

EVALUATION  
of  
THREE MILE ISLAND NUCLEAR POWER STATION - UNIT ONE

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GPU Nuclear Corporation

May 1983

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## SUMMARY

### INTRODUCTION

The Institute of Nuclear Power Operations (INPO) conducted an evaluation of GPU Nuclear Corporation's Three Mile Island Nuclear Power Station - Unit One (TMI-1), during the weeks of May 9 and 16, 1983. TMI-1 is an 800-MWe (net) Babcock & Wilcox pressurized water reactor. The station is located on Three Mile Island in the Susquehanna River about ten miles southeast of Harrisburg, Pennsylvania. The unit began commercial operation in September 1974 and has been shut down since February 1979.

### PURPOSE AND SCOPE

INPO conducted an evaluation of site activities to make an overall determination of plant safety, to evaluate management systems and controls, and to identify areas needing improvement. Information was assembled from discussions, interviews, observations, and reviews of documentation.

The INPO evaluation team examined station organization and administration, operations, maintenance, technical support, training and qualification, radiological protection, and chemistry. The team also observed the actual performance of selected evolutions and surveillance testing. As a basis for the evaluation, INPO used performance objectives and criteria relevant to each of the areas examined; these were applied and evaluated 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.

### DETERMINATION

Within the scope of this evaluation, the team determined that TMI-1 is in an acceptable material condition and is being effectively maintained by qualified personnel.

The following beneficial practices and accomplishments were noted:

There is a well-defined program focused on operational planning and preparation for startup, including the startup qualification program.

There is a strong commitment to management self-assessment activities, including the Operations QA Program, the Radiological Assessment Program, and the Off-Shift Tour Program.

Station personnel are well qualified. Their morale, positive attitude, and motivation reflect commitment to improved performance.

There is an overall improvement in station housekeeping.

Improvements were recommended in a number of areas. The following are considered to be among the most important:

The overall station chemistry program, including coordination between on-site and off-site activities, needs to be strengthened.

There is a need for more first-line supervisory involvement in unlicensed operator and chemistry activities.

The warehouse program for ensuring adequate inventory and quality of spare parts needs to be upgraded.

Increased emphasis is needed on the industrial safety program to reduce the number of lost-time accidents.

In each of the areas evaluated, INPO has established PERFORMANCE OBJECTIVES and supporting criteria. All PERFORMANCE OBJECTIVES reviewed during the course of this evaluation are listed in APPENDIX II.

Findings and recommendations are listed under the PERFORMANCE OBJECTIVES to which they pertain. Particularly noteworthy conditions that contribute to meeting PERFORMANCE OBJECTIVES are identified as Good Practices. Other findings describe conditions that detract from meeting the PERFORMANCE OBJECTIVES. It would not be productive to list as Good Practices those things that are commonly done properly in the industry since this would be of no benefit to GPU Nuclear Corporation or to INPO's other member utilities. As a result, most of the findings highlight conditions that need improvement.

The recommendations following each finding are intended to assist the utility in ongoing efforts to improve all aspects of its nuclear programs. In addressing these findings and recommendations, the utility should, in addition to correcting or improving specific conditions, pursue underlying causes and issues.

As a part of each station evaluation, the evaluation team will follow up on responses to findings in previous reports. Findings with response actions that are incomplete but progressing on a reasonable schedule have been carried forward in APPENDIX I to this report. In areas where additional improvements were needed or where response actions have not been timely, a new finding that stands on its own merit has been written. Thus, this report stands alone, and reference to previous evaluation reports should not be necessary. For this evaluation there are two new findings relating to previous findings and four findings carried forward in Appendix I.

The findings listed herein were presented to GPU Nuclear Corporation management at an exit meeting on May 19, 1983. Findings, recommendations, and responses were reviewed with GPU Nuclear Corporation management. Responses are considered satisfactory.

To follow the timely completion of the improvements included in the responses, INPO requests a written status by February 29, 1984. Additionally, a final update will be requested six weeks prior to the next evaluation.

The evaluation staff appreciates the cooperation received from all levels of GPU Nuclear Corporation.



**GPU NUCLEAR CORPORATION****Response Summary**

GPU Nuclear is pleased that INPO's evaluation confirms that TMI-1 is in an acceptable material condition and that the plant is being effectively maintained by qualified personnel.

The findings and recommendations offered by the evaluators will be helpful to us in our continuing efforts to achieve excellence. Each finding has been carefully reviewed, and our responses provide a plan and schedule to make improvements. Status reports on our accomplishments will be submitted as requested.

The two years since the last INPO evaluation at TMI-1 have been a uniquely difficult period for a nuclear plant involving final preparations for restart (including completion of plant modifications), the major repair of the steam generators, and an exceptional level of regulatory inspections and adjudicatory hearing activities.

We believe that the good practices noted throughout the report and the beneficial practices and accomplishments noted in INPO's Summary are indications of our dedication to safe operation and improved performance, and the ability of our organization to make improvements. We are committed to continuing to make such improvements.

We wish to thank the INPO evaluation team members for their professional conduct of this evaluation and believe our association and interaction with the evaluation team have been of significant assistance to GPU Nuclear Corporation.

ORGANIZATION AND ADMINISTRATION

## INDUSTRIAL SAFETY

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

**Finding (OA.5-1)**      **Increased emphasis is needed on industrial safety.** Although the established program is effective in correcting identified safety deficiencies, the trend of lost-time accidents has not improved, and several examples of lack of adherence to safety rules were noted. A company safety manual has been under review for some time, but has not been approved for use.

**Recommendation**      Upgrade the existing industrial safety program with emphasis on the following areas:

- a.    timely approval and issue of company policies regarding industrial safety
- b.    strengthened supervisory involvement in promoting adherence to safe work practices
- c.    improved safety awareness and compliance with safety rules by all personnel

**Response**              The need for improvement in the area of industrial safety had been recognized, and several actions had been initiated to accomplish it. These actions included the establishment of a 1983 goal of reducing the number of reportable and lost-time accidents/injuries by 25 percent from the 1982 level and the preparation of a draft Nuclear Corporation Safety Manual, which is now under review by the operating companies. Subsequently, each department in the plant has been assigned specific goals for the reduction of accidents/injuries over the next six months. Progress in meeting these goals will be reviewed by senior management with the appropriate department head on a periodic basis to measure effectiveness and to implement further actions when adequate progress is not being achieved. Training of all supervisors on the contents of the revised Safety Manual and their responsibility for its implementation and the enforcement of safe work practices will be accomplished by September 1983. This will be followed by safety training of all company employees involved in industrial-related functions or who work in an industrial environment. Adequate safety training is already being conducted through the general employee training and retraining programs for those individuals who are not normally associated with industrial work or environments.

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## DOCUMENT CONTROL

**PERFORMANCE OBJECTIVE:** Document control systems should provide correct, readily accessible information to support station requirements.

