INPO’s four technical cornerstone programs serve as the foundation for its activities.

**EVALUATIONS**

Evaluations of nuclear power plants operated by member utilities are conducted on a regularly scheduled basis. Corporate support and monitoring of operating plants is also periodically evaluated. In these evaluations, teams of Institute and utility personnel compare plant performance to standards of excellence based on experience and best practices. INPO also conducts review visits in selected areas to supplement the evaluation, accreditation and events analysis programs.

**EVENTS ANALYSIS AND INFORMATION EXCHANGE**

Events analysis programs identify and communicate lessons learned from plant events so utilities can take action to prevent similar events at their plants. INPO also operates an extensive computer network through which members and participants electronically exchange information in areas such as plant maintenance, operating experience and equipment reliability.

**TRAINING AND ACCREDITATION**

INPO supports its member utilities in their work to achieve and maintain accreditation of training programs. The National Academy for Nuclear Training, under the auspices of INPO, integrates the training-related efforts of nuclear utilities, the independent National Nuclear Accrediting Board and the Institute.

**ASSISTANCE**

INPO helps members improve in nuclear operations areas through assistance programs and other activities that continually evolve to meet the changing needs of the nuclear industry. Through assistance visits, workshops, technical documents, short-term loan of personnel and many other methods, INPO fosters comparison and the exchange of successful methods among members.
Curtis Dunsmore, reactor operator, and Lenny Beller, senior reactor operator, train on Brunswick Nuclear Plant's control room simulator, which replicates the plant's control room.
At INPO, we often talk about the quest for excellence in the nuclear power industry. This sounds like excellence is a goal the industry may someday reach. But the quest for excellence means seeking continuous improvement. Excellence, therefore, is not a destination. Excellence is a journey.

We began that journey at INPO 15 years ago. A look back at our history shows that INPO and the nuclear power industry have traveled a considerable distance. Performance in the nuclear industry has continued to improve, in some areas dramatically. Nuclear plants are operating more safely and more reliably.

Fifteen years ago, nuclear power plants in the U.S. produced electricity less than 60 percent of the time. This year, the industry exceeded its ambitious goal to reach 80 percent median unit capability factor by 1995 — a year ahead of schedule. The unplanned automatic scram rate is also better than the industry’s 1995 goal and shows nearly a tenfold improvement from the early 1980s. The other plant performance indicators in this annual report show graphically the industry’s continuing progress.
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Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.
When INPO first began recognizing plants for excellent performance, six plants were placed in the “excellent” category, as measured by the plant evaluation process. At our 1994 CEO Conference, we recognized 23 plants for excellent performance — matching last year’s record number.

The number of significant events at nuclear plants is an additional means of monitoring the industry’s progress in its quest for excellence. This indicator, published annually by the Nuclear Regulatory Commission, has shown a tenfold reduction in significant events over the past decade.

As plant performance improves, INPO continues to refine the evaluation process to provide more insight to our members and stimulate further performance improvements. The Institute is also assisting member utilities and other industry support organizations as they address the challenges of achieving more efficient operations. INPO has also recognized the need to control its own costs and in 1994 reduced member assessments for the second straight year.

As the industry works to improve economic performance, it becomes even more important for INPO to reinforce high standards of safety and reliability. Events in 1994 reemphasized the need for safety to continue to be the nuclear industry’s number-one priority. Despite increased economic pressure to keep a plant on line, operators must be assured that the conservative decision – the decision to, in the face of uncertainty, place the plant in a safe condition – will be supported by top utility management.

To help sustain the industry’s progress, in 1994 we worked with our members on unique initiatives to improve the industry’s management and leadership development efforts and to address human performance issues. We issued Management and Leadership Development – Building on the Principles for Enhancing Professionalism, which utilities are now using to assess their development efforts. We also established a Special Review Committee on Human Performance to examine ways to create a working environment that enhances human performance at nuclear plants.

INPO is part of worldwide endeavors to improve nuclear plant performance. In addition to supporting World Association of Nuclear Operators (WANO) programs and the WANO-Atlanta Center, the Institute is assisting in the Department of Energy’s International Nuclear Safety Program, which seeks to improve the operational safety of Soviet-designed nuclear power plants. This includes using U.S. nuclear plant personnel to help these plants develop symptom-based emergency operating procedures.

In 1994, we also strengthened our cooperative relationships with other industry organizations, including the Electric Power Research Institute and the Nuclear Energy Institute, to better support the nuclear industry.

The journey in the quest for excellence continues. The progress the industry has seen over the past 15 years shows we are traveling in the right direction. At INPO, we look forward to continuing that journey.
Kim Dahlberg believes his participation as a host-utility peer in the evaluation of Nine Mile Point made the evaluation more effective in revealing areas the plant staff needed to work on. Also, as a member of the evaluation team, he understood clearly the performance issues identified during the evaluation – and could assist his fellow employees in understanding and responding to them. “As a host peer you participate in the discussions and your voice is heard. As a result of this interaction, when we were done I could personally support every finding of the INPO team.” At the time of the May 1994 evaluation, Dahlberg was in Niagara Mohawk’s executive development program, after serving as Nine Mile Point Unit 1 plant manager. He was later named Unit 2 plant manager. He says, “Here I was on the team, and now I’m the person accountable for implementing the responses. I saw things that I know we need to improve. The team leaves, but the host peer stays. He has internalized the problem and can help the plant staff get to the best fix – and fix it right the first time.”

Each evaluation team includes experienced INPO personnel and peer evaluators from similar plants. Peers from other utilities have been part of the evaluation process since 1984, when the first senior reactor operator (SRO) peers joined the teams. Peers bring current operational experience and fresh perspectives, invaluable additions to evaluations and assistance visits.
Including a representative of the plant being evaluated as an integral part of the evaluation team was piloted in 1993 and proved so successful that host-plant peers became an established part of the evaluation process in early 1994. Training, technical support and outage managers have all served as host-plant peers. Their knowledge of the plant helps make evaluations more efficient and more thorough, while increasing utility understanding and acceptance of the evaluation results. The use of host peers on accreditation visits was piloted in 1994 and is meeting with similar success.

