodine-125 sealed source to produce images of bones or foreign bodies. The action is taken so that physicians, trained and licensed to use similar devices need not amend their licenses to use this new one.

Licensed Operator Staffing at Nuclear Power Units - Part 50

On July 11, 1983, NRC published amendments to its regulations under 10 CFR Part 50, effective January 1, 1984. The final rule requires nuclear power plant licensees to provide a minimum number of licensed operators and senior operators on shift at all times to respond to normal and emergency conditions. The new staffing requirements will help assure the protection of the health and safety and the public by allowing the senior operator in charge the flexibility to move about the facility as needed which assuring that a senior operator is continuously present in the control room during unit operations.

Amendments Specifying Licensee Responsibility for Nuclear Materials and Procedures for Termination of Specific Licenses - Parts 30, 40, and 70

On July 15, 1983, the NRC amended its regulations to specify procedures for the termination of specific licenses authorizing the possession and use of nuclear materials. The amendments, effective August 15, 1983, clarify a licensee's authority and responsibility for nuclear materials and establish clear procedures for the termination of a license. The amendments specify that a license remains in effect, with respect to possession of residual nuclear materials prsent as contamination, until the Commission notifies the licensee, in writing, that the license is terminated.

Partial Regionalization of The Operator Licensing Function to Include Region I - Part 55

On July 21, 1983, the NRC amended its regulations to further implement its regional licensing program. This amendment assigns authority and responsibility for the issuance of licenses for operators and senior operators of licensed nuclear reactors located in Region I to the Regional Administrator of Region I.

Glass Enamel and Glass Enamel Frit Containing Uranium; Suspension of Exemption Permitting Use - Part 40

On July 25, 1983, NRC suspended its regulations, effective immediately, that provide an exemption from licensing requirements applicable to the possession and use of source material for glass enamel and glass enamel frit containing small amounts of source material. The suspension is intended to prevent any further increase in the circulation of cloissone jewelry containing uranium until the NRC completes its reevaluation of the exempt use of glass enamel and glass enamel frit containing uranium in consumer products.

Licensee Event Report - Parts 20 and 50

On July 26, 1983, NRC amended its regulations in 10 CFR Part 50, effective January 1, 1984. The final Licensee Event

Report (LER) rule requires the reporting of operational experience at nuclear power plants. The LER rule was needed to codify a single set of reporting requirements that apply to all operating nuclear power plants. The final rule changes the requirements which define the events and situations that must be reported and also specifies the items of information that must be provided in each report. The LER rule applies only to commercial nuclear power plant licensees.

Revised Access Authorization Fees for Licensee Personnel - Part 25

On August 3, 1983, NRC published an amendment to its regulations, effective immediately, to revise the access authorization investigation fees charged to licensee personnel who require access to National Security Information and/ or Restricted Data. The revised fees will reflect the current access authorization investigation cost charged to the NRC by the Office of Personnel Management plus part of NRC's overhead associated with the processing of access authorization requests.

Uranium Mill Tailings Regulations; Suspension of Selected Provisions - Part 40

On August 4, 1983, NRC suspended selected portions of its regulations dealing with the disposal of uranium mill tailings. The provisions suspended are those which would be affected by recently published proposed Environmental Protection Agency (EPA) standards for protection of the environment from these wastes. The suspension places in abeyance certain Commission regulations that could have a significant cost impact on its licensees if the regulations are implemented before the Commission makes the anticipated rule changes necessary to conform the regulations to the EPA standard when it is finalized. The suspension is effective from September 6, 1983 until April 1, 1984 or the effective date of a final rule which would change Appendix A to conform to final EPA standards, whichever comes first.

Rule to Achieve Compatibility with the Transport Regulations of the International Atomic Energy Agency (IAEA) - Part 71

On August 5, 1983, the NRC amended its regulations for the transportation of radioactive material to make them compatible with those of the International Atomic Energy Agency (IAEA) and thus with those of most major nuclear nations of the world. The amendments, effective September 6, 1983, apply to all NRC specific licensees who place byproduct, source, or special nuclear material into transportation.

Minor Clarifying Amendments - Parts 20, 21, and 73

On August 25, 1983, NRC amended its regulations, effective August 22, 1983 to indicate a change in the commercial telephone number for its Region III Office.

Immediate Notification Rule - Part 50

On August 29, 1983, NRC published an amendment to its regulations in 10 CFR Part 50, effective January 1, 1984, to require timely and accurate information from licensees following significant events at commercial nuclear power plants. The amendment clarifies reporting criteria and requires early reports only on those matters of value to the exercise of the Commission's responsibilities. The amendment also clarifies the list of reportable events and provides the Commission with more useful reports regarding the safety of operating nuclear power plants.

Irretrievable Well-Logging Sources - Parts 30, 70, and 150

On August 29, 1983, NRC amended its regulations, effective September 28, 1983 to establish requirements to accomplish in the event of an irretrievable well-logging source. The amendment sets out requirements for sealing and protecting the well-logging source, identifying the well site, and reporting the occurrence to the Commission.