**Finding (OA.6-1)** Vendor technical manual content, distribution, and use are not rigorously controlled. Some manuals marked "Controlled Copy" were noted in the plant without evidence of proper control. Some maintenance procedures refer to portions of technical manuals for detailed work instructions even though the referenced portions have not been reviewed for technical adequacy.

**Recommendation** Establish improved control of vendor technical manuals to ensure they are complete and current. Ensure that portions of manuals used to control work are technically adequate.

**Response** A list of about 60 technical manuals, which were considered to be the most important for plant operation and maintenance, has been selected for priority review and updating, including vendor participation as required. The revised manuals will be issued as "controlled documents" using the normal document control system. This is a long-term project that may take two years to complete. Procedures are in place for the control of these manuals. All manuals that are currently in the plant will be stamped "for information only." As controlled copies from the initial list of 60 manuals are received, additional manuals will be selected for review and upgrading as part of this continuing program. When a manual has been issued as a controlled document, all "information only" copies of that manual will be purged from the plant.

Maintenance Procedure 1407-1, Corrective Maintenance, will be revised by November 1983 to require that an engineering review be conducted of the applicable portions of technical manuals whenever technical manuals are used to control work.

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## QUALITY PROGRAMS

**PERFORMANCE OBJECTIVE:** Quality programs should contribute to the effective performance of activities important to safety and reliability. Quality programs include quality assurance, quality control, and other programs that provide an independent assessment of plant activities or that function specifically to promote quality of workmanship.

**Finding (OA.8-1)** The following Good Practice was noted: An effective program is in use for monitoring plant operations. The Operations QA Program has 10 dedicated monitors who are SRO licensed or have equivalent experience. Activities to be monitored are selected using a graded approach based on safety importance, previous experience,

uniqueness, and plant data trends. Summary reports listing all findings are given to responsible line supervisors for information and appropriate action. These findings include minor deficiencies corrected in the course of monitoring. Corrective actions for more significant findings are tracked using Material Non-Conformance Reports or Quality Deficiency Reports.

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OPERATIONS

## CONDUCT OF OPERATIONS

**PERFORMANCE OBJECTIVE:** Operational activities should be conducted in a manner that achieves safe and reliable plant operation.

**Finding (OP.2-1)** Shift supervisory personnel need to be more effectively involved in routine operations activities outside the control room. Although supervisory tours are conducted, routine activities of operations personnel are not consistently monitored to ensure conformance with station policies and good operating practices.

**Recommendation** Emphasize shift supervisory involvement in routine operations activities outside the control room.

**Response** This is considered to be a significant finding and, as such, will receive considerable management attention. As noted, supervisory tours are being conducted, but the supervisors do not consistently and effectively monitor to ensure personnel conform with station policies and good operating practices. The requirements for monitoring plant evolutions, and especially operator/maintenance technician performance and compliance with station policies and good operating practices, have been and will continue to be emphasized to all supervisory personnel, especially the shift supervisors and shift foreman. In addition, the following actions will be taken in response to this finding:

- a. Managers involved in the Off-Shift Tour Program have been instructed to review supervisor involvement in activities in the plant outside the control room. This includes the requirement to actually accompany the shift supervisor, shift foreman, and shift maintenance foreman on their tours of the plant on a periodic basis.
  - b. A senior, experienced former SRO-licensed shift supervisor will be assigned and report directly to the Operations and Maintenance Director. His primary responsibility will be to monitor operations and maintenance activities in the plant on a continuing basis. This assignment will be effective by August 1983.
  - c. For at least the next one to two years, a degreed engineer, in addition to the STA, will be assigned as a QA operations monitor on a 24-hour shift assignment basis whenever the plant is critical. These monitors will report to the QA manager on site and will be responsible for monitoring and reporting plant operator and maintenance technician performance and adherence to high standards and good operating practices.
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**Finding (OP.2-2)**

The following Good Practice was noted: An effective program is used to administer and control routine non-technical specification surveillances conducted by the Operations Department. The program includes items such as the following:

- a. component lubrication
- b. component operability and performance
- c. rotation of non-operating equipment
- d. inventory of chemicals, fuels, and other supplies
- e. data acquisition for long-term trending of equipment

The control and administration of these items using a single, computer-based program contributes to equipment reliability and minimizes the administrative burden on the Manager Plant Operations and shift personnel.

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### PLANT STATUS CONTROLS

**PERFORMANCE OBJECTIVE:** Operational 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.

**Finding (OP.3-1)**

Additional emphasis is needed to improve operator response to equipment alarms, particularly those outside the control room. Equipment is sometimes operated with unresolved local alarms.

**Recommendation**

Emphasize to operators the need for timely and thorough investigation of equipment alarms. Increase supervisory involvement in shift activities to ensure that alarms on operating equipment are minimized.

**Response**

All operators will be reinstructed by October 1983 on the absolute requirement for timely and thorough investigation, response, and reporting of equipment and system alarms. Supervisors have also been instructed to re-emphasize the importance of proper alarm response to their operators. Although the above action is needed and will be done on a periodic basis, the real key to solving this finding will be a continuing management emphasis that achieves direct, on-the-spot observation and instruction, as appropriate, by the operators' first-line supervision.

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**Finding (OP.3-2)**      **Performance of independent verification of valve position needs improvement.** The second verification of valve position is sometimes performed by observing the first individual check the valve position rather than performing an independent second check.

**Recommendation**      Revise current operating practices to ensure that the second valve position verification is accomplished by an independent check.

**Response**              Guidance to ensure that the second valve position verification is accomplished by an independent check will be included in the next revision to Administrative Procedure 1029, Conduct of Operations. This procedure is currently under review, and the change should be issued by September 1983. To ensure this guidance is understood and is being followed, supervisors will be instructed to monitor selected valve lineup evolutions as part of their plant tours.

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#### OPERATOR KNOWLEDGE AND PERFORMANCE

**PERFORMANCE OBJECTIVE:** Operator knowledge and performance should support safe and reliable plant operation.

**Finding (OP.4-1)**      **Operator and supervisor knowledge need improvement in some areas.** Some auxiliary operators could not explain proper operation of the diesel engine support systems. Additionally, some control room operators and supervisors had difficulty discussing electrical distribution controls and using electrical drawings to analyze unusual transients.

**Recommendation**      Improve supervisor and operator knowledge in the areas identified above. Include these areas in the existing pre-startup training program.

**Response**              Training in the diesel generator and its auxiliaries will be included in the training cycle for both licensed and non-licensed operators. Practical demonstrations will be included as part of this training. Also, training in electrical diagram and logic drawings will be included in the operator training program. The initial phase of these training modules will be conducted by November 1983.

Additionally, a joint review of the training program by the Operations and Training departments will be completed by June 1984 to identify any other general weak areas that are not currently covered by the training program.