**Evaluation process evolves**

The addition of host-plant peers is only one of the enhancements to the evaluation process made in 1994. Since INPO conducted the industry's first plant evaluation at Commonwealth Edison's Dresden Station in 1980, its fundamental mission has remained the same: to promote the highest levels of safety and reliability – to promote excellence – in the operation of
nuclear electric generating plants. While the mission remains the same, the evaluation process has evolved over the years. In early 1994, INPO began observing selected startups and major plant evolutions outside the normal evaluation period to gather additional information for plant evaluations. This initiative has proved to be useful in identifying improvement opportunities that might not be apparent during normal operations. Small teams, usually consisting of two INPO employees and, whenever possible, an industry peer, observed 16 plant startups as part of this initiative. During 1994, evaluation teams also looked more closely at the ability of control room crews to diagnose plant symptoms and effectively use abnormal operating procedures. Another focus was on long-standing equipment deficiencies that could affect plant response to abnormal operating conditions. Teams also placed increased emphasis on equipment performance and materiel condition, human performance, and utility management and leadership development. Overall, these enhancements to the evaluation process are designed to make sure evaluations of plant performance are as complete and useful as possible to member utilities.

Laser alignment is one of the many sophisticated tools used in nuclear power plants to ensure components operate at top performance.
1994 evaluation teams included:

- 50 senior reactor operator peers
- 46 host-utility SRO peers on simulator observation teams
- 57 maintenance peers
- 53 peers in other functional areas
- 36 host-utility peers

Control room shift supervisor Daniel Hardin (left) joins auxiliary operator JR. Woodall in confirming the operability of the backup air compressor in Brunswick's turbine building.
Tailoring INPO programs and assistance to meet member needs

"Two years ago, we rededicated ourselves to generating electricity in a safe, reliable, economic and environmentally sound manner. With INPO's help, we are achieving this mission."
INPO personnel have been a common sight at Brunswick Nuclear Plant over the last few years — and Brunswick Vice President Roy Anderson says working closely with INPO has played a key part in helping improve performance.

The Carolina Power & Light Company facility has seen more than 15 INPO assistance visits, plus as many as seven loaned INPO employees at one time, in positions ranging from mechanical maintenance manager to plant manager. "In the past year, Brunswick's performance has improved significantly. I think much of that has to do with our linking up with INPO to find the best practices in the industry and then applying them. We've gotten a tremendous amount of value from bringing in this kind of outside perspective and experience," Anderson says. Managers at the plant knew they had a number of areas for improvement — and wanted to find the best ways to improve as quickly as possible. To do this, says Anderson, "We went over the plant schedule with the INPO senior manager assigned to coordinate assistance for Brunswick, and we developed an assistance plan for the year based on major plant activities." For example, visits dealing with various aspects of outage preparation and planning were scheduled prior to the Unit 2 refueling outage that began in March 1994. Other visits focused on work management, design engineering documentation, procedure adherence, emergency preparedness, and turbine electrohydraulic controls. "Two years ago, we rededicated ourselves to generating electricity in a safe, reliable, economic
and environmentally sound manner,” says Anderson. “With INPO’s help, we are achieving this mission.” Three assistance visits to Brunswick concentrated on outage preparation, as did a two-week outage review visit in April. The major scope Unit 2 outage was completed very close to the schedule, improving greatly on the station’s past outage performance. The outage review visit at Brunswick was one of 12 conducted at member utilities in 1994. Outage review visits focus on outage nuclear safety, equipment reliability and availability, and overall outage effectiveness and efficiency. Industrywide, improvements in outage management have led to a reduction in refueling outage lengths from a median of 78.5 days in 1989 to 56.5 days in 1994. Brunswick also received one of the nine work management assistance visits INPO conducted during 1994. These visits help identify ways to streamline work flow, eliminate duplicate work and better implement work management improvement programs. The best performing plants effectively plan and efficiently execute maintenance work. INPO reverse loaned employees worked at Brunswick for periods of a few months to more than a year. For example, an INPO department manager served as a unit manager on a long-term assignment, while an evaluator from INPO’s Outage Department served as technical support outage manager on short-term loan during the Unit 2 outage.

**Assistance offered in many areas**

INPO’s work with Brunswick is an example of the assistance available to meet a variety of utility requests. In 1994, the Institute sent 200 teams on assistance visits. More than 150 utility peers participated on these assistance teams. More than 900 industry personnel exchanged ideas and operating experience at INPO-sponsored workshops and working meetings at INPO’s Atlanta headquarters. These included a number of small working meetings that focused on specific operational issues, such as outage management and engineering support. These forums have proved to be a useful way to share information among people with similar concerns. INPO also provides assistance by referring utilities to effective techniques developed by other nuclear operators as well as the Electric Power Research Institute (EPRI) and the Nuclear Energy Institute (NEI).
INPO’s activities to analyze and disseminate operating experience from nuclear plants around the world are part of the Significant Event Evaluation and Information Network (SEE-IN). In 1994, 38 SEE-IN documents were issued. These included two Significant Operating Experience Reports (SOERs). SOER 94-1: Nonconservative Decisions and Equipment Performance Problems Result in a Reactor Scram, Two Safety Injections and Water-Solid Conditions describes an event involving ineffective monitoring and control of primary plant parameters, including reactivity, with degrading plant conditions. SOER 94-2: Boron Dilution Events in Pressurized Water Reactors addresses events involving rapid reduction of boron concentration in reactor coolant systems and the potential consequences of such events.

