U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-289/86-01

Docket No. 50-289

License No. DPR-50 Priority -- Category C

Licensee: GPU Nuclear Corporation
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Middletown, Pennsylvania 17057

Facility At: Three Mile Island Nuclear Station, Unit 1

Inspection At: Middletown, Pennsylvania

Inspection Conducted: January 10, 1986 - February 7, 1986

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Inspection Summary:

Resident and region-based NRC staff conducted routine safety inspections (388 hours) of power operation, focusing on plant and personnel performance. Specifically, items reviewed in detail in the operations area were: control rod drive position indication switches; decay heat relief valve actuation; makeup demineralizer hot spot flush; waste gas routine release; and heatup/startup activities. Special focus occurred on licensee event actions for a reactor protection system breaker shunt trip malfunction and for a partial loss of ICS/NNI power. Other review items included: independent technical and safety review; radiation protection program implementation; security plan and implementation procedures; fire protection plan and implementation procedures; and licensee action on previous inspection findings.

Inspection Results:

Licensee personnel exhibited good control of operations and of shutdown and startup activities. Operators were responsive to off normal events and properly implemented facility procedures. Licensee management continued an aggressive attitude on conducting corrective maintenance and in implementing an ambitious preventive maintenance program. However, some recent events revealed poor interface between the maintenance and fire protection personnel. Enhanced job planning could have improved licensee activities on the makeup system demineralizer hot spot flush.

The fire protection program was adequate, except as noted below, and personnel properly implemented respective procedures. The inspection identified an apparent violation on the adequacy of fire brigade response actions (details, paragraph 7.6.3.1). The inspection identified a number of other unresolved issues for which more information is needed.

The security program was adequate and personnel properly adhered to respective implementing procedures.

The licensee properly implemented the independent technical and safety review program in accordance with Technical Specifications. The program required reports on such reviews could be enhanced with more consistent methodology among divisions. The TS program elements were met despite the diversity and complexity of the system. This area will continue to be reviewed by NRC's Region I with respect to review adequacy.

The licensee appears to be properly planning the eddy current outage from a modification and health physics viewpoint.

DETAILS

1. Introduction and Overview

1.1 NRC Staff Activities

The overall purpose of this inspection was to assess licensee activities for the power operation mode as they related to reactor safety, worker radiation protection, and security/safeguards measures. Within each area, the inspectors documented the specific purpose of the area under review, and the scope of inspection activities and findings, along with appropriate conclusions. The inspectors made this assessment by reviewing information on a sampling basis through actual observation of licensee activities, interviews with licensee personnel, measurement of radiation levels, or independent calculation and review of listed applicable documents.

1.2 Licensee Activities

The licensee operated the facility at full power during this inspection, except for one week. At the beginning of this period, the licensee completed residual startup testing for the 100% power (startup testing) plateau. This test was Refueling Procedure (RP) 1550-09, Unit Acceptance Tests. The data were reviewed by the NRC staff and the review was documented in NRC Inspection Report No. 50-289/85-30.

Between January 27 and February 3, 1986, the licensee placed the plant in cold shutdown in order to break vacuum in the main condenser to repair leaking pipe expansion bellows on the eighth stage extraction steam lines. The licensee entered the "C" condenser through an opening cut in the side of the main condenser. The licensee found both eighth stage expansion bellows to be significantly deteriorated; both were replaced. The licensee performed a search of the main condenser and extraction steam lines to locate and remove pieces of the damaged expansion bellows. A visual inspection of the remaining tenth and twelfth stage expansion bellows in the "C" condenser was conducted and no apparent deterioration was found.

Based on what was found in the "C" condenser, the licensee decided to examine the other eighth, tenth, and twelfth stage expansion bellows in the "A" and "B" condensers. A visual inspection found cracking on all four of the eighth stage expansion bellows; they were replaced. No apparent deterioration was found on the tenth and twelfth stage expansion bellows.

Repair work was completed on February 2. The damaged expansion bellows were sent off site for metallurgical examination to determine the cause of the failure. Following restart of the plant, an approximate 35 MW(e) increase in power was noted.

At the end of the inspection period, the plant was at full power at normal operating pressure (2155 psig) and temperature (579 F).

2. Plant Operations

2.1 Scope of Review

The TMI-1 Resident Office inspectors periodically inspected the facility to determine the licensee's compliance with the general operating requirements of Section 6 of the Technical Specifications (TS) in the following areas:

-- review of selected plant parameters for abnormal trends

-- plant status from a maintenance/modification viewpoint, including plant housekeeping and fire protection measures

-- control of ongoing and special evolutions, including control room personnel awareness of these evolutions

-- control of documents including logkeeping practices

-- implementation of radiological controls

-- implementation of the security plan, including access control, boundary integrity, and badging practices

The inspectors focused their attention on the areas listed below.

-- control room operations during regular and backshift hours, including frequent observation of activities in progress, and periodic reviews of selected sections of the shift foreman's log and control room operator's log and other control room daily logs

-- followup items on activities that could affect plant safety or impact plant operations

-- areas outside the control room

-- selected licensee planning meetings

Because of additional resident inspector coverage at this facility, special attention was given to those areas listed in Attachment I to the report. As a result of this review, the inspectors reviewed specific events in more detail as described in the sections that follow.

2.2 Findings

2.2.1 General

Licensee management continued their presence and involvement in daily activities. The quality assurance department sustained their presence and detailed involvement in licensee activities. Positive control and adequate preparations were demonstrated during the week-long forced outage for steam line expansion bellows replacement. The plant shutdown and subsequent startup went smoothly without significant problems.

2.2.2 Malfunction of CRD Reed Switches

Two methods of control rod position indication are used -- relative and absolute. Relative position indication monitors input pulses to the control rod drive (CRD) motor while absolute position indication monitors the position of the control rod through the use of reed switches. There are 45 equally spaced reed switches mounted in a fiberglass housing that is strapped to the motor tube of the control rod drive mechanism (CRDM). These reed switches are closed by a magnet attached to the torque taker; as the control rod moves in and out of the core, the magnet passes by the reed switches. A reed switch is held closed whenever the magnet is within 1.5 inches above or below it. As the reed switch closes, electrical contact is made varying the resistance of the circuit, which is then translated to position indication. Once the magnet passes by, the reed switch opens and electrical contact is broken.

Occasionally, the licensee experiences problems with these reed switches. This is indicated by a "fault" light on the position indication panel and an asymmetric rod alarm when the magnet on the torque taker passes a defective reed switch. The problem occurs when a film forms on the surface of the reed switch contacts, preventing the switch from closing electrically. The film apparently forms on the reed switches from impurities that leach out from the glass tubes.

In the past, the licensee would remove defective reed switches and send them to the vendor (Diamond Power Corporation) for repair. The vendor would apply 5 volts at 100 milli-amps to the defective reed switch to "burn-off" the film. The success rate was approximately 75%. The licensee decided to implement this simple method on site to repair the defective reed switches.

