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REGION I

Report No. 87-06

Docket No. 50-289

License No. DPR-50

Licensee: GPU Nuclear Corporation

P. O. Box 480

Middletown, Pennsylvania 17057

Facility Name: Three Mile Island Nuclear Station, Unit 1

Inspection At: Middletown, Pennsylvania

Inspection Conducted: February 17 - March 3, 1987

Inspectors: W. Baunack, Project Engineer
P. Bissett, Reactor Engineer
L. Briggs, Lead Reactor Engineer
D. Johnson, Resident Inspector (TMI-1)
J. Kaucher, Resident Inspector (Limerick II)
T. Kenny, Senior Resident Inspector (Salem 1 & 2)
S. Peleschak, Reactor Engineer (Entry Level)
D. Trimble, Resident Inspector (Calvert Cliffs 1 & 2)
F. Young, Resident Inspector (TMI-1)

Reviewed By: for R. Conte, Team Leader — 3-17-87 Date

Approved By: A. Blough, Senior Team Manager — 3-17-87 Date

Inspection Summary:

This special safety inspection (459 staff hours) was to assess licensee control measures for overall readiness to start up TMI-1 after a scheduled five month refueling outage. The inspection included a design review of the Heat Sink Protection System (HSPS), focusing on instrument and control aspects. The following functional areas were covered: plant operations; maintenance; surveillance; technical support, including modification and test control; and assurance of quality. Within each functional area, the team members assessed the status and quality of: the licensee meeting safety-grade design for HSPS; procedure revisions as a result of facility modifications (including HSPS) and

recent technical specification changes; quality assurance department involvement in the outage; and, licensee prerequisite lists for startup. Licensee and NRC outstanding items to remain open at the time of startup were assessed for any impact on safety. The adequacy of completed work as prerequisites for Cycle 6 startup was also selectively reviewed.

Inspection Results:

The team noted that sufficient control measures existed to assure the safe restart of TMI-1. In all functional areas reviewed, the licensee's organization appeared to be dedicated and conscientious in assuring the readiness of the facility and personnel for this startup. At the time of the inspection, completed maintenance and surveillance (except for new systems) demonstrated plant readiness for startup in their respective areas. The quality assurance department involvement in this outage was substantial.

The team also noted a number of licensee initiatives that enhanced the overall control of activities. In the plant operations area, there was a dedicated shift technical adviser providing interface support between that department and engineering personnel. Requalification examinations will be completed, along with extensive training, for licensed operators on new modifications installed during this outage. The licensee's extensive prerequisite list has an apparent overall command and control effect on all licensee divisions to support the TMI-1 division.

As would be expected, a substantial amount of work remains to be completed. Most significantly, a number of design analyses in the mechanical, structural, electrical, and instrument and control disciplines was needed to confirm the fully safety-grade configuration of the emergency feedwater system. There were residual issues in the overall environmental qualification and fire protection programs. In the plant operations area, system walkthroughs and valve lineups had not started but were scheduled to be completed. Updated "as-built" configuration documents, such as drawings, were needed to be placed in the control room. Based on the large volume of work remaining, the tentative startup date appeared to be in jeopardy in the judgement of the team. The licensee emphasized that the startup date would be adjusted if plant readiness for restart was not achieved when currently scheduled.

The team identified a number of items that were not specifically known to licensee representatives. The apparent failure to follow procedures in the surveillance area was another example of the licensee's procedure adherence problem for which the licensee was in the process of taking generic correction action (paragraph 4.2.3). The apparent failure to properly review and approve an HSPS setpoint calculation was another example of a lack of attention to detail in the technical support area (paragraph 5.1.2.4). A number of other HSPS design analyses either were not well documented or it was not clear that they would have been completed prior to plant startup without team identification of the issues; e.g., seismic II over I study. There appears to be a need to enhance the operating procedures and labeling of cabinets for the HSPS.

There was one instance of operations department disruption of the smooth conduct of a preoperational test. This could have been precluded had there been more forethought in the test preplanning and pre-implementation evaluation stage. In general, the test program was adequately performed and was identifying design/installation errors as intended.

Careful management involvement and close attention to detail on the part of personnel and their supervisors will be needed to assure the safe startup of TMI-1.

TABLE OF CONTENTS

DETAILS

1.0 Introduction and Overview

1.1 Background and Purpose

With the shutdown of TMI-1 on October 31, 1986, the licensee completed the first cycle of operation since the TMI-1 restart and entered a scheduled five month outage for refueling and extensive facility modifications. Significant modification work included upgrading of the fire protection and emergency feedwater systems. Also, a number of the restart commitments and TMI Task Action Plan (TAP) items are due to be completed for this startup. In light of the outage length, significant licensee workload and scope of modifications, Region I chose to perform a special readiness assessment team (RAT) inspection at TMI-1.

The purpose of the inspection was to assess the licensee's overall readiness for startup after this extended refueling outage. The main focus of the inspection was on the adequacy of licensee management controls that would assure the resolution of technical and safety issues prior to plant startup. The team was well aware that the plant would not be physically ready for operation at the time of this inspection.

1.2 Inspection Process

The team was composed mostly of experienced resident and region-based inspectors assigned to TMI-1 and other Region I facilities. The following functional areas were reviewed: plant operations; maintenance; surveillance; technical support, focusing on modification and preoperational testing control; and, assurance of quality, which included certain training aspects.

An important part of this inspection was a detailed design review in the Instrument and Control (I&C) area for the Heat Sink Protection System (HSPS), the safety-grade initiation and control system for the emergency feedwater system. From the design review, NRC staff followup occurred on site regarding the HSPS installation and other functional activities. This methodology was similar, but on a more limited basis, to the first performance appraisal team inspection of 1986.

A number of general attributes were assessed by the team on a sampling basis.

-- The status and quality of the safety-grade design of HSPS to meet regulatory requirements and commitments.

-- The status and quality of procedure revisions as a result of facility modifications and recent Technical Specifications (TS) amendments.

-- The status and completeness of licensee outstanding items lists for startup in the various functional areas. Included in this was an assessment of an impact on safety, if any, for these outstanding items that would be left open at the time of startup.

-- Impact on safety of those NRC inspection findings that will be outstanding at the time of startup.

-- Quality assurance department involvement in the refueling outage.

-- Overall adequacy of the licensee's prerequisite lists and startup plans.

1.3 Safety-Grade Emergency Feedwater Background

Commission Order CLI 85-9 permitted TMI-1 to resume operation subject to the conditions imposed in the restart proceedings. Restart Condition 3(a) requires that prior to startup following Cycle 6 refueling, GPU Nuclear Corporation shall upgrade the EFW system to provide safety-grade automatic control and to provide other system improvements to include redundant control and block valves, automatic start on Once-Through Steam Generator (OTSG) low level and upgrades of the main steam rupture detection system and the condensate storage tank low-low level alarm to safety grade. This condition, along with the associated hearing records and NRC staff safety evaluations, basically delineate the requirements that are embodied in Task Action Plan (TAP) II.E.1.1 and II.E.1.2 of NUREG 0737.

The purpose of this review was to verify that the licensee incorporated NRC-imposed design objectives into licensee design packages/documents and plant installation documents/records as required by the Restart Condition 3(a). A review of the NRC-imposed design objectives was performed as part of NRC Inspection Report No. 50-289/85-20. This report, coupled with past inspection reports, verified the required design requirements had been incorporated in the licensee's design/installation documents. Selected modifications for restart completed in 1985 were also verified to be in accordance with the intended design and properly installed for restart. Additional required reviews to be completed were being followed as an unresolved item (289/85-20-01).

This report focused on the design and installation of the HSPS portion of safety-grade emergency feedwater. Residual issues associated with restart condition 3(a) are addressed in paragraph 7.2.

The NRC findings and conclusions are addressed below (Sections 2 through 7).

2. Plant Operations

2.1 Criteria and Scope of Review

To assess readiness in the plant operations area, the inspector reviewed the following items: (1) licensee mechanisms to identify work to be completed; (2) listings of outstanding work and administrative controls for ensuring work completion; (3) status of incorporating procedure changes resulting from the Heat Sink Protection System (HSPS) modification and related technical specification changes; (4) the technical adequacy of HSPS procedure changes; (5) training material and training activities provided to operators on HSPS; (6) the interface of HSPS with the Integrated Control System (ICS); and, (7) human factors placement of Emergency Feedwater System (EFW) valves. The basic requirements for this area are TS 6.8 and ANSI 18.7-1976. The HSPS modification was chosen for review because it was a major activity completed during the outage with significant importance to safe plant operations.

The inspector looked for evidence that all work necessary for startup had been identified, was being adequately performed, and would be completed on an appropriate schedule.

Principal documents reviewed included the "TMI Post 6R Refueling Outage Startup Review List," the operations department list of jobs to be completed, the training handout for HSPS, portions of plant operating procedures affected by changes to the HSPS, and proposed HSPS technical specification changes as submitted by the licensee on January 28, 1987.

The inspector performed walkdowns of principal portions of the EFW, HSPS, and the two-hour backup air supply systems.

2.2 Findings/Conclusions

2.2.1 General Findings

The Plant Operations Director (POD) assigned an engineer with shift technical advisor qualifications and experience to act as a single point of contact for HSPS for the department. That individual was to become familiar with the system, provide training and training material to the department, provide input to designers on operational needs, and to prepare necessary procedure changes for HSPS. The inspector found the engineer to be very knowledgeable, thorough, and effective in carrying out his assigned tasks.

The licensee has decided to administer the annual operator requalification examinations just prior to startup. Questions will reflect plant modifications incorporated during the outage. This appears to be an effective way of assuring operator familiarity with these modifications and a good way to refresh operator knowledge prior to return to power operations.

Operations department detail review of, and input to, the design of the HSPS system did not occur until near the beginning of the refueling outage. As a consequence, it was barely possible to incorporate significant HSPS design changes requested by the operations department.

2.2.2 Tracking System

The inspector reviewed the licensee's "Post 6R Refueling Outage Startup Review List." This is a compilation of all prerequisite activities that must be accomplished prior to startup. Each division provided input to the document and approved its scope and content. This listing was being actively used by company managers to track progress and was being regularly updated. Its general level of detail went to the point of including such items as individual system valve alignments to be performed. At the time of the inspection, many activities were still indicated as outstanding in the operations area (e.g., all valve alignments had yet to be performed and 56 procedures required revision).