The Operations Plant Manual, which is currently under development, will provide a significant improvement in ensuring that the operators are provided appropriate information and background for training in important plant systems and equipment. This manual is scheduled to be completed by January 1984.

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## OPERATIONS PROCEDURES AND DOCUMENTATION

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

**Finding (OP.5-1)**      Some emergency and operating procedures need improvement to enhance their usability. Some cautions follow the action steps to which they apply, and some notes contain procedural steps. It is recognized that extensive effort has been made to improve emergency and operating procedures.

**Recommendation**      During normal review and revision of plant procedures, identify and correct the type of problems noted above.

**Response**      Administrative Procedure 1001D will be revised by October 1983 to include the requirement that cautions precede rather than follow the action steps to which they apply and that procedural steps are clearly indicated as part of the procedure and not contained in notes. Current procedures will be reviewed for these conditions and corrections made as appropriate during the required biannual procedure review process. Emergency procedures will be given priority.

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**Finding (OP.5-2)**      The following Good Practice was noted: Emergency action levels for initiation of the emergency plan are placed at appropriate steps in emergency and abnormal condition operating procedures. This method of indicating when specific emergency plan classifications should be implemented eliminates the need for referring to other documents at a time when rapid response is important.

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**OPERATIONS FACILITIES AND EQUIPMENT**

**PERFORMANCE OBJECTIVE:** Facilities and equipment should effectively support plant operation.

**Finding (OP.6-1)**

**The following Good Practice was noted:** The station has an effective cleanliness and housekeeping program. The program includes the following key elements:

- a. clear definition of area responsibilities
- b. weekly inspections by plant management
- c. written inspection reports with follow-up action on noted deficiencies
- d. off-shift tours by senior management that include a review of plant cleanliness conditions

As a result of this program, the station has maintained a high level of cleanliness during a period of extensive maintenance.

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MAINTENANCE

## MAINTENANCE ORGANIZATION AND ADMINISTRATION

**PERFORMANCE OBJECTIVE:** Maintenance organization and administration should ensure effective implementation and control of maintenance activities.

**Finding (MA.1-1)**      **Control of maintenance activities needs improvement.** Maintenance activities are not always formally documented to reflect appropriate review and authorization of changes in work scope. QA requirements, use of procedures and vendor manuals, and post-maintenance test requirements need to be established and documented prior to continuing jobs with changes in work scope.

**Recommendation**      Improve control of maintenance activities. Ensure that proper review and approval by appropriate managers is documented for extended work scope.

**Response**              A procedure change to Maintenance Procedure 1407-1 is being prepared to incorporate the guidelines indicated below for reviewing and approving changes in work scope. This change will be implemented by October 1983.

Work done on an item will be limited to that which falls within the boundary of the instructions in the job ticket. Additional maintenance work determined to be needed as a result of troubleshooting or the performance of the authorized work will be controlled by a new job ticket or by addition of the new work to the initial job ticket by the responsible manager or supervisor. In the event a change in work scope is added to the initial job ticket, it will receive review and approval appropriate to the new scope prior to commencement of the work.

Work on the backshifts will be controlled in the same manner, with the exception of emergency maintenance.

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**WORK CONTROL SYSTEM**

**PERFORMANCE OBJECTIVE:** The control of work should ensure that identified maintenance actions are properly completed in a safe, timely, and efficient manner.

**Finding (MA.3-1)**      **The plant needs to improve the identification and processing of deficiencies for corrective maintenance action.** Many valve, flange, and pump deficiencies are not included in the work control system. In addition, some caution tags identify deficiencies that are not included in the work control system.

**Recommendation**      Develop measures to ensure timely identification and processing of plant deficiencies for corrective maintenance. INPO Good Practice MA-301, "Plant Material Deficiency Identification," could be of assistance in this effort.

**Response**              By January 1984, a formal system will be established so that all employees, especially Operations Department personnel, can identify material deficiencies and determine if the deficiency is covered by a job ticket or not. For an interim period, a senior, experienced former SRO-licensed shift supervisor will be assigned responsibility by August 1983 for monitoring general overall maintenance conditions in the plant and ensuring that material deficiencies are identified and job tickets are prepared as required. He will coordinate efforts between Operations and Maintenance, ensuring that the concerns of the operators are communicated to Maintenance and that appropriate follow-up action is taken.

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### PREVENTIVE MAINTENANCE

**PERFORMANCE OBJECTIVE:** Preventive maintenance should contribute to optimum performance and reliability of plant equipment.

**Finding (MA.5-1)**      The following Good Practice was noted: Infrared heat sensors for monitoring steam trap performance are used by maintenance personnel to detect and photograph hot spots in electrical equipment and systems. This practice has resulted in the early identification and correction of electrical deficiencies in equipment such as inverter and control rod drive cabinets, isolated phase bus duct grounding straps, and various distribution systems.

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### MATERIALS MANAGEMENT

**PERFORMANCE OBJECTIVE:** Materials management should ensure that necessary parts and material are available when needed.

**Finding (MA.9-1)**      Improvement is needed in warehousing practices to ensure that the quality of stored items is maintained. Storage requirements, preventive maintenance, and environmental and shelf-life controls are not adequately implemented.

**Recommendation** Establish programs that address storage requirements and preventive maintenance for stored equipment and material. Upgrade existing efforts in the area of environmental and shelf-life controls. Ensure these programs include materials in "direct turnover" status.

**Response** The vacant position of director of materials management has recently been filled by a highly qualified individual with extensive experience. One of his primary responsibilities is improving warehousing practices at all three GPU nuclear plants. He has initiated development of a long-term master plan with milestone completion dates for achieving these improvements. The plan should be completed by August 1983. The items noted in this finding are all included in the master plan and should be essentially completed and in place by July 1984. Preventive maintenance (PM) requirements, where applicable, for spare parts are currently being incorporated in the Maintenance Department's PM program. This effort should be completed and the PM program for spare parts implemented by October 1983.

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**Finding (MA.9-2)** The warehouse spare parts program does not fully support the Maintenance Department. Problem areas include the following:

- a. Some items for critical plant equipment are kept in uncontrolled shop and plant storage areas. Items are issued in standard quantities, and current procedures do not provide for returning unused items to inventory.
- b. Consumables required for the preventive maintenance program are not always available.
- c. Maintenance Department is sometimes not informed when their recommendations for spare parts stocking are revised or disapproved. This sometimes results in inadequate spare parts inventory and causes increased direct purchasing of material and supplies.
- d. Maintenance planners spend the majority of their time in parts procurement activities because of inadequate warehouse inventory, direct purchase activities, and tracking of spare parts inventory requests.

**Recommendation** Implement appropriate actions, including those listed below, to strengthen warehouse support of the Maintenance Department.

- a. Upgrade the spare parts issue and return procedures to accommodate returning unused items to inventory. Provide for traceability and storage of usable equipment removed from the plant or equipment obtained by direct purchase.



