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PREOPERATIONAL REVIEW

AND

ASSISTANCE VISIT

TO

SEABROOK STATION

November 1987

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INSTITUTE OF NUCLEAR POWER OPERATIONS

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SUMMARY

The Institute of Nuclear Power Operations (INPO) conducted an assistance visit to Seabrook Station during the weeks of November 2 and 9, 1987. Seabrook is a 1150-MWe Westinghouse PWR that completed fuel loading in October 1986 and is awaiting a low power operating license.

INPO reviewed site activities to assist in the station's preparation and readiness for operating in a safe and reliable manner. Areas reviewed included station organization and administration, operations, maintenance, technical support, training and qualification, radiological protection, chemistry, and operating experience review. Information was assembled from discussions, interviews, observations, and reviews of documentation. Corporate support activities were not included in the scope of the review, except as an incidental part of the team's effort to assist the station in preparing to operate.

As a basis for the preoperational review and assistance visit, INPO used its April 1987 Performance Objectives and Criteria for Operating and Near-term Operating License Plants; these were applied in light of the experience of team members, INPO's observations, and good practices within the industry.

INPO's goal is to assist member utilities in achieving the highest standards of excellence in nuclear plant operation. The recommendations in each area are based on best practices, rather than minimum acceptable standards or requirements. Accordingly, areas where improvements are recommended are not necessarily indicative of unsatisfactory performance.

The recommendations are the result of the team's evaluation compared to the performance objectives. These recommendations were covered in more depth in dialogue between team members and your personnel.

In summary, we were favorably impressed by the following:

- The teamwork of plant staff, their professional approach and cooperation between departments, and overall positive attitude.
- The exemplary material condition and housekeeping in containment and primary plant systems and areas.
- The organization and procedure structure, along with the substantial personnel experience in key positions indicating the station is well positioned for startup operations.

Recommendations were made in a number of areas. The following are considered to be among the most important areas in need of improvement:

1. The effectiveness of licensed operator training on the simulator.
   a. Some errors are not critiqued, thereby missing opportunities for performance improvement.

b. Some critiques are incomplete and do not describe expected operator response and the basis for the correct action.

c. Opportunities for simulator training instructors to improve operating team performance are missed.

2. Continuing training programs in areas other than licensed operator training.

a. Industry and in-house experience is not always incorporated.

b. Plant modification or procedure changes are not always incorporated.

c. Refresher training in selected areas is not being conducted.

3. Preparations for working with radioactivity.

a. Radiation worker training and skills need improvement.

b. Health physics and chemistry technicians need additional training and practical work to enhance their knowledge and skills.

c. Provisions are needed for radiological controls over locked areas, vacuum cleaners, and ventilation units.

4. Some management decisions or actions which have been deferred.

a. A comprehensive layup program for secondary systems needs to be developed.

b. Decisions are needed on systems for processing radioactive waste.

c. The program for performance monitoring of plant equipment should be implemented.

5. The evaluation of operating experience and incorporation of lessons learned.

a. Events categorized at significant by others need to be evaluated.

b. In-house event evaluations need to be strengthened.

c. SOER recommendation implementation needs improvement.

6. Development and implementation of plans to compensate for non-licensed operator personnel losses and to increase the number of licensed operators.

Specific recommendations are listed under the performance objectives to which they pertain, and describe conditions that should assist Seabrook in meeting the performance objectives. Additional supporting details for selected recfommendations are provided in the Appendix. Particularly noteworthy conditions that contribute to meeting performance objectives are identified as good practices. The recommendations were presented to New Hampshire Yankee management at an exit meeting on November 24, 1987.

During INPO's next evaluation of Seabrook, the evaluation team will review the results of this assistance visit as part of their preparation for the evaluation and as part of their on site activities.

ORGANIZATION AND ADMINISTRATION

STATION ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Station organization and administration should ensure effective implementation of policies and the planning and control of station activities.

Good Practice (OA.1-1) Commitments implemented in procedures are effectively maintained in-force by using "protected" procedure steps. These steps are identified in the body of the procedure with an appropriate reference (in the reference section) to the commitment. These procedure steps are not changed without first verifying that the change does not violate the intent of the commitment or a commitment modification has been obtained.

MANAGEMENT OBJECTIVES

PERFORMANCE OBJECTIVE: Formal management objectives should be used to improve station performance.

Recommendation (OA.2-1) Develop a set of long-term station goals to provide direction for the annual goals program and to support the industry long-term goals effort. Although annual goals have been developed, long-term goals have not been established. The goals and objectives program should reflect the business plans of the utility and goals for power operation for the plant and support group.

PERSONNEL PLANNING AND QUALIFICATION

PERFORMANCE OBJECTIVE: Personnel programs should ensure that station positions are filled by highly qualified individuals.

Recommendation (OA.4-1) Establish a management development program to develop qualified candidates for key corporate and station positions. Elements of this program should address the following:

a. Identify key positions and prerequisite skills and experience.

b. Identify potential candidates for development.

c. Inventory skills and experience of candidates in relation to skills and experience needed for key positions

d. Provide training or position opportunities to develop needed skills and experience.

e. Periodically review the program to assess progress of candidates and identify additional candidates as needed.

The Edison Electric Institute/INPO manual, Human Resource Management: A System Description, may be of assistance in this effort.

Recommendation (OA.4-2) Develop and implement a comprehensive human resource management plan in the operations area to assure adequate numbers of licensed operators will be available to support the long-term operational needs of the station. The recent high turnover rate of auxiliary operators has impacted the ability to conduct initial operator license training. The number of auxiliary operators filling positions designated for training status has decreased from 15 to 2 in eight months. An initial license class planned to start in early 1988 may be deferred due to non-availability of candidates.

INDUSTRIAL SAFETY

PERFORMANCE OBJECTIVE: Station industrial safety programs should achieve a high degree of personnel safety.