Training materials were developed with industry assistance to help utility staffs implement the training recommendations in these SOERs. These materials include study guides, discussion topics and, when appropriate,
1994 Workshops and Working Meetings included:

<table>
<thead>
<tr>
<th>Conference/Meeting</th>
<th>Attendance</th>
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<tbody>
<tr>
<td>CEO Conference</td>
<td>172</td>
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<tr>
<td>Engineering Managers Workshop</td>
<td>162</td>
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<tr>
<td>INPO/EPRI Chemistry Managers Workshop</td>
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<td>Maintenance Working Meetings (5)</td>
<td>57</td>
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<tr>
<td>Operations Managers Workshops (4)</td>
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<tr>
<td>Outage Management Working Meetings (3)</td>
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<tr>
<td>Plant Managers Workshop</td>
<td>100</td>
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<tr>
<td>Radiological Protection Managers Working Meetings (3)</td>
<td>34</td>
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<tr>
<td>Training Managers Workshop</td>
<td>153</td>
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</table>

ALWR documents published in 1994 are:

- A Review of Commercial Nuclear Power Industry Standardization Experience (INPO 94-003)
- Operating Experience to Apply to Advanced Light Water Reactor Designs (INPO 93-004 Revision 02)
- Principles and Objectives for the Operation and Support of Standard Nuclear Plants (INPO 94-005 Preliminary).

Simulator scenarios. SEE-IN documents and other operating experience information are shared through NUCLEAR NETWORK®, a worldwide computerized messaging system operated by INPO. NETWORK users exchanged information and shared experience about industry events and issues by sending approximately 14,500 messages in 1994. This included increased use of NETWORK by World Association of Nuclear Operators members. INPO also facilitates information sharing about nuclear plant component performance through the Nuclear Plant Reliability Data System (NPRDS), a database covering the performance and selected design characteristics of key nuclear plant equipment. In response to industry feedback, the number of components and types of component failures included was reduced to eliminate unnecessary data. Also, component engineers assigned to major equipment areas now analyze NPRDS failure reports and other data to support industry efforts to monitor equipment performance and identify adverse trends more quickly. INPO also conducted assistance visits to help plants use NPRDS and other data sources to identify and solve equipment problems.

### Supporting industry initiatives

Operating experience was a key part of work done to support INPO's portion of the industry's Strategic Plan for Building New Nuclear Power Plants. Adaptation of advanced light water reactor (ALWR) products, such as standardization concepts and plant process analyses, to currently operating plants is being explored. The ALWR work is aided by extensive input from INPO members, as well as international and supplier participants. Identifying and sharing information on proven ways to achieve safe and reliable plant performance while more effectively using resources was part of INPO's contribution to the industry's Strategic Plan for Improved Economic Performance. INPO assisted utilities in their efforts to streamline processes such as work management, engineering support and training. Throughout the year, utility managers shared effective and efficient practices at INPO workshops and working meetings.
Auxiliary or nonlicensed operators make rounds through the plant to ensure that all components are operating normally. Brunswick auxiliary operator Debbie Evenson checks a pressure gauge on the air compressor receiver.
When Kevin Bruckerhoff returned to Callaway Nuclear Plant after attending the Maintenance Supervisor Professional Development Seminar, he hit the ground running. On the plane from Atlanta, Bruckerhoff, general supervisor, mechanical, worked on a list of ideas from the seminar he thought would benefit Callaway — and by fall 1994, a year later, most had been implemented. “I came back like I was supercharged. I had all these ideas, and I couldn’t wait to start doing them,” he says. “What was great was finding that different plants had already dealt with problems similar to those we have here. We talked about the solutions others had come up with and how well they had worked.” The ideas Bruckerhoff returned with included team-building and employee recognition methods, peer reviews of work, new planning methods and procedure changes that would allow craftsmen to have more input into their work. The two-week seminar, which augments the extensive utility training of supervisors, is designed to enhance the management and leadership skills and knowledge of newly assigned maintenance supervisors. Patterned after the three-year-old Shift Supervisor Professional Development Seminar, the course had two successful pilot sessions in 1993 and was held five times in 1994. Five seminars are scheduled for 1995. When Bruckerhoff returned, he talked about the experience with colleague Ron Lamb, on rotation from operations as general supervisor, electrical. Five years earlier, Lamb had attended the National Academy for Nuclear Training’s Control Room Teamwork
Development Course, held at member utilities to improve teamwork in control room activities. Says Lamb, now Callaway superintendent of operations, “That course was some of the best training I ever received anywhere. I'm usually pretty hard on training, but this course helped change our approach to control room operations at Callaway. The course helped us mature and become more professional in being able to offer and take constructive criticism and to speak up when necessary.” Bruckerhoff and Lamb thought the maintenance supervisors working for them needed a teamwork course to similarly improve their work. Staff members from INPO's

“I came back like I was supercharged. I had all these ideas, and I couldn't wait to start doing them.”
Training and Education organization assisted Callaway with a specially designed teamwork course in October – and those who attended say they are already seeing an improved ability to communicate.

### Executives give high marks to reactor technology course

The executives who attended the Reactor Technology Course for Utility Executives at the Massachusetts Institute of Technology (MIT) also responded positively. The Reactor Technology Course began as a pilot program in 1993 and became a permanent addition in 1994. One of the 12 utility executives who attended wrote, “I have a greater respect for the reactor core and nuclear safety and leave this course with a better appreciation and understanding of the reasons for regulations and our company’s commitment to operator training.” The annual five-week course, conducted jointly by the National Academy and the MIT Department of Nuclear Engineering, is for senior utility executives whose responsibilities include or are expected to be closely involved with nuclear electric generation. The course emphasizes the fundamentals of nuclear technology by focusing on the behavior of the reactor core and on critical safety functions.