Authority to Issue Notices of Violation to Non-Licensees and Delegation of

Authority to Regional Administrators - Part 2

On September 28, 1983, NRC published a final rule amending its regulations to reflect its existing legal authority to issue a notice of violation to any person subject to the jurisdiction of the Commission, including a non-licensee. The final rule, effective October 28, 1983, requires thosepersons to reply formally to a notice of violation. In addition, the rule codifies the authority of Regional Administrators to issue these notices.

PROPOSED RULES

Proposed Guidance for Implementation of Standard Review Plan Rule; Request for Comments - Part 50

On October 22, 1982, NRC published a notice of proposed guidance for the implementation of Standard Review Plan Rule inviting comments, suggestions, and recommendations.

Commission Review Procedures for Power Reactor Construction Permits;

Immediate Effectiveness Rules - Part 2

On October 25, 1982, NRC published a proposed amendment to its rules of practice for review of Atomic Safety and Licensing Board decisions granting power reactor construction permits. The proposed rule would avoid unnecessary delay in the issuance of construction permits.

Proposed Amendments Specifying Licensee Responsibility for Nuclear Materials and Procedures for Termination of Specific Licenses - Parts 30, 40, and 70

On October 26, 1982, NRC published a notice of proposed rulemaking to specify procedures for the termination of specific

licenses authorizing possession and use of nuclear materials. The proposed rule is necessary to establish clear procedures for the termination of licenses in order to establish a more coherent regulatory framework.

Authority to Issue Notices of Violation to Non-Licensees and Delegation of Authority to Regional Administrators - Part 2

On November 15, 1982, NRC published a proposed amendment to specifically authorize the issuance of a notice of violation to any person subject to the jurisdiction of the Commission, including non-licensees. The proposed amendment would conform the Commission's procedural requirements with its substantive regulations. In addition, the proposed rule codifies the authority of Regional Administrators to issue notices of violation.

Authority for Copying of Records and Retention Periods for Security Records - Parts 19, 21, 30, 40, 50, 70, 71, 73, and 110

On November 22, 1982, NRC published a notice of proposed rulemaking to provide specific authority to copy licensee records maintained pursuant to Commission requirements and to specify retention periods for required security records. The proposed rule is intended to avoid delays in obtaining information needed for Commission inspection and enforcement activities and to codify guidance relating to record retention.

Proposed Revision of License Fee Schedules - Part 170

On November 22, 1982, NRC published a proposed rule to amend its regulations and fees for inspections and review of applications for permits, licenses, amendments, renewals, and special projects (including topical and other reports). The revised schedule of fees would more completely recover costs incurred by the Commission providing services to identifiable recipients.

Consumer Products Containing Small Quantities of Radioactive Material; Modified Recordkeeping and Transfer Reporting Requirements - Part 32

On November 23, 1982, NRC published a proposed rule to modify the recordkeeping and annual reporting requirements imposed on persons specifically licensed to distribute consumer products containing small quantities of byproduct material. The proposed amendment is intended to reduce the required number of reports submitted to the Commission and would have no effect on safety properties of the products that are distributed.

Hearing on Denial of Reactor Operator License - Parts 2 and 55

On November 24, 1982, NRC published a proposed amendment to its rules of practice and its regulations governing reactor operator licenses, to eliminate the operator license applicant's opportunity for an adjudicatory hearing when the license application is denied solely because the applicant has failed the written examination or operating test or both. (Withdrawn July 11, 1983 - see below).

Amended Material Control and Accounting Requirements for Special Nuclear Material of Low Strategic Significance - Part 70

On December 14, 1982, NRC published a proposed rule to amend its regulations on the Material Control and Accounting (MC&A) requirements for fuel cycle facilities possessing Low Enriched Uranium (LEU). The amendments would clarify the differences between safeguards requirements for Low Enriched Uranium and Strategic Special Nuclear Material (SSNM), thereby making the regulations more consistent with the low strategic significance of LEU.

Codes and Standards for Nuclear Power Plants - Part 50

On December 22, 1982, NRC published a notice of proposed rulemaking to incorporate by reference the Summer 1982 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Adoption of these amendments would permit the use of improved methods for construction of nuclear power plants.

Access to and Protection of National Security Information and Restricted Data - Parts 25 and 95

On December 30, 1982, NRC published a proposed amendment to modify the requirements for submitting reports on classification/declassification actions, adding a specific marking to classified documents released to IAEA representatives, and maintaining records concerning visits involving classified information. The proposed amendments also update the regulations in accordance with the requirements of Executive Order 12356 and its Implementing Directive. The proposed amendments are necessary to incorporate experience gained under the current regulations and to prevent the unauthorized disclosure of National Security Information and Restricted Data.

Financial Protection Requirements and Indemnity Agreements; Removal of Appendices A Through H - Part 140

On March 4, 1983, NRC published a proposed amendment to its regulations pertaining to financial protection requirements and indemnity agreements by removing Appendices A through H from 10 CFR Part 140. The proposed amendments would remove unnecessary detail from the regulations, and make the information contained in the Appendices available in the form of a Regulatory Guide. (On October 19, 1983, the Commission published a proposed rule seeking comment on its proposal to add statements to its regulations that would indicate that the text of the Facility Form policy, including any codified amendatory endorsement or change to the policy, is an example of a contract that has been "accepted" as evidence of financial protection but that other variations on the text would be considered by the Commission. This action is intended to remove the misimpression that the Commission requires the exact language presented in the text of the Facility Form policy. This proposal supersedes the March 4, 1983, notice.)