Recommendation (OA.5-1) Improve adherence to station industrial safety policies. Policies related to wearing of personal protective equipment and the use of ladders and scaffolds are often not followed. The following types of problems exist:

a. Many personnel were observed not wearing eye protection, hard hats, ear protection, safety belts, and other protective equipment where required. For example, three electricians performing battery testing did not wear gloves or aprons, and one of these individuals with prescription glasses did not use side shields.

b. Personnel were also observed working at heights or climbing without required safety belts.

c. Many scaffolds and temporary platforms were missing required hand rails or toe boards, and several portable ladders were not tied-off.

QUALITY PROGRAMS

PERFORMANCE OBJECTIVE: Quality programs should effectively monitor activities that affect safe and reliable plant operation, provide feedback to line management on quality of performance, and contribute to improved performance.

Recommendation (OA.7-1) Establish the desired role of quality control, and communicate it effectively to all personnel. Strong differences of opinnion exist between the quality control group and station line managers related to the level of quality control activity, the significance of some quality control deficiencies, and the method of resolution of these deficiencies. These differences detract from line management's use of the quality organization to improve station performance. Areas where differences were noted include the following:

a. level of quality control activity

Hold points are normally added to work instructions by quality control during job package reviews. The number of hold points added and the type of inspections performed are perceived by line managers to be in excess of what is needed to verify the quality of work. Quality organization managers disagree, believing the level of inspection and review is appropriate for the quality of performance observed. Guidelines for establishing hold points that are understood and supported by both the line organization and quality control have not been developed.

b. threshold for reporting quality control identified deficiencies

Line managers perceive that a large portion of quality control deficiencies are below the level of significance that would warrant formal reporting. Quality control managers feel that their role is to report all deviations regardless of significance or on-the-spot correction. Guidelines for the reporting of quality control deficiencies that are

understood and supported by both the line organization and quality control have not been developed.

c. method of resolving quality control identified deficiencies

Until recently, all quality control deficiencies required formal investigation, problem resolution, and response by station staff, even when satisfactory resolution was achieved on the spot. Line managers expressed concern that the volume of reports and the effort to investigate and respond to each one represents a significant amount of time. A recent change permits quality control to designate whether or not a response is required. Station line managers are uncertain this change will be effective in reducing the administrative workload associated with quality control reporting.

FITNESS-FOR-DUTY PROGRAM

PERFORMANCE OBJECTIVE: The fitness-for-duty program should identify persons who are unfit for their assigned duties as a result of drug or alcohol use, or other physical or psychological conditions, and remove them from such duty and from access to vital areas of the plant. In addition, the program should provide for a drug-free working environment.

Recommendation (OA.8-1) Strengthen the fitness-for-duty program by ensuring supervisory personnel attend training/retraining in behavioral observation and by periodically providing employees with information on the effects of drug and alcohol abuse and important aspects of the program. The following problems were observed:

a. Training records indicate approximately 20 percent of supervisors are overdue for initial or recurring training in behavioral observation. In addition, quotas available for this training are not fully utilized.

b. Employees (other than supervisors) have not received information on the effects of drug and alcohol abuse.

c. Periodic training on important aspects of the fitness-for-duty program was to have been implemented in general employee retraining;

however, the instructor guides for this training do not include coverage of any aspects of the fitness-for-duty program.

d. Observed general employee retraining did not address important aspects of the fitness-for-duty program such as chemical testing, employee assistance, or co-worker responsibilities.

OPERATIONS

OPERATIONS ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Operations organization and administration should ensure effective implementation and control of operations activities.

Recommendation (OP.1-1) Upgrade administrative controls for some operations department activities. The following actions need to be taken:

a. Apply independent verification to components with remote indication in the control room. Valves and other components that have indication in the control room are excluded from the independent verification program.

b. Provide a means for control room operators to identify and track the status of deficient control room instrumentation. Currently, deficient control room instrumentation is entered into the maintenance system but is not marked or tracked to ensure control room operators are aware of its status. Also, although a list of computer generated (video) alarms which have been inhibited is available from the computer, operators are not required to discuss the status of these alarms during shift turnover.

c. Require appropriate contingency action, such as additional monitoring of local conditions or redundant indicators, for equipment parameters masked by deficient remote alarms or instruments. A number of video alarms such as "SW CATHODIC PROTECTION LOST" have been inhibited for various reasons. However, additional monitoring has not been implemented to ensure that abnormal or degraded conditions are detected.

d. Provide minimum and maximum acceptable values for equipment parameters required to be monitored during auxiliary operator rounds. Only a few parameters are provided acceptance limits on auxiliary operator logs. When questioned, auxiliary operators were unsure when some parameters were abnormal.

e. Periodically inspect plant areas for unauthorized tags and for proper placement of authorized tags. Tagging administrative instructions do not require an in-plant tag audit although this was recommended in a prior INPO assistance visit. As a result, a number of unauthorized caution tags are attached to plant components. For example, caution tags numbered 85-117 and 85-119 are attached to valves 1-IA-V-0326 and 0327. These tags advise that "...air blows are in progress. Do not change valve position." However, blowdown of the instrument air header for moisture and particulate removal has been completed for some time. There is no current tagging order for these tags. In addition, many tags from the construction and startup period are attached to plant components. These tags are no longer applicable and need to be removed.

INPO documents 85-017, Guidelines for the Conduct of Operations at Nuclear Power Stations, and 87-003 (Good Practice OP-214), Independent Verification, should be of assistance in these efforts.

PLANT STATUS CONTROLS

PERFORMANCE OBJECTIVE: Operations personnel should be cognizant of the status of plant systems and equipment under their control and should ensure that systems and equipment are controlled in a manner that supports safe and reliable operation.