### Accreditation shows training quality

Courses such as the maintenance and shift supervisor professional development seminars augment utilities’ extensive accredited training efforts. Key training programs of all operating nuclear power plants in the U.S. are accredited by the independent National Nuclear Accrediting Board. Following initial accreditation, utility training programs are reviewed for renewal by the Accrediting Board every four years. In 1994, the National Nuclear Accrediting Board renewed accreditation for 233 programs at 34 plants. Since 1988, when accreditation renewals began, the Accrediting Board has renewed the accreditation of about 95 percent of the utility training programs reviewed without additional follow-up action – positive evidence of the high quality of training in the nuclear industry and of the industry’s commitment to sustain that quality. Additionally, when the Board has placed training programs on probation, utility management has taken prompt and effective action to restore the quality of training programs so

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### 1994 National Academy Seminars and Courses

<table>
<thead>
<tr>
<th>Seminar</th>
<th>Number of 1994 Sessions</th>
<th>1994 Participants</th>
<th>Participants to Date</th>
<th>First Offered</th>
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<td><strong>CEO Seminar</strong></td>
<td>1</td>
<td>8</td>
<td>55</td>
<td>1988</td>
</tr>
<tr>
<td><strong>Reactor Technology Course for Utility Executives</strong></td>
<td>1</td>
<td>12</td>
<td>22</td>
<td>1993</td>
</tr>
<tr>
<td><strong>Senior Nuclear Executive Seminar</strong></td>
<td>2</td>
<td>20</td>
<td>121</td>
<td>1989</td>
</tr>
<tr>
<td><strong>Senior Nuclear Plant Management Course</strong></td>
<td>4</td>
<td>39</td>
<td>299</td>
<td>1986</td>
</tr>
<tr>
<td><strong>Shift Supervisor Professional Development Seminar</strong></td>
<td>8</td>
<td>83</td>
<td>236</td>
<td>1991</td>
</tr>
<tr>
<td><strong>Maintenance Supervisor Professional Development Seminar</strong></td>
<td>5</td>
<td>44</td>
<td>62</td>
<td>1993</td>
</tr>
<tr>
<td><strong>Control Room Teamwork Development Course</strong></td>
<td>53</td>
<td>950 (at 12 stations)</td>
<td>&gt; 4,000</td>
<td>1989</td>
</tr>
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</table>
that accreditation could be renewed. The National Academy conducted 37 accreditation evaluations in 1994, aided by 118 accreditation peers from member utilities. During the accreditation process, emphasis continued on the importance of comprehensive utility self-evaluations and line management involvement in the training of their personnel. Academy training coordinators assigned to each station helped focus the 52 training assistance visits in 1994 on these areas and other specific needs of the stations. In response to a 1993 review of INPO training and accreditation activities, a number of actions were taken in 1994 to better use industry operating experience to assess training effectiveness. These included increasing the involvement of INPO training personnel in reviewing and sharing industry event information as well as beginning to trend industry events and their causes to identify potential industrywide training enhancements. Additionally, greater emphasis was placed on using plant and human performance to determine training effectiveness. Efforts to enhance coordination between plant evaluation activities and training and accreditation activities included pilot simultaneous accreditation and plant evaluations.
"I believe the organization as well as the individuals benefit from job exchanges. New perspectives are brought to the job, and it helps the organization continue to move forward."
Pacific Gas and Electric Company vice president Warren Fujimoto knows firsthand the value of management development programs, including job rotation. In 1994, he left his corporate office in nuclear technical services to change places with then Diablo Canyon vice president and plant manager John Townsend. He says of the exchange, “I believe the organization as well as the individuals benefit from job exchanges. New perspectives are brought to the job, and it helps the organization continue to move forward. It adds value by creating a climate of positive change.” Fujimoto’s job rotation is part of a systematic management and leadership development program at PG&E that actively develops the skills of potential leaders. Up to 20 potential candidates for each key position are identified, as well as whether they would be ready for those positions now, in five years, or in the long term. Selected candidates are placed in training and rotational assignments designed to give them the skills needed for that position.

PG&E’s program is an example of the many utility efforts to improve management and leadership development. These utilities’ programs include many of the essential elements of effective management and leadership development processes outlined in a new INPO document, *Management and Leadership Development – Building on the Principles for Enhancing Professionalism*. The essential elements were developed by a Special Committee on Management and Leadership Development, established to address a growing concern about the need for increased management development at nuclear utilities. They describe a results-oriented process that
Analytical techniques help ensure that nuclear plant components operate reliably. Barry R. Sculthorpe, predictive maintenance assistant superintendent at St. Lucie Nuclear Power Plant, performs a bearing failure analysis.
supports the development of individuals with strong management and leadership potential, with responsibility for the success of development activities clearly assigned to senior managers. This process includes identifying high-potential individuals and developing and assessing that potential with challenging job assignments and other learning opportunities.

**Human performance key to progress**

As the number of equipment-related problems has declined, personnel and organizational performance factors have become more apparent in significant events. INPO’s Special Review Committee on Human Performance first met in early 1994 to examine ways to enhance human performance at nuclear power plants. The committee included representatives from the nuclear industry as well as human performance experts. Members used information developed by four working groups, as well as from INPO reports and data analyses, to identify ways to create a working environment that enhances human performance. These include cooperation between workers and managers to eliminate barriers to human performance improvements, making teamwork a fundamental way of doing business and management reinforcement of desired behaviors. The working groups played a key role in the committee’s research. Three of the working groups were composed of utility personnel, ranging from instrumentation technicians to senior vice presidents. The fourth working group, which included representatives of two INPO supplier participants as well as such companies as AT&T, Delta Air Lines and United Parcel Service, contributed human performance perspectives from outside the electric utility industry. Working group members identified human performance issues in their workplaces, and then discussed potential causes and solutions.
In September, an INPO team visited Kansai Electric Power Company’s Ohi Power Station to exchange information on operator training, particularly training to respond to abnormal or emergency conditions, as well as information on other aspects of plant operation. Ohi is north of Osaka on Japan’s western coast. The team included two industry peers, three INPO employees and a liaison engineer on loan to INPO from Kansai. After observing crews responding to emergency and abnormal scenarios in the simulator and discussing operator training, as well as observing other plant activities, the team noted a number of exemplary practices to share with the nuclear industry. In addition, team members made several suggestions based on experience at other plants that should prove beneficial to Ohi’s simulator training. The Japanese visit was one of 21 technical exchange visits to 11 international participants in 1994. Fifty-five INPO employees and 27 peers from U.S. and international utilities participated. These visits are part of the global exchange of information through the Institute’s international participant program. International participants operate more than 220 nuclear reactors in 14 countries. Throughout the year, the Institute staff shared international strengths in various ways, including during plant evaluation and assistance visits. International speakers were featured at several INPO workshops. In addition, 24 liaison engineers from 10 countries worked at INPO in 1994, while 12 INPO employees were on international assignments. INPO members also participated in WANO voluntary peer reviews. Seven were conducted in 1994, including two at U.S. plants, and up to 12 are planned for 1995. These voluntary peer reviews are patterned after INPO’s plant evaluations.
1994 WANO Performance Indicators