The inspector reviewed corrective maintenance procedure 1430-CRD-19, "CRD PI Tube Troubleshooting, Repair or Replacement," Revision 3, dated December 11, 1985, Attachment 2, "Repair of a Defective Position Indicator Reed Switch." The inspector also reviewed the machinery history file for the CRD system to review job tickets associated with this procedure.

The inspector found no discrepancies in the procedure. If the "burn-off" method fails to solve the problem, the procedure states that the reed switch will probably need to be replaced. The inspector determined the success rate to be approximately 70% with respect to the onsite refurbishment. The inspector had no further questions in this area.

2.2.3 Decay Heat Removal (DHR) System Leakage

During a reactor coolant system (RCS) cooldown on January 29, 1986, when the decay heat removal system was placed into operation, a relief valve (DH-V57B) lifted spilling water on the auxiliary building floor and into the floor drain system. (The relief valve is mounted on the DHR pump suction line between the BWST suction valve and a downstream check valve (DH-V14B)). The lifting of the relief valve was attributed to leakage past the check valve. This leakage caused a buildup of pressure between the check valve and the closed BWST suction valve.

Technical Specification (TS) 4.5.4 states that the maximum allowable leakage from the DHR system components as measured during refueling tests shall not exceed 6 gallons per hour. Since this leakage via the lifted relief valve during system operation was in excess of 6 gallons per hour, the inspector requested the Plant Review Group (PRG) to review this occurrence to verify compliance with the TS requirement.

The PRG met to review this information in relation to TS 4.5.4 on February 4, 1986. The PRG concluded the piping which contains the leaking check valve is required by TS to be tested at no less than 55 psig. The relief valve

setpoint is much greater than 55 psig (150 psig) and, therefore, would not and did not lift under conditions where the RCS pressure was less than the relief valve setpoint. The PRG also concluded that under accident conditions at which RCS high activities might be experienced, the pressure in the DHR suction side piping would be low. For these reasons, the PRG concluded the TS was being met.

Additionally, the PRG reviewed the situation from an operational point of view and concluded that in order to avoid radioactive spills and generation of radwaste, lifting of the relief valve should be avoided. Accordingly, operations will review the decay heat removal procedure and will provide appropriate cautions against establishing decay heat removal at RCS pressures that could challenge the relief valves when RCS activity could cause a significant release.

It was also noted that the leaking check valves (only DH-V14B leaked during this event; however, DH-V14A is also known to be leaking) are scheduled for repairs during the next refueling outage. The NRC will verify the repair of these valves at that time. This item is unresolved (289/86-01-01).

The inspector agreed that, in the interim, until the valves are repaired during the next refueling outage, the procedural controls recommended by the PRG were adequate.

2.2.4 Makeup Demineralizer Hot Spot Flush

On January 10, 1986, the licensee decided to flush a hot spot out of the resin fill line to the makeup and purification mixed bed demineralizer (MU-K1A) for ALARA considerations. The hot spot was located in a low section of piping between CA-V129A and the demineralizer; the dose rate of the hot spot was 175 R/hr. The valve and associated piping is located in "mini-valve alley" on the 305' elevation of the auxiliary building.

Licensee representatives believed the hot spot was composed of contaminated resin that apparently lifted-off the demineralizer bed and settled out in a low section of piping next to CA-V129A. An ALARA review was conducted on January 8, 1986 to determine RWP requirements and the manner in which the flush would be carried out. Operations personnel were to line up and vent the demineralizer to the spent resin storage tank. By using reclaimed water from the chemical addition room, the flushing water would pass through the piping, CA-V-129A, demineralizer bed and

into the spent resin storage tank. The objective was to move the contaminated resin beads from the piping into the demineralizer bed.

The licensee depressurized and drained MU-K1A slightly to allow room for flushing water. Using applicable sections of OP 1104-54, "Makeup and Purification Demineralizer Resin Replacement," approximately 50-100 gallons of water were used for the flush. The flush appeared to be successful because the hot spot dose rate was reduced to 500 mR/hr. To return the system to operation, it needed to be vented and filled with water. During the venting operation, contaminated resin beads were carried into vent piping outside of the cubicle along an adjacent passageway. Because of the new hot spot, the passageway had to be posted as a radiation area.

During the ALARA review, licensee representatives thought that there was a resin trap at the exit of the demineralizer tank prior to entering the vent header. Based on this assumption, licensee representatives did not think that contaminated resin could be swept into the vent header. A subsequent review of the system drawings by the licensee revealed that there was no resin trap installed. A licensee representative stated that almost every resin tank similar to this one has a resin trap at the vent exit; this was the basis for their assumption.

Licensee representatives used poor judgement in assuming that a resin trap was present at the exit of the demineralizer tank. The inspector noted that OP 1104-54 contained a caution statement that resin could be observed in the vent sight glass during the venting operation. This should have keyed licensee representatives to the fact that there was no resin trap present. Normally, small amounts of resin observed in the sight glass is not a major problem because it is clean resin. Other aspects of this flushing operation were carried out well and in accordance with procedures.

The inspector also reviewed licensee surveys and posting of the radiation area to determine if they were in accordance with procedural requirements. Current surveys of mini-valve alley and the adjacent hallway reflecting the new radiological conditions were available at the control point and the technician performing the surveys appeared knowledgeable in general survey practices and techniques. Shielding and posting efforts in the hallway outside mini-valve alley were found to be adequate. The inspector had no further questions in this area.

By mid-February 1986, radiation dose rates inside the vent header had decayed significantly; the highest reading was 100 mR/hr contact. The inspector agreed with the licensee's conclusion that the vent header would not need to be flushed as long as dose rates from the vent header continued to decrease and remained low.

The inspector expressed his concern to licensee management that future hot spot flushing operations of contaminated resin could be enhanced with better job planning. The licensee representatives acknowledged the inspector's concern. The inspector had no further questions in this area.

2.2.5 Waste Gas Release

During release of the "B" waste gas decay tank to the vent stack on Saturday, January 18, 1986, the discharge caused the vent stack radiation monitor to reach the lower of two alarm setpoints. In response to this alarm, the release was stopped and a sample was taken to determine activity levels in the tank. This sample confirmed the original calculations, and the release, which totaled about 2.8 curies, was completed.

Later that day, approximately five hours after the release was completed, one of the offsite radiation monitoring stations about one-half mile west of the plant alarmed momentarily. The two events were reviewed by the licensee and were determined to be unrelated. The offsite radiation monitor alarm was concluded to be a spurious alarm. This particular station transmits its data via radio signal. No other stations alarmed.

The inspector reviewed the licensee's actions to ensure that the evolution had been conducted in accordance with applicable station procedures and that the release did not exceed any discharge limits. The inspector independently reviewed the analytical results of the grab samples taken on the waste gas tanks to determine the amount of activity being discharged and reviewed the meteorological conditions at the time of the release and the subsequent five hours. The meteorological data demonstrated that the discharges from the plant would have been swept in the direction of the detector in question. However, at the time of the alarm, the licensee had terminated the release several hours prior to the alarm from the offsite detector. Due to the amount of activity discharged and the dispersion of

this material that would have occurred, the inspector concurred with the licensee's characterization of the event.