Recommendation (OP.3-1) Discontinue the use of caution tags as a substitute for approved operating procedures. A number of caution tags contain operating information more appropriately placed in operating procedures. For example, caution tag 86-3840 located on the main control board handswitch for steam generator blowdown, instructs the operator to valve-in cooling water to the steam generator wet layup pump seal when system water temperature rises above 150 degrees F. This operation is not included in the system operating procedure and therefore has bypassed the normal procedure change and review process.

OPERATIONS PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Operations procedures and documents should provide appropriate direction and should be effectively used to support safe operation of the plant.

Recommendation

Improve the application of human factors to the emergency operating procedures. The following actions should be taken:

a. Provide specific identification for components and instruments. Many steps in the emergency procedures provide general guidance such as "Verify power to the AC emergency busses" or "Take manual control of main FW FCVs and close all valves." The specific components required for proper performance of these steps should be identified to ensure the operator can positively identify the correct component.

b. Provide appropriate ranges for parameters the operator is required to monitor or control. For example, procedure ES-0.2, step 6c states, "Maintain SG narrow range level - at 50%." Steam generator level is difficult to maintain precisely. An acceptable range for steam generator level would be appropriate in this instance. Another example is procedure ECA-0.0, step 14b, which requires the operator to "Monitor DC volts and amps" but does not provide acceptable ranges for these parameters.

c. Refer to a specific normal plant operating procedure when exiting the emergency operating procedures. Frequently, the emergency procedures direct the user to exit to "Appropriate normal plant procedures." A better practice is to provide a specific procedure number and title the operator is expected to enter at that point.

d. Highlight information contained in notes so that this type of information is easily recognized by the procedure user. Notes throughout the emergency procedures do not standout from normal text, and the potential for this information to be missed during procedure execution is increased.

Good Practice (OP.5-2)

Important operating references and records are effectively organized and centrally located for operator use. References and records such as operating procedures, locked valves list,

technical specifications, abnormal statement status sheets, standing orders, and night orders are in well labeled binders. These records are kept in a cabinet labeled for each binder in the control room behind the unit shift supervisor's desk. This arrangement and location provide rapid access to these records by control room personnel.

Good Practice (OP.5-3) Valve reference books provide exact locations for all valves in the plant. Plant valves are listed sequentially by valve number for easy reference. In addition to valve location, the books list the piping and instrumentation drawing and the location on the drawing where the specific valve can be found. This aids operators in locating infrequently operated valves.

Good Practice (OP.5-4) Pre-fire strategy binders are provided in fire equipment breakout lockers to aid firefighters in combating plant fires. The pre-fire strategy binders include plant layout drawings annotated with essential firefighting information. Through the use of color coding and symbols, the drawings depict room layout, location of equipment such as fire hoses, extinguishers, communications stations, stairwell locations, potential radiation areas, and the relative importance of equipment to plant operation and reactor safety. Additionally information on chemical hazards, room construction, and ventilation is included in the binders.

MAINTENANCE

PLANT MATERIAL CONDITION

PERFORMANCE OBJECTIVE: The material condition of the plant is maintained to support safe and reliable plant operation.

Recommendation (MA.2-1) Improve the material condition of balance-of-plant components and piping that are corroding due to lack of protective coating. The following are examples of problems noted:

a. The main condenser water boxes and circulating water inlet and outlet pipes have had the original anti-sweat protective coating removed due to blistering. As a result, these components are exhibiting extensive surface corrosion.

b. The flange bolts for the circulating water intake and discharge butterfly valves and expansion joints to the condenser are heavily corroded.

c. Circulating water pump suction and discharge piping and flange bolts are rusting. A general deterioration of protective coating is evident.

d. Many pipe welds were not painted following welding and inspection and are presently rusting. Of particular note are a number of rusting weld areas in the emergency feedwater system.

WORK CONTROL SYSTEM

PERFORMANCE OBJECTIVE: The control of maintenance work should support the completion of tasks in a safe, timely, and efficient manner such that safe and reliable plant operation is optimized.

Recommendation (MA.3-2) Improve the work request planning process to reduce delays encountered during job performance. Develop guidelines that define the responsibilities of system engineers and planners in the preparation of work request packages. Ensure work request packages clearly define the scope of the work to be performed. Identify and resolve problems that contribute to delays in the work request package planning process. A review of a representative sample of work request packages and interviews with personnel involved in work planning and work performance revealed the following planning problems:

a. Jobs are not consistently walked-down to verify that the scope of the work request is correct and adequate. For example, a 1 1/2 hour delay occurred prior to the start of motor-operated valve testing in the emergency feedwater system due to a required work package scope change. The same test had been performed on two other valves the previous two days requiring the same scope change, but this information was not incorporated into related work packages.

b. Spare parts are not staged prior to releasing a work request to the appropriate repair shop. As a result, the parts may not be available when needed.

c. Equipment tag-out boundaries are not defined as part of the work request package. For example, one work package initiated during the evaluation did not include drawings of the piping configuration, and the work request specified tagging "as-required." The work crew determined that tagging would be required. Operations was notified and requested the work crew to sketch the piping configuration and isolation points to expedite the tag-out. Finally, the job was delayed until the following day when the equipment could be properly isolated.

d. Planners spend up to eight hours per work request package reviewing controlled drawings for unincorporated design changes that may impact the scope of the work request.

e. A method is not available for maintenance personnel to provide feedback that would assist in improving the quality of work request packages.

MAINTENANCE FACILITIES AND EQUIPMENT

PERFORMANCE OBJECTIVE: Facilities and equipment should effectively support the performance of maintenance activities.

Good Practice (MA.8-1) Seabrook station personnel have designed a load cell that streamlines testing of motor-operated valves with Rotork actuators. This design allows installation of the load cell in place of the coupling between the actuator stem and the valve stem eliminating the need to remove the actuator from the valve. This substantially reduces the time and work effort required to obtain stem thrust data.