For the U. S. Nuclear Utility Industry
For the U.S. Nuclear Utility Industry

**Unit Capability Factor**

Unit capability factor is the percentage of maximum energy generation that a plant is capable of supplying to the electrical grid, limited only by factors within the control of plant management. A high unit capability factor indicates effective plant programs and practices to minimize unplanned energy losses and to optimize planned outages. The 1994 value is better than the 1995 goal and a marked improvement over performance in the mid-1980s.

**Unplanned Capability Loss Factor**

The unplanned capability loss factor is the percentage of maximum energy generation that a plant is not capable of supplying to the electrical grid because of unplanned energy losses, such as unplanned shutdowns or outage extensions. A low value indicates important plant equipment is well maintained and reliably operated and there are few outage extensions. Since 1980, the industry has made steady progress in controlling unplanned shutdowns and outage length.

**Unplanned Automatic Scrams**

The unplanned automatic scrams per 7,000 hours critical indicator tracks the median scram (automatic shutdown) rate for approximately one year (7,000 hours) of operation. Unplanned automatic scrams result in thermal and hydraulic transients that affect plant systems. The scram rate has been reduced by almost 90 percent since 1980, and has been better than the 1995 goal since 1993.
Nuclear plants with good performance, as measured by the World Association of Nuclear Operators (WANO) performance indicators, are generally recognized as well-managed plants. These plants usually are more reliable and can be expected to have higher margins of safety.

In recognition of this and in keeping with its mission to promote excellence and the highest levels of safety and reliability, the Institute of Nuclear Power Operations (INPO) collects U.S. industry data on key performance indicators and shares this information with its members and participants.

Performance data showing U.S. industry progress from 1980 to 1994 is shown graphically for nine selected WANO performance indicators. An additional index monitors progress in controlling certain chemical parameters to promote long-term reliability and performance of plant materials and components. These parameters are already being maintained within the strict guidance developed by the industry. Because data collection for an improved method of calculating the chemistry indicator began in 1994, trend data is not available.

Unit capability factor and unplanned capability loss factor performance trends before 1990 are estimated from available data.

Developing the U.S. program

The performance indicator program, now in its 12th year, was refined in 1985. Three special industry review groups joined INPO in developing a set of 10 performance indicators to monitor plant performance and promote long-term industry improvements. In 1985, each U.S. utility with an operating nuclear unit set challenging long-term 1990 goals for most of the overall indicators. These individual unit goals were averaged to determine industrywide targets.

Establishing an international program

In 1988, INPO began reviewing the U.S. performance indicator program to determine refinements that would be needed for 1990 and beyond. An ad hoc review group was formed, consisting of U.S. utility executives along with representatives of WANO, the International Union of Producers and Distributors of Electrical Energy, the Nuclear Management and Resources Council (now the Nuclear Energy Institute) and the Electric Power Research Institute.

This review group agreed on a set of performance indicators and definitions that nuclear operating organizations worldwide could use to support the exchange of performance information. In May 1989, the WANO Governing Board adopted these performance indicators for use by utilities worldwide. Worldwide data collection began in 1990, and the international exchange of indicator data has led to comparison of plant performance and emulation of the best international practices.

Setting U.S. 1995 goals

In 1990, each U.S. utility set long-term goals in the areas monitored by the international performance indicators. U.S. industry goals for 1995 were then developed from individual utility goals. The industry goals were reviewed by INPO's review and advisory groups, and finally by the INPO Advisory Council and Board of Directors. The 1995 goals for U.S. utilities provide the industry with challenging, achievable targets.

Looking beyond 1995

The performance indicator program has traditionally been reviewed at five-year intervals due to performance improvements and changes in the industry operating environment. In 1993 and 1994, an ad hoc group of industry executives, along with other industry groups and technical committees, reviewed the performance indicator program to determine the performance indicator definitions and approach to goal setting that would best serve the industry's needs after 1995.

The review indicated that the performance indicator program is providing useful management-level information. Refinements to improve the accuracy and usefulness of some of the indicators were suggested and will be implemented in 1995. Additionally, long-term performance goals for 2000 will be developed during 1995.
The collective radiation exposure indicator monitors the effectiveness of personnel radiation exposure controls for pressurized water reactors (PWRs) and boiling water reactors (BWRs). Low exposure indicates strong management attention to radiological protection. Worker exposure has been reduced significantly over the past decade.

This indicator monitors the volume of low-level solid radioactive waste produced per unit for pressurized water reactors and boiling water reactors. Minimizing radioactive waste reduces storage, transportation and disposal needs, lessening the environmental impact of nuclear power. The 1994 values continue to be better than 1995 goals.

The industrial safety accident rate tracks the number of accidents that result in lost work time, restricted work or fatalities per 200,000 work-hours. The nuclear industry continues to provide one of the safer industrial work environments, and the 1994 rate is substantially better than the accident rate of the electric services industry and of the private sector as a whole.
Mockups are important tools in the intensive job training at nuclear power plants. Tom Harrison (right), Brunswick technical training senior specialist, and mechanic first class James Peterson work with a reproduction of the reactor recirculation pump shaft seal.
Safety System Performance

The safety system performance indicator monitors the availability of three important safety systems at each plant. The industry's goal is to encourage a high state of readiness, with at least 85 percent of these systems meeting specific 1995 goals for availability in excess of 97 percent. The 85 percent target allows for normal year-to-year variations in individual system performance. The percentage of safety systems meeting the 1995 industry goals for availability has improved since tracking began in 1989 and has been better than the 1995 goal since 1992.