- b. Revise the spare parts provisioning program to ensure Maintenance Department input in determining items to be stocked and stocking levels.
- c. Improve the timeliness of the review process for spare parts inventory requests.
- d. In conjunction with b and c, consider a weekly status report to maintenance planners on outstanding purchase requisitions and spare parts inventory requests.

**Response**

Implementation of the recommendations in this finding are included in the master plan for upgrading the warehouse. The specific responses and actions to be carried out with approximate completion dates are indicated below:

- a. The master plan will assess the needed process for return of unused items to inventory and storage. In conjunction with QA and site Maintenance, an appropriate procedure will be established by January 1984.
  - b. Coordination with site activities will be expanded to complement the existing PM program for early identification of PM consumable items. This, along with priority procurement action, should be in place and operable by October 1983.
  - c. Current procedures (7231-WHP-6480) call for return to the originator of all revisions/disapprovals of spare parts stocking recommendations. Materials Management will take action to ensure full compliance with the existing procedure and coordinate effectively with originators of spare part recommendations.
  - d. Full implementation of master plan actions, to be essentially completed by July 1984, should enhance warehouse support to site maintenance. This involves improved identification of inventory requirements and on-line access to status of purchase requisitions, purchase orders, and stores inventory.
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TECHNICAL SUPPORT**OPERATING EXPERIENCE REVIEW PROGRAM**

**PERFORMANCE OBJECTIVE:** Industrywide and in-house operating experiences should be evaluated and appropriate actions undertaken to improve plant safety and reliability.

SOER STATUS

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

<u>Number of Recommendations</u>	<u>Action Taken</u>
109	Satisfactory
28	Not applicable
36 (1 red tab)	Pending - awaiting decision
19 (No red tab)	Pending - awaiting implementation
0	Need further review
16	Previously evaluated as satisfactory or not applicable

The following recommendations are pending - awaiting decision:

<u>SOER Number</u>	<u>Recommendation Number</u>
81-6	2
81-8	1,4
81-15	1a,1b
81-16	1,3
82-7	1,2
82-10	1,2,3,4,5,6,7
82-11	5
82-12	1
82-13	1,2,3,6,7,8,10
82-15	1,4
82-16	1
83-1	1,2,3,6,7,10,11,12

The following recommendations are pending - awaiting implementation:

<u>SOER Number</u>	<u>Recommendation Number</u>
81-5	4
81-6	1,1a
81-10	1
81-15	2c
82-8	1
82-11	1,2,3,4
82-13	5,9,11,12,13
82-15	3
83-1	9,13,14



An update on the status of each recommendation listed in the "pending - awaiting decision" or "pending - awaiting implementation" categories shown 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. A tabular summary, similar to that used in this report, is requested.

<b>Finding (TS.3-1)</b>	<b>The operating experience review program should be improved.</b> Although some vendor bulletins are currently being addressed, a comprehensive program is not in place to review and process appropriate vendor information.
<b>Recommendation</b>	Modify the program currently being used to process INPO and NRC information, as described in GPU Nuclear procedure No. EP-017, to specifically include vendor information, or develop and implement a separate program to ensure that vendor information is properly reviewed and processed.
<b>Response</b>	A procedure will be developed that will formalize the process of reviewing and taking action on information provided from vendors. Special attention will be given to the results of the recently completed Salem review in this area. This program will integrate the actions taken by Systems Engineering, Engineering Projects, Plant Maintenance, and Plant Engineering on vendor information received from vendors, will ensure that it receives the appropriate technical review, and will ensure that applicable items are sent to the appropriate department for inclusion in maintenance and operating procedures, design changes, and training, as required. The procedure for this program is scheduled to be implemented by October 1983.

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## PLANT MODIFICATIONS

**PERFORMANCE OBJECTIVE:** Plant modification programs should ensure proper review, control, implementation, and completion of plant design changes in a safe and timely manner.

<b>Finding (TS.4-1)</b>	<b>Some temporary modifications are installed on operating systems without a technical design review.</b> Procedure AP 1013 for electrical jumpers, lifted leads, and mechanical bypasses requires only a limited safety evaluation. It does not require technical design reviews similar to those performed for permanent modifications.
<b>Recommendation</b>	Conduct technical design reviews of electrical jumpers, lifted leads, and mechanical bypasses currently in place on operating systems. Implement controls to ensure technical design reviews are performed on future temporary modifications prior to placing modified systems in service.

**Response**

A design review by Plant Engineering of electrical jumpers, lifted leads, and mechanical bypasses currently in place will be conducted prior to restart. The procedure for installation of these devices will be modified by October 1983 to require the review and concurrence of Plant Engineering (an engineer in the applicable discipline) for all electrical jumpers, lifted leads, and mechanical bypasses that are not already specifically approved by plant procedures prior to making these temporary modifications to in-service systems.

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**Finding (TS.4-2)**

**The review of plant modification designs needs improvement.** Plant personnel do not always perform operability and maintainability reviews. Designers sometimes fail to identify physical obstructions and structural restrictions.

**Recommendation**

Ensure that plant modification designs are reviewed for operability and maintainability. Increase involvement of Operations and Maintenance personnel in the reviews. Ensure that reviews include plant walkdowns by designers prior to construction.

**Response**

Constructibility reviews have been held on TMI-1 modifications over the past year. A revision to Procedure EMP-014 was in progress at the time this finding was issued. The revision specifically calls for operability/maintainability/constructibility reviews of the modification design when the engineering is at or near the 80 percent completion stage. The operability/maintainability/constructibility review meeting is designed as a multidisciplinary meeting held at the plant. The review is scheduled such that there is sufficient design material available to scope out the design change, but is early enough to permit changes in the design, if necessary. EMP-014 will require an examination of the detailed design for operability and maintainability by plant personnel and a walkdown by the design engineers prior to issuing the modifications for construction.

The revision to EMP-014 is scheduled for issue by August 1983.

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## REACTOR ENGINEERING

**PERFORMANCE OBJECTIVE:** On-site reactor engineering activities should ensure optimum nuclear reactor operation without compromising design, safety, or nuclear fuel limits.

**Finding (TS.5-1)** Formal controls need to be established for software development and revision on the computer used by the nuclear engineer. This computer is used for important reactor physics calculations in support of plant operation.

**Recommendation** Develop administrative controls for software development and revision.

**Response** The need for more formally controlling the development, revision, and use of computer software has been previously identified by Plant Engineering and listed as a Nuclear Engineering goal. A Plant Engineering Procedure, PEP-5, will be issued that incorporates the guidance in Technical Functions Procedure EP-007, "Standard Computer Program Controls." This will reflect current practices in software control and provide written guidance to help ensure that new programs and revisions continue to be handled in an appropriate manner. This procedure will be implemented by December 1983.