Group Licensing for Certain Medical Uses - Part 35

On March 30, 1983, NRC published a proposed amendment to its regulations to add a device used for instantaneous imaging

to its list of devices that may be used by licensed physicians. The proposed amendment would allow physicians, who are adequately trained and licensed to use similar devices, the use of this added medical device without amending their licenses.

Temporary Operating Licenses - Parts 2 and 50

On April 6, 1983, NRC published proposed amendments to Parts 2 and 50 to establish a detailed procedural framework for considering and issuing temporary operating licenses. The authority to issue temporary operating licenses using the simplified procedures expires after December 31, 1983.

Criteria and Procedures for Determining the Adequacy of Available Spent Nuclear Fuel Storage Capacity - Part 53

On April 29, 1983, NRC published proposed amendments to its regulations to meet NRC responsibilities under the Nuclear Waste Policy Act of 1982. The new rule would establish procedures and criteria for determining whether a person owning and operating a civilian nuclear power reactor cannot reasonably provide adequate spent nuclear fuel storage capacity.

Reports of Theft or Loss of Licensee Material - Part 20

On May 9, 1983, NRC published a notice of proposed rulemaking that would amend its regulations concerned with reports of theft or loss of licensed material. The proposed amendment would modify that part of the regulation which permits licensee judgement in the reporting of loss or theft of licensed material, with a requirement that the licensee report all licensed material (in a quantity greater than the minimum specified in the amended regulation) lost, stolen, or missing for more than 30 days after its absence becomes known to the licensee.

Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses - Parts 50 and 51

On May 20, 1983, NRC published a notice of proposed rulemaking to ensure the continued safe management of spent fuel beyond the expiration date of reactor operating licenses.

Uranium Mill Tailings Regulations; Proposed Suspension of Selected Provisions - Part 40

On May 26, 1983, NRC published a proposal to suspend selected portions of its regulations dealing with the disposal of uranium mill tailings. The action places in abeyance regulations the Commission anticipates to conform to Environmental Protection Agency standards recently proposed.

Deletion of Exception Filing Requirement for Appeal From Initial Decision; Consolidation of Responsive Briefs - Part 2

On June 29, 1983, NRC published a proposed amendment to its regulations which would change the procedure for an appeal to the Commission from an initial adjudicatory decision. The proposal would eliminate the filing of exceptions to the decision and would require instead the filing of a notice of appeal. In addition, parties would be required to file a single responsive brief, regardless of the number of appellant briefs filed.

Protection of Employees Who Provide Information - Part 50

On July 6, 1983, NRC published a notice of proposed rulemaking to amend 10 CFR Part 50. The proposed amendments would require production and utilization facility (principally nuclear power reactor) licensees, permittees, and applicants to include in their procurement documents a provision to require their contractors and subcontractors to post a notice to employees related to employee protection. The required notice would contain information notifying employees that an employer is prohibited from discriminating against an employee engaging in protected activities and that an employee may seek a remedy for prohibited discrimination by filing a complaint with the Department of Labor. The proposed rule would affect licensees, permittees, applicants, and their contractors/subcontractors who are contractually responsible for construction of basic components or production and utilization facilities.

Implementation of the Convention on the Physical Protection of Nuclear Materials - Parts 40, 70, and 73

On July 14, 1983, NRC published a notice of proposed rulemaking that would implement the provisions of the Convention on the Physical Protection of Nuclear Material. The proposed amendements would require: The physical protection of transient shipments of special nuclear material of moderate and low strategic significance, irradiated reactor fuel, and natural uranium; Advance notification to the NRC of the export of Convention defined nuclear materials; Advance notification and assurance of protection to the NRC concerning transient shipments of Convention defined nuclear materials between and from countries not parties to the Convention.

Frequency and Participation in Emergency Preparedness Exercises - Part 50

On July 21, 1983, NRC published a notice of proposed rulemaking to amend 10 CFR Part 50. The proposed amendments would provide flexibility for emergency preparedness exercise participants in regard to the required frequency and extent of participation in the exercises conducted for nuclear power reactor facilities.

Physical Protection Requirements for Nonpower Reactor Licensees Possessing Formula Quantities of Strategic Special Nuclear Material - Part 73

On July 27, 1983, NRC published a notice of proposed rulemaking to amend its physical protection regulations for nonpower reactor licensees possessing formula quantities of strategic special nuclear material (SSNM). The proposed amendments were prepared in response to a Commission request for the development of these new physical protection requirements. These amendments would replace the interim requirements which are currently in force at these facilities. The result of these amendments will be the most cost-effective approach for providing assurance against the theft of a formula quantity of SSNM,

while taking into account the unique features of the facility design, and fuel type and form at nonpower reactors.