Recommendation (MA.8-2) Maintenance shop facilities should be upgraded to effectively support plant operations. This recommendation was previously made as a result of the 1986 INPO assistance visit. The following problems were noted during tours of existing maintenance facilities:

a. The instrument and control shops are cramped and overcrowded. Sufficient storage space is not available for vendor manuals, spare parts, test equipment, and tools.

b. The maintenance shop for mechanics and electricians is congested and lacks adequate electrical work area.

c. Facilities are not provided for maintenance shop work on contaminated equipment or storage of contaminated tools.

d. A 20 by 30 foot room in the waste processing building has been designated for decontamination of equipment and tools. Decontamination equipment installed consists of a two basin sink that can be used for manual decontamination of relatively small items. Industry practice is to have ultrasonic cleaners, freon cleaners, and/or abrasive cleaners available.

e. Special tools, jigs, and fixtures have not been inventoried and stored in designated areas.

TECHNICAL SUPPORT

TECHNICAL SUPPORT ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Technical support organization and administration should ensure effective implementation and control of technical support.

Recommendation (TS.1-1) Provide guidance and direction to system engineers to identify responsibilities and management expectations. Guidance should ensure a consistent understanding of system engineer responsibilities as they relate to temporary modification, component and system performance trending, root-cause analysis, work request reviews, and safety reviews of modifications. Guidance should also clearly communicate management's expectations with regard to system engineer involvement in system related evolutions such as surveillance testing, maintenance activities, and modification implementation. Interviews with a number of system engineers indicate a wide variance in understanding of system engineer functions and responsibilities. A similar issue was identified in the 1986 INPO assist visit.

Additionally, appropriate training on subjects such as reactor physics, administrative, controls and system and component design and operation should also be provided to members of the technical staff such as reactor engineers, system engineers, and engineering support personnel. Although a job-task analysis was recently completed to identify training needs, currently the technical staff receives neither initial or continuing training.

PLANT MODIFICATIONS

PERFORMANCE OBJECTIVE: Plant modification programs for permanent and temporary modifications should ensure proper design, review, control, implementation, and documentation of plant design changes in a timely manner.

Recommendation (TS.3-1) Revise the administrative controls for temporary modifications to require that controlled drawings and procedures be marked-up to identify installed temporary modifications. Presently, when temporary modifications are initiated, a sticker is attached to the effected drawings to indicate that system configuration has been changed. Marked-up copies of the affected drawings are attached to the temporary modification requests. To determine system configuration, personnel must review the marked-up drawings attached to the temporary modification against the controlled copy. With multiple changes outstanding against a drawing

plant personnel are unable to determine system configuration by reviewing a single drawing and sometimes rely instead on other uncontrolled documents. For example, a problem was observed when an operator was preparing to tagout a temporary modification in the chlorination building. To prepare the tagout the operator used two hand-drawn sketches prepared by the maintenance department rather than the controlled piping and instrument diagram and the temporary modification drawing.

In addition, the planning department sometimes experiences delays in preparing work packages since system configuration must be determined from multiple drawings.

PLANT PERFORMANCE MONITORING

PERFORMANCE OBJECTIVE: Performance monitoring activities should optimize plant reliability and efficiency.

Recommendation (TS.5-1) Implement a performance monitoring program to assess performance of equipment in-service and to obtain baseline data during initial plant heat-up and low power physics testing. An overall plant performance monitoring program procedure and several component monitoring procedures have been developed but not approved or implemented. Systems presently in service that should be monitored include residual heat removal, fire protection, and cathodic protection. A similar issue was identified in the 1986 INPO assist visit.

TRAINING AND QUALIFICATION

TRAINING ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: The training organization and administration should ensure effective implementation and control of training activities.

Recommendation (TQ.1-1) Implement continuing training programs for instrumentation and control technicians, electrical and mechanical maintenance personnel, health physics technicians, chemistry technicians, and the technical staff that provide timely, systematic coverage of the following:

a. industry and in-house operating experience

b. plant modifications

c. procedure changes

d. refresher training for selected areas of the initial training programs

e. training on infrequently performed or difficult tasks that affect safe and reliable plant operation

Interviews with the responsible line managers confirm that the listed areas lack formal programs, although the instrumentation and control and health physics groups do provide limited coverage of industry events. In these two areas, the line managers acknowledged there is little effort at extracting training information from the event as it may apply to the plant, and that the process is very informal. It consists primarily of a notification of the fact that a particular event has happened.

GENERAL EMPLOYEE TRAINING

PERFORMANCE OBJECTIVE: General employee training should ensure that plant personnel, contractors, and visitors have a basic understanding of employee responsibilities and safe work practices and have the knowledge and practical abilities necessary to effectively implement radiological protection practices associated with their work.

Recommendation (TQ.4-1) Ensure all personnel are proficient in radiological protection skills before working in radiologically controlled areas. Improve individual demonstration of practical abilities in radiological protection during the initial and continuing

General Employee Training programs. INPO 87-004, Guidelines for General Employee Training, should be used in this effort.

The following are examples of deficiencies noted in general employee retraining:

a. The proper method of donning and removing protective clothing is not demonstrated.

b. The number of students and short time allotted for General Employee Training practical exercises prevented the instructors from effectively evaluating all individual performance objectives.

c. Lesson plans, objectives, and performance checklists were not used by the instructors during the practical portion of training.

NON-LICENSED OPERATOR TRAINING AND QUALIFICATION

PERFORMANCE OBJECTIVE: The non-licensed operator training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

Recommendation (TQ.5-1) Improve auxiliary operator continuing training to provide timely, job-specific training on industry and in-house operating events, plant modifications, and changes to procedures. Currently, auxiliary operators attend licensed operator "update" training, which is not specific to the auxiliary operator position, and are responsible for reading the auxiliary operator operational review notebook. These two training methods have not been effective in teaching lessons learned from industry events.