In support of the startup review list, the operations department was using a more detailed tracking list. The operations' list was also being closely monitored and regularly updated. To check the validity of the operations tracking system, the inspector verified that the procedure changes initiated by the operations coordinator for the HSPS modification were included on the operations' list and that several of those changes that were noted as completed (distributed) had indeed been incorporated into plant procedures.

The above tracking methodology was successfully used by the licensee for the TMI restart in 1985 and for the eddy current outage in 1986. This, coupled with the fact that the system is being emphasized and closely monitored by senior licensee managers, provides confidence that necessary activities will be accomplished prior to restart.

The inspector discussed the large number of outstanding items with the Plant Operations Director (POD) and questioned whether all necessary items could physically be accomplished by the tentatively planned startup date of March 20, 1987. The POD indicated that a delay in startup may be considered to allow additional time to perform checkouts and tests of modified systems.

2.2.3 Labeling of HSPS Cabinets

The HSPS control circuitry is housed in four cabinets. Two of these cabinets contain only a single instrumentation channel. The remaining two cabinets each house both instrumentation for a single channel and for an actuation train. Train actuations can be initiated if cabinet test switches are improperly positioned. This could cause inadvertent isolation of main feedwater to the steam generator (OTSG) and emergency feedwater actuation for example. Bypass switches which are similar in appearance are located in the channel instrumentation sections.

At the time of the inspection, the cabinets only had labels indicating the instrument rack numbers. An individual not familiar with rack numbers could possibly enter the wrong cabinet. In fact, an engineer supervising the HSPS modification opened the wrong cabinet door when he was showing the inspector connector points within a cabinet. Control room operators only have a general annunciator to indicate that a HSPS cabinet door has been opened. They do not have indication that a channel has been placed in test. The backs of the channel and train cabinets are similar in appearance and have similar labeling of terminal boards.

Because of the potential for initiation of unwarranted HSPS trips due to operator/technician error, the inspector expressed concern that the labeling may need improvement. The inspector was told that similar concerns have been expressed by members of the plant staff. Licensee management agreed that the adequacy of HSPS cabinet labeling would be reviewed subsequent to completion of testing and initial checkout of the system, which may occur after startup. The area of human factors labeling of the HSPS cabinets is unresolved pending completion of licensee committed action and subsequent NRC:R1 review (289/87-06-01).

2.2.4 Operator Training and Interface with Engineering on HSPS

The inspector reviewed an operator training handout on HSPS. The handout was written by the operations coordinator for the HSPS modification. That individual was aware that the System Design Description (SDD) TI-424B, Division II, was not up to date and he worked with the system designers to ensure that the training handout was correct.

All operating crews received four hours of classroom training on HSPS. All will also receive a plant walkthrough of the system. At the time of inspection, not all crews had received the walkthrough training.

During development of the training material and during the training administration, the operations coordinator and operations personnel noted weaknesses in system design. They noted that following HSPS actuation on low steam generator pressure, the feedwater isolation signal cannot be defeated if OTSG pressure returns above the actuation setpoint of 750 psig. They noted that there was no capability to select an alternate indication of OTSG level in the event of failure of the level transmitter locally selected to feed the ICS system. These weaknesses were pointed out to system designers and improvements were implemented (feedwater isolation defeat capability improved, a median selector switch added, and a non-safety-related backup power supply added for train power).

2.2.5 Procedure and Drawing Changes

The inspector reviewed with the operations coordinator for HSPS the changes that have either been made or have been initiated to operating procedures as a result of the HSPS modification and the associated technical specification changes. The coordinator appeared to have done a thorough job in determining which procedures required revision and in initiating required changes. Changes still outstanding were being tracked in the operations department tracking system.

The inspector noted that no guidance was provided to operators on the possible need for defeating the main feedwater (MFW) isolation function if MFW is used to increase OTSG level to the 90-95 percent control range in the event of a small break loss of coolant accident (SBLOCA). Isolation occurs at 94 percent level and would impede the ability to use MFW in this situation.

The licensee stated that emergency feedwater (EFW) is the most effective means for raising OTSG level during a SBLOCA and that their procedures adequately addressed EFW. They feared that including instructions on MFW use would unnecessarily complicate their emergency procedures which could hamper operator efforts. Further, an alarm response procedure cautions the impending MFW isolation on high OTSG level.

While the inspector agreed that the general philosophy of simplifying procedures was sound, he noted that, due to the importance of the OTSG cooling path in a SBLOCA in a B&W designed plant, consideration of the use of MFW as an alternate means of providing water to the OTSG may be appropriate. Therefore, the POD agreed to further evaluate the need for addressing MFW isolation specifically in the emergency procedures. The need for this procedure revision is unresolved pending completion of licensee review and subsequent NRC:RI review (289/87-06-02).

The inspector performed partial walkdowns of the EFW and the two-hour backup air supply systems. He noted that the controlled drawings for these systems have not been updated to reflect outage modifications. The inspector understood that these drawings would be updated prior to startup as part of the modification completion process (see also Section 5).

2.2.6 Potential Design Weaknesses

During a walkdown of the two-hour backup air supply system, the inspector noted that both seismically qualified, safety-related two-hour supply headers provide motive air to the diaphragm control valve (MS-V-6), which regulates steam pressure to the steam-driven emergency feedwater pump. The inspector questioned the effects of a diaphragm rupture during EFW system operation to verify that this single failure could not bleed down the redundant air headers and render them inoperable. A design requirement for the air system is that it remain operable in the event of a single failure. The inspector was concerned that in the high temperature environment in which the valve is located the rubber diaphragm could degrade (as has occurred at another nuclear power plant) and rupture. The MS-V-6 fails open on loss of air pressure. This would increase steam pressure to the pump and the controller would probably port additional air to the valve in an attempt to close it to reduce line pressure. Such action could bleed the air headers down. The licensee's single failure analysis should address this concern (289/86-12-02) (see Section 5.3).

2.2.7 HSPS Interface with the Integrated Control System

The inspector discussed with the operations HSPS coordinator the possible effects of HSPS system failures on the Integrated Control System (ICS) . With the inclusion of the median power supply in system design, it appears that failures would be benign and the more plausible failures would be indicated to the operators (see also Section 5).

2.2.8 Control of Spare Connections from HSPS to the Reactor Protection System

At one time, the licensee intended to have interconnections between the HSPS and the Reactor Protection System (RPS). The inspector was told by licensee personnel that this connection will not be made. The inspector examined the connection terminals that would have been used and confirmed that no connections existed and no spare output leads existed which could, if not properly terminated, ground against each other or the cabinet itself.

2.3 Summary

Licensee tracking systems appeared to adequately identify and track work activities to be completed prior to startup. Many items were still outstanding. However, these systems were being actively used and monitored by station managers, thus providing assurance that outstanding items will be completed.

The use of a single coordinator for the operations department for the HSPS modification appeared to have provided an excellent means for assuring that feedback to designers was provided and that necessary procedure changes and training were accomplished or initiated. Operations detailed interface with HSPS designers was not initiated until the start of the refueling outage; however, no deficiencies were noted by the team which were attributable to this relatively late interface.

Labeling of the HSPS cabinets appears confusing and may result in the possibility of spurious trips due to operator/technician error. A possible design weakness noted by the team in the two-hour backup air supply system will be evaluated by the licensee and NRC staff. The HSPS interface with ICS does not appear to create the possibility of adverse effects on ICS or HSPS.

Licensee consideration is being given to possible inclusion into the procedures of the use of main feedwater in providing water to OTSG's during SBLOCA conditions and an appropriate caution statement addressing MFW isolation (unless defeated) when approaching the 95 percent level on the OTSG operating range.

3. Maintenance

3.1 Criteria and Scope of Review

Plant maintenance programs were reviewed to verify that the licensee had developed, implemented, and maintained a corrective and preventive maintenance program necessary to ensure the operability of safety-related systems. Of importance during this inspection was the review of maintenance activities accomplished during the present 6R outage and an assessment of those activities that would be deferred until after startup or during the 7R outage.

In addition to a program review, NRC team members witnessed on-going maintenance activities and discussed maintenance-related activities and administrative controls with appropriate personnel. They also assessed present staffing levels and management involvement within this area. Interviews were held with maintenance department personnel (mechanical, electrical, and instrument and controls) and interfacing departments, including operations, engineering, and quality assurance. Acceptance criteria for this review included ANSI N-18.7-1976 and the licensee's (NRC approved) Quality Assurance Plan (QAP).

Discussions were held with the planning and scheduling manager to determine the manner in which maintenance activities, both preventive and corrective, were planned, scheduled, tracked, and documented. Discussions were also held with the preventive and corrective maintenance managers to assess their involvement with the accomplishment of maintenance activities.

Administrative procedures utilized to control the conduct of work, along with completed work packages, were reviewed to verify the following:

-- required administrative approvals were obtained prior to commencement of work;

-- approved procedures and/or instructions and controlled drawings were used during the accomplishment of work;

-- appropriate post-maintenance testing was completed prior to declaring a system or equipment operable;

-- QC notification points, where deemed applicable, were appropriately placed within the procedure;

-- qualified test equipment and tools were identified;

-- procedures and appropriate data sheets were properly completed;

-- acceptance criteria were met;

-- appropriate reviews were completed as required; and,

-- records were assembled, stored, and retrieved as part of maintenance history.

Direct observation of on-going maintenance activities was also performed during the inspection to provide verification of the completion of the above attributes. This observance of work also gave the inspector the opportunity to assess actual work practices and communication and coordination between various work groups.

The inspector also assessed present staffing levels and reviewed management's involvement in the maintenance area. This review, coupled with a review of outstanding job orders, provided the team with an indication of the adequacy of staffing levels and management involvement.

3.2 Findings/Conclusions

3.2.1 General

This review indicated, overall, that the conduct of maintenance activities is performed by an organization dedicated towards maintaining plant equipment in a state of operational readiness. No obvious weaknesses were determined during this review. Coordination of efforts between various on-site disciplines was evident and the prioritization of outstanding work activities was viewed as an excellent assessment of what had to be accomplished prior to restart.