ADVANCED NOTICES OF PROPOSED RULEMAKING

Backfitting Process for Power Reactors - Part 50

On September 28, 1983, the NRC published an advance notice of proposed rulemaking to obtain public comment on a number of broad policy questions regarding the establishment of specific procedures for the long-term management of the Commission's process for the imposition of new regulatory requirements for power reactors. This process, commonly referred to as "backfitting," includes both plant-specific and generic changes that are proposed for one or more classes of power reactors. The Commission intends, through the conduct of this rulemaking, to replace its existing regulation (10 CFR 50.109) with a new rule.

Withdrawal of Proposed Rules

Licensing Requirements For Pending Operating License Applications - Part 50

On April 1, 1983, NRC published a notice withdrawing a proposed rule that would have codified Three Mile Island related provisions in NUREG-0737 for applicants for nuclear power plant operation licenses. Experience gained since the publication of the proposed rule in the *Federal Register* on May 13, 1981, indicates that the proposed requirements are not necessary.

Transuranic Waste Disposal; Withdrawal of Proposed Rule - Parts 20 and 150

On May 9, 1983, NRC published a notice withdrawing two proposed rules in which the Atomic Energy Commission (NRC predecessor) proposed to restrict the disposal of transuranic waste by shallow land burial. The proposed amendments were included within the scope of the new 10 CFR Part 61, "Licensing Requirements for the Land Disposal of Radioactive Waste," issued as a final rule by NRC December 27, 1982.

Hearings on Denial of Reactor Operator License; Withdrawal of Proposed Rule - Parts 2 and 55

On July 11, 1983, NRC published a notice terminating action on proposed amendments to 10 CFR Parts 2 and 55 regarding adjudicatory hearings in operator license proceedings.

Appendix 5

Regulatory Guides - Fiscal Year 1983

NRC regulatory guides describe methods for implementing specific parts of Commission's regulations and, 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. 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 with the U.S. Government Printing Office to become a consigned sales agent for certain NRC publications including regulatory guides, except for draft guides issued for public comment which receive free distribution. Active guides are sold on a subscription or individual copy basis. NRC licensees receive, at no cost, pertinent draft and active regulatory guides as they are issued.

The following guides were issued or revised (or withdrawn as noted) during the period October 1, 1982, to September 30, 1983.

Division 1 - Power Reactor Guides

1.67 WITHDRAWN. Installation of Overpressure Protection Devices

1.84 Design and Fabrication Code Case Acceptability—ASME Section III, Division 1 (Revisions 20 and 21)

1.85 Materials Code Case Acceptability—ASME Section III, Division 1 (Revisions 20 and 21)

1.97 Instrumentation for Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following an Accident (Revision 3)

1.147 Inservice Inspection Code Case Acceptability—ASME Section XI, Division 1 (Revision 2)

1.150 Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations (Revision 1)

1.151 Instrument Sensing Lines

Division 2 - Research and Test Reactor Guides

2.6 Emergency Planning for Research and Test Reactors (Revision 1)

Division 3 - Fuels and Materials Facilities Guides

3.8 Preparation of Environmental Reports for Uranium Mills (Revision 2)

3.15 Standard Format and Content of License Applications for Storage Only of Unirradiated Power Reactor Fuel and Associated Radioactive Material (Revision 1)

Division 4 - Environmental and Siting Guides

4.18 Standard Format and Content of Environmental Reports for Near-Surface Disposal of Radioactive Waste.

Division 5 - Materials and Plant Protection Guides

5.59 Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance (Revision 1)

Division 6 - Product Guides

NONE

Division 7 - Transportation Guides

7.10 Establishing Quality Assurance Programs for Packaging Used in the Transport of Radioactive Material

Division 8 - Occupational Health Guides

8.18 Information Relevant to Ensuring That Occupational Radiation Exposures at Medical Institutions Will Be As Low As Reasonably Achievable (Revision 1)

8.30 Health Physics Surveys in Uranium Mills

8.31 Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Mills Will Be As Low As Is Reasonably Achievable

Division 9 - Antitrust and Financial Review Guides

NONE

Division 10 - General Guides

NONE

DRAFT GUIDES

Division 1

IC 127-5	Criteria for Programmable Digital Computer Systems Software in Safety Systems of Nuclear Power Generating Stations
IC 609-5	Criteria for Electric, Instrumentation, and Control Portions of Safety Systems
MS 203-4	Proposed Revision 1 to Guide 1.82, Sumps for Emergency Core Cooling and Containment Spray Systems

Division 3

CE 034-4	Second Draft, Spent Fuel Heat Generation in an Independent Spent Fuel Storage Installation
ES 114-4	Guidelines for Ground-Water Monitoring at In Situ Uranium Solution Mines
ES 115-4	Guidelines for Modeling Ground-Water Transport of Radioactive and Nonradioactive Containments at Tailings Disposal Sites
MS 146-4	Design, Installation, and Inspection of Seepage Control Liners at Uranium Recovery Facilities