LICENSED OPERATOR TRAINING AND QUALIFICATION

PERFORMANCE OBJECTIVE: The licensed operator training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

Good Practice (TQ.6-1) Individual interviews with licensed operators are used to evaluate requalification training program effectiveness and to solicit input for training needs.

An interview guideline, reviewed by both operations and training management, is used to conduct interviews. Results of the interviews are confidential and are collated into a

report for review by the curriculum advisory committee. The report is used as a basis document for requalification program revisions.

SIMULATOR TRAINING

PERFORMANCE OBJECTIVE: Simulator training should be conducted utilizing methods and techniques that maximize its effectiveness in developing and maintaining necessary job-related knowledge and skills.

Recommendation (TQ.8-1) Improve post-exercise critiques during licensed operator continuing training on the simulator. Many training critiques are incomplete and do not adequately describe expected operator responses or their bases. Many opportunities to identify performance problems and provide recommendations for improvement were missed by the instructors during simulator training. Examples of inadequate post-exercise critiques include the following:

a. After students incorrectly tripped all reactor coolant pumps with the reactor at power, the instructor's critique consisted only of a statement that the reactor coolant pumps should not be tripped. A complete critique would have explained the reasons for not tripping the pumps and the consequences of the improper action.

b. The instructor did not critique or correct operator performance following an event where the operators stopped a charging pump that was supplying the only cooling flow to the reactor.

c. Control room communications problems were not critiqued during several scenarios where communications errors led or contributed to significant operator errors.

Recommendation (TQ.8-2) Improve simulator capability to accommodate multiple failure scenarios. The simulator currently accomplishes major transients such as tube ruptures and loss of coolant accidents; however, during more complex scenarios, such as loss of core cooling or loss of heat sink, instructors encounter difficulty in entering malfunctions and controlling the simulator. Some additional simulator functions are impacted by insufficient computer execution capability. Improve realism during simulator training by installing representative communications systems in the simulator. The following are examples of problems encountered during simulator training:

a. The terminal debugging facility (TDF) would not come on line in the instructor's booth to allow the instructor to input the decay heat level called for by the exercise guide (lesson plan). A computer technician stated that the central processing unit was overloaded and that the computer was preempting low priority functions like the TDF in order to perform required calculations for the scenario.

b. A primary component cooling water pump continued to run even after the operator had turned the pump switch to off. The booth instructor explained the problem as an anomaly with the simulator computer. The pump had to be tripped from the instructor's console in the instructor's booth.

c. The simulator control room does not include methods of communicating with individuals working outside the control room, similar to that used in the plant.

RADIOLOGICAL PROTECTION

RADIOLOGICAL PROTECTION ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Radiological protection organization and administration should ensure effective implementation and control of radiological protection activities.

Recommendation (RP.1-1) Improve facilities and equipment in preparation for dealing with the contamination and radiation that will result from plant startup and operation. Specific areas for improvement are as follows:

a. Controls are not adequate for the entrances to some areas which will be locked high radiation areas. For example, there are two entrances to the high level waste storage area which have no mechanism (such as a locked door) to prevent entry. In addition, a few doors in the radioactive waste building designated to be locked have damaged locks that will not work.

b. High sensitivity equipment for monitoring protective clothing prior to reuse after being laundered is not available. Without such equipment, manual surveys must be performed which will be very time consuming (up to 30 minutes per set of protective clothing). Industry experience has shown that rapid manual surveys are inadequate to detect small particles which may be embedded in the fabric.

c. Vacuum cleaners and ventilation units do not have locks installed to prevent unauthorized opening of the devices. This is important to prevent airborne contamination and internal exposure. In addition, storage areas should be established and locked to prevent the unauthorized use of vacuum cleaners, ventilation units, and brooms. Equipment to be used within the radiologically controlled areas should be so designated and should not be used in uncontrolled areas.

d. Presently no plans exist to use a mockup of a steam generator channel head at the station for training maintenance workers. Experience has shown that this type of mockup is important to increase worker efficiency and thereby save both time and exposure during outages.

RADIOLOGICAL PROTECTION PERSONNEL KNOWLEDGE AND PERFORMANCE

PERFORMANCE OBJECTIVE: Radiological protection personnel have the knowledge and practical abilities necessary to implement radiological protection practices effectively.

Recommendation (RP.2-1) Consider sending health physics technicians to support outage work at other stations to help the technicians maintain skills, develop new techniques, and improve morale. It is recognized that technician support is required to meet technical specification requirements and to participate in emergency exercises. However, as conditions permit, as many technicians as possible should receive such temporary assignments. It has been over two years since any technician has performed job coverage under actual radiological conditions.

Recommendation (RP.2-2) Provide recurring training to health physics technicians in areas such as station procedures, radioactivity, and industry events involving unplanned exposures. Some technicians displayed knowledge weaknesses in these areas. Continuing training has not occurred during the past two years. Although some industry events are discussed during department meetings, training is not provided to emphasize causes of events, and means of prevention.

EXTERNAL RADIATION EXPOSURE

PERFORMANCE OBJECTIVE: External radiation exposure controls should minimize personnel radiation exposure.

Good Practice (RP.4-1) All concrete surfaces inside containment have been painted to prevent fixed contamination and components have been well labelled to facilitate work and minimize workers' exposure times. For example, two-inch block letters and numbers are stenciled adjacent to every snubber in containment. All entrances through the bioshield are similarly labelled to aid workers in finding the correct reactor coolant pump and steam generator.

SOLID RADIOACTIVE WASTE

PERFORMANCE OBJECTIVE: Solid radioactive waste controls should minimize the volume of radioactive waste and ensure safe transportation of radioactive material.