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## PLANT PERFORMANCE MONITORING

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

**Finding (TS.6-1)** Improvements are needed in the plant performance monitoring program. Some instrumentation used for data collection is not included in the surveillance or preventive maintenance calibration programs. The responsibility for performing data analysis is not clearly defined. Important system or component degradation may not be readily detected due to the time delay between data collection and transmittal for analysis.

**Recommendation** Include instrumentation used for plant performance monitoring data collection in a routine calibration program. Establish clear responsibilities for data analysis. Consider increasing the frequency of data transmittal for analysis to ensure system or component trends do not go undetected.

**Response** The following actions are planned to address the finding:

- a. Instrumentation used for the Plant Thermal Performance Monitoring Program will be added to the Preventive Maintenance Calibration Program by October 1983.

- b. The responsibility for data analysis lies within the Technical Functions Division. Further delineation of responsibilities within Technical Functions is needed. The Formal Description (Engineering Standard) of the program will be completed by October 1983 and will specify the responsibilities of the Plant Analysis Section, both on site and at Headquarters and of other Technical Functions sections.
- c. The intent of the Plant Performance Monitoring Program is to detect changes in plant or equipment performance that are slowly developing in nature. Plant degradations that are rapid in nature would be detected by normal Operations Department watchstanding practices, by STA monitoring, and through the use of plant annunciator and computer-based alarm systems. In addition, Operations engineers perform a daily review of plant operating logs.

Plant data are analyzed on a monthly basis. This frequency ensures the availability of sufficient data to clearly define a trend. This frequency is supported by one year's experience gained through conduct of a performance monitoring program at GPU's Oyster Creek Nuclear Generating Station.

The Plant Analysis Section will require the Plant Performance Monitoring Program to identify desired program enhancements on a refueling cycle interval based on actual TMI-1 experience. The frequency of data analysis will be included as part of the cyclic review.

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TRAINING AND QUALIFICATION

## 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.

- Finding (TQ.3-1)** Improvements are needed in the on-the-job training (OJT) program for licensed operators. Although good OJT study guides exist for some major plant evolutions covered by procedures, additional study guides should be developed to identify the actions, knowledge, and skill requirements for each OJT task or checkout.
- Recommendation** Develop guidelines for actions, knowledge, and skills required for successful completion of each OJT task or checkout. INPO Good Practice TQ-501, "Development and Implementation of On-the-Job Training Programs," may be of assistance in this effort.
- Response** A special review team consisting of licensed operators and personnel from the Training Department has been established to review the entire operator training program. Improvement of OJT guidelines and procedures is a specific area being reviewed by the team. TQ-501 is being used as a guideline in performing this review. The results of this review are expected to be available in August 1983. The target date for issuance of revised guidelines for OJT checkouts is January 1984.
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## MAINTENANCE PERSONNEL TRAINING AND QUALIFICATION

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

- Finding (TQ.5-1)** Mechanical, electrical, instrument, and utility maintenance personnel need initial training in basic maintenance fundamentals or plant systems prior to job assignment in the plant.
- Recommendation** Provide systems overview and maintenance fundamentals training to all personnel prior to their assignment to in-plant maintenance duties. Evaluate the existing skills and knowledge of experienced personnel entering the maintenance force, and provide initial training as necessary. INPO documents "Guidelines for Mechanical



Maintenance Personnel Qualification" (GPG-05), "Guidelines for Electrical Maintenance Personnel Qualification" (GPG-07), and "Guidelines for Instrument and Control Technician Qualification" (GPG-08) could be of assistance in this effort.

**Response**

A program will be developed by January 1984 to provide training in generic maintenance fundamentals, basic plant systems, and administrative requirements to newly hired utility personnel prior to independent job assignment in the plant. Craft-specific training will be provided when an individual advances from the utility classification to a craft (mechanical, electrical, instrument) classification. Provisions will be included to allow personnel with prior training and experience to be exempt from portions of the program based on demonstrated knowledge level and performance.

A program for plant familiarization and procedural training for those individuals who are hired directly into a higher classification will be developed and implemented by January 1984. In addition, the knowledge and skills of such individuals will be evaluated to determine if any remedial training in maintenance fundamentals or craft skills is needed, and such training will be accomplished prior to independent job assignment in the plant.

**Finding (TQ.5-2)**

**OJT for mechanical, electrical, and utility maintenance personnel needs improvement.** OJT tasks and checkouts have not been established to ensure that these personnel are appropriately trained or evaluated in required skills and knowledge.

**Recommendation**

Develop and implement a more structured OJT program incorporating the following:

- a. identification of tasks to be performed, simulated, or discussed
- b. identification of individuals or classifications of individuals qualified and responsible for conducting OJT
- c. skill and knowledge required for each identified task to be performed, simulated, or discussed
- d. identification of individuals or classifications of individuals qualified and responsible for conducting final checkouts
- e. assurance that individuals have demonstrated competency in specified tasks prior to job assignment

The existing minor maintenance qualification sheets, which document competency on selected minor maintenance tasks, could be expanded to document completion of OJT. INPO Good Practice TQ-501, "Development and Implementation of On-the-Job Training Programs," could be of assistance in this effort.

**Response**

A more formal and structured OJT program for mechanical, electrical and utility maintenance personnel will be developed and implemented by August 1984. This program will include the recommendations listed above.

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**Finding (TQ.5-3)**

The following Good Practice was noted: The continuing training program for maintenance personnel is effective and comprehensive. Maintenance personnel rotate through four weeks of formal training each year. The training content for each cycle of training is determined by maintenance and training management. Among topics included are the following: specific systems, components, or processes; industry experiences; and administrative requirements and procedures. Individuals are assigned to attend scheduled training as deemed necessary by maintenance supervisors.

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### TRAINING FACILITIES AND EQUIPMENT

**PERFORMANCE OBJECTIVE:** The training facilities, equipment, and materials should effectively support training activities.

**Finding (TQ.9-1)**

Improvements are needed in the study and reference material available for use in systems training. Existing system descriptions are out of date. The plant is aware of this situation, and an Operations Plant Manual is being written to provide updated system descriptions.

**Recommendation**

Complete the development of the Operations Plant Manual. Implement a process to ensure that the newly developed material will be kept updated to reflect system modifications.



**Response**

The Operations Plant Manual is scheduled to be completed by January 1984. A specific individual has been assigned as coordinator for this manual, with an individual "owner" assigned to each section. It will be the owner's responsibility to review periodically and update his/her section of the manual in accordance with a specific schedule. Individuals using the manual can recommend changes, as appropriate, by simply contacting the owner of the section involved. Updates required due to modifications to plant equipment/systems will be formally controlled through Administrative Procedure 1043, Control of Plant Modifications.