2.2.6 Reactor Plant Heatup and Startup

On January 27, 1986, the licensee commenced a shutdown of TMI-1 for a forced outage to repair a leaking expansion bellows on a feed heater extraction steam line (see paragraph 1.2).

On February 2, 1986, the licensee completed repair work and commenced a plant startup. The plant was returned to full power by February 6, 1986. Following restart of the plant, an approximate 35 MWe increase in power was noted.

The inspector was present and witnessed major portions of the forced shutdown and subsequent startup. In addition, visual inspection of the ruptured bellows and other maintenance related work was conducted. The inspector noted work was being performed in accordance with station procedures and personnel performing the work were knowledgeable about their tasks. Discussions with control room operators demonstrated that they were aware of plant status. Portions of the startup witnessed were performed in accordance with applicable procedures. Actual middle management presence in the control room and in the plant was noted on a continuous basis during plant shutdown and startup. Presence of management appeared to aid in allowing the licensee to complete the repairs in a timely and safe manner.

2.3 Conclusion

Operators continued to conduct themselves in a competent manner and their performance-oriented actions reflected a strong training program. Licensee management and the quality assurance department continued their presence and involvement in daily activities. Final preparation for forced outage work was conducted at a fast pace, but management control ensured no adverse regulatory or safety conditions resulted. In general, operators were responsive to daily plant problems as they arose. Overall, procedures were properly implemented. Radiological control practices were good.

As equipment problems became evident, appropriate corrective maintenance was planned, scheduled, and implemented as evidenced by the reed switch problem. The licensee continued to implement an aggressive preventive maintenance program. One job, the flush of the makeup demineralizer hot spot, could have been better thought out prior to implementation. Overall, personnel acted cautiously when abnormal situations arose, such as during the identification of a hot spot

immediately after flushing. Personnel awareness and caution were also exhibited when the lifted DH relief valve was seated in order to minimize the spread of contamination and minimize liquid radwaste generation.

3. Event Followup

3.1 Failure of RPS Shunt Trip Breaker

3.1.1 Event Chronology

At 2:26 p.m. on January 14, 1986, during monthly Reactor Protection System (RPS) surveillance testing, one of the two a.c. reactor trip breakers (CB-11) failed to open when its shunt trip feature was tested. The plant was at normal temperature and pressure at 100% power. Just prior to the failure, the breaker's undervoltage (UV) trip feature had been tested successfully.

Subsequent to the initial failure of the breaker to open, the test switch was placed in the shunt trip position two or three additional times; the breaker still failed to open.

In accordance with Technical Specifications (TS 3.5.1.6), the licensee tested the other a.c. breaker, four d.c. breakers, and tagged open CB-11. A faulty circuit board was replaced with a unit from stock and CB-11 subsequently passed the surveillance test at 7:00 p.m. that day.

3.1.2 Event Review

The inspector reviewed the event to determine the following information:

-- details regarding the cause of the event and event chronology;

-- consistency of licensee actions with license requirements, approved procedures, and the nature of the event; and,

-- proposed licensee actions to correct the cause of the event.

The inspector's review of the breaker malfunction included discussions with cognizant licensee personnel and review of the following documents:

-- system electrical drawings;

-- surveillance procedure (SP) 1303-4.1, "Reactor Protection System;"

-- temporary procedure (TP) 400/0.1, "ITE-27H Solid State Relays Calibration CRDM Circuit Breaker Modification," Revision 0, MXT 5.3.5.1.2.

The inspector also examined the failed ITE undervoltage relay to assess the licensee's conclusions.

3.1.3 Licensee Findings

The licensee began troubleshooting the ITE/Brown Boveri undervoltage relay and discovered that K1 (output relay) was not closing when the undervoltage relay was de-energized. Subsequent troubleshooting revealed that a 48/125 VDC control voltage jumper on the undervoltage relay was plugged in the 48 VDC position instead of the 125 VDC position. Therefore, the undervoltage relay was set to operate at an input voltage of 48 VDC instead of the applied input voltage of 125 VDC. An overheating condition was created and was evidenced by yellow discoloration and deformation of the originally clear plastic cover for K1. Overheating was also indicated on one other resistor.

The licensee determined the cause of the failure to be improper voltage set-up of the ITE undervoltage relay due to an incorrectly located control voltage jumper. The faulty undervoltage relay was calibrated and checked for proper control voltage jumper placement. The shunt trip portion of RPS breaker CB-11 was retested and was found to be operable.

As a preventive measure, the licensee inspected the undervoltage relay for RPS breaker CB-10 and two other undervoltage relays in the plant and determined that the control voltage jumpers were in the proper location. The licensee also functionally tested the shunt trip portion of CB-10 and verified it to be operable.

The licensee decided that the event was not reportable; but when requested by the inspector, the licensee agreed to submit a special report.

3.1.4 NRC Staff Findings

The licensee's initial actions in response to this event were timely and consistent with license requirements, approved procedures and the nature of the event. The

inspector agreed with the licensee's conclusion that an incorrectly located control voltage jumper caused the output relay (K1) to overheat and fail.

The licensee bought the undervoltage relays from ITE/Brown Boveri but had their subsidiary -- Metropolitan Edison, Lebanon Relay Department -- calibrate them using TP 400/0.1. A QC inspector from the licensee's QC department witnessed testing of three undervoltage relays and reviewed the data associated with four other undervoltage relays. Therefore, QC receipt inspection was not performed.

The inspector's review determined that TP 400/0.1 did not adequately check for the proper location of the control voltage jumper nor require an independent verification of that jumper. From discussions with licensee personnel and review of calibration data, the inspector determined that data obtained during calibration was not affected by the position of the control voltage jumper; therefore, a visual inspection was the only means to ensure proper placement of the control voltage jumper.

The licensee has agreed to write a special report concerning this event. Preliminary discussions with the licensee indicated that corrective actions to prevent recurrence consist of writing a permanent procedure with a check-off to ensure proper placement of the control voltage jumper and performing the calibrations on site. This area will remain unresolved until the inspector reviews the special report that is expected to be issued in February 1986 (289/86-01-02).

3.2 Partial Loss of ICS/NNI Power

3.2.1 Event Chronology

At 11:24 a.m. on January 24, 1986, a 30 amp Integrated Control System (ICS) auto power (subfeed) breaker tripped open causing a loss of auto power to all ICS Bailey control stations. The plant was at 100% power steady-state conditions with the ICS in auto control. At the time, maintenance was being performed on a feedwater flow transmitter that is powered from ICS auto at the time.

Both feedwater pumps ran back to approximately 4100 rpm as designed, causing a small reduction in feedwater flow to the Once-Through Steam Generators (OTSGs). As feedwater

flow and OTSG level decreased slightly, Reactor Coolant System (RCS) pressure and Tave began to increase while main steam/turbine header pressure decreased.