3.2.2 Preventive/Corrective Maintenance

The inspector found preventive maintenance (PM) and corrective maintenance (CM) programs to be well maintained, controlled, and documented. Various weekly status sheets summarize the status of outstanding job orders to which PM and CM work activities are written against. These status reports also provide the amount of progress being made in various areas, thus, enabling management to effectively analyze areas where a backlog of scheduled maintenance might effect the operability of safety-related equipment.

Various computerized and manual mechanisms were found to be in place that documented and tracked the status of work activities. Utilizing these mechanisms, supervisory personnel recently prioritized all existing job orders to determine which tasks needed to be completed prior to restart compared to those which could be deferred. Many deferred tasks will be accomplished during planned system outages that presently are scheduled after restart.

The PM data base is quite extensive as noted by the inspector's review. Much effort has been expended towards evaluating and expanding upon the preventive maintenance program. Increased emphasis was placed in this area in 1979 and has continued since. The inspector questioned the licensee as to whether any PM requirements are in place for manually operated valves, particularly EF-V-52, 53, 54, and 55. Another reactor of the B&W design experienced difficulty in operating similarly designed, manually operated isolation valves. At TMI-1, the EFW discharge isolation valves (EF-V-52, 53, 54, and 55) are manually operated block valves down stream of four parallel flow control valves that fail closed on a loss of air. As depicted in NRR's Safety Evaluation relating to NUREG 0737, Item II.E.1.2, Emergency Feedwater system, NRC staff approved the design change to make the EFW flow control valve fail closed and the discharge isolation valve to be manually operated. These valves could require local manual operation (closure) in the event of a main steam line break inside containment with an EFW flow control valve failure. Licensee representatives stated that PM requirements have yet to be identified for the above-mentioned valves. Until particular PM requirements are assigned to EF-V-52, 53, 54, and 55, this area will remain unresolved (289/87-06-03).

Significant work has been accomplished within the areas of MOVATS testing of motor-operated valves and valve packing repairs during the present outage. All motor-operated valves within the scope of NRC:IE Bulletin 85-03 have been tested along with numerous others. Again, priority lists have been generated detailing the order in which valves are to be tested. Additional review on the part of the licensee has indicated that many of the valves are overrated; thus, many valves, including those previously tested, will have their torque switches readjusted to produce more conservative thrust values.

A group was dedicated solely to repacking valves during this outage. Efforts are continuing in this area. Again, prioritized lists were generated to facilitate the accomplishment of this endeavor. The inspector noted that over 350 valves had been repacked during this outage.

3.2.3 Maintenance Activities

The inspector observed the work in progress on valve MS-V-009A. This swing check valve had been disassembled for inspection purposes and workers were presently performing resurfacing work on the valve seat prior to running a dye check. Initial disassembly of MS-V-009A had revealed that the disc stud nut, washer, and cotter key were missing. The valve was found to still be operable. Further investigation, as dispositioned by engineering, resulted in locating the nut and washer; however, the cotter key was never found.

Upon visual inspection of the disassembled valve, the inspector questioned the looseness of the valve disc nut-to-stud fit. Further review indicated that engineering had previously identified and evaluated the same concern. Final resolution was to secure the nut-to-the-disc stud by lock welding in addition to installing the cotter pin. This will make any future valve disassembly more difficult; however, it does provide additional assurance of the integrity of the valve. Similar actions were performed on MS-V-009B even though no problems had been identified.

The inspector also observed the conduct of PM Procedure E-5, 480 V Circuit Breaker - Inspection and Testing, which dealt with solid state trip devices. The inspector found the appropriate attributes, as detailed in paragraph 3.1, to have been effectively accomplished.

3.3 Summary

The team found that the various divisions of the maintenance department were adequately staffed. Maintenance supervisory personnel were knowledgeable of on-going activities and have effectively maintained control of scheduled activities throughout this outage. Communication and coordination between maintenance and other groups appeared to be more than adequate. Organization and quality of completed work packages were excellent.

4. Surveillance

4.1 Criteria and Scope of Review

The licensee's established program for the scheduling and control of surveillance testing activities was reviewed. Review criteria consisted primarily of the technical specification requirements and the requirements of Station Procedure 1001J, Technical Specification Surveillance Testing Program. The adequacy of the station procedure has been previously reviewed during the inspections associated with the plant startup.

Specific areas inspected were:

-- control, scheduling, tracking, and evaluation of surveillance tests;

-- verification of the completion of all technical specification required refueling interval procedures;

-- control of exceptions and deficiencies (E&D's) associated with completed surveillance test procedures;

-- verification that procedures have been prepared for the surveillances required by recently issued Technical Specification Amendments;

-- detailed review of the past performance of one set of instruments which will be associated with the HSPS installation;

-- the QA monitoring and inspection of the surveillance testing program; and,

-- previously identified unresolved items were evaluated for possible impact on startup.

4.2 Findings/Conclusions

4.2.1 Surveillance Procedure Controls

The licensee controls the surveillance test program by Station Procedure 1001J, Technical Specification Surveillance Testing Program. This procedure specifies the responsibilities of various individuals associated with the surveillance test program, specifies the general flow process for the performance of a surveillance test, and the requirements associated with the accomplishment of a test. The procedure provides for the disposition of problems encountered during surveillance testing by defining exceptions and deficiencies and specifying the method of resolving of these exceptions and deficiencies. Surveillance test review and record keeping requirements are also specified by the procedure.

The licensee's adherence to requirements of the procedure was reviewed in detail with particular emphasis on the scheduling of required testing. Specifically, the scheduling of refueling interval surveillances was inspected, since these are the most difficult to schedule by use of a computer.

A review of documentation, the computer generated surveillance checklist, and discussions with facility personnel indicates that the general requirements of Procedure 1001J are being fulfilled. In the area of tracking and scheduling of refueling interval surveillances, significantly more controls have been established than are procedurally required.

The 1001J preventive maintenance supervisor is aware of certain improvements which can be made to the procedure to more specifically reflect the controls which have been established. These procedure changes are expected to be incorporated into the procedure by August 1987. The conscientious efforts on the part of personnel involved in the tracking, scheduling, and assuring completion of required testing is noteworthy. As an additional check to the controls established to assure completion of required surveillance testing, the Operating Procedure 1102-1, Plant Heatup to 525 F, specifies additional verification that technical specification-required surveillances have been completed.

With the controls which have been established, performance of required testing within the interval specified appears to be assured.

4.2.2 Refueling Interval Surveillances

Records verifying the completion of all surveillance tests required to be performed at a refueling interval were reviewed to determine that each has been performed as required.

In addition to computer generated data indicating late completion dates for scheduled tests, a manual list is maintained which identifies tests to be performed prior to the completion of this outage. An additional control, a regulatory retest log, has been established for tests which, due to plant conditions or equipment out of service, cannot be performed when scheduled. The maintenance of this log by control room personnel was verified.

At the time of the inspection, there were no overdue refueling interval-required tests. Some tests which would come due during the operating cycle are scheduled to be performed during the outage and tests which had been scheduled, but could not be performed, are being tracked.

4.2.3 Completed Procedure Review

The inspectors reviewed selected completed surveillance tests to verify that test procedures were properly completed, test results were reviewed as required, data and test results were acceptable, and that corrective action was taken where necessary. Completed surveillance tests reviewed during this inspection are listed in Attachment 2.

During the review of Procedure 1302-5.10, Reactor Building 4 psig Channel, performed February 11, 1987, the inspector found a wire/jumper control sheet attached, which identified the lifting of certain leads during the performance of the surveillance test. The jumper control sheet also verified the proper reconnection of the lifted leads. The jumper control sheet is part of a licensee procedure which controls lifted leads and jumpers.

A review of the surveillance procedure as written did not identify any leads which required lifting. Subsequent discussions with licensee personnel disclosed that the procedure was not performed as written; that is, the calibration of the entire loop at one time. Rather, the calibration was performed component by component. Further discussions with licensee personnel indicated that a number of loop calibration procedures had been changed to permit and provide instructions for component-by-component calibration; consequently, technicians were accustomed to performing calibrations in this manner. This procedure, however, had not been changed and the failure to initiate a procedure change prior to the performance of the procedure is considered to be an apparent violation of TS 6.8.1 (289/87-06-04).

It was noted that, in the performance of the test, measures were established to control the necessary lifting and reconnecting of leads.

4.2.4 Control of Problems Encountered During Surveillance Testing

The licensee has established a means of documenting and evaluating problems encountered during surveillance testing. This control is achieved through the use of a "TS Surveillance Exception and Deficiency (E&D) Sheet." Deficiencies are equipment problems or malfunctions or a test not completed. These must be immediately identified to the shift supervisor. Exceptions are non-substantiative changes which do not alter the intent or scope of the procedure. Exceptions must also be identified to the shift supervisor prior to implementation.

Both exceptions and deficiencies are documented as is the resolution of exceptions and deficiencies. A log of open deficiencies is maintained in the control room. Also, the preventive maintenance supervisor maintains a log of open deficiencies. Licensee representatives stated both logs and all completed surveillance procedures will be reviewed for unresolved items prior to startup from this outage. In addition, the plant heatup procedure requires the review of unresolved surveillance discrepancies.

The licensee's controls to ensure exceptions and deficiencies are resolved prior to plant startup appear to be adequate.

4.2.5 Surveillance Procedures Required by Technical Specifications Amendments

A review was conducted to verify that the required surveillance test procedures have been prepared for several recently issued Technical Specification amendments. The preparation of selected procedures for surveillances specified in Amendment Nos. 119, 122, and 123 were verified.

The procedures were reviewed to determine that prerequisites were specified, the procedure was technically adequate to ensure that testing ensures compliance with requirements, acceptance criteria were specified, required data are recorded, and proper procedure sign-off and review are specified.

For all surveillance requirements selected adequate procedures have been prepared. Several of the procedures were noted to have been just recently issued. The surveillance requirements and associated procedures, which were reviewed, are listed in Attachment 2.