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RADIOLOGICAL PROTECTION

## RADIOLOGICAL PROTECTION ORGANIZATION AND ADMINISTRATION

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

<b>Finding (RP.1-1)</b>	The criteria used for extending radiation work permits (RWP) is not sufficiently defined. Most routine RWPs are extended for seven days without a requirement to resurvey areas on a routine basis to ensure that radiological conditions have not changed.
<b>Recommendation</b>	Provide additional guidance in the RWP procedure on extending RWPs. Establish resurvey requirements for extended RWPs.
<b>Response</b>	The RWP procedure is being revised to include criteria for extending RWPs and the requirement to resurvey extended RWP work areas at least every 72 hours. Additionally, the procedure revision will require that copies of extended RWPs be placed at a discrete location for daily foreman review. The revision to this procedure will be implemented by October 1983.

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GENERAL EMPLOYEE TRAINING IN RADIOLOGICAL PROTECTION

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

<b>Finding (RP.3-1)</b>	<p>The following Good Practice was noted: During general employee training in radiological protection, each individual is required to perform the following activities:</p> <ul style="list-style-type: none"><li>a. demonstrate practical abilities such as donning and removing protective clothing and the proper use of personnel monitoring devices</li><li>b. work in a simulated radiologically controlled area using a RWP specifically addressing the work to be performed</li><li>c. respond to station emergency alarms and unusual radiological conditions</li></ul>
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## EXTERNAL RADIATION EXPOSURE

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

**Finding (RP.4-1)** The station ALARA program has not been fully implemented. Additional items needing implementation are as follows:

- a. man-rem estimates and exposure goals for specific jobs
- b. man-rem action levels requiring post-job reviews

**Recommendation** Complete implementation of the station ALARA program by addressing the areas noted above.

**Response** The following actions are planned to address the finding:

- a. Radiological Controls will expand efforts to establish man-rem estimates and goals for specific low level exposure work. This will be accomplished through increased use of the man-rem estimate section of the RWP and/or ALARA reviews, coupled with implementation of an Exposure Tracking Number (ETN) system. This effort is expected to be completed by November 1983.
  - b. The ALARA procedure will be revised to include guidelines for determining when a post-job review is required. The revision to this procedure should be implemented by November 1983.
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## PERSONNEL DOSIMETRY

**PERFORMANCE OBJECTIVE:** The personnel dosimetry program should ensure that radiation exposures are accurately determined and recorded.

**Finding (RP.8-1)** The quality control program for the new thermoluminescent dosimeter (TLD) system does not include spiked TLDs whose identity is unknown to personnel performing the analysis.

**Recommendation** Expand the existing dosimetry quality control program to include spiked TLDs whose identity is unknown to personnel performing the analysis. Develop acceptance criteria for the accuracy of these dosimeter results, and evaluate cases where acceptance criteria are not met.

**Response**

The existing TLD quality control program will be expanded to include use of spiked TLDs, whose identity is unknown to personnel performing the analysis, on a periodic basis in addition to the use of known spiked TLDs as is presently done. Acceptance criteria for dosimeter results will be established that include appropriate evaluation and action when the acceptance criteria are not met. These actions will be completed by November 1983.

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**Finding (RP.8-2)**

**Improvements are needed in the self-reading pocket dosimeter (SRPD) program.** The following areas need improvement:

- a. the identification of faulty SRPDs when there are unfavorable comparisons with TLDs
- b. the criteria for investigating the results of comparisons between TLDs and SRPDs
- c. the cause of the high percentage of SRPDs that fail the calibration check

**Recommendation**

Revise the SRPD program to include the following:

- a. Issue SRPDs to workers by serial number. Perform calibration checks on SRPDs when unfavorable comparisons with TLDs occur.
- b. Lower the threshold and acceptable deviation percentage values for SRPD and TLD comparison.
- c. Establish operating histories for SRPDs and remove problem dosimeters.

INPO Good Practice EPN-03, "Comparison of Dosimetry Results," could be of assistance in this effort.

**Response**

The following actions will be taken to address the finding:

- a. By November 1983, SRPD issue by serial number will be examined, and implementation of this program will be made if it is determined to be efficient and useful.
  - b. The existing criteria for SRPD/TLD comparisons will be examined by November 1983, and necessary corrective action will be initiated.
  - c. The performance, test failure rate of SRPDs will be reviewed on a periodic basis and corrective actions taken as necessary.
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CHEMISTRY

## CHEMISTRY ORGANIZATION AND ADMINISTRATION

**PERFORMANCE OBJECTIVE:** Chemistry organization and administration should ensure effective control and implementation of chemistry activities.

**Finding (CY.1-1)**      **Supervision of chemistry technicians needs strengthening.** The chemistry foreman assigned to supervise chemistry technicians is also performing other responsibilities that require significant amounts of time and limit his attention to laboratory activities. As a result, chemistry technician activities are not always prioritized or monitored for optimum use of technician time.

**Recommendation**      Initiate appropriate actions to improve supervision of chemistry technicians.

**Response**              The ability to provide additional supervision of technician activities has been strengthened by the following actions:

- a. Additional clerical support has been assigned to assist the chemistry foreman responsible for technician activities.
  - b. An additional chemistry professional was hired to provide technical support for laboratory activities, including procedure review and preparation, and instrument installation, calibration, and troubleshooting. The foreman previously responsible for this work will be able to devote more time to technician supervision.
  - c. An additional foreman on temporary assignment from the Training Department will provide additional supervision throughout the restart program until one additional chemistry supervisor is hired.
  - d. The assignment of additional first-level supervisors is under consideration.
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**Finding (CY.1-2)**      **Coordination of activities between on-site and off-site Chemistry Departments needs strengthening.** For example, the preparation and approval process for station chemistry procedures is not always timely and sometimes results in procedures that are unnecessarily complex. Also, the installation and calibration of new analytical equipment are not always timely.

<b>Recommendation</b>	Improve the coordination of activities between the on-site and off-site Chemistry Departments including addressing the items noted above.
<b>Response</b>	GPU Nuclear Corporation will continue to refine the chemistry assignment matrix so that the responsibilities of all affected parties, both on-site and off-site, are clearly defined and understood. A monthly chemistry management meeting is being conducted at which major problems and interface difficulties are discussed and resolved. This meeting will also be used to focus attention on and establish priorities for the support needs of the plant to meet the chemistry upgrade program schedule. The procedure review process will be shortened by issuing drafts for review, and then calling all responsible reviewers to the site to witness procedure performance and provide final concurrence.

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#### CHEMISTRY PERSONNEL TRAINING AND QUALIFICATION

**PERFORMANCE OBJECTIVE:** The chemistry qualification program should ensure that chemistry personnel have the knowledge and practical abilities necessary to implement chemistry practices effectively.