Numerous alarms in the control room sounded, including a "Reactor Trip" alarm. A determination was made that the reactor and turbine had not tripped, but a loss of ICS auto power had occurred.

RCS pressure was reduced by manually opening the pressurizer spray valve and loss of main steam header pressure was reduced by manually closing the turbine control valves. After the plant was stabilized, EP 1202-42, "Total or Partial Loss of ICS Auto Power," was reviewed to ensure that all immediate and followup actions were performed. As a result, in accordance with the procedure, the pressurizer heater low level interlock was bypassed for RCS pressure control. Personnel were then dispatched to determine which breaker had tripped. Work on the flow transmitter was terminated.

The breaker was closed at 12:38 p.m. and ICS auto power was restored, after the ICS demand signals for the main feedwater pumps (MFPs) had been readjusted so that a plant transient would not occur when the breaker was closed. All ICS stations were placed in automatic and the plant was returned to 100% power.

3.2.2 Event Review

The inspectors reviewed the event to determine the following information:

-- details regarding the cause of the event and event chronology;

-- consistency of licensee actions with license requirements, approved procedures and the nature of the event;

-- operator response to the event; and,

-- follow-up licensee actions to prevent or reduce recurrence of the event.

As part of the review, the inspectors had discussions with cognizant licensee personnel, reviewed various emergency and alarm response procedures, and reviewed Plant Incident Report No. 1-86-01.

3.2.3 Licensee Findings

The first indication of a plant transient was a reactor trip alarm, loss of ICS auto power alarm, and several other alarms. The loss of ICS auto power causes the reactor trip alarm; the alarm response procedure also reminds the operator that a reactor trip alarm occurs when ICS auto power is lost. By training, operators are instructed to determine the validity of the reactor trip alarm before entering ATP 1210-1, "Reactor Trip."

Stabilizing turbine header pressure at a lower pressure was a significant action because sufficient reduction in feedwater flow to the OTSGs was realized when the MFPs ran back to 4100 rpm. Therefore, power was stabilized at 97% with an elevated Tave. Opening the pressurizer spray valve restricted increase in the RCS pressure to 2285 psig. (Reactor trip setting was 2300 psig.)

Design features of the ICS enabled the operators to stabilize the plant quickly. Operators were able to switch certain transmitters to hand power so that indication would not be lost, while other ICS control stations failed as is when the 30 amp breaker opened. EP 1202-42 adequately identified the failed indicators and other alternate indicators available for plant control.

During the event, a PORV tailpipe temperature alarm was received along with indication of a perturbation in the RCS drain tank level. The licensee believes a spurious signal caused the PORV to open for approximately 0.2 seconds. No significant RCS depressurization was observed.

After controlled and deliberate troubleshooting of the 30 amp ICS auto power breaker was performed, it was closed. Verifying MFP ICS demand signals prior to closing the breaker ensured a minimal system perturbation. In addition, the sliding links for the feedwater flow transmitter were verified open in case it had caused the breaker to trip. When the breaker was closed, test equipment indicated normal current readings.

Initially, licensee representatives believed that the feedwater flow transmitter caused the 30 amp ICS auto breaker to open because the transmitter was being powered - up when the transient occurred and it was also located in the same cabinet as the breaker. However, subsequent testing of the transmitter did not reveal any problems. After additional troubleshooting was performed, a loose wire on the 30 amps ICS auto breaker was found. This

apparently caused the breaker to open. As an additional measure, the licensee checked other breakers for loose wires.

The licensee stated that there is a potential for ICS failures during maintenance activities in the ICS cabinets. Therefore, when work is to be performed on the ICS, the following will be observed:

-- the shift supervisor will be shown the scope of work using appropriate prints;

-- headphone communications will be established between the control room and the ICS work location; and,

-- at least four main areas of the console will be continuously manned.

The licensee's initial review of the transient has proposed the following corrective actions.

-- Review of the light indications for a loss of ICS auto power. The licensee felt there was an inconsistency in the design logic of the system.

-- Develop ICS maintenance procedures that identify upstream fuses and/or breakers that could be affected by the maintenance activity.

-- Initiate an engineering change so that MFP ICS signal shaping modules are powered from hand rather than auto.

-- Review and revise, if appropriate, the power supply for the reactor trip alarm relay.

-- Incorporate any lessons learned from the incident into the emergency procedures (EP 1202-40,41,42).

-- Provide clear guidance on restoring ICS to auto from hand while at power in OP 1105-4.

-- Test and replace, as necessary, the 30 amp ICS auto breaker.

-- Technical Functions Division will provide an independent review of the plant incident.

3.2.4 NRC Findings

The operators' performance during the transient was very good. There were a number of times when inappropriate operator action, had it occurred, would have worsened the transient. Good operator performance reflects proper training and preparation. Careful planning by the licensee before closing the 30 amp ICS breaker prevented a transient from occurring due to runup of the MFPs.

Modifications to the ICS performed during the last several years were very important to the successful response of the plant to the transient. Except for the MFPs running back to 4100 rpm, all other major ICS equipment failed as is; also, indicators automatically had backup power available.

Procedures were good and provided adequate guidance to the operators during the transient. However, several procedural improvements are planned to be incorporated by the licensee.

The inspector's review of licensee corrective action revealed that the operators understanding of the light indications associated with the ICS were deficient. By training, the operators believed that the subfeed auto/hand light should have been out, not the ICS auto light. A memorandum from the Plant Operations Supervisor to shift supervisors, dated February 6, 1986 (Serial No. 3210-86-0038), discussed a console indication labeling upgrade for a loss of ICS/NNI power. In this memorandum, specific information dealing with the ICS light indication response to the various breaker trips was discussed. The memo supported the light-out indication for the ICS auto light. The information contained in the memo was discussed with all the operating crews. The inspector considered this action adequate.

The licensee agreed to provide a special report on this event. The remaining open licensee actions, including the special report to the NRC, will remain unresolved and will be reviewed in a subsequent inspection (289/86-01-03).

3.3 Conclusion

These events, in particular the loss of ICS power event, confirm previous NRC conclusions of excellent operator performance as a result of a substantial training program. There apparently was still some confusion among licensed operators on the proper response of the loss of ICS/NNI power indicating light system, but this did

not affect the response to avoid a safety system challenge. Pending a review of the subject reports, appropriate corrective actions were proposed or implemented by the licensee.

The RPS breaker event substantiated already identified weaknesses in the licensee's program for independent verification of equipment control activities (re: NRC Inspection Report No. 50-289/85-27).

4. Independent Technical and Safety Review

Facility Technical Specifications (TS) 6.5.1 and 6.5.2 specify the requirements for Responsible Technical Reviews (RTR) and Independent Safety Reviews (ISR) of various activities identified in these TS. During this inspection, the licensee's compliance with these requirements was reviewed. The specific requirements reviewed and the results of the review are as follows.