Fuel Reliability

The fuel reliability indicator monitors progress in preventing defects in the metal cladding that surrounds fuel. The long-term industry goal is that units should strive to operate with zero fuel cladding defects, even though minor defects pose no significant safety concern and are difficult to eliminate entirely. The graph shows the percentage of plants with no cladding defects apparent during steady state operation. The percentage has improved significantly since 1989, and the industry is using increasingly sophisticated monitoring to detect the smallest defects and take appropriate corrective action.

Thermal Performance

Thermal performance monitors how efficiently a plant converts thermal energy into electrical output. A low gross heat rate indicates high efficiency. For trending, the graph shows industry gross heat rate in British thermal units (BTUs) per kilowatt hour. Plants also measure thermal performance as the percentage of the design gross heat rate achieved. The industry goal is for individual units to strive to achieve 99.5 percent of design gross heat rate by 1995. In 1994, the industry median value was 99.4 percent. The 1994 gross heat rate shows continued improvements in efficiency.
INPO 1994
Annual Report

Financial Statements and Rosters
**Balance Sheets**
As of December 31, 1994 and 1993

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>1994</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Assets:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-term cash investments</td>
<td>$25,569,921</td>
<td>$19,220,089</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>852,882</td>
<td>935,952</td>
</tr>
<tr>
<td>Prepaid expenses</td>
<td>496,297</td>
<td>345,239</td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td>$26,919,100</td>
<td>$20,501,280</td>
</tr>
<tr>
<td><strong>Property and Equipment, at Cost:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>5,283,845</td>
<td>5,283,845</td>
</tr>
<tr>
<td>Building</td>
<td>19,790,509</td>
<td>19,732,977</td>
</tr>
<tr>
<td>Equipment and leasehold improvements</td>
<td>18,406,773</td>
<td>18,629,246</td>
</tr>
<tr>
<td>Accumulated depreciation and amortization</td>
<td>($14,302,755)</td>
<td>($11,927,171)</td>
</tr>
<tr>
<td><strong>Net property, at cost</strong></td>
<td>$29,178,372</td>
<td>$31,718,897</td>
</tr>
<tr>
<td>Bond Proceeds Held by Trustee</td>
<td>1,115,204</td>
<td>2,655,365</td>
</tr>
<tr>
<td>Other Noncurrent Assets</td>
<td>250,238</td>
<td>79,333</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$57,462,914</td>
<td>$54,954,875</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LIABILITIES AND MEMBERS’ AND PARTICIPANTS’ EQUITY</th>
<th>1994</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Liabilities:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current maturities of long-term debt</td>
<td>$1,280,000</td>
<td>$1,220,000</td>
</tr>
<tr>
<td>Accounts payable and accrued liabilities</td>
<td>2,601,042</td>
<td>1,988,983</td>
</tr>
<tr>
<td>Other accrued employee benefits</td>
<td>3,045,678</td>
<td>2,862,872</td>
</tr>
<tr>
<td><strong>Total current liabilities</strong></td>
<td>$6,926,720</td>
<td>$6,071,855</td>
</tr>
<tr>
<td>Long-Term Debt</td>
<td>21,335,000</td>
<td>22,615,000</td>
</tr>
<tr>
<td>Long-Term Portion of Employee Benefits</td>
<td>6,116,785</td>
<td>5,680,610</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td>$34,378,505</td>
<td>$34,367,465</td>
</tr>
<tr>
<td>Members’ and Participants’ Equity</td>
<td>$23,084,409</td>
<td>$20,587,410</td>
</tr>
<tr>
<td><strong>Total liabilities and members’ and participants’ equity</strong></td>
<td>$57,462,914</td>
<td>$54,954,875</td>
</tr>
</tbody>
</table>

The Balance Sheets do not include prepayments of members’ and participants’ assessments (i.e. payments of 1995 dues late in calendar year 1994 or 1994 dues late in calendar year 1993), which were $8,822,505 in 1994 and $7,873,312 in 1993.

INPO’s financial statements are audited by independent certified public accountants. Copies of the complete financial statements are available to members and participants upon request.
**Statement of Revenues and Expenses**
For the Years Ended December 31, 1994 and 1993

<table>
<thead>
<tr>
<th></th>
<th>1994</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td>REVENUES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member assessments</td>
<td>$43,497,948</td>
<td>$44,987,465</td>
</tr>
<tr>
<td>International and supplier fees</td>
<td>3,767,515</td>
<td>3,962,865</td>
</tr>
<tr>
<td>Interest income</td>
<td>1,709,043</td>
<td>1,193,556</td>
</tr>
<tr>
<td>Other income</td>
<td>4,852,575</td>
<td>4,332,599</td>
</tr>
<tr>
<td><strong>Total revenues</strong></td>
<td><strong>53,827,081</strong></td>
<td><strong>54,476,485</strong></td>
</tr>
<tr>
<td>EXPENSES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries and benefits</td>
<td>31,044,118</td>
<td>32,533,952</td>
</tr>
<tr>
<td>Travel and relocation</td>
<td>5,480,072</td>
<td>5,478,879</td>
</tr>
<tr>
<td>Computer services and telecommunications</td>
<td>2,494,201</td>
<td>3,338,714</td>
</tr>
<tr>
<td>Outside services</td>
<td>2,470,574</td>
<td>2,816,656</td>
</tr>
<tr>
<td>Training, workshops and meetings</td>
<td>1,049,141</td>
<td>1,110,179</td>
</tr>
<tr>
<td>Scholarships and fellowships</td>
<td>988,750</td>
<td>970,750</td>
</tr>
<tr>
<td>General and administrative</td>
<td>4,409,005</td>
<td>4,727,999</td>
</tr>
<tr>
<td>Depreciation</td>
<td>3,394,221</td>
<td>3,542,306</td>
</tr>
<tr>
<td><strong>Total expenses</strong></td>
<td><strong>51,330,082</strong></td>
<td><strong>54,519,435</strong></td>
</tr>
<tr>
<td>Excess of revenues over expenses or of (expenses over revenues)</td>
<td>$2,496,999</td>
<td>($42,950)</td>
</tr>
</tbody>
</table>