For the HSPS currently being installed, only one quarterly proposed technical specification-required surveillance procedure is currently under review. The licensee intends to perform this one surveillance prior to startup to avoid the risk associated with the first-time performance of a procedure with the plant in operation. The surveillance testing requirements for a first surveillance test of a newly-installed system are intended to be completed using startup and test data. To ensure compliance with technical specification surveillance requirements, the Plant Review Group (PRG) will review completed startup and test packages to verify technical specification compliance. This review will be performed and documented before plant startup.

4.2.6 Review of Delta Pressure Instrument Performance

One of the existing surveillance requirements for the start of EFW pumps is the loss of both feedwater pumps indication, which provides input to the emergency feedwater auto initiation instrument channel. The loss of feedwater pumps is detected by four delta pressure switches which sense feed pump suction and discharge pressures. Two switches are associated with each channel.

These switches were previously installed and operating as part of the existing protection system. A review was conducted of the past performance of those devices. These devices were selected for review to verify the adequacy of a refueling interval calibration frequency (18 months plus or minus 25 percent), since the quarterly required surveillance does not verify the instrument setpoint and, also, because the failure of any single instrument will also cause the failure of one channel to initiate. No failure of a single instrument will cause both channels to initiate.

The feedwater pump delta pressure is sensed by four instruments identified as FW-DRS-829, 830, 542, and 543. Data associated with previous testing was reviewed. Results of this review are as follows:

12/18/81	Test	829 830 542 543	All failed to meet test acceptance criteria
6/21/83	Test	543	Failed to meet test acceptance criteria
7/23/84	Test	829	Failed to meet test acceptance criteria
2/1/86	Test	829 830 852 543	All failed to meet test acceptance criteria

Since the plant experienced little operating time from 1981 to 1985, the most recent test data are the most meaningful. The instrument activation setpoint is specified as 50 psig. The "as-found" data for the 1986 test was as follows:

DPS 542 "As-Found" Setpoint - 22 psig
DPS 543 "As-Found" Setpoint - 14 psig
DPS 829 "As-Found" Setpoint - 55 psig
DPS 830 "As-Found" Setpoint - 67 psig

As a result of finding all four switches out of calibration, a plant engineering evaluation request was prepared on February 3, 1986. A response to this evaluation was approved on November 17, 1986, which included a recommendation and a suggestion that the devices be checked during this outage. Prior to this inspection, these instruments were not scheduled for calibration during this outage.

The performance of these instruments was discussed with licensee personnel. During these discussions, the licensee stated that: (1) the instruments would be calibrated prior to startup (this had been performed and data were under review at the conclusion of the inspection); (2) based on the review of instrument performance, the adequacy of a refueling interval calibration frequency would be determined; and, (3) since the instrument now provides input to a different channel logic, the setpoint and acceptance criteria would be evaluated.

This will be accomplished prior to plant startup. The completion of the licensee's actions is considered to be an unresolved item (289/87-06-05).

4.2.7 QA Monitoring of Surveillance Test Program

The surveillance test program procedures states: "The manager, TMI QA Mod/Ops, is responsible for providing monitoring and inspection of the surveillance test program ..." This monitoring of the surveillance test program is accomplished primarily by the frequent monitoring of surveillance activities. Records show that many surveillance activities have been monitored. Also, detailed monitoring of the Fuel Handling Building (FHB) Engineered Safeguard Features (ESF) Ventilation System modification was performed.

Among the findings resulting from these monitorings are that in the preparation of some test exceptions certain procedure change requirements may be bypassed. A change to Administrative Procedure (A)) 1001J was made to more specifically describe what constitutes a test exception. This area will probably require continued licensee attention.

Also, in the conduct of performing initial surveillance testing for the FHB ESF ventilation modification test procedures, which were classified as not important to safety, were implemented to verify technical specification surveillance test requirements, which are classified as important to safety.

The resolution to this finding was a commitment that until such time as 1001J is revised to define the process of initial technical specification surveillance testing of plant modifications, the Plant Review Group will review completed startup and test group test packages as applicable to verify technical specification compliance.

The QA monitoring of the surveillance test program is being performed as specified by 1001J.

4.2.8 Previously NRC Identified Outstanding Items

Certain previously identified items judged to pertain to the area of surveillance were evaluated for possible impact on plant startup following this outage. The items evaluated were Unresolved Item Nos. 289/86-19-03, 86-17-03, 86-12-02, and 86-12-09. Nothing was identified which must be resolved prior to plant startup.

4.3 Summary

The licensee has established a detailed procedure which describes the conduct of the surveillance testing program. Within the scope of this review, the program appears to be conducted in accordance with procedural requirements. Significantly more is actually being performed in the scheduling and tracking of surveillance testing than is required by the procedure. The personnel involved in the assurance that all surveillances are being performed as required were noted to be extremely knowledgeable of the surveillance program status and extremely conscientious in carrying out their responsibilities.

No overdue surveillances were identified; surveillance procedures were noted as being adequate and for the most part are being adhered to. Problems identified during the performance of testing are documented, tracked, and resolved in accordance with procedural requirements. QA monitoring or surveillance activities is being performed with some substantive problems being identified.

The violation and unresolved items which were identified, as well as the QA findings, do not indicate a lack of controls but rather the need for the continuation of personnel training on all levels, technician as well as supervisory, to be continuously vigilant for conditions adverse to quality.

5. Technical Support (Modification and Test Control)

5.1 Modification Control

5.1.1 Criteria and Scope of Review

The inspectors reviewed the instrumentation and controls portion of the Heat Sink Protection System (HSPS) design modification. The criteria used to evaluate the operability and design requirements were the System Design Description (SDD), Division I and II. The SDD design requirements were further evaluated against committed standards, including applicable IEEE Standard (e.g., 279-1971 and 388-1981); NUREG 0737; the TMI Final Safety Analysis Report (FSAR); and, commitments made as a result of correspondence submitted with respect to NUREG 0737, II.E.1.1 and 2. Particular emphasis was placed on evaluation on how the HSPS design meets the five criteria of single failure, independence, availability, loss of power, and redundancy.

While at GPUN Corporate headquarters in Parsippany, New Jersey, the inspector interviewed key project personnel during the conduct of the inspection. The SDD for the emergency feedwater system upgrade to safety-grade design was reviewed to establish the design criteria/input and to evaluate the system limitations and setpoints. The design calculations for the HSPS system were also reviewed.

The inspectors reviewed HSPS design drawings to ensure that design input data were accurately reflected in the system design documents. A list of documents reviewed is contained in Attachment 2.

In addition, during the week of February 23, 1987, at the TMI plant site, the inspectors performed a walkdown of equipment associated with the HSPS. The in-plant review included a walkdown of the modifications done in the control room and the relay room. The inspectors visually observed the new HSPS cabinet and the new cable and conduit runs installed to support the modification.

5.1.2 Findings/Conclusions

5.1.2.1 Essential Design Elements of Restart License Condition 3(a)

The inspectors reviewed the applicable documents that addressed the licensee's action on the required Restart License Condition 3(a) modifications. A significant amount of the design change and plant modification was incorporated into one large plant modification, HSPS. The HSPS

modification installed OTSG high and low level alarms, upgraded the main steam line rupture detection system and the necessary logic circuits and control to make EFW safety grade from an electrical perspective.

A detailed review of the HSPS determined that the licensee had incorporated into the plant the required control and automatic initiation systems.

In general, the design followed applicable IEEE standards. Discussions with responsible cognizant design engineers indicated the personnel involved were knowledgeable of the design basis and purpose of the modification. The design change, which was a major modification and significant work and engineering effort, had been performed in a manner to ensure the final design had minimal effect on how the plant responded and, subsequently, operated. Sound engineering judgement was used in the original concept of the modification and subsequent upgrades which were required as part of Appendix R or field modification. Within the scope of this review, the inspectors did note several concerns that are described in the following sections. The concerns mainly dealt with proper documentation of the work and subsequent revisions and not the actual engineering or the engineering philosophies that was applied to the design.

The inspectors concluded that work was in progress to complete all of the plant modifications as proposed by the licensee to meet the intent of TAP Item II.E.1.1 and II.E.1.2 of NUREG 0737. All modifications were scheduled to be completed and tested prior to restart of the unit from 6R outage.

5.1.2.2 Incomplete Licensee Analyses

The inspectors asked to review the Failure Modes and Effects Analyses (FMEA) for HSPS but were informed that the FMEA that had been performed had been determined by the licensee to be inadequate and a new FMEA was being performed. The licensee has committed to complete the FMEA and incorporate any required changes prior to startup (289/87-06-09). The inspectors also requested to review the High Energy Line Break (HELB) analyses on the HSPS but were informed that this study had been performed but had not been documented as yet. The licensee has committed to complete and document this analysis and incorporate any required modifications prior to startup (289/87-06-08). In addition, the team noted that the licensee was still in the process of seismically qualifying the air controller for MS-V-6. The licensee stated that this review would be completed prior to startup (289/87-06-08).

5.1.2.3 Voltage Drop Calculation

The inspectors, while at the site, interviewed organizations involved in the design of HSPS. During these interviews, it was determined that no voltage drop calculations have been performed on circuits involved with HSPS. In the case of voltage drop analysis, it is critical to the design of power and control circuits that applied voltage be within the minimum voltage requirements of safety-related equipment. The licensee has committed to perform the calculations necessary to assure that minimum voltage requirements are met prior to startup. Further, the short circuit study and breaker coordination study, as required by 10 CFR 50 Appendix R, has not been completed.

In the case of fault and breaker coordination studies, the licensee has committed to perform a coordination study of safety-related a.c. and d.c. protective devices (289/87-06-09).

5.1.2.4 Design Input/Output Control

A review of the calculation associated with low OTSG level EFW actuation setpoint determined that a revision to the calculation had been performed. The revision had not been performed per applicable corporate procedures and a summary sheet of calculation revision had not been prepared as required by Technical Procedure EP-006, Revision 2-01, Design Calculations. Because the applicable procedure was not followed, the design calculation did not receive the same level of review as the original calculation. Specifically, this change was not reviewed and validated as required by EP-006. The data were then transmitted to the site via FCR and the instruments calibrated to these setpoints.