4.1 Division Review and Approval Responsibility

The TS require that each division within the GPU Nuclear Corporation be responsible for performing RTR and ISR of areas assigned in the GPUN Review and Approval Matrix. To implement this requirement, a number of procedures have been developed. The Corporate Procedure 1000-ADM-1291.01, GPU Nuclear Safety Review and Approval Procedure, has been prepared to control and implement the GPUN safety review and approval process. This procedure applies to each division/facility of GPUN. This procedure makes each Division Vice President responsible for the development and implementation of divisional procedures to support the requirements of the corporate procedure. These divisional procedures have been developed and are identified as follows:

-- Technical Functions Division, Procedure 5000-ADM-1291.02, Independent Safety Review;

-- Nuclear Assurance Division, Procedure 6000-ADM-1291.01, Performance of Safety Reviews;

-- Radiological and Environmental Control Division, Procedure 9000-ADM-1291.01, Radiological and Environmental Controls Division Safety Review and Approval Procedure; and,

-- Three Mile Island Division, Procedure 1034, Plant Review Group.

A review of the corporate procedure verified that adherence to this procedure would ensure compliance with the TS requirements for RTR and ISR. No specific review was performed on each of the individual division procedures (except in the area of reports to the division vice presidents), nor were any requirements of the procedures which are in addition to TS requirements verified by the inspector.

Many of the specific review requirements of the TS are specified in a GPUN review and approval matrix which is a part of corporate procedure 1000-ADM-1291.01. Specific activities described by the review and approval matrix were selected for review in order to verify that each division was performing as required. The following specific subjects requiring review were verified:

-- General Plant Operating Procedures -- Verified procedures 1103-1, "Reactor Coolant Inventory Tracking System" and 1104-45J, "Combustible Gas/Heat Activation Device," received RTR and ISR by qualified TMI-1 and Technical Function Division personnel, as required;

-- Emergency Operating Procedures -- Verified procedures 1202-12, "Excessive Rad Levels" and 1202-40, "Total Loss of Power to ICS/NNI," received RTR and ISR by qualified TMI-1 and Technical Functions Division personnel, as required;

-- Fire Protection Operating Procedures -- Verified procedure 1104-45E, "Fire Service Protection System," received RTR and ISR by qualified TMI-1 Division personnel;

-- Calibration Procedures -- Verified Procedure 1430-MU-1, "Seal Leakoff Transmitter Flow Calibration," received RTR and ISR by qualified TMI-1 Division personnel.

-- Preventive Maintenance Procedures -- Verified procedure IC-133, "MAP-5 Post-Accident Iodine and Particulate Samples," received RTR and ISR by qualified TMI-1 Division personnel;

-- Corrective Maintenance Procedures -- Verified Procedure 1410-P-9, "Adjusting MU Pump Mechanical Seals,: received RTR and ISR by qualified TMI-1 Division personnel.

-- Surveillance Procedures -- Verified Procedures 1302-17.4, "RM-L-12 Calibration," and 1303-11.39, "Emergency Feedwater Pump Auto Start," received RTR and ISR by qualified TMI-1 Division personnel.

-- Radiological Controls -- Verified procedures 9100-ADM-4000.06, 9100-PLN-4200.01, and 9100-IMP-4250.08 and Procedure Change Requests (PCRs) 1-RC-85-0103, 1-RC-85-0088, and 1-RC-85-0045 received RTR and ISR by qualified radiation controls personnel;

-- Environmental Monitoring Procedures -- Verified procedures 9420-SUR 4523.05, "Determination of REMP Investigational Levels and Subsequent Actions," 9420-IMP-4522.12, "REMP Sample Collection Procedure," and 9420-SUR-4570.01, "TMINS Hydrographic Survey," received RTR and ISR by qualified radiological controls personnel;

-- Emergency Plan Implementing Procedures -- Verified TCN 1-86-0002 to 1004.2, "Emergency Directions," TCN 1-85-0179 to 1004.4, "Callout of Duty Roster Personnel," TCN 1-85-0193 to 1004.5, "Communications and Record Keeping," and PCR 1-EP-86-0008 to 6415-IMP-1300.10, "Onsite/Offsite Radiological and Environmental Monitoring," received RTR and ISR by qualified members of the Emergency Preparedness Department;

-- Security Plan and Implementing Procedures -- Verified the security plan and procedure 7000-ADM-1291.01, "Performance of Safety Reviews," received RTR and ISR by qualified security personnel;

-- Quality Assurance Plan and Implementing Procedures -- Verified the GPUN Operational Quality Assurance Plan and procedures 1000-ADM-7215 01, "Important-to-Safety Material Nonconformance Reports," anc 1000-ADM-7215.02, "GPUN Quality Deficiency Reports" received RTR and ISR by qualified Nuclear Assurance Division personnel;

-- Process Control Program Implementing Procedures -- Verified procedure 1104-28I, "Process Control Program - Hittman," and 1104-28D, "Packaging Non-Compactible Trash," received RTR and ISR by qualified TMI-1 division personnel;

-- Offsite Dose Calculation Manual Implementing Environmental Controls Procedures -- Verified procedures 9420-IMP-4522.02, "REMP Sample Collection Procedures TLDs," and 9420-IMP-4522.03, "REMP Sample Collection Procedure Fish, Aquatic Sediment, Aquatic Plants," received RTR and ISR by qualified Environmental Controls personnel;

-- Special Temporary Procedures (STP) -- Verified STP No. 1-85-0048, "Main Generator Manual Excitation Test," and STP No. 1-85-0050, "OTSG A/B Blowdown," received RTR and ISR by qualified TMI-1 Division personnel;

-- Technical Specifications/License Change Requests -- Verified Technical Specifications Change Requests 127, 128, and 133 received RTR and ISR by qualified Technical Functions personnel or by qualified reviewers from other divisions as permitted by procedure 1034, "Plant Review Group;"

-- Licensee Event Report (LER) -- Verified LER 85-001-0, "Inadvertent ESAS Actuation," and LER 85-002, "Manual Reactor Trip Due to Fire in the Control Rod Drive Transfer Switch," received RTR and ISR by qualified TMI-1 and Technical Functions Division personnel;

-- Review of Written Summaries of Audit Reports -- Verified GPUN Audit Reports S-TMI-85-03, "TMI-1 and TMI-2 Radwaste Management," and S-TMI-85-11, TMI-1 Operations," received reviews as required by Section IV of the TMI-1 Review and Approval Matrix;

-- Investigation of Violations of Technical Specifications -- The Plant Review Group (PRG) is currently reviewing violations of TS. Examples of violations of TS being reviewed by the PRG are Quality Deficiency Report SRC-049-85, dealing with oxygen concentration in the reactor coolant system, TCN 1-86-0005 not being reviewed within 14 days as required, and a missed surveillance requirement on RM-A5. Section IV of the TMI Review and Approval Matrix specifies certain specific documentation requirements associated with the investigation of violations of TS. There appears to be no question that violations of TS are being reviewed by qualified TMI-1 division personnel as evidenced by PRG meeting minutes. However, the documentation of these reviews is not as required by the notes associated with Section IV of the Review and Approval Matrix. Additional information relative to documentation is identified in the following paragraph.