<b>Finding (CY.2-1)</b>	Chemistry technicians need additional training in fundamental water chemistry and plant systems knowledge.
<b>Recommendation</b>	Assess the knowledge level of individual technicians in the areas noted in the finding, and develop a training program to correct identified deficiencies.
<b>Response</b>	The chemistry technicians knowledge level in the area of fundamental water chemistry and plant systems will be assessed by written and oral examination by October 1983. Deficiencies in knowledge will be corrected through training provided by the training modules already developed. Experienced technicians with demonstrated knowledge level and practical ability will be reassigned to shift coverage to better utilize their level of knowledge and to conduct OJT for the new technicians. A schedule for training chemistry technicians to improve deficiencies identified by testing will be provided by December 1983.

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### LABORATORY ACTIVITIES

**PERFORMANCE OBJECTIVE:** Laboratory and counting room activities should ensure accurate measuring and reporting of chemistry parameters.

**Finding (CY.4-1)**      Laboratory work areas are not always maintained in accordance with good housekeeping practices. Work areas were dusty, and countertops were cluttered.

**Recommendation**      Provide more emphasis on laboratory housekeeping practices. The chemistry laboratories should be kept clean and uncluttered to provide an atmosphere that promotes optimum analytical accuracy.

**Response**              More emphasis is being placed on laboratory housekeeping practices. The importance of good housekeeping practices has been re-emphasized to all Chemistry Department personnel. Chemistry Department managers/supervisors have been instructed to monitor housekeeping practices on a continuing basis and to immediately take appropriate corrective actions when housekeeping is found to be deteriorating. Monitoring of the laboratory since the evaluation has not identified housekeeping as a continuing problem. Dust in the laboratory is due to an inadequate ventilation system filter. An engineering project to investigate ventilation system inadequacies will be initiated in 1984.

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### CHEMICAL AND LABORATORY SAFETY

**PERFORMANCE OBJECTIVE:** Work practices associated with chemistry activities should ensure the safety of personnel.

**Finding (CY.5-1)**      Safety practices associated with chemistry activities need improvement. Eating, drinking, and smoking were observed in the secondary laboratory where poisonous chemicals are stored and handled. In addition, safety equipment is not always used or accessible.

**Recommendation**      Place more attention on chemistry and laboratory safety practices. Eating, drinking, and smoking should not be allowed in the secondary laboratory. Keep the areas around safety equipment such as eye wash fountains and emergency showers clear so that emergency access to these facilities will not be affected. Ensure that technicians wear proper eye protection while working in the laboratory.

**Response**              All chemistry managers/supervisors have been instructed to be alert to initiate immediate corrective actions for laboratory safety deficiencies and unsafe practices. Obstructions to field safety equipment, as noted during the evaluation, have been removed.



There currently is not adequate space available for a separate eating, drinking, and smoking area in the close vicinity of the secondary laboratory. As an interim measure, a specific location will be established within the laboratory where the technicians will be permitted to eat, drink, and smoke. Chemistry analyses will not be performed in this area. As a long-term solution, a project is currently being evaluated for inclusion in the 1984 capital budget that will modify the rad con/chemistry work areas and provide a space that will be adequate for both radiation technicians and chemistry technicians to eat, drink, and smoke.

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## APPENDIX I

### Summary of Outstanding Response Action from Previous Evaluation (1981)

#### MANPOWER RESOURCES

**Finding (OA.3-1)** **Written qualification requirements are current for supervisory and technical positions.** For positions below first-line supervisors, the qualification requirements need updating.

**Recommendation** Update and maintain current job specifications for appropriate positions below first-line supervisors. INPO is coordinating an industry-wide job analysis project for certain operator, maintenance, and technician positions. GPU may wish to utilize the results in defining qualification requirements for applicable TMI positions.

**Response** GPU has been involved with EEI efforts on validation of job requirements for power plant personnel. GPU will be using that effort and the referenced INPO-led effort in the development of new job specifications for nonexempt personnel. The revised job specifications and a procedure to maintain these current are scheduled to be completed by December 1982.

**Status** Supervisory and non-supervisory exempt job specifications have been updated, and a program is in place to continue updating as changes occur. Action for exempt positions is considered complete. The non-exempt position specifications are subject to union negotiation and have not been approved. However, since a new union contract was recently signed, the negotiation and approval of these position specifications are expected to be completed in the near future.

#### PLANT MODIFICATIONS

**Finding (TS.4-1)** **Plant operators are not able readily to determine some system configurations with available drawings.** The current system of revising drawings and maintaining accurate information in the control room is adequate. However, systems that were modified prior to the new drawing control procedure have not had their drawings updated. In order to correct this problem, GPU has initiated a program to update these drawings prior to plant startup.

**Recommendation** The program to update drawings used by operators should be continued to completion.

**Response** GPU will have baseline engineering drawings essential for plant operations updated and in the control room prior to restart. Review of all old modification packages, which predated the new control procedures, to ensure that previous modifications are properly reflected on the drawings will be completed by the end of 1982.

Status	Efforts are progressing to update drawings for 237 modifications processed under the old change modification program. Currently, 193 of the modifications have been installed, 156 walked down by design drafting, and 44 have not been installed. Drawings for all 193 modifications installed will be updated by the time of restart. Drawings for modifications to be installed under this program in the future will be revised as the modifications are installed. This item should be completed by restart.
Finding (TS.4-2)	<b>Improved controls are needed to ensure piping system mechanical stresses are not changed without appropriate engineering review.</b> The use of lead blankets around system pipes for shielding purposes should receive a technical review prior to each installation. An evaluation is in progress by GPU Technical Functions personnel to determine the effects on systems that currently have add-on lead shielding in place.
Recommendation	Complete the engineering evaluation of lead blankets currently in place and develop a program or guidelines to control the future placement of temporary shielding on plant piping systems and equipment.
Response	This problem had been identified by the plant staff earlier this year and engineering guidelines are being developed to control the placement of lead shielding on or in the vicinity of piping systems and equipment. These guidelines will be implemented by April 1, 1982. To correct the immediate problem, a radiation survey of the areas where lead blankets were installed was conducted. As a result, a large amount of the temporary shielding was removed due to reduced radiation levels because of the long period the plant has been shut-down. An engineering evaluation of lead blankets still installed will be completed and appropriate modifications made before restart of the unit.
Status	Some temporary lead shielding is still in place on plant systems. Most of this shielding will be removed by restart. An engineering evaluation will be made of the remaining temporary shielding to justify continued use. A procedure has been drafted and is scheduled to be issued by restart. The draft procedure appears to provide the necessary guidance and to require appropriate reviews to control future use of lead shielding.