Division 5

SG 043-4	Proposed Revision 1 to Guide 5.11, Nondestructive Assay of Special Nuclear Material Contained in Scrap and Waste
SG 045-4	Proposed Revision 1 to Guide 5.23, In Situ Assay of Plutonium Residual Holdup

Division 7

MS 144-4	Fracture Toughness Criteria for Ferritic Steel Shipping Cask Containment Vessels with a Maximum Wall Thickness of Four Inches (0.1 m)

Division 8

OP 713-4	Applications of Bioassay for Tritium

Appendix 6

Nuclear Electric Generating Units in Operation Or Under Construction

(As of December 31, 1983)

The following listing includes nuclear power reactor electrical generating units which were in operation, under construction, or under NRC review for construction permits in the United States as of December 31, 1983, representing a total capacity of approximately 123,000 MWe. TYPE is indicated by: BWR - boiling water reactor, PWR - pressurized water reactor, HTGR - high temperature gas-cooled reactor, and LMFBR - liquid metal cooled fast breeder reactor. STATUS is indicated by: OL - has operating license, CP - has construction permit, UR - under review for construction permit. The dates for operation are either actual or those scheduled by the utilities as of December 31, 1983.

This listing includes 7 fewer units than a year ago, reflecting cancellations of plans for future facilities.

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
ALABAMA						
Decatur	Browns Ferry Nuclear Power Plant Unit 1	1,065	BWR	OL 1973	Tennessee Valley Authority	1974
Decatur	Browns Ferry Nuclear Power Plant Unit 2	1,065	BWR	OL 1974	Tennessee Valley Authority	1975
Decatur	Browns Ferry Nuclear Power Plant Unit 3	1,065	BWR	OL 1976	Tennessee Valley Authority	1977
Dothan	Joseph M. Farley Nuclear Plant Unit 2	804	BWR	OL 1977	Alabama Power Co.	1977
Dothan	Joseph M. Farley Nuclear Plant Unit 2	814	PWR	OL 1981	Alabama Power Co.	1981
Scottsboro	Bellefonte Nuclear Plant Unit 1	1,235	PWR	CP 1974	Tennessee Valley Authority	1988
Scottsboro	Bellefonte Nuclear Plant Unit 2	1,235	PWR	CP 1974	Tennessee Valley Authority	1990
ARIZONA						
Wintersburg	Palo Verde Nuclear Generating Station Unit 1	1,304	PWR	CP 1976	Arizona Public Service Co.	1984
Wintersburg	Palo Verde Nuclear Generating Station Unit 2	1,304	PWR	CP 1976	Arizona Public Service Co.	1985
Wintersburg	Palo Verde Nuclear Generating Station Unit 3	1,304	PWR	CP 1976	Arizona Public Service Co.	1986

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
ARKANSAS						
Russellville	Arkansas Nuclear One Unit 1	836	PWR	OL 1974	Arkansas Power & Light Co.	1974
Russellville	Arkansas Nuclear One Unit 2	858	PWR	OL 1978	Arkansas Power & Light Co.	1980
CALIFORNIA						
Eureka	Humboldt Bay Power Plant Unit 3[1]	65	BWR	OL 1962	Pacific Gas & Electric Co.	1963
San Clemente	San Onofre Nuclear Generating Station Unit 1	436	PWR	OL 1967	So. Calif. Ed. & San Diego Gas & Electric Co.	1968
San Clemente	San Onofre Nuclear Generating Station Unit 2	1,100	PWR	OL 1982	So. Calif. Ed. & San Diego Gas & Electric Co.	1984
San Clemente	San Onofre Nuclear Generating Station Unit 3	1,100	PWR	OL 1983	So. Calif. Ed. & San Diego Gas & Electric Co.	1984
Diablo Canyon	Diablo Canyon Nuclear Power Plant Unit 1[2]	1,084	PWR	CP 1968	Pacific Gas & Electric Co.	1984
Diablo Canyon	Diablo Canyon Nuclear Power Plant Unit 2	1,106	PWR	CP 1970	Pacific Gas & Electric Co.	1985
Clay Station	Rancho Seco Nuclear Generating Station Unit 1	873	PWR	OL 1974	Sacramento Municipal Utility District	1975
COLORADO						
Platteville	Fort St. Vrain Nuclear Generating Station	330	HTGR	OL 1973	Public Service Co. of Colorado	1979
CONNECTICUT						
Haddam Neck	Haddam Neck Generating Station	555	PWR	OL 1967	Conn. Yanke Atomic Power Co.	1968
Waterford	Millstone Nuclear Power Station Unit 1	654	BWR	OL 1970	Northeast Nuclear Energy Co.	1971
Waterford	Millstone Nuclear Power Station Unit 2	864	PWR	OL 1975	Northeast Nuclear Energy Co.	1975
Waterford	Millstone Nuclear Power Station Unit 3	1,156	PWR	CP 1974	Northeast Nuclear Energy Co.	1986
	Turkey Point Station Unit 3	646	PWR	OL 1972	Florida Power & Light Co.	1972

[1]Shut down indefinitely (not included in summary)
[2]Authority for fuel load and cold system testing reinstated 11/09/83.