Failure to properly review and verify the design calculation associated with OTSG low level EFW actuation setpoint is considered an apparent violation of the 10 CFR 50 Appendix B, Section III and the licensee's Operational Quality Assurance Plan, Section 4.2.12 (289/87-06-06). The inspectors reviewed the setpoint calculation revision and determined that, even though the change was not administered properly, it did improve the overall calculation.

One setpoint (EFW pump start setpoint at 15 inches) contained no tolerance and had no basis in the loop error calculation. The setpoint tolerances assigned to the other setpoints transmitted in the FCR were not considered in the loop error calculation. Additionally, instrument inaccuracies due to accident conditions were not accounted for in the loop error calculations. Finally, the assumptions made in the calculations have not been verified; in particular, vendor-supplied tolerances were not verified to be the proper values. The licensee, who was in the process of re-doing the calculation, has committed to review the inspector's concerns prior to startup to ensure that the correct setpoints for the HSPS are established.

5.1.2.5 Configuration Control

The team reviewed several Field Change Requests and Safety Evaluations (SE) to evaluate both the change process and the technical adequacy of the resolutions. The field change process adequately handles field questions which require engineering resolution. With respect to changes to SE, the licensee's system presently allows revisions to pages by whiting out the revision number on a page and then typing the new revision number over the old number. This occurred for Revision 1 to SE No. 412024-004. Revision 0, however, was retrievable from document control in its entirety. In addition, required review signatures associated with changes do not identify which signatures are satisfying which reviews. The inspector noted that this process made it very difficult to ensure the changes were administered correctly. For the revision reviewed by NRC, it could be inferred from the signatures present that the proper reviewers had, in fact, been involved.

In addition, a review of the areas changed by Revision 1 indicated that certain areas/elements for consideration; i.e, seismic consideration, were not revised. The bases for not revising these sections were not clearly documented. If an area was affected, additional narrative was added to justify the new conclusion that the change did not have an adverse effect on safety. If an element was not affected, no additional narrative was added. Independent review by the inspector of the elements where no new narrative was added indicated that these areas were not essentially affected by the change. It did, however, make the review of the revision impossible to verify, short of interviewing each reviewer, whether the individual reviewers considered all elements or areas as part of their review.

The inspector found that the SDD's contained incorrect (outdated) information and did not always reflect the latest design data. The licensee has committed to amend the SDD's Division II by posting Field Change Requests (FCR's) prior to startup against SDD's and then to revise the SDD's to reflect "as-built" system configurations after startup.

Some random reference errors and incorrect setpoints were found on the HSPS drawings. One significant error of omission was found in that the startup range channel bypass switches were not incorporated on the Foxboro functional drawings. The inspector was concerned that because of the errors found, and because the GPU logic diagrams for the HSPS are not being updated, the control room would not have drawings reflecting the "as-built" conditions at the time of startup. The licensee has committed (in a previous NRC inspection) to mark up the control room drawings prior to startup and to revise the drawings within thirty days (289/86-14-03).

5.1.2.6 Plant Walkdown

During the in-plant walkdown, it was noted that in Section T5 of HSPS Cabinet A1 did not have a minimum separation of 6 inches between 1E and non-1E wiring. Minimum separation distance must be maintained or analysis/testing performed to show that separation of less than 6 inches is acceptable as required by IEEE Standards. The licensee plans to address this before startup (289/87-06-09). Additionally, it was determined that a seismic Category 2 over seismic Category 1 interaction walkdown was not performed. The licensee has committed to perform a walkdown to verify no adverse interaction between seismic Category 2 and seismic Category 1 equipment as required by Regulatory Guide (RG) 1.29 (289/87-06-08).

5.2 Preoperational Testing

5.2.1 Heat Sink Protection System (HSPS) Test Procedure Review

5.2.1.1 Criteria and Scope of Review

During the recent refueling outage (Cycle 6), the licensee installed the HSPS to conform to NUREG 0737, Item II.E.1.2, Auxiliary Feedwater System. The HSPS provides for several functions such as automatic initiation of emergency feedwater (EFW) on Once-Through Steam Generator (OTSG) low water level, high containment pressure, loss of feedwater pumps and loss of reactor coolant pumps. The system also isolates main feedwater to the OTSG on high water level and low OTSG pressure.

The preoperational test procedures listed below were reviewed for technical and administrative adequacy and to verify that testing planned or conducted would adequately satisfy regulatory guidance and licensee commitments. Specific observations included proper licensee review and approval, test objections, prerequisites, special initial conditions (if required), test date recording requirements, technical content as compared to system prints and logic diagrams, and system return to normal. The following preoperational and supplemental test procedures were reviewed:

-- Test Procedure (TP) 300/0, Startup and Test Generic Instrument Procedure (loop calibration of OTSG level instruments);

-- TP 300/0.1, EF-V-30A, EF-V-30B, EF-V-30C, and EF-V-30D, Control Testing;

-- TP 332/1, Functional Test for Pressure/Temperature Compensation of OTSG Level Indication; and,

-- TP 332/2, HSPS Logic Test.

5.2.1.2 Findings/Conclusions

The above review indicated that the procedures as written would adequately test the HSPS and provided sufficient overlap of the various tests involved to ensure that all portions of the system would be tested.

One preoperational test, TP 332/3, HSPS Functional, was in the early draft stage. The inspector discussed the test philosophy with the Startup and Test (SU&T) engineer and briefly reviewed the rough draft of the procedure. The inspector was satisfied that, if written and approved as the SU&T engineer stated, that the test would fully functionally verify system operation. The inspector also discussed testing to verify the back-up HSPS power supply. The SU&T engineer agreed to incorporate a functional test of the back-up power supply in TP 332/3. The above is unresolved pending the drafting of and NRC review of technically complete HSPS functional test, TP 332/3 (289/87-06-07).

During the review of TP 332/2, which had been completed, but had not been through the licensee's results review and approval cycle, the inspector noted what appeared to be an inconsistency in the 10 CFR 50.59 review policy. When discussed with the licensee, it was noted that the procedure the inspector was reviewing had not had its results reviewed and the inconsistency would have been identified and corrected. The inspector noted that this item was previously identified (289/86-17-05 and 289/86-17-06) and is in the process of being resolved.

5.2.2 Heat Sink Protection System Test Witnessing

5.2.2.1 Criteria and Scope of Review

Testing witnessed by the inspector included the following observations, including the crew's overall performance:

-- approved procedure with latest revision available and in use by test personnel;

-- a designated person in charge and conducting the test;

-- minimum test personnel requirements met;

-- qualified personnel performing the test;

-- test precautions followed and prerequisites met;

-- QA/QC notification and witness requirements met (QA engineer present as required);

-- proper plant supporting systems in service;

-- special test and measuring equipment required by the test procedure, its calibration, and use;

-- procedure is technically adequate for the test;

-- testing being performed as required by the test procedure;

-- test personnel actions were correct and timely during performance of the test; and,

-- adequate communications established for test performance.

5.2.2.2 Findings and Conclusions

5.2.2.2.1 TP 300/0.1, EF-V-30A, EF-V-30B, EF-V-30C, and EF-V-30D, Control Testing

The inspector observed several portions of TP 300/0.1 which proceeded without problem and in accordance with the above. During Section 9.3, Test Valve Control, manual control of the valves was attempted from the control room. Three valves stroked properly; however, the "C" valve failed to operate. The SU&T engineer troubleshot the control circuit and had control transferred to the remote shutdown (RSD) panel. The "C" valve could be controlled from the RSD panel. Control was then transferred back to the control room and the "C" valve could then be properly controlled. This matter was discussed with the licensee, who agreed to gather information concerning the transfer relays and would then initiate a Field Questionnaire for Technical Function resolution. Resolution of this item will be followed during a routine inspection.

5.2.2.2.2 TP 332/1, Functional Test for Pressure/Temperature Compensation of OTSG Level Indication

The inspector observed a portion of the performance of this test on February 24, 1987. Further testing was suspended until some new modules (median level selector module), which were not expected to be delivered in time to be installed, were received. The installation of the new modules negated a large portion of the testing already accomplished under TP 332/1. Retesting of the HSPS was in progress at the end of the inspection.

5.2.3 Appendix R Modifications, Testing, and Procedure Review

5.2.3.1 Criteria and Scope of Review

The criteria and scope of review for Appendix R modifications test procedure review and test witnessing are as stated in paragraph 5.2.2.1 above.

5.2.3.2 Findings/Conclusions

During the Cycle 6 refueling outage, a large number of Appendix R modifications are being made such as replacement of regular cable with fire retardant cable, rerouting of cables, separation of cables, and installation of modifications necessary to support a remote shutdown panel.

The modifications are being administratively controlled by a tie-in document which is controlled by the control room operators. The document controls each phase of the modification beginning with installation through testing and QC verification prior to return to operation.

Technical aspects are implemented by procedure No. 1420-EL-2, Revision 4, Preoperational Startup Testing of Electrical Equipment. This procedure gives guidance and requirements covering twenty-eight different tests depending on the modification. The inspector discussed the implementation of testing with the cognizant SU&T engineer. The engineer explained that some modifications receive more extensive testing than that recommended by 1420-EL-2. These modifications are tested under supplemental tests which are in greater detail and are developed for a specific modification. The inspector reviewed two Appendix R modification preoperational test procedures and witnessed major portions of their performance. The following were reviewed:

-- TP 422/1, Emergency Diesel Generator Functional Test; and,

-- TP 400/0.3, Containment Building Chilled Water Pump.

Both modifications were made to allow control of the respective component to be transferred to the local area (remote from the control room) for shutdown outside the control room, which are Appendix R requirements.

TP 400/0.3 proceeded smoothly with only minor problems which were immediately corrected. During TP 422/1, the operations staff was directed to electrically strip and de-energize the Emergency Diesel Generator (EDG) "B" bus. In addition, the operators removed the fuse in the 125 V d.c. control circuit for the undervoltage relay to prevent losing the 480 V a.c. bus when the 4160 V a.c. bus was de-energized. This prevented the EDG breaker from being closed at the remote location when required by TP 422/1. This initially caused some confusion and testing was suspended to review the EDG breaker schematic. It was determined that the undervoltage relay must energize to allow breaker closure on a loss of power or from the remote control location. The test procedure was modified to allow the undervoltage relay contact in the EDG breaker closing circuit to be jumpered. The test was then successfully completed. QA/QC coverage was provided during both tests.