## TRAINING ADMINISTRATION

Finding (TQ.2-1)	A training program for middle-level managers in plant systems and technology is needed. Currently, such courses exist for individuals at the operator/technician level and at the senior management level. However, individuals in positions between these levels receive no such training.
Recommendation	Provide plant systems and technology training to middle-level managers. Existing programs for personnel at operator/technician levels and/or senior management levels could be utilized in this effort.
Response	GPU agrees that a formal training program for middle-level managers in plant systems and technology is needed. A specific course on pressurized water reactor (PWR) systems and technology is under development and is scheduled to be available in July 1982. Attendance at this course, or portions thereof, will be determined on an individual basis taking into consideration the background, work assignments, and professional development objectives of the individual employee.
Status	A course in plant systems and technology has been implemented for corporate and site engineers. When this initial course is completed in the fall of 1983, it will be modified based on feedback from attendees and an assessment of the needs of middle management. The modified course is expected to be in place and offered to managers by December 1983.

## APPENDIX II

### Performance Objectives Reviewed

#### ORGANIZATION AND ADMINISTRATION

OA.1 Station Organization and Administration

Station organization and administration should ensure effective implementation and control of station activities.

OA.2 Management Objectives

Station management objectives should be established and progress monitored through a formal program.

OA.3 Management Assessment

Management should monitor and assess station activities to improve performance in all aspects of nuclear plant operation.

OA.4 Personnel Planning and Qualification

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

OA.5 Industrial Safety

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

OA.6 Document Control

Document control systems should provide correct, readily accessible information to support station requirements.

OA.7 Station Nuclear Safety Review Committee

Review of station nuclear activities by a knowledgeable, interdisciplinary group should ensure achievement of a high degree of nuclear safety.

OA.8 Quality Programs

Quality programs should contribute to the effective performance of activities important to safety and reliability. Quality programs include quality assurance, quality control, and other programs that provide an independent assessment of plant activities or that function specifically to promote quality of workmanship.



## OPERATIONS

OP.1 Operations Organization and Administration

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

OP.2 Conduct of Operations

Operational activities should be conducted in a manner that achieves safe and reliable plant operation.

OP.3 Plant Status Controls

Operational 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.

OP.4 Operations Knowledge and Performance

Operator knowledge and performance should support safe and reliable plant operation.

OP.5 Operations Procedures and Documentation

Operational procedures and documents should provide appropriate direction and should be effectively used to support safe operation of the plant.

OP.6 Operations Facilities and Equipment

Facilities and equipment should effectively support plant operation.

## MAINTENANCE

MA.1 Maintenance Organization and Administration

Maintenance organization and administration should ensure effective implementation and control of maintenance activities.

MA.2 Plant Material Condition

The material condition of the plant should be maintained to support safe and reliable plant operation.

MA.3 Work Control System

The control of work should ensure that identified maintenance actions are properly completed in a safe, timely, and efficient manner.

MA.4 Conduct of Maintenance

Maintenance should be conducted in a safe and efficient manner to support plant operation.

MA.5 Preventive Maintenance

Preventive maintenance should contribute to optimum performance and reliability of plant equipment.

MA.6 Maintenance Procedures and Documentation

Maintenance procedures should provide appropriate directions for work and should be used to ensure that maintenance is performed safely and efficiently.

MA.7 Maintenance History

Maintenance history should be used to support maintenance activities and optimize equipment performance.

MA.8 Maintenance Facilities and Equipment

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

MA.9 Materials Management

Materials management should ensure that necessary parts and material are available when needed.

TECHNICAL SUPPORT

TS.1 Technical Support Organization and Administration

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

TS.2 Surveillance Testing Program

Surveillance inspection and testing activities should provide assurance that equipment important to safe and reliable plant operation will perform within required limits.

TS.3 Operations Experience Review Program

Industrywide and in-house operating experiences should be evaluated and appropriate actions undertaken to improve plant safety and reliability.

TS.4 Plant Modifications

Plant modification programs should ensure proper review, control, implementation, and completion of plant design changes in a safe and timely manner.

TS.5 Reactor Engineering

On-site reactor engineering activities should ensure optimum nuclear reactor operation without compromising design, safety, or nuclear fuel limits.

TS.6 Plant Performance Monitoring

Performance monitoring activities should optimize plant efficiency and reliability.

TS.7 Technical Support Procedures and Documentation

Technical support procedures and documents should provide appropriate direction and should be effectively used to support safe operation of the plant.

TRAINING AND QUALIFICATION

TQ.1 Training Organization and Administration

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

TQ.2 Non-Licensed Operator Training and Qualification

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

TQ.3 Licensed Operator Training and Qualification

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

TQ.4 Shift Technical Advisor Training and Qualification

The shift technical advisor (STA) training and qualification program should develop and improve the knowledge and skills to perform assigned job functions.

TQ.5 Maintenance Personnel Training and Qualification

The maintenance personnel training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

TQ.6     Training for the Technical Staff

The training program for the technical staff should broaden overall knowledge of plant processes and equipment as a supplement to position-specific education and training.

TQ.7     Training for Supervisors and Managers

The training program for supervisors and managers should broaden overall knowledge of plant processes and equipment and develop supervisory and management skills.

TQ.8     General Employee Training

The general employee training program should develop a basic understanding of employee responsibilities and safe work practices.

TQ.9     Training Facilities and Equipment

The training facilities, equipment, and materials should effectively support training activities.

RADIOLOGICAL PROTECTION

RP.1     Radiological Protection Organization and Administration

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

RP.2     Radiological Protection Personnel Training and Qualification

The radiological protection training and qualification program should ensure that radiological protection personnel have the knowledge and practical abilities necessary to effectively implement radiological protection practices.

RP.3     General Employee Training In Radiological Protection

General employee training should ensure that plant personnel, contractors, and visitors have the knowledge and practical abilities necessary to effectively implement radiological protection practices associated with their work.

RP.4     External Radiation Exposure

External radiation exposure controls should minimize personnel radiation exposure.

- RP.5     Internal Radiation Exposure  
Internal radiation exposure controls should minimize internal exposures.
- RP.6     Radiological Protection Instrumentation and Equipment  
Instrumentation and equipment used to obtain measurements of radioactivity should be calibrated, used, and maintained so that results are accurately determined.
- RP.7     Solid Radioactive Waste  
Solid radioactive waste controls should minimize the volume of radioactive waste and ensure safe transportation of radioactive material.
- RP.8     Personnel Dosimetry  
The personnel dosimetry program should ensure that radiation exposures are accurately determined and recorded.
- RP.9     Radioactive Contamination Control  
Radioactive contamination controls should minimize the contamination of areas, equipment, and personnel.

### CHEMISTRY

- CY.1     Chemistry Organization and Administration  
Chemistry organization and administration should ensure effective control and implementation of chemistry activities.
- CY.2     Chemistry Personnel Training and Qualification  
The chemistry qualification program should ensure that chemistry personnel have the knowledge and practical abilities necessary to implement chemistry practices effectively.
- CY.3     Chemistry Control  
Chemistry controls should ensure optimum chemistry conditions during all phases of plant operation.
- CY.4     Laboratory Activities  
Laboratory and counting room activities should ensure accurate measuring and reporting of chemistry parameters.