-- Review of Every Unplanned Release of Radioactivity to the Environment -- The inspector reviewed Radiological Investigation Report No. 85-008, dealing with a small release (.7 Ci) on October 28, 1985, resulting from makeup pump 1A maintenance, Plant Incident Report No. 1-85-19, dealing with a release (46.3 Ci) on December 30, 1985, also resulting from makeup pump 1A maintenance and Radiological Investigation Critique minutes dealing with a small release (1.4 Ci) on December 17, 1985, resulting from gas compressor maintenance. These documents show that releases of radioactivity to the environment are being reviewed by qualified TMI-1 Division and Radiation Controls Division personnel. As discussed above, Section IV of the TMI Review and Approval Matrix specifies certain specific documentation requirements for reviews of every unplanned release of radioactivity to the environment and investigations of violations of TS. Reviews of these items are being conducted. However, the documentation of these reviews does not entirely satisfy the documentation requirements specified in the matrix.

The licensee will more clearly define the method for documenting the review of TS violations and unplanned releases. This item is unresolved pending completion of licensee action as noted above and subsequent NRC Region I review (289/86-01-04). Also, included in this unresolved item is that the licensee will also more clearly define what constitutes an unplanned release of activity to the

environment which requires review under Section IV of the Review and Approval Matrix and Section 6.5.1.10 of the Technical Specifications.

4.2 Reviewer Qualifications and Designation

The TS specify the qualifications for RTR and ISR. Step 4.1 of corporate procedure 1000-ADM-1291.01 requires "each divisional vice president will be responsible for having ISR and RTR identified within his organization."

The inspector verified that reviewers for RTR and ISR were designated in writing as follows.

-- Memo dated November 1, 1985, from the PRG Chairman, TMI-1 designates the RTR and ISR for the TMI-1 division.

-- Memo dated December 19, 1984, from the security manager designates the Security Department RTR and ISR.

-- Memo dated October 7, 1985, from the safety review coordinator designates the Quality Assurance Department, Training and Education Department, Nuclear Safety Assessment Department, and the Emergency Preparedness Department RTR and ISR.

-- Memo dated December 18, 1985, from a senior licensing engineer identifies the safety reviewers for the Technical Functions Division.

-- Memo dated December 5, 1985, from the Director, Radiological and Environmental Controls Division, designates the Radiation Controls - TMI-1, Environmental Controls - TMI-1, Environmental Controls - Corporate, and Radiation Engineering - Corporate Technical and Safety Reviewers.

The TS specify safety reviewer qualifications. The corporate safety Review and Approval Procedure specifies the same qualification requirements and in addition requires training and retraining for RTR and ISR.

The formal records documenting the qualifications and training of reviewers are being maintained at the corporate office in Parsippany. Sample unofficial records being maintained at the site indicate that reviewer qualifications and training requirements are being met. For each of the specific items reviewed by the inspector, the RTR and ISR were verified as being on the list of qualified reviewers.

4.3 Review Records

Technical Specification 6.5.1.13 requires records of RTR be maintained. Step 4.13.1.2 of the corporate procedure 1000-ADM-1291.01, states "records of documents prepared, reviewed, and approved in accordance with the GPU Nuclear Safety Review and Approval Matrix will be maintained for the life of the operating license."

The format of the records maintained show that reviews are being performed in accordance with the Review and Approval Matrix vary considerably among the various groups involved in performing reviews. However, the inspector found that, for the specific items reviewed, sufficient records are being maintained to show RTR and ISR are being performed as required by the matrix. The quality of these reviews will be subject to inspection in the future. Qualification records were reviewed as noted in paragraph 4.2.

Technical Specification 6.5.2.7 requires that reports of ISR be prepared, maintained and transmitted to the cognizant division vice president. The corporate Safety Review and Approval Procedure 1000-ADM-1291.01 in Step 4.13.1.3 requires "Reports of all technical reviews and independent safety reviews will be prepared and transmitted to the responsible division vice president. They will be maintained for the life of the operating license."

Neither the TS or the corporate procedure specify any time period for submitting the report. Also, each of the division procedures differ somewhat in their requirements relating to reports to the division vice presidents. The requirement of each divisional procedure and how each division complies with the requirement for submitting a report to the vice president is as follows.

-- TMI-1 Division -- Procedure 1034 specifies "Reports of reviews...shall be transmitted periodically to the vice president, the Operations and Maintenance Director, and the Plant Engineering Director of TMI-1." Reports of reviews by the TMI-1 division are transmitted to the vice president by the forwarding of Plant Review Group meeting minutes and by Weekly Plant Review Group supplementary reports.

-- Technical Functions Division - The Technical Functions Procedure 5000-ADM-1291.02 specifies "Engineering Services shall prepare reports of reviews for each plant annually. These reports shall be retained at the corporate storage area and copies transmitted to the vice president, Technical Functions, and the cognizant plant vice president. Each report shall be a summary of Independent Safety Reviews conducted; it will include irregularities and a listing of all reviews conducted during the period, by subject, as listed in the Review and Approval Matrix." One report of reviews was prepared by a

senior licensing engineer. This report, dated April 19, 1984, covers the period August 28, 1982, to April 1984. The report is approximately 75 pages in length and, basically, lists the procedures and other items reviewed by Technical Functions. Also, a report dated March 15, 1985, identified as 1984 Annual Report - Safety Review Process is a two-page report which summarizes the reviews conducted during 1984. The report also summarizes minor administrative deficiencies noted.

-- Nuclear Assurance Division -- The Nuclear Assurance Division Procedure 6000-ADM-1291.01 in the Records Section, Step, 4.13.1.3 states "Copies of all safety evaluations developed by Nuclear Assurance or where Nuclear Assurance performed the Independent Safety Review will be sent to the Nuclear Assurance Safety Review Coordinator (NASRC). The NASRC will assure they are maintained for the life of the operating license." In accordance with this procedural requirement, the site QA and Emergency Preparedness groups forward reports of reviews they perform to the Nuclear Assurance Safety Review Coordinator. Although the Nuclear Assurance Division Procedures do not require a report to the responsible division vice president, a report dated April 11, 1984, was submitted to the responsible vice president. This report summarized reviews performed since the process started in August 1982 until April 1984. This report stated it was submitted in accordance with the corporate procedural requirement. Although no procedural guidance was provided, the report summarized the reviews that were done by document type and number and also identified certain trends and/or problems identified.

-- Administration Division - The Administration Division Procedure 7000-ADM-1291.01 requires "Reports of all Technical Reviews and Independent Safety Reviews will be prepared and transmitted to the Division Director - Administration. They will be maintained for the life of the operating license." A report which lists all safety reviews which have been performed of Administration Division documents since the inception of the safety review system in August 1982 was submitted to the responsible vice president on February 19, 1985.