5.2.4 General Preoperational Test Findings/Conclusions

The team found the technical support personnel (design and test engineer) were knowledgeable of their assigned equipment, current problem on related work activities, and dedicated to performing meaningful tests to ensure correct system/component function.

Resources in the startup and test department appear to be strained. During periods of routine operation or minor outage modification, the number would be adequate. During this outage, there were a large number of modifications being made, and subsequently, a great deal of testing. The high level of activity and long hours were beginning to show in the test engineers talked to by the inspectors and is a contributing factor in the late production of TP 332/3. No other adversities were noted. No procedure inadequacies were noted as a result of this.

5.3 Summary of Findings (Modification and Test Control)

In the mechanical/structural area, the inspector noted that the following work/analysis had not been completed.

-- Single failure analysis associated with MS-V-6 (see Section 2 of this report).

-- HELB analysis was under review and has not been completed (paragraph 5.1.2.2).

-- MS-V-6 air controller seismic study (paragraph 5.1.2.2.)

-- A walkdown to determine the acceptability of the seismic Category 2 over seismic Category 1 interaction has not been documented by the licensee (paragraph 5.1.2.6).

The licensee acknowledged that these mechanical/structural analyses are required to be completed prior to restart of the unit and this area remains unresolved pending completion of licensee action and further NRC:RI review (289/87-06-08).

In the electrical/instrumentation area, the inspector noted:

-- FMEA has not been completed; this study is necessary to establish that single failure requirements have been met (paragraph 5.1.2.2);

-- coordination study for safety-related a.c. and d.c. protective devices has not been completed (paragraph 5.1.2.3);

-- voltage drop calculations for HSPS circuits have not been completed to determine that equipment minimum voltage requirements have been met or identified by the licensee to be required (paragraph 5.1.2.3);

-- HSPS loop error calculation is inadequate and needs to be redone to establish valve setpoints (paragraph 5.1.2.4); and,

-- wire separation in the HSPS cabinet needs to be readdressed (paragraph 5.1.2.6).

The licensee acknowledged that these analyses are also required to be completed prior to restart of the unit and this remains unresolved pending completion of licensee action and NRC:RI review (289/86-06-09).

Configuration control documents need to be updated (289/86-14-03) (paragraph 5.1.2.5).

The HSPS functional testing to serve as the initial surveillance test needs to be completed and this area remains unresolved (289/87-06-06).

5.4 Overall Summary (Modification and Test Control)

The team concluded the major elements of the design of the HSPS essentially meets TAP II.E.1.1 and II.E.1.2, and related correspondence. However, the adequacy of the final design cannot be fully confirmed until the completion of essential design analysis functional testing as noted previously. A number of key configuration control documents for HSPS are not yet updated but will be before Cycle 6 startup.

An apparent violation was identified in that a revised HSPS setpoint calculation was issued without proper review and approval. The type of errors noted during the inspection indicated a need for improvement in attention to detail on the part of licensee engineering personnel.

No test procedure inadequacies were noted. In fact, the team found the test procedures to be generally well written and technically correct. One item identified by the team is that test procedures could benefit from a better description of what function was intended to be tested to allow a reviewing organization or person to more quickly understand the test.

The testing program is organized such that design or installation errors will be sufficiently identified and corrected.

The in-place, tie-in document system seems to provide good control of modification and testing activities. However, one instance (EDG breaker test) was noted where operations department adversely affected the smooth conduct of a test by impromptu action to solve one problem without full evaluation of the consequences of that action. Both problems could be solved with proper planning, communication, and evaluation.

Management was involved with personnel conducting modification and testing activities on a daily basis.

6. Assurance of Quality

6.1 Criteria and Scope of Review

The inspectors reviewed the implementation of the licensee's quality assurance (QA) program, focusing on procurement, audits, and design control with respect to the HSPS system. In their review, the inspectors utilized technical specifications (TS), Quality Assurance Plan (QAP), and related ANSI Standards as acceptance criteria; and, more specifically, they reviewed the documents listed in Attachment 2.

6.2 Findings/Conclusions

6.2.1 Procurement

Procurement was being performed by procedures set forth within the Quality Assurance/Quality Control (QA/QC) documents. The inspector identified that the microfilming of purchase orders did not produce a clarity that was easily readable; however, the licensee does file the original document in another area. The inspector concluded that, although a document is available for review, there does not seem to be much wisdom of microfilming documents that are unreadable and keeping the original document. The licensee should research this area to make the necessary corrections for a more efficient system.

6.2.2 Audits

Audits are being performed on a scheduled basis; however, audits related to the HSPS system, which is where this inspection was concentrated, have not been completed. The inspector had a meeting with the corporate and site audit teams and discussed the methods and findings that have been completed to date. The inspector concluded that a thorough review had been done by the corporate audit team and that the audit had identified the following findings dealing with incomplete analyses or documentation that were of significance.

-- Failure Modes and Effects Analysis (FMEA)

-- High Energy Line Break Analysis (HELB)

-- Seismic study associated with MS-V-6

-- Single failure analysis associated with backup instrument air

These are discussed in detail in Section 5 of this report. This is reasonable since the audit process is a sampling technique. The documentation of the above-noted corporate audit is unresolved pending licensee issuance and subsequent NRC:RI review (289/87-06-10).

Similarly, the inspector noted that site audits had identified findings and the more significant ones have been corrected. Completed audits related to the outage have been reviewed and no adverse findings were identified.

6.2.3 Design Control

Design control is being performed in accordance with the QA program. The NRC inspector concluded that QC presence is evident at the job site where work is being performed. The licensee's QC inspectors delineate their observations for the various witness and hold points in a QC notebook or they can be recorded on QC witness/hold point forms generated by QA engineering during modification document review. The NRC inspectors observed in one particular case QC personnel verifying data being recorded for HSPS logic testing per TP 332-1. A data sheet in this particular procedure contained a signoff for QC personnel to list their observations; but, even though QC coverage was evident, no signoff or test observations were made on the official test document.

The inspectors discussed the method of establishing hold and witness points with QC/QA management personnel. The inspectors verified that hold and witness points were established for various work, surveillances, and test evaluations in a formal manner. In the specific case noted above for TP 332-1, however, it appeared that documentation of the QC inspection results could have been included in the actual test document. Licensee QC/QA management indicated that they would review this matter. The inspectors concluded that a program for establishing hold and witness points was established and properly implemented.

6.2.4 General QA Department Findings

The inspectors, did not have any adverse findings in the review of the QA department. The licensee management should address the duplication process used in the retention of purchase orders and the microfilming of the same in order to obtain a more efficient method of documentation of purchase orders.

Overall, the inspectors found the QC/QA organization to be knowledgeable of the design changes and informed as to plant conditions. The organization appeared to be well staffed with knowledgeable and experienced personnel.

6.2.5 Procedures for Startup

The team noted that, especially in the functional areas of plant operations and surveillance, there was a substantial amount of procedure revision work remaining to be completed before startup. Based on a sampling review, the team concluded that, in all functional areas, there was a reasonable list of affected procedures as a result of modification (primarily HSPS) and TS amendments (Nos. 101 to 121). The NRC's TMI-1 Resident Office will selectively review the results of the licensee's effort in this area in a future inspection.

6.2.6 Technical and Safety Process for Startup

As noted in Section 7, the NRC staff identified several issues with the licensee's technical and safety (T&S) review process. These issues centered around improper implementation and adequacy of the process required by 10 CFR 50.59. In conjunction with this inspection, a followup inspection occurred as a result of the management meeting held February 12, 1987, (re: NRC Inspection Report 289/87-04). The focus of this inspection was to assure sufficient interim corrective measures were established by the licensee for safety considerations associated with the Cycle 6 startup until the general issues were resolved between NRC staff and the licensee.

The inspector learned that TMI-1 division had established for startup an interim policy that all important-to-safety procedure/procedure changes would be subject to the licensee's two-step review process. This two-step review process (re: NRC Inspection Report 50-289/86-17) meets the requirements of the TS and 10 CFR 50.59.

The inspector then noted that support divisions at TMI-1 were in line with the corporate policy on T&S review, which may be deficient when only the first step of the two-step process is used for important-to-safety changes. The initial step, however, does query the reviewer on the effect of the change to plant safety and as to whether or not TS or FSAR changes are needed.

The inspector considered this situation to be adequate for Cycle 6 startup pending resolution of the general issues between NRC staff and the licensee (re: Unresolved Item Nos. 289/86-17-05 and 86-17-06).

Within the other functional areas addressed by this report, the team noted several discrepancies,

-- In the design control area, the revision to the HSPS safety evaluations was misleading in terms of who performed Responsible Technical Reviewer/Independent Safety Reviewer (RTR/ISR) review of the revision. Further, the 1984 10 CFR 50.59 form had 1984 signatures for Revision 1, dated 1986. Also, there was incomplete documentation to confirm consideration of all safety evaluation elements/considerations in the revised narrative pages of the safety evaluation.

-- In the testing area, test activities on HSPS were misclassified as not important to safety apparently because of the poor understanding of the corporate policy which tends to de-emphasize the not-important-to-safety/important-to-safety (NITS/ITS) classification methodology. With the preoperational test procedures to represent the initial surveillance procedures for HSPS, the inspector stated that those test procedures (TP's) are subject to the same TS LCO/surveillance and administrative control requirements as their surveillance procedure (SP) counterpart tests.

No technical inadequacies or safety issues resulted from these discrepancies, although the potential could exist in cases of incomplete documentation as noted above. These examples continue to point out lack of thorough documentation of records required by 10 CFR 50.59 and TS and to reflect that the new policy on T&S review was not clearly understood at all working levels. This area will continue to be reviewed under the previous unresolved item (289/86-17-06).