*Under the terms of Indemnity Agreements between INPO and its member utilities, INPO has obtained Directors and Officers Liability Insurance in the amount specified in the agreements. The cost of this coverage is included in general and administrative expenses.*
Board of Directors

Jerry Harrington – Chairman
Texas Utilities Company

Daniel A. Boltom
Wisconsin Public Service Corporation

Robert J. Farling
Centerior Energy Corporation

Zack T. Pate
Institute of Nuclear Power Operations

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Carolina Power & Light Company

James T. Rhodes
Virginia Power

Bernard M. Fox
Northeast Utilities

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PECO Energy Company

George W. Davis
Boston Edison Company

John D. Townsend
Pacific Gas and Electric Company

Phillip R. Clark Sr.
GPU Nuclear Corporation

Ronald W. Watkins
Nebraska Public Power District
## Members

- Arizona Public Service Company
- Baltimore Gas and Electric Company
- Boston Edison Company
- Carolina Power & Light Company
- Centerior Energy Corporation
- Commonwealth Edison Company
- Consolidated Edison Company of New York, Inc.
- Consumers Power Company
- The Detroit Edison Company
- Duke Power Company
- Duquesne Light Company
- Entergy Operations, Inc.
- Florida Power Corporation
- Florida Power & Light Company
- GPU Nuclear Corporation
- Georgia Power Company
- Houston Lighting & Power Company
- IES Utilities Inc.
- Illinois Power Company
- Indiana Michigan Power Company
- Maine Yankee Atomic Power Company
- Nebraska Public Power District
- New York Power Authority
- Niagara Mohawk Power Corporation
- North Atlantic Energy Service Corporation
- Northeast Utilities
- Northern States Power Company
- Omaha Public Power District
- PECO Energy Company
- Pacific Gas and Electric Company
- Pennsylvania Power & Light Company
- Public Service Electric and Gas Company
- Rochester Gas and Electric Corporation
- South Carolina Electric & Gas Company
- Southern California Edison Company
- Southern Nuclear Operating Company
- TU Electric
- Tennessee Valley Authority
- Union Electric Company
- Vermont Yankee Nuclear Power Corporation
- Virginia Power
- Washington Public Power Supply System
- Wisconsin Electric Power Company
- Wisconsin Public Service Corporation
- Wolf Creek Nuclear Operating Corporation

## Associate Members

- Allegheny Electric Cooperative, Inc.
- Arkansas Power & Light Company
- Atlantic City Electric Company
- Bangor Hydro-Electric Company
- Cajun Electric Power Cooperative, Inc.
- Carolina Electric Cooperative
- Central Hudson Gas & Electric Corporation
- Central Iowa Power Cooperative
- Central Power and Light Company
- City of Anaheim Public Utilities
- City of Austin Electric Utility Department
- City of Chicopee Municipal Lighting Plant
- City of Riverside Public Utilities Department
- City Public Service Board (San Antonio, Texas)
- Commonwealth Energy System
- Corn Belt Power Cooperative
- Delmarva Power & Light Company
- Department of Water and Power, City of Los Angeles
- El Paso Electric Company
- Gulf States Utilities Company
- Hudson Light & Power Department
- Iowa-Illinois Gas and Electric Company
- KG&E, A Western Resources Company
- Kansas City Power & Light Company
- Kansas Electric Power Cooperative, Inc.
- Long Island Lighting Company
- Louisiana Power & Light Company
- Madison Gas and Electric Company
- Maine Public Service Company
- Massachusetts Municipal Wholesale Electric Company
- Municipal Electric Authority of Georgia
- New England Power Company
- New York State Electric & Gas Corporation
- North Carolina Eastern Municipal Power Agency
- North Carolina Municipal Power Agency Number 1
- Oglethorpe Power Corporation
- Ohio Edison Company
- Pennsylvania Power Company
- Piedmont Municipal Power Agency
- Public Service Company of New Mexico
- Salt River Project Agricultural Improvement and Power District
- Saluda River Electric Cooperative, Inc.
- San Diego Gas & Electric
- South Carolina Public Service Authority
- Southern California Public Power Authority
- Soyland Power Cooperative, Inc.
- Taunton Municipal Lighting Plant
- The United Illuminating Company
- Wisconsin Power & Light Company
Operating experience is shared throughout the world through NUCLEAR NETWORK®. Moriyasu Abe, on loan to INPO from Tokyo Electric Power Company, reads a NETWORK entry.

**International Participants**

- **Belgium**
  - Electrabel

- **Brazil**
  - FURNAS Centrais Elétricas S.A.

- **Canada**
  - Ontario Hydro

- **France**
  - Electricité de France

- **Germany**
  - Technische Vereinigung der Grosskraftwerksbetreiber e.V.

- **Japan**
  - Central Research Institute of Electric Power Industry

- **Korea**
  - Korea Electric Power Corporation

- **Mexico**
  - Comision Federal de Electricidad

- **Slovenia**
  - Nuklearna Elektrarna Krsko

- **South Africa**
  - Eskom

- **Spain**
  - UNESA

- **Sweden**
  - Nuclear Training and Safety Center

- **Taiwan, R.O.C.**
  - Taiwan Power Company

- **United Kingdom**
  - Nuclear Electric plc

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  - Nuclear Training and Safety Center

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  - Comision Federal de Electricidad

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  - Electricité de France

- **George Jenkins**
  - 1995-96 Vice Chairman
  - Nuclear Electric plc

- **Isao Tanaka**
  - 1995-96 Vice Chairman
  - Central Research Institute of Electric Power Industry

- **Francisco Bilbao**
  - UNESCO

- **Juergen Buettner**
  - Technische Vereinigung der Grosskraftwerksbetreiber e.V.