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
FLORIDA						
Florida City	Turkey Point Station Unit 4	646	PWR	OL 1973	Florida Power & Light	1973
Red Level	Crystal River Plant Unit 3	806	PWR	OL 1977	Florida Power Corp.	1977
Ft. Pierce	St Lucie Plant Unit 1	817	PWR	OL 1976	Florida Power & Light Co.	1976
Ft. Pierce	St Lucie Plant Unit 2	842	PWR	OL 1983	Florida Power & Light Co.	1983
GEORGIA						
Baxley	Edwin I. Hatch Plant Unit 1	757	BWR	OL 1974	Georgia Power Co.	1975
Baxley	Edwin I. Hatch Plant Unit 2	771	BWR	OL 1978	Georgia Power Co.	1979
Waynesboro	Alvin W. Vogtle, Jr. Plant Unit 1	1,100	PWR	CP 1974	Georgia Power Co.	1987
Waynesboro	Alvin W. Vogtle, Jr. Plant Unit 2	1,100	PWR	CP 1974	Georgia Power Co.	1988
ILLINOIS						
Morris	Dresden Nuclear Power Station Unit 1[2]	200	BWR	OL 1959	Commonwealth Edison Co.	1960
Morris	Dresden Nuclear Power Station Unit 2	772	BWR	OL 1969	Commonwealth Edison Co.	1970
Morris	Dresden Nuclear Power Station Unit 3	773	BWR	OL 1971	Commonwealth Edison Co.	1971
Zion	Zion Nuclear Plant Unit 1	1,040	PWR	OL 1973	Commonwealth Edison Co.	1973
Zion	Zion Nuclear Plant Unit 2	1,040	PWR	OL 1973	Commonwealth Edison Co.	1974
Cordova	Quad-Cities Station Unit 1	769	BWR	OL 1972	Comm. Ed. Co.-Iowa-Ill Gas & Elec. Co.	1973
Cordova	Quad-Cities Station Unit 2	769	BWR	OL 1972	Comm. Ed. Co.-Iowa-Ill Gas & Elec. Co.	1973
Seneca	LaSalle County Nuclear Station Unit 1	1,078	BWR	OL 1982	Commonwealth Edison Co.	1983
Seneca	LaSalle County Nuclear Station Unit 2	1,078	BWR	OL 1983	Commonwealth Edison Co.	1984
Bryon	Byron Station Unit 1	1,120	PWR	CP 1975	Commonwealth Edison Co.	1984
Byron	Byron Station Unit 2	1,120	PWR	CP 1975	Commonwealth Edison Co.	1985
Braidwood	Braidwood Unit 1	1,120	PWR	CP 1975	Commonwealth Edison Co.	1985

[2]Authority for fuel load and cold system testing reinstated 11/09/83.

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
ILLINOIS (continued)						
Braidwood	Braidwood Unit 2	1,120	PWR	CP 1975	Commonwealth Edison Co.	1986
Clinton	Clinton Nuclear Power Plant Unit 1	950	BWR	CP 1976	Illinois Power Co.	1986
INDIANA						
Madison	Marble Hill Unit 1	1,130	PWR	CP 1978	Public Service of Indiana	1986
Madison	Marble Hill Unit 2	1,130	PWR	CP 1978	Public Service of Indiana	1988
IOWA						
Pala	Duane Arnold Energy Center Unit 1	515	BWR	OL 1974	Iowa Elec. Power & Light Co.	1975
KANSAS						
Burlington	Wolf Creek	1,150	PWR	CP 1977	Kansas Gas & Elec. Co.	1985
LOUISIANA						
Taft	Waterford Steam Electric Station	1,151	PWR	CP 1974	Louisiana Power & Light Co.	1984
St. Francisville	River Bend Station Unit 1	934	BWR	CP 1977	Gulf States Utilities Co.	1985
MAINE						
Wiscasset	Maine Yankee Atomic Power	810	PWR	OL 1972	Maine Yanke Power Co.	1972
MASSACHUSETTS						
Rowe	Yankee Nuclear Power Station	175	PWR	OL 1960	Yankee Atomic Elec. Co.	1961
Plymouth	Pilgrim Station Unit 1	670	BWR	OL 1972	Boston Edison Co.	1972
MICHIGAN						
Big Rock Point	Big Rock Point Nuclear Plant	64	BWR	OL 1962	Consumers Power Co.	1963
South Haven	Palisades Nuclear Power Station	635	PWR	OL 1971	Consumers Power Co.	1971