6.2.7 Other Management Control Issues

The team noted a number of residual issues as a result of NRC Inspection No. 50-289/86-23 on licensee implementation of 10 CFR 50 Appendix R, Fire Protection Rule. There are at least two exemption requests that need to be approved by NRC staff prior to startup and a number of licensee commitments need to be completed before Cycle 6 startup. As an example, the integrated functional test procedure for the remote shutdown panel is being written and will be performed prior to Cycle 6 startup. The team noted no new discrepancies in this area and it was satisfied that the resolution of these issues could be adequately addressed by Region I, the Resident Office, and/or the Office of Nuclear Reactor Regulation.

The team also noted a number of residual issues as a result of NRC Inspection 50-289/87-01 on licensee implementation of 10 CFR 50.48 on Environmental Qualification. At the exit interview for that inspection, the licensee initially committed to meet with Region I to discuss, if any, of the (equipment qualification) EQ file deficiencies warranted hardware changes prior to Cycle 6 startup.

Subsequent to this inspection, the meeting was held at NRC Region I and it will be documented in a separate meeting report.

6.2.8 Prerequisite List

The team reviewed the "TMI-1 Post 6R Refueling Outage Restart Prerequisite Review Changes," which was written by the licensee to ensure management personnel responsible for completing prerequisites are cognizant of their items needing completion prior to criticality. The team inspectors had discussions with licensee management to discuss the above document. The licensee indicated that this control had been used effectively in the past. The licensee management concluded that a very good confidence level will be attained prior to criticality. The "tie-in" document system has been put in place to control a modification through the process of testing QA review and final acceptance to the plant. The team concluded that the prerequisite list and tie-in documents should be effective, if properly implemented, in assuring the safe restart of the unit.

6.2.9 Training

Based on past good licensee performance, this area was not specifically reviewed. However, the team inspectors remained conscious of this area within their respective functional areas to look for obvious deficiencies related to the training of licensed and non-licensed personnel. A summary of the team's view of this area is presented below.

Overall, the team concluded favorably in regard to training of personnel for the modifications that were installed during this outage. As an example, extensive training is in progress for the two primary modifications of this outage: HSPS and the remote shutdown panel. In addition to classroom sessions, plant walkthroughs and easy-to-read handouts were provided to licensed operators.

The results of team interviews with licensee representatives indicated that they were knowledgeable of the basic design elements of these modifications. Planned testing should enhance personnel knowledge of these new systems. Licensee management recognized the need to complete the specific training plan prior to plant startup.

In conjunction with this inspection, there was another Region I inspection in progress on the licensee's requalification process (NRC Inspection No. 50-289/87-03). The team leader provided the NRC licensing examiners, conducting that review, with specific examples for followup related to recent facility changes.

6.3 Summary

Procurement is appropriately controlled. Poor quality of microfilmed procurement records is backed up by hard copies.

There is a significant amount of in-line process inspection (quality control) by the Quality Assurance Department (QAD) for modifications. The corporate audit on four specific modifications and other on-site installation audits were reasonably thorough to assure overall proper implementation of the modification and testing control program. Audit reports need to be issued. A majority of audit findings on HSPS were similar to NRC findings in this inspection. The QAD is well staffed with experienced personnel who are knowledgeable in their respective areas.

The licensee has a substantial effort in progress to revise procedures potentially affected by outage modifications and recent TS amendments. The list of procedures to be revised appears to be reasonably complete.

The T&S review process for the TMI-1 Division is adequate. The corporate policy for T&S remains unclear and, apparently, is not well understood by licensee personnel. The adequacy of the corporate policy remains unresolved with the NRC staff.

A number of actions are needed to be completed by the licensee before startup to assure compliance with the NRC's environmental qualification and fire protection rules.

The licensee's "TMI-1 Post 6R Refueling Outage Restart Prerequisite Review Change List" is a substantial initiative to provide the licensee with the necessary requisite assurance of readiness for TMI-1 startup.

7. Previous Inspection Items

7.1 (Closed) Unresolved Item (289/85-12-01): Adequacy of Installation of Post-Accident Sampling (PASS) Station Handwheels

A review of TMI-1 Licensing Action Item No. 9196 indicated that all loose Post-Accident Sampling System (PASS) handwheels were subsequently tightened by plant maintenance. Also, a weekly valve position check of the PASS includes a verification of the tightness of all associated handwheels. Discussions with the on-site senior chemist and a visual inspection at the PASS by the inspector indicated that no further problems have been encountered with the PASS valve handwheels.

7.2 (Open) Unresolved Item (289/85-20-01): Safety-Grade Emergency Feedwater Installation

A review was performed to identify the residual issues open in TAP II.E.1.1 and II.E.1.2 as previously documented in NRC Inspection Report (IR) No. 50-289/85-20. All issues have been inspected and found acceptable with the exception of the following: (1) EFW pipe support modification in the reactor building (IR No. 50-289/87-02); (2) system interaction study (IR No. 50-289/86-21 and 87-02); (3) EFW Control and Block Valve (IR No. 50-289/87-03); (4) safety-grade power for CO-V-111A/B and upgrade cable for CO-V-14A/B (IR No. 50-289/86-21); (5) environmental qualification for EFW and ES power, control, and instrument cables in the intermediate building (IR No. 50-289/87-01); and, (6) condensate storage tank level and low level alarm (IR No. 50-289/86-21 and 87-02). However, in each instance, there has been a partial review by the NRC staff as noted in applicable inspection reports listed above. In each case, the open issue has been completed by the licensee or is scheduled to be completed prior to plant startup in March 1987.

From the sampling review of licensee's documentation and previous inspection reports, the inspector concluded that it appeared that the licensee had completed all requirements of Restart License Condition 3(a) as described in Section 5 of this report. Final determination requires additional review by the NRC staff to verify the completeness and adequacy of the licensee's documentation on the above six issues and others as delineated in the recent NRC staff SER for TAP Item II.E.1.2.

7.3 (Closed) Unresolved Item (289/86-03-19): Adequacy of Pipe Support EF-18 Installation

A review of TMI-1 Licensing Action Item No. 86-9165 indicated that blanket Job Ticket (JT) No. 86-56 was initiated to correct the discrepancy on pipe support EF-18. A general review of other area supports was conducted by the licensee to identify whether or not any other pipe support discrepancies existed. No additional discrepancies were identified. A visual inspection of pipe support EF-18 by the inspector verified that EF-18 was installed correctly.

7.4 (Closed) Inspector Follow Item (289/86-03-20): Human Factors Placement of EFW Manual Isolation Valves

The inspector walked down selected portions of the EFW system. He confirmed that in the post-outage modification configuration there were no obstacles that may obstruct manual operation of the EFW flow control valves (EFW 30A through D) or operation of the manual isolation valves on their discharge. The valves were also relatively easy to reach. With control room permission and as supervised by an auxiliary operator, the inspector manually opened and closed one of the EFW 30 valves which had a support bracket located approximately 10 inches above the valve handwheel. The bracket did not interfere with valve operation.

7.5 (Closed) Inspector Follow Item (289/86-09-02): Installation of 480-Volt a.c. Breaker Solid State Overcurrent Trip Devices

The inspector reviewed the status of the installation of solid state overcurrent trip devices for 480-volt a.c. breakers. All Class 1E 480-volt breakers have been upgraded with the new overcurrent trip devices. Time setpoint changes were necessitated as a result of this upgrade on 1P-4C and 1S-4C breakers. Field Change Request (FCR) 053027, which detailed this change, was also reviewed.

7.6 (Closed) Unresolved Item (289/86-12-01): Artificial Condition Established by Blowing Down Steam Traps Before Testing Turbine-Driven EFW Pump

The licensee performed STP-1-86-0014 on May 23, 1986, to demonstrate that the turbine-driven EFW pump would not overspeed or have other speed control difficulties due to the potential condensate buildup in the steam supply lines over a period of time in which operators did not manually verify the lack of condensate.

During this test, the steam traps were capped and blowdown of the lines did not occur for 28 hours and 40 minutes. The pump was subsequently started with a stable acceleration to 3800 rpm and stable operation at 3800 rpm for longer than any time required to flush potential condensate from the steam supply line. Based on these acceptable test results, this item is considered closed.

7.7 (Open) Violation (289/86-12-02): Single Failure Analysis on EFW Instrument Air System (in part).

See paragraph 2.2.6

7.8 (Open) Unresolved Item (289/86-14-03): Drawing Control

See paragraph 5.1.2.5.

7.9 (Closed) Unresolved Item (289/86-14-05) and (Open) Unresolved Item (289/86-17-05): Improper Implementation of the Technical and Safety Review Process

The second Performance Appraisal Team (PAT II) inspection documented the misclassification of certain Special Temporary Procedures (STP's) and technical functions procedures, which resulted in an apparently inadequate 10 CFR 50.59 safety evaluation for these procedure/procedure changes. The Region I Inspection No. 50-289/86-17 included the PAT II finding along with additional examples of the same finding.

The PAT II also identified technical inadequacies with the subject STP's and certain Temporary Change Notices (TCN's). The STP's were no longer effective and the TCN's were corrected as noted in PAT II. The subject of improved performance in the adequacy of procedures was discussed at the recent Systematic Assessment of Licensee Performance (SALP) meeting on February 24, 1987. Licensee planned corrective action with respect to improving procedure adequacy to avoid procedure implementation challenges (re: NRC Inspection Report 50-289/86-19) should enhance this area.

Accordingly, the PAT II unresolved item (289/86-14-05) is considered closed administratively with Region I followup and disposition of these findings in a future inspection (289/86-17-05).

7.10 (Closed) Unresolved Item (289/86-14-06) and (Open) Unresolved Item (289/86-17-06): Adequacy of the Current Technical and Safety Review Process

The PAT II documented that a two-step process of safety review was implemented as of September 1, 1986. The process was described in detail in NRC Region I Inspection Report 50-289/86-17. The two steps were essentially embodied in the use of two forms with the second form having the traditional criteria to determine whether or not an unreviewed safety question existed. The first form was an initial screening process for whether or not the second form was to be used.

The issue was discussed at a recent Management Meeting in Region I (re: NRC Inspection Report 50-289/87-04). Region I followup and disposition of the finding will occur in a future inspection (289/86-17-06).