-- Radiological and Environmental Control Division - The Radiological and Environmental Controls Division Procedure 9000-ADM-1291.01 in Step 5.7 requires "A summary of the responsible technical reviews and the independent safety reviews performed by TMI-1 and Oyster Creek R&EC Division personnel shall be forwarded to the vice president, R&EC, on a semi-annual basis." Although the procedure specifies a summary of RTR and ISR be forwarded to the vice president on a semi-annual basis, the Radiological Controls Group lists reviews performed in a Radiological Controls Monthly Status Report. Also, a different group in the same division, the Radiological and Environmental

Controls Group, in response to an April 1984 audit finding which identified the group's failure to provide the required report to the vice president, committed to providing a summary report of reviews to the vice president on a semi-annual basis as the division procedure requires. During this inspection, it was noted these semi-annual reports had not been submitted. Prior to the conclusion of the inspection, a report of Technical and Safety Reviews performed by TMI Environmental Controls personnel during 1985 was submitted. This three-page report only listed the procedures/documents reviewed. The licensee felt this report satisfied the TS requirement.

As can be seen from the above, in the absence of any specific guidance, the frequency at which the required report is submitted to the responsible vice president varies considerably from division to division and also the content of the reports varies from a listing of documents reviewed to an analysis of the reporting division's review process.

These problems were discussed with licensee representatives. The licensee representatives stated the Corporate Safety Review and Approval Procedure 1000-ADM-1291.01 is currently in the process of being reviewed and that to correct the problems identified during this inspection, the revision to the procedure will address both the frequency and the content of the reports to the cognizant division vice president. This revision to the procedure will be issued by June 30, 1986. This item is unresolved (289/86-01-05).

4.4 Conclusion

The licensee's review and approval system is complex; but, overall, TS requirements are satisfied by each of the divisions. How that goal is achieved is diverse among the divisions. The reports of reviews could be enhanced by a more consistent and unified approach based on corporate guidance. NRC Region I will continue to review this area with respect to unresolved items noted above and with respect to quality of these reviews.

5. Outage Planning and Preparation

As part of the health physics programmatic review, the inspector reviewed the special preparations for the next outage that will involve significant health physics related work. Presently, the next scheduled evolution is an eddy current inspection scheduled in March 1986.

Discussions with the Radiological Field Operations supervisory staff indicate that planning and preparations for the upcoming March outage have been initiated in a timely fashion. Representatives from the Radiological Controls department have been involved in preliminary outage planning meetings.

The licensee indicated that in plant health physics (HP) technician staff will not be augmented with contractor personnel during the outage. The HP staff will be supplemented by discontinuing the cyclic training shift, which normally requires a percentage of the staff to be in training. Shift coverage during steam generator work will be split into two 10-hour work shifts and a single 4-hour cleanup shift. The cleanup shift will be devoted to decontamination and housekeeping efforts in support of outage activities.

Additional licensee preparatory effort has included:

-- designation of a responsible individual establishing an outage control point on the 306-foot elevation of the intermediate building;

-- scheduling a pre-outage calibration of instrumentation that will become due for calibration during the outage; and,

-- scheduling pre-outage qualification boards for all technicians who will become due for requalification during the outage.

The inspector reviewed licensee surveys and posting of several newly-developed hot spots in the hallway adjacent to mini-valve alley in the auxiliary building. The hot spots were created when radioactive resin from a makeup and purification system demineralizer was inadvertently introduced into a waste gas header (see paragraph 2.2.4). Current surveys of the alley and hallway reflecting the new radiological conditions were available at the control point and the technician performing the surveys appeared knowledgeable in general survey practices and techniques. Shielding and posting efforts in the hallway outside the alley were found to be adequate.

6. Security Program and Implementation

6.1 MC 81018 - Security Plan and Implementing Procedures

The licensee was adhering to the Modified Amended Physical Security Plan (MAPS) for Three Mile Island Nuclear Station, Units 1 & 2, Revision 21, dated January 7, 1986. Implementing procedures were reviewed and were adequate to satisfy the general performance requirements and objectives of 10 CFR 73.55. No unauthorized changes were identified.

6.2 MC 81020 - Management Effectiveness

The inspectors interviewed and observed members of the security force and found that they were knowledgeable of their duties and appeared very professional. Since the last inspection, the licensee has made the following changes or upgrades to security equipment:

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Quarterly management meetings are held between the two GPU Nuclear sites and the corporate headquarters in Parsippany, New Jersey. These meetings aid in keeping upper level management aware of current issues and problems so that they may assist lower level management and keep them informed of current trends and future plans.

6.3 MC 81022 - Security Organization

The licensee's security management structure and chain of command were reviewed by the inspectors and found to be in conformance with the approved physical security plan, contingency plan, and implementing procedures. The licensee's response to several actual contingencies and one simulated contingency was observed by the inspectors and was found to be adequate.

6.4 MC 81038 - Records and Reports

Weekly and quarterly security equipment test records were reviewed by the inspectors and found to have been accomplished in accordance with the physical security plan. A review of Security Event Report No. 85-01, dated January 20, 1985, disclosed that it was timely and complete.

6.5 MC 81042 - Testing and Maintenance

The testing and maintenance program for security equipment conformed to the physical security plan and implementing procedures. The inspectors observed the testing of intrusion and access control equipment and found the systems acceptable.

6.6 MC 81046 - Locks, Keys, and Combinations

The inspectors observed the key and lock custodian conduct a security key inventory and a test of the card key system. All security keys were accounted for in accordance with the security plan and licensee procedures.

6.7 MC - 81052 - Physical Barriers (Protected Areas)

The inspectors verified by observation that the PA physical barriers were maintained by the licensee in accordance with the physical security plan.

6.8 MC 81054 - Physical Barriers (Vital Areas)

The inspectors toured the vital areas and verified by observation that the licensee was maintaining the physical barriers surrounding the vital areas in accordance with the physical security plan.

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6.9 MC 81058 - Security System Power Supply

The inspectors determined that the licensee was maintaining an adequate uninterruptible power supply system to provide emergency power to physical security equipment in accordance with the physical security plan. The inspectors verified, through a review of weekly and quarterly test and maintenance records, that the power supply system was tested at periodic intervals.

6.10 MC 81064 - Compensatory Measures

The inspectors determined by reviewing records that compensatory measures conformed to the physical security plan and implementing procedures. Security personnel demonstrated adequate knowledge of compensatory measures when interviewed by inspectors.

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6.12 MC 81070 - Access Control (Personnel)

The inspectors determined that the licensee was maintaining personnel access control to the PA and VA in conformance with the physical security plan and implementing procedures.

6.13 MC 81072 - Access Control (Packages)

The inspectors observed the search process at the entry control points into the PA and verified that packages and material were being processed into the PA in conformance with the physical security plan and implementing procedures.

6.14 MC 81078 - Detection Aids (Protected Areas)

The licensee demonstrated to the inspectors that the intrusion detection system (IDS) would detect penetration tests of the PA in conformance with the security plan and implementing procedures.

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6.16 MC 81084 - Alarm Stations

Observation by the inspectors of the operations and tests of equipment in the central and secondary alarm stations verified that the licensee was maintaining them in accordance with the security plan and implementing procedures.