Recommendation (RP.7-1) Important decisions regarding the future operation of radioactive waste processing facilities need to be resolved. Specific areas needing attention are the following:

a. Discussions with plant and corporate staff, indicate an uncertainty whether high conductivity waste will be processed using the installed radioactive waste evaporator or a demineralizer. A decision should be made prior to contaminating the evaporator.

b. Uncertainties exist regarding the practicality of using the asphalt extruder to solidify spent resin as opposed to dewatering or solidifying in a liner. This decision should be made prior to contaminating the asphalt system. Modifications to the radioactive waste system to support dewatering may also be advisable should this technique be selected. In addition, radiological consequences and access control to areas that would be affected by liner storage and any additional transfer lines have not been addressed.

c. The method for handling wet rags and mop heads has not been decided. The approach to handling these items may include laundering and/or drying of the wet items. However, a decision on the technique and equipment to use has not been made. Also, location to perform the necessary tasks has not been determined.

CHEMISTRY

CHEMISTRY PERSONNEL KNOWLEDGE AND PERFORMANCE

PERFORMANCE OBJECTIVE: Chemistry personnel have the knowledge and practical abilities necessary to implement chemistry practices effectively.

Recommendation (CY.2-1) Conduct chemistry technician training to increase knowledge of the radioactive nuclides that will be present in the reactor coolant system, the radioactive waste system, and the plant effluents shortly after plant startup. Increase the effectiveness and realism of the training by providing practice in counting representative radioactive samples. Technicians should have a thorough understanding of which radioactive nuclides will be present, why they are present, and what they indicate. This training will improve recognition of potential problems and increase understanding of normal changes. Examples of weaknesses include the following:

a. Many technicians could not state which nuclides would be present in the reactor coolant shortly after plant startup. The short-lived nuclides that would be present were not stated. Cobalt-60 and iron-59, which are long-lived nuclides, were stated to be important, when in fact they are not significant at startup.

b. Many technicians could not properly describe the significance of fission products in the coolant and the actual concentration of fission products that would be expected from a defect-free core.

c. Technicians have not had practice in counting a wide variety of unknown samples to prepare them for counting radioactive coolant samples. The counting room work has been limited to counting many samples that contain no radioactivity and counting periodic cross-check samples that contain a set mixture of long-lived radionuclides.

d. Technicians have not carried out minimum detectable activity determinations on a variety of radioactive samples. This has only been carried out on non-radioactive samples and on some periodic check samples.

CHEMISTRY CONTROL

PERFORMANCE OBJECTIVE: Chemistry controls should ensure optimum chemistry conditions during all phases of plant operation.

Good Practice (CY.3-1) Corrosion coupons are used to measure the actual corrosion rates of materials present in the water of closed cooling systems. The measured corrosion rates are evaluated and reported to plant management in millimeters per year and millimeters per 40 years with appropriate comments about the actual rates seen. The data obtained to date shows that the corrosion rates are acceptable in all cases but one. The exception is a higher than acceptable corrosion rate for carbon steel in the thermal barrier cooling system . This information has been used as the basis for an engineering services request to improve air exclusion from the thermal barrier cooling system. In addition, closed cooling water system heat exchangers are inspected periodically and a photographic record of heat exchanger condition is maintained.

Recommendation (CY.3-2) Upgrade chemistry data evaluation practices to ensure all chemistry data is thoroughly checked for consistency and correctness before it is entered into the computer data base that is used for trending. Ensure that all limits in the computer base are correct. Check all ammonia analyses for correlation with pH and conductivity. Problems noted in this area include the following:

a. The computer data base includes some measured ammonia concentrations of a few parts per billion when the lower limit of measurement for ammonia is about 100 parts per billion.

b. The computer data base includes many results for hydrazine shown as "parts per million," when the actual measured values are "parts per billion" of hydrazine.

c. Ammonia concentration, pH, and conductivity measurements are not routinely checked for correlation. The steam generator blowdown data includes some examples of specific conductivities that are significantly lower than the specific conductivity expected from the measured ammonia concentrations. In one period, themeasured specific conductivities were about one-half to one-third of the values expected based on the ammonia concentrations.

d. The data base limits for hydrazine in closed cooling water systems are incorrect. This error resulted in satisfactory data being labelled as outside the hydrazine limits.

LAYUP CHEMISTRY CONTROL

PERFORMANCE OBJECTIVE: Chemistry control should ensure optimum chemistry conditions during plant or system layup periods.

Recommendation (CY.7-1) Implement a comprehensive and effective layup program for all major plant components on a timely basis. The plant should include provisions for monitoring the effectiveness of the layup methods used. EPRI document NP-5106, "Plant Layup and Equipment Preservation Sourcebook," contains guidance that may be useful in the development and implementation of this program.

Although some efforts have been taken to layup plant components, parts of the secondary system are only partially filled with treated water under low flow conditions that do not ensure uniform mixing of the chemical additives. Under these conditions, localized corrosion is likely to occur. Problems noted include the following:

a. The main condenser hotwells and most of the condensate piping contain water, and hydrazine is added to minimize oxygen in the system. Flow in this system is provided by a 100 gallon per minute pump, which has been installed as a temporary modification to bypass the condensate pumps. This low flow is unlikely to provide uniform mixing of chemicals and also will not provide dispersion of impurities entering the system. This may allow localized corrosion to occur.

b. The cathodic protection system on the circulating water side of the main condenser was inoperable as a result of an inadvertent draining of the water boxes. The maintenance of the correct protection voltage on this system is important in minimizing corrosion of the water boxes, tube sheets, and condenser tubes.

OPERATING EXPERIENCE REVIEW

IN-HOUSE OPERATING EXPERIENCES REVIEW

PERFORMANCE OBJECTIVE: In-house operating experiences should be evaluated, and appropriate actions should be undertaken to improve safety and reliability.

Recommendation (OE.2-1) Provide timely notification via NUCLEAR NETWORK of important in-house events that are of generic interest to the nuclear industry. Assign clear responsibilities for the determination of when to issue operating experience items over NUCLEAR NETWORK. Develop and implement guidelines that can be used to determine which in-house events are of generic interest.