Accordingly, the PAT II unresolved item is duplicative and is considered administratively closed.

The status of current technical and safety review process with respect to Cycle 6 startup was reviewed as a part of this readiness assessment inspection as documented in Section 6.

7.11 (Closed) Unresolved Item (289/86-19-03): Review of Procedures Regarding Detection of High Water Level in the Intermediate Building as an Indicator of Such Events as a Feed Line Break.

The inspector reviewed the annunciator procedure for the upgraded pit level indication system. The procedure directed appropriate investigation/diagnostic actions. Additionally, the inspector reviewed annunciators for the EFW room "A" and "B" sumps. Both called for operator action to go to the area and investigate the cause.

8. Exit Interview

The team discussed the inspection scope and findings with the licensee management at a final exit meeting conducted March 3, 1987. The interim exit meetings occurred: February 20, 1987, in the Modification Control Area (Technical Support); and, on February 27 1987, in the Plant Operations Area. Licensee personnel in attendance at the final exit interview are noted below and also in Attachment 1 as denoted by an asterisk.

R. Chisholm, Manager, Electrical Power & Instrumentation
J. Colitz, Manager, Plant Engineer, TMI-1
J. Garrison, Planning and Scheduling Manager
D. Hassler, Licensing Engineer
H. Hukill, Director, TMI-1
J. Langenbach, TMI-1 Engineering Projects Director
L. Markowicz, Representative - Media Relations
R. McGoey, Manager, PWR Licensing
L. Ritter, Administration, Plant Operations
L. Robinson, Representative - Media Relations
M. Sanford, Manager, Mechanical Systems
C. Shorts, Manager, Technical Functions, TMI-1
C. Smyth, Manager, Licensing, TMI-1
R. Toole, Operations and Maintenance Director, TMI-1

A representative of the Commonwealth of Pennsylvania, Ajit Bhattacharyya, also attended the meeting.

No proprietary information was discussed at the exit meetings. The inspection results, as discussed at the meeting, are summarized in the cover page of this inspection report.

Unresolved Items are matters about which more information is required in order to ascertain whether they are acceptable, violations, or deviations. Unresolved items discussed during the exit meeting are addressed in paragraphs 2.2.3, 2.2.5, 3.2.2, 4.2.6, 5.2.1.2, 5.3, and 6.2.2.

INSPECTION REPORT 50-289/87-06

ATTACHMENT 1

PERSONS CONTACTED

The following is a list of key licensee supervisory or management personnel contacted during this inspection. There were other technical and administrative personnel who also were contacted.

Plant Operations

D. Dyckman, Manager, Program and Control, TMI-1
*M. Ross, Plant Operations Director, TMI-1

Maintenance

R. Harper, Corrective Maintenance Manager
D. Shovlin, Manager, Plant Maintenance
M. Snyder, Preventive Maintenance Manager, TMI-1
R. Troutman, Planning and Scheduling Manager

Surveillance

*C. Hartman, Manager, Plant Engineering
V. Orlandi, Lead I&C Engineer
H. Wilson, Supervisor, Preventive Maintenance

Modification Control

GPUN

J. Auger, PWR Licensing Engineer
B. Gan, Project Engineer
S. Kowkabany, TMI-1 Licensing Engineer
*J. Langenbach, TMI-1 Engineering Projects Director
R. Wulf, Manager, TMI Projects

Impell Corporation

D. Baker, Engineer
P. Kelley, Engineer

Preoperational Testing

*T. Hawkins, Manager, Startup and Test
C. Patton, Startup and Test Manager
J. Riddlemoser, Startup and Test Engineer
G. Tullidge, Startup and Test Engineer

Assurance of Quality

J. Fornicola, Manager, TMI QA Modifications/Operations
C. Incorvati, TMI-1 Audit Supervisor
R. Markowski, Manager, QA Program Development/Audit
*M. Nelson, Manager, Nuclear Safety
*R. Prabhakar, Quality Control Manager - TMI-1
L. Wickas, Manager, Operations QA

*Attended exit interview on March 3, 1987.

INSPECTION REPORT NO. 50-289/87-06

ATTACHMENT 2

DETAILED ACTIVITIES REVIEWED

Portions of the following documents/records of activities were reviewed:

General

Technical Specifications
Operational Quality Assurance Plan
Administrative Procedures

Operations

Listed within body of the report.

Surveillance Tests

1302-5.10, Reactor Building 4 psig Channel - Performed February 11, 1987

1302-5.11, Reactor Building 30 psig Channel - Performed February 18, 1986

1302-6.3, EFW Flow Instrumentation Calibration - Performed June 17, 1986

1302-6.17, EFW Initiation - Loss of Feedwater - Performed February 1, 1986

1303-11.9, Reactor Building Emergency Cooling System - Performed December 30, 1986

1301-10.1, Internal Vent Valve Inspection & Exercise - Performed December 23, 1986

1303-11.14, Reactor Building Purge Exhaust - Performed December 17, 1986

1303-11.21, Core Flooding System Valve Operability Test - Performed November 1, 1986

1303-11.39, EFW Pump Automatic Start - Performed August 27, 1986

1303-11.54, Low Pressure Injection - Performed November 2, 1986

2 Attachment 2

Surveillance Procedures Reviewed by Amendment

Amendment No. 119, Heat Removal Capacity

-- 1300-3C, Decay Heat Closed Cooling Water Pumps Functional Test, November 3, 1986

-- 1300-3F, Motor-Driven Emergency Feedwater Pump Functional, November 4, 1986

-- 1300-G, Turbine-Driven Emergency Feedwater Pump Functional, July 15, 1985

-- 1303-11.42, Emergency Feedwater Flow Test From CST, July 22, 1986

Amendment No. 122, Fuel Handling Building Engineered Safety Feature Air Treatment System

-- 1301-4.1, Weekly Surveillance Checks, December 30, 1985

-- 1303-5.8, Auxiliary and Fuel Handling Building Exhaust Air Treatment, January 17, 1987

-- 1303-5.13, Auxiliary and Fuel Handling Building Exhaust Air Distribution, January 17, 1987

-- 1303-5.14, Auxiliary and Fuel Handling Building Exhaust Air Distribution, January 23, 1987

-- 1303-5.15, Fuel Handling Building Air Treatment System Operational Test, January 1, 1986

-- 1303-11.15, Auxiliary and Fuel Handling Building Filter Efficiency Test, January 19, 1987

-- 1303-11.56, Fuel Handling Building Air Filter Efficiency Test, January 1, 1986

Amendment No. 123, Regulator Control Rod Power Silicon Controlled Rectifier Electronic Trips

-- 1303-4, Reactor Protection System, July 11, 1985

Maintenance Activities

Listed within the body of the report.

3 Attachment 2

Modification Control (Specific to the Heat Sink Protection System)

-- SDD-TI-424-B, Revision 4, Division I
-- SDD-TI-424-B, Revision 2, Division II
-- GPU Logic Diagrams

  -- IC-640-41-001, Revision 1
  -- IC-640-41-002, Revision 1
  -- IC-640-41-003, Revision 1
  -- IC-640-41-004, Revision 1
  -- IC-640-41-005, Revision 1
  -- IC-640-41-007, Revision 0
  -- IC-640-41-008, Revision 1
  -- IC-640-41-010, Revision 1
  -- IC-640-41-011, Revision 1
  -- IC-640-41-013, Revision 1
  -- IC-640-41-014, Revision 1
  -- IC-640-41-015, Revision 1
  -- IC-640-41-016, Revision 1
  -- IC-640-42-001, Revision 0
  -- IC-640-42-002, Revision 1
  -- IC-640-42-003, Revision 1
  -- IC-640-42-004, Revision 0
  -- IC-640-42-005, Revision 0
  -- IC-640-42-006, Revision 1

-- Foxboro HSPS Functional Drawings

  -- 84N35833 FD 0001, Revision 0, Sheet 1 of 3
  -- 84N35833 FD 0001, Revision 0, Sheet 2 of 3
  -- 84N35833 FD 0003, Revision 0, Sheet 1 of 3
  -- 84N35833 FD 0003, Revision 0, Sheet 2 of 3
  -- 84N35833 FD 0003, Revision 0, Sheet 3 of 3
  -- 84N35833 FD 0009, Revision 0, Sheet 1 of 3
  -- 84N35833 A2 C017, Revision 3
  -- 84N35833 A2 W003, Revision 3

-- Impell Drawings

  -- 0370-064-111, Revision 0
  -- 0370-064-104, Revision 2
  -- 0370-064-092, Revision 0
  -- 0370-064-001, Revision 5, Sheet 1 of 3
  -- 0370-064-001, Revision 4, Sheet 2 of 3
  -- 0370-064-001, Revision 2, Sheet 3 of 3

-- HSPS Loop Error Calculation 0370-129-001, Revision 0
-- Verification Plan for 0370-129-001, dated April 28, 1985
-- Field Change Request 038520
-- Field Change Request 054605
-- Technical Functions Division Procedure EP-006, Calculations
-- GPU Training Handing for HSPS (January 8, 1987)
-- Field Change Request 032720
-- Field Change Request 051202
-- Field Change Request 032728
-- Field Change Request 051206
-- Field Change Request 051213
-- Field Change Request 051211
-- Field Change Request 052405
-- GPUN Letter 5211-86-2214, dated December 23, 1986

-- SE No. 000424-004, Revision 1
-- SE No. 412024-004, Revision 0
-- SE No. 412024-006, Revision 1

Preoperational Testing

Listed within the body of the report.

Assurance of Quality

QA/QC Organization Chart
Post-6R Refueling Outage Startup Review List

Design Change - WA-A25C-30024
A25C-G1024E
A25C-G1024M

Procedure Documents - Purchase Order 020756 - Piping
016065 - Transmitters (Foxboro)
089145 - Cable (Mild Environment)
615426 - Cable (ITS & IEEE-323-1974)

Audit Plan O-TMI-86-11 (corporate review of design changes related to TMI-1 6R modifications)

Audits - S-TMI-87-01 - "Refueling"
S-TMI-86-05 - "Functional Audit of Safety Systems"
S-TMI-85-20 - "Project Engineering (SU&T)