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
MICHIGAN (continued)						
Lagonna Beach	Enrico Fermi Atomic Power Plant Unit 2	1,093	BWR	CP 1972	Detroit Power Co.	1984
Bridgman	Donald C. Cook Plant Unit 1	1,044	PWR	OL 1974	Indiana & Michigan Elec. Co.	1975
Bridgman	Donald C. Cook Plant Unit 2	1,082	PWR	OL 1977	Indiana & Michigan Elec. Co.	1978
Midland	Midland Nuclear Power Plant Unit 1	492	PWR	CP 1972	Consumers Power Co.	1985
Midland	Midland Nuclear Power Plant Unit 2	818	PWR	CP 1972	Consumers Power Co.	1985
MINNESOTA						
Monticello	Monticello Nuclear Generating Plant	525	BWR	OL 1970	Northern States Power Co.	1971
Red Wing	Prairie Island Nuclear Generating Plant Unit 1	503	PWR	OL 1973	Northern States Power Co.	1973
Red Wing	Prairie Island Nuclear Generating Plant Unit 2	500	PWR	OL 1974	Northern States Power Co.	1974
MISSISSIPPI						
Port Gibson	Grand Gulf Nuclear Station Unit 1	1,250	BWR	OL 1982	Mississippi Power & Light Co.	1984
Port Gibson	Grand Gulf Nuclear Station Unit 2	1,250	BWR	CP 1974	Mississippi Power & Light Co.	Indef
Yellow Creek	Yellow Creek Unit 1	1,285	PWR	CP 1978	Tennessee Valley Authority	Indef
Yellow Creek	Yellow Creek Unit 2	1,285	PWR	CP 1978	Tennessee Valley Authority	Indef
MISSOURI						
Fulton	Callaway Plant Unit 1	1,188	PWR	CP 1976	Union Electric Co.	1984
NEBRASKA						
Fort Calhoun	Fort Calhoun Station Unit 1	478	PWR	OL 1973	Omaha Public Power District	1973
Brownville	Cooper Nuclear Station	764	BWR	OL 1974	Nebraska Public Power District	1974

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
NEW HAMPSHIRE						
Seabrook	Seabrook Nuclear Station Unit 1	1,198	PWR	CP 1976	Public Service of N.H.	1985
Seabrook	Seabrook Nuclear Station Unit 2	1,198	PWR	CP 1976	Public Service of N.H.	Indef
NEW JERSEY						
Toms River	Oyster Creek Nuclear Power Plant Unit 1	620	BWR	OL 1969	GPU Nuclear Corp.	1969
Salem	Salem Nuclear Generating Station Unit 1	1,079	PWR	OL 1976	Public Service Elec. & Gas Co.	1977
Salem	Salem Nuclear Generating Station Unit 2	1,106	PWR	OL 1980	Public Service Elec. & Gas Co.	1981
Salem	Hope Creek Generating Station Unit 1	1,067	BWR	CP 1974	Public Service Elec. & Gas Co.	1986
NEW YORK						
Indian Point	Indian Point Station Unit 2	864	PWR	OL 1973	Consolidated Edison Co.	1974
Indian Point	Indian Point Station Unit 3	891	PWR	OL 1975	Power Authority of the State of New York	1976
Scriba	Nine Mile Point Nuclear Unit 1	610	BWR	OL 1969	Niagara Mohawk Power Co.	1969
Scriba	Nine Mile Point Nuclear Unit 2	1,080	BWR	CP 1974	Niagara Mohawk Power Co.	1986
Ontario	R. E. Ginna Nuclear Power Plant Unit 1	470	PWR	OL 1969	Rochester Gas & Elec. Co.	1970
Brookhaven	Shoreham Nuclear Power Station	820	BWR	CP 1973	Long Island Lighting Co.	1984
Scriba	James A. FitzPatrick Nuclear Power Plant	810	BWR	OL 1974	Power Authority of the State of New York	1975
NORTH CAROLINA						
Southport	Brunswick Steam Electric Plant Unit 2	790	BWR	OL 1974	Carolina Power & Light Co.	1975
Southport	Brunswick Steam Electric Plant Unit 1	790	BWR	OL 1976	Carolina Power & Light Co.	1977

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
NORTH CAROLINA (continued)						
Cowans Ford Dam	Wm. B. McGuire Nuclear Station Unit 1	1,180	PWR	OL 1981	Duke Power Co.	1981
Cowans Ford Dam	Wm. B. McGuire Nuclear Station Unit 2	1,180	PWR	OL 1983	Duke Power Co.	1984
Bonsal	Shearon Harris Plant Unit 1	915	PWR	CP 1978	Carolina Power & Light Co.	1986
OHIO						
Oak Harbor	Davis-Besse Nuclear Power Station Unit 1	874	PWR	OL 1977	Toledo Edison-Cleveland Electric Illum. Co.	1977
Perry	Perry Nuclear Power Plant Unit 1	1,205	BWR	CP 1977	Toledo Edison-Cleveland Elec. Illum. Co.	1985
Perry	Perry Nuclear Power Plant Unit 2	1,205	BWR	CP 1977	Toledo Edison-Cleveland Elec. Illum. Co.	1992
Moscow	Wm. H. Zimmer Nuclear Power Station Unit 1	810	BWR	CP 1972	Cincinnati Gas & Elec. Co.	1985
OREGON						
Prescott	Trojan Nuclear Plant Unit 1	1,080	PWR	OL 1975	Portland General Elec. Co.	1976
PENNSYLVANIA						
Peach Bottom	Peach Bottom Atomic Power Station Unit 2	1,051	BWR	OL 1973	Philadelphia Elec. Co.	1974
Peach Bottom	Peach Bottom Atomic Power Station Unit 3	1,035	BWR	OL 1974	Philadelphia Elec. Co.	1974
Pottstown	Limerick Generating Station Unit 1	1,065	BWR	CP 1974	Philadelphia Elec. Co.	1985
Pottstown	Limerick Generating Station Unit 2	1,065	BWR	CP 1974	Philadelphia Elec. Co.	1987
Shippingport	Beaver Valley Power Station Unit 1	810	PWR	OL 1976	Duquesne Light Co. Ohio Edison Co.	1976
Shippingport	Beaver Valley Power Station Unit 2	852	PWR	CP 1974	Duquesne Light Co. Ohio Edison Co.	1986
Goldsboro	Three Mile Island Nuclear Station, Unit 1	776	PWR	OL 1974	GPU Nuclear Corp.	1974
Goldsboro	Three Mile Island Nuclear[3] Station, Unit 2	906	PWR	OL 1978	GPU Nuclear Corp.	1978