A review of recent in-house events identified the following events that could be of generic interest to the industry:

a. frequent failures of ITE-Gould JIO relays

b. problems encountered with Westinghouse OT2 switches

Recommendation (OE.2-2) Identify and document contributing causes of incidents involving personnel error so that appropriate corrective action can be taken to reduce the number of personnel errors. Provide periodic management reports that identify causal factors for personnel errors and take appropriate action to reduce repeated human performance problems.

Investigations of in-house events involving personnel errors are often not identifying recurring problems or contributing factors. The following deficiencies were noted:

a. Several recent personnel errors have resulted in significant in-house events among which are the repeated actuation of safety-related systems. For example:

1. Several engineered safety features actuated when a technician made an error in removing a main steam isolation valve from service.

2. Twelve hundred gallons of borated water was injected into the reactor coolant system when a licensed operator incorrectly operated a safety injection block/reset switch.

3. Twenty thousand gallons of water was drained from the refueling water storage tank as a result of a shift supervisor authorizing the modification of a tagging boundary for a residual heat removal system relief valve.

b. Several incident reports do not identify the contributing causes of personnel errors or specific actions to prevent recurrence. Examples include the following:

1. Turbine trip, reactor coolant system low flow, and neutron high flux trip signals were received during periodic testing. No cause was listed for the event, nor was corrective action to prevent recurrence identified.

2. A turbine trip and feedwater isolation occurred when a technician inadvertently opened the leads to the wrong transmitter. The incident report did not identify if the transmitters were properly labeled or if the technician had adequate instruction for performing the task. Also, the incident report did not identify if pre-job planning was adequate.

3. A circulating water pump tripped when a common "high-side" tap to the high differential pressure trip instrument was isolated. The incident report did not identify whether the procedure validation/ verification process was adequate or in need of improvement.

In addition management is not provided, on a periodic basis, with categorized causes of in-house events. The only information provided is a monthly report of the total number of incident reports closed versus the total number of incident reports open.

INDUSTRY OPERATING EXPERIENCE REVIEW

PERFORMANCE OBJECTIVE: Significant industry operating experiences should be evaluated, and appropriate actions should be undertaken to improve safety and reliability.

SOER STATUS

The status of Significant Operating Experience Report (SOER) recommendations is as follows:

Total number of recommendations issued to date	400
Number previously evaluated as satisfactory or not applicable	248
Number reviewed this evaluation (including 26 previously evaluated as satisfactory or not applicable)	178
o Number satisfactory	119
o Number not applicable	4
o Number pending - awaiting decision	0
o Number pending - awaiting implementation (0 red tab)	46
o Number needing further review (1 red tab)	9

The following recommendations have not been effectively implemented and further review is needed. Two of these recommendations, previously evaluated by INPO to have been satisfactorily addressed, have been reopened as subsequent review has determined that the action taken was not effective; e.g., subsequent actions removed procedural requirements or deleted necessary training or the action intended was not completed.

SOER Number	Recommendation Number
81-9	2b
82-9	1
83-9	7
84-2	1
84-3	5
84-7	2
84-3 (reopened)	2, 6
86-2	1

(See Appendix, p.1 for additional details)

An update on the status of each recommendation listed above is requested in the six-month follow-on response to this report. In addition, the status of each red-tab SOER recommendation received subsequent to this evaluation should be included in the six-month follow-on response.

Recommendation (OE.3-1) Review Significant Operating Experience Report (SOER) recommendations that have not yet been implemented and establish priorities for implementation. Particular attention should be given to those SOER recommendations that may be appropriate to implement prior to initial criticality.

a. There are a number of SOER recommendations greater than three years old that remain open due to the need for either trending/performance monitoring program development or for the implementation of required training.

1. Trending/performance monitoring programs need to be developed for a number of open SOER recommendations. Examples include the following:

- SOER 82-9, recommendation 1 -- A trending program needs to be developed to monitor hydrogen gas usage. Detection of excessive hydrogen usage could provide indication of a potentially dangerous gas environment.

- SOER 83-1, recommendation 7 -- A performance monitoring program has not been developed for trending important operating parameters of the diesel generators.

2. Required training has not been accomplished for a number of open SOER recommendations. Examples include the following:

- SOER 82-12, recommendation 5 -- A training course has not been developed to train both plant personnel and contractors on the importance of preventing loose parts from being left in steam generators. The course should emphasize both the need for reporting when loose objects are suspected to have been left in the steam generators and the consequences of allowing loose parts to be introduced into the steam generators.

- SOER 83-9, recommendation 7 -- Training has not been developed to address the operability of motor operated valves following either manual seating or backseating.

b. There are a number of SOER recommendations that have not been implemented that may be appropriate to implement prior to initial criticality. Most of these recommendations are greater than three years old. Examples include the following:

1. SOER 84-2, recommendation 1--Guidelines should be established for reactor engineering personnel that address actions to be taken to recover a mispositioned rod to ensure that fuel damage does not occur.

2. SOER 83-8, recommendation 10--Procedures should be established to ensure that vendor changes to the reactor trip breakers are reviewed and implemented as required.

3. SOER 82-15, recommendation 2 -- A comprehensive program should be implemented to prevent freezing of critical system instrumentation during cold weather conditions.

(See Appendix II, p. 2 , for additional details)

Recommendation (OE.3-2) Perform comprehensive evaluations of Significant by Others (SO) notifications issued by INPO on NUCLEAR NETWORK. Items on this notification list are considered significant by INPO; even though a separate INPO document is not prepared for SO notifications since the issues have been adequately addressed by another organization. Track corrective actions that result from these evaluations to completion.