6.17 MC 81088 - Communications

The inspectors confirmed by observing tests and by interviewing central and secondary alarm station operators that the licensee was maintaining internal and external communications in conformance with the security plan and implementing procedures.

6.18 MC 81501 - Personnel Training and Qualification

The licensee's training and qualification (T&Q) program was found by the inspectors to be implemented as outlined in the T&Q plan. However, Enclosure 2 to Revision 6, dated August 7, 1984, omits the conditions or standards for task 1.3, "Directs Site Protection Force," which is a task listed in Enclosure 1. The licensee advised that the omission has been identified and is included in a proposed

revision (No. 7). The revision is currently in the review process and it will correct this omission. A random review of 25% of the training records reflected that training and qualification or requalifications were current.

6.19 MC 83601 - Safeguards Contingency Plan

The inspectors determined that the licensee's program for responding to security threats and other contingencies as outlined in the Safeguards Contingency Plan (SCP) and its implementing procedures was adequate. The inspectors observed the security force respond, in accordance with the SCP, to several alarms and to one simulated contingency. No deficiencies were noted.

6.20 Conclusion

Based on this sampling review, the licensee has complied with the plan and is adhering to implementing procedures.

7. Fire Protection/Prevention

The inspector reviewed several documents in the below listed areas of the program to verify that the licensee had developed and implemented adequate procedures consistent with the Fire Hazard Analysis (FHA), Final Safety Analysis Report (FSAR), and Technical Specifications (TS). The documents reviewed, the scope of review, and the inspection findings for each area of the program are described in the following sections.

7.1 Program Administration and Organization

The inspector reviewed the following licensee documents:

-- Technical Specifications, Section 6, Administrative Controls;

-- Administrative Controls - Fire Protection Program Procedure No., 1038, Revision 11; and,

-- Fire Protection Evaluation, Procedure 5000-ADM-7370.01 (EP-013), Revision 2.

The scope of review was to ascertain that:

-- personnel were designated for implementing the program on site; and,

-- qualifications were delineated for personnel designated to implement the program.

No unacceptable conditions were identified.

7.2 Administrative Control of Combustibles

The inspector reviewed the following licensee documents:

-- "Control of Transient Combustible Materials," Administrative Procedure No. 1035, Revision 11; and,

-- "Good Housekeeping," Administrative Procedure 1008, Revision 14.

The scope of review was to verify that the licensee had developed administrative controls which included:

-- special authorization for the use of combustible, flammable, or explosive hazardous material in safety-related areas;

-- prohibition on the storage of combustible, flammable, or explosive hazardous material in safety-related areas;

-- the removal of all wastes, debris, rags, oil spills, or other combustible materials resulting from work activities or at the end of each work shift, whichever is sooner;

-- all wood used in safety-related areas is to be treated with flame retardant;

-- periodic inspection for accumulation of combustibles;

-- transient combustibles to be restricted and controlled in safety-related areas; and,

-- housekeeping to be properly maintained in areas containing safety-related equipment and components.

No unacceptable conditions were identified.

7.3 Administrative Control of Ignition Sources

The inspector reviewed Maintenance Procedure 1410-Y-26, "Control of Hot Work," Revision 12. The scope of review was to verify that the licensee had developed administrative controls which included:

-- requirements for special authorization (work permit) for activities involving welding, cutting, grinding, open flame , or other ignition sources and that they are properly safeguarded in areas containing safety-related equipment and components; and,

-- prohibition on smoking in safety-related areas, except where "smoking permitted" areas had been specifically designated by plant management.

The inspector observed that the referenced procedure is not clear in the requirement for fire watchers to stay on location 30 minutes after the hot work is completed. The licensee stated that this is the case at TMI. A procedure change was issued that clearly states this requirement.

7.4 Other Administrative Controls

The inspector reviewed the following licensee documents:

-- Technical Specifications, Section 6, Administrative Controls; and,

-- General Employee Training - Module IV, Fire Protection, Revision 1.

The scope of review was to verify that the licensee had developed administrative controls which require:

-- work authorization, construction permit, or similar arrangement is provided for review and approval of modification, construction, and maintenance activities which could adversely affect the safety of the facility;

-- fire brigade organization and qualifications of brigade members are delineated;

-- fire reporting instructions for general plant personnel are developed;

-- periodic audits are to be conducted on the entire fire protection program; and,

-- fire protection/prevention program is included in the licensee's QA program.

No unacceptable conditions were identified.

7.5 Equipment Maintenance, Inspection, and Tests

The inspector reviewed the following randomly selected documents to determine whether the licensee had developed adequate procedures which established maintenance, inspection, and testing requirements for the plant fire protection equipment:

-- "Fire Pump Capacity Testing," Surveillance Procedure (SP) 3303-R2, Revision 6;

-- "Hose Station Inspection," SP 1301-12.2, Revision 5;

-- "Fire Pump Periodic Operation," SP 3303-M1, Revision 13;

-- "Diesel Fire Pumps Battery Check," SP 3301-Q2, Revision 8;

-- "Fire System Diesel Battery Check," SP 3301-W2, Revision 4;

-- "Fire Protection Instrumentation Non-Supervised Circuits Test," SP 1303-12.14, Revision 3;

-- "Fire System Valve Line Up Verification," SP 3301-M1, Revision 20; and,

-- "Fire Pump Diesel Fuel Sampling," SP 3303-Q1, Revision 9.

In addition to reviewing the above documents, the inspector reviewed the maintenance/inspection/test records of the procedures listed above to verify compliance with Technical Specifications and established procedures.

No unacceptable conditions were identified.

7.6 Fire Brigade Training

7.6.1 Procedure Review

The inspector reviewed the following licensee procedures:

-- "Fire Brigade Training Administrative Program," Administrative Procedure 6210-ADM-2620.03;

-- "Administrative Controls, Fire Protection Program," AP 1038; and,

-- Amendment 44 to Facility Operating License No. DRP-50.

The scope of review was to verify that the licensee had developed administrative procedures which included:

-- requirements for announced and unannounced drills;

-- requirements for fire brigade training and retraining at prescribed frequencies;

-- requirements for at least one drill per year to be performed on a "backshift" for each brigade; and,

-- requirements for maintenance of training records.

No unacceptable conditions were identified.

7.6.2 Records Review

The inspector reviewed training records of fire brigade members for calendar years 1985 and 1986 to ascertain that they had attended the required quarterly training and participated in a quarterly drill, and received the annual hands-on fire extinguishment practice. In addition to the records reviewed, the inspector witnessed a fire drill.

No unacceptable conditions were identified, except as follows.

7.6.3 Fire Brigade Training Findings

7.6.3.1 Fire Brigade Training Violates T.S. Requirements

The inspector requested to observe a fire brigade drill scheduled to be performed during the inspection. The inspector positioned himself by the firefighter's equipment locker expecting that the firefighters would don their protective gear responding to the drill. The senior resident inspector observed activities at the scene.

Upon announcing the drill, only one fire fighter came to the