[3]Shut down indefinitely (not included in summary)

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
PENNSYLVANIA (continued)						
Berwick	Susquehanna Steam Electric Station Unit 1	1,052	BWR	OL 1982	Pennsylvania Power & Light Co.	1983
Berwick	Susquehanna Steam Electric Station Unit 2	1,052	BWR	CP 1973	Pennsylvania Power & Light Co.	1984
SOUTH CAROLINA						
Hartsville	H. B. Robinson S.E. Plant Unit 2	665	PWR	OL 1970	Carolina Power & Light Co.	1971
Seneca	Oconee Nuclear Station Unit 1	860	PWR	OL 1973	Duke Power Co.	1973
Seneca	Oconee Nuclear Station Unit 2	860	PWR	OL 1973	Duke Power Co.	1974
Seneca	Oconee Nuclear Station Unit 3	860	PWR	OL 1974	Duke Power Co.	1974
Broad River	Virgil C. Summer Nuclear Station Unit 1	900	PWR	OL 1982	So. Carolina Elec. & Gas Co.	1984
Lake Wylie	Catawba Nuclear Station Unit 1	1,145	PWR	CP 1975	Duke Power Co.	1984
Lake Wylie	Catawba Nuclear Station Unit 2	1,145	PWR	CP 1975	Duke Power Co.	1987
TENNESSEE						
Daisy	Sequoyah Nuclear Power Plant Unit 1	1,128	PWR	OL 1980	Tennessee Valley Authority	1981
Daisy	Sequoyah Nuclear Power Plant Unit 2	1,148	PWR	OL 1981	Tennessee Valley Authority	1982
Spring City	Watts Bar Nuclear Plant Unit 1	1,165	PWR	CP 1973	Tennessee Valley Authority	1984
Spring City	Watts Bar Nuclear Plant Unit 1	1,165	PWR	CP 1973	Tennessee Valley Authority	1986
Hartsville	TVA Plant A Unit 1	1,205	BWR	CP 1977	Tennessee Valley Authority	Indef
Hartsville	TVA Plant A Unit 2	1,205	BWR	CP 1977	Tennessee Valley Authority	Indef
TEXAS						
Glen Rose	Comanche Peak Steam Electric Station Unit 1	1,150	PWR	CP 1974	Texas Utilities	1985

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
TEXAS (continued)						
Glen Rose	Comanche Peak Steam Electric Station Unit 2	1,150	PWR	CP 1974	Texas Utilities	1986
Bay City	South Texas Nuclear Project Unit 1	1,250	PWR	CP 1975	Houston Lighting & Power Co.	1987
Bay City	South Texas Nuclear Project Unit 2	1,250	PWR	CP 1975	Houston Lighting & Power Co.	1989
VERMONT						
Vernon	Vermont Yankee Generating Station	504	BWR	OL 1972	Vermont Yankee Nuclear Power Corp.	1972
VIRGINIA						
Gravel Neck	Surry Power Station Unit 1	775	PWR	OL 1972	Va. Electric & Power Co.	1972
Gravel Neck	Surry Power Station Unit 2	775	PWR	OL 1973	Va. Electric & Power Co.	1973
Mineral	North Anna Power Station Unit 1	865	PWR	OL 1976	Va. Electric & Power Co.	1978
Mineral	North Anna Power Station Unit 2	890	PWR	OL 1980	Va. Electric & Power Co.	1980
WASHINGTON						
Richland	WPPSS No. 1 (Hanford)	1,266	PWR	CP 1975	Wash. Public Power Supply System	Indef.
Richland	WPPSS No. 2 (Hanford)	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	1987
WISCONSIN						
LaCrosse	LaCrosse (Genoa) Nuclear Generating Station	48	BWR	OL 1967	Dairyland Power Coop.	1969
Two Creeks	Point Beach Nuclear Plant Unit 1	495	PWR	OL 1970	Wisconsin Michigan Power Co.	1970
Two Creeks	Point Beach Nuclear Plant Unit 2	495	PWR	OL 1971	Wisconsin Michigan Power Co.	1972
Kewanee	Kewanee Nuclear Power Plant	515	PWR	OL 1973	Wisconsin Public Svc. Corp.	1974

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