- **Willy De Roovere**
  - Electrabel

- **Pedro J. Figueiredo**
  - FURNAS Centrais Elétricas S.A.

- **Ron Lewis**
  - Ontario Hydro

- **Eng Lin**
  - Outgoing member
  - Taiwan Power Company

- **Brian Oaten**
  - Eskom

- **Stane Rozman**
  - Nuklearna Elektrarna Krsko

- **Morgan Tsai**
  - Taiwan Power Company

- **Moo Sun Yu**
  - Korea Electric Power Corporation
Supplier Participants

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Atomic Energy of Canada Limited
B&W Nuclear Technologies
Bechtel Corporation
Fluor Daniel, Inc.
General Electric Company
Gilbert Associates, Inc.
Hitachi, Ltd.
Mitsubishi Group
Raytheon Engineers & Constructors, Inc.
Sargent & Lundy
Siemens AG
Stone & Webster Engineering Corporation
Toshiba Corporation
Westinghouse Electric Corporation

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Hiroyasu Hayakawa
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Toshiba Corporation

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Sargent & Lundy

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Ryuzo Masuoka
Hitachi, Ltd.

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Mitsubishi Group

Dan A. Nauman
Siemens AG

Ian C. Rickard
ABB Combustion Engineering, Inc.

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Fluor Daniel, Inc.

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Aircraft Owners and Pilots Association’s Air Safety Foundation

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Radian Corporation

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Winston & Strawn

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Aubrey C. Daniels and Associates

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Chemical Bank

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Rutgers University

Salomon Levy, Ph.D.
Levy & Associates

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University of Arizona

Lynn M. Shishido-Topel, Ph.D.
Illinois Commerce Commission

Warren Sinclair, Ph.D.
National Council on Radiation Protection & Measurements

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Electric Power Research Institute

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Southern Nuclear Operating Company

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Rear Admiral, U. S. Navy (retired)

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Formerly of Emory University

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Arizona Public Service Company (retired)

A. Francis DiMeglio (4)
Rhode Island Atomic Energy Commission (retired)

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Public Service Electric and Gas Company

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University of Missouri

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Duke Power Company

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Professional Communication Consultants, LTD

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Virginia Polytechnic Institute and State University

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Bellocore Training and Education Center

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Rochester Gas and Electric Corporation

William L. Stewart (1)
Arizona Public Service Company

Wes M. Taylor (1)
TU Electric

David A. Ward (4)
E.I. du Pont de Nemours and Company (retired)

Ward O. Winer, Ph.D. (3)
Georgia Institute of Technology

Warren F. Witzig, Ph.D. (3)
Pennsylvania State University

National Nuclear Accrediting Board

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Baltimore Gas and Electric Company

Garry L. Randolph
1995 Chairman
Union Electric Company

Curtis Coggin
Georgia Power Company

Joseph K. Gasper
Omaha Public Power District

C. Randy Hutchinson
Entergy Operations, Inc.

Gregory J. Maxfield
Wisconsin Electric Power Company

Otto L. Maynard
Wolf Creek Nuclear Operating Corporation

L. William Pearce Jr.
Commonwealth Edison Company

Arthur R. Shean
Maine Yankee Atomic Power Company

Clark R. Steinhardt
Wisconsin Public Service Corporation

Stephen L. Swalls
IES Utilities Inc.

Thomas P. Walsh
Consolidated Edison Company of New York, Inc.

Academy Council

(1) Utility Executive

(2) Non-nuclear Industrial Training Expert

(3) Member of the Postsecondary Education Community

(4) Nominated by the Nuclear Regulatory Commission
Brunswick radiation control supervisor Raymond Foy (left) coaches technician Mike Humphrey during a routine radiological survey.
INPO

PRESIDENT and CHIEF EXECUTIVE OFFICER
Zack T. Pate

Claude C. Cross
Vice President and Assistant to the President

J. David Hembree
Assistant to the President and Corporate Secretary

Government Relations
William R. Kindley
Vice President

Industry Relations and Information Services
Angelina S. Howard
Vice President

Communications Division
Philip N. McCullough
Director

Information Systems Division
Bernard J. LaScala
Director

International and Supplier Division
Stanley J. Anderson
Vice President and Director

EXECUTIVE VICE PRESIDENT and CHIEF OPERATING OFFICER
Terence J. Sullivan

Plant Evaluation Division
Alfred C. Tollison Jr.
Vice President and Director

Corporate Support Division
Mark A. Peifer
Director

Plant Operations Division
Paul J. Borer
Director

Plant Support Division
Donald L. Gillispie Jr.
Director

Administration
Carroll J. Ver Steeg
Vice President, Director and Corporate Treasurer

Vice President, Corporate Support Division
Mark A. Peifer

Comptroller
David W. Weeks

Training and Education
William T. Subalusky
Vice President and Executive Director
National Academy for Nuclear Training

WANO, Atlanta Center
Stanley J. Anderson
Director

LEGAL COUNSEL
King & Spalding
Atlanta, Georgia

INDEPENDENT AUDITORS
KPMG Peat Marwick LLP
Atlanta, Georgia

EXECUTIVE OFFICES
700 Galleria Parkway, NW
Atlanta, GA 30339-5957
Telephone 404-644-8000
FAX 404-644-8549

Legal thanks to Brunswick Nuclear Plant, Callaway Nuclear Plant, Diablo Canyon Power Plant, Nine Mile Point Nuclear Station, and St. Lucie Nuclear Power Plant for their assistance with the photography in this annual report.