Current operating experience program review guidelines do not require reviews of SO events to ensure that the issues have been adequately addressed. Examples where comprehensive reviews and tracking were not conducted for SO items include the following:

a. Inadequate capacity on thermal compensating accumulators for certain Rockwell main steam isolation valve accumulators

b. Sticking of Dresser diaphragm seal globe valves

c. Leaks with Automatic Sprinkler Corporation of America mercury check switches

APPENDIX

ADDITIONAL SUPPORTING DETAILS

Appendix provides additional information concerning selected findings which should be useful in determining corrective action.

OPERATING EXPERIENCE REVIEW

The following recommendations have not been effectively implemented and further review is needed. Two of these recommendations, previously considered by INPO to have been satisfactorily addressed, have been reopened as subsequent review has determined that the action taken was not effective; e.g., subsequent actions removed procedural requirements or deleted necessary training or the action intended was not completed.

SOER 81-9 "Desiccant Carry-over to the Instrument Air System"

- Recommendation 2B states that the downstream filter system should have regularly scheduled maintenance for cleaning or replacement of the filter element. The plant has chosen not to perform regularly scheduled maintenance. Instead, when a filter high differential pressure alarm is received in the control room, a work request will be submitted for filter replacement.

SOER 82-9 "Turbine Generator Exciter Explosion"

- Recommendation 1 states that hydrogen gas usage should be trended and that guidelines should be established for action to be taken when hydrogen usage exceeds a specified level. Currently, the plant has no trending program for hydrogen gas bottle usage nor have guidelines been established that address actions taken at specified usage levels.

SOER 83-9 "Valve Inoperability Caused by Motor-Operator Failures"

- Recommendation 7 states that plant procedures should require an evaluation of motor-operated valve (MOV) operability when a MOV is manually seated or backseated. Plant procedures and operations department guidelines do not address valve operability after manually seating or backseating a MOV. Also, discussions with operations personnel indicated that they are not sure of what the MOV operational status would be after manual operation.

SOER 84-2 "Control Rod Mispositioning"

- Recommendation 1 states both that appropriate plant management personnel should be notified prior to recovery of a mispositioned rod and that procedures should address recovery power level, rate of rod movement, and movement of other rods to support recovery.

  - Although plant procedures require notification of the shift superintendent, he is still considered to be a shift operating person and as such is not considered "appropriate plant management" for the purpose of this notification.

- Guidelines need to be developed for reactor engineering personnel to aid them in the recovery of a mispositioned rod.

SOER 84-3 "Auxiliary Feedwater Pumps Disabled by Backleakage"

o Recommendation 5 requires performance of periodic inspections or testing of all check valves in the emergency feedwater system (EFW). The preventive maintenance program at the station does not include periodic inspection or testing of all check valves in the EFW system.

SOER 84-7 "Pressure Locking and Thermal Binding of Gate Valves"

o Recommendation 2 states that appropriate actions should be taken to ensure that gate valves susceptible to the pressure locking or thermal binding phenomenon will open when required. The station has chosen not to take any action until there are gate valve failures.

SOER 85-3 "Excessive Personnel Radiaton Exposures"

o Recommendation 2 states that plant personnel should receive training/retraining on selected industry events involving unplanned radiation exposures. Interviews with health physics technicians revealed that they were not knowledgeable about lessons learned from recent industry events involving unplanned exposures.

o Recommendation 6 states that potentially high radiation areas should be properly controlled. A number of doors, restricting access to high radiation areas, were found to be easily defeated. Other areas, such as the high level radioactive waste storage area, are not controlled by locked gates.

SOER 86-2 "Inaccurate Closed Position Indication on Motor-Operated Valves"

o Recommendation 1 states that MOVs with remote position indication limit switch settings that can result in a closed indication while the valve is partially open should be identified. Design change requests are being written to fix problem safety related MOVs but to date no list has been compiled which reflects which MOVs must be done. Also, non-safety-related MOVs have not been addressed.

Recommendation (OE.3-1)

There are a number of SOER recommendations that remain open due to the need for program development. Others remain open due to required training not having been conducted. Examples include the following:

1. Trending/performance monitoring programs need to be developed for the following SOERs:

   o SOER 81-9, recommendation 1 -- Repetitive task sheets to inspect the desiccant within the drying towers need to be developed by the system engineer.

- SOER 82-12, recommendation 7 -- A performance monitoring program needs to be developed for trending important operating parameters of the diesel generators.

- SOER 86-1, recommendation 1 -- A performance monitoring program needs to be developed for trending emergency feedwater performance.

2. Required training needs to be accomplished for some open SOER recommendations. Examples include the following:

   - SOER 82-10, recommendation 1 -- A task analysis needs to be done to identify trainees and training content of a course for degraded fire barrier recognition.

   - SOER 83-8, recommendation 12 -- Training needs to be conducted for technical staff, managers, and supervisors on the methodology to be used to determine the safety classification of equipment and activities for which they are responsible.

There are a number of SOER recommendations that have not been implemented that are appropriate to implement prior to initial criticality. Examples include the following:

1. SOER 82-12, recommendation 1 -- A program should be implemented to monitor loose parts in the secondary in order to detect possible degradation of the steam generator heat removal flow path.

2. SOER 83-8, recommendation 9 -- Engineering standards for determining the safety classification of equipment and services should be developed.

3. SOER 83-8, recommendation 10 -- Procedures should be established to ensure that vendor changes to the reactor trip breakers are reviewed and implemented as required.

4. SOER 86-1, recommendation 2 -- A preventive maintenance program should be developed to ensure the performance of emergency feedwater valve operators is monitored and trended.

5. SOER 86-2, recommendation 1 -- Identify both safety related and non-safety related motor operated valves that have remote position indication limit switch settings that can result in a closed indication while the valve is partially open.

6. SOER 86-3, recommendation 1 -- Establish a preventive maintenance program for the check valves addressed in the SOER. Also, review current EFW check valves to ensure all appropriate check valves have been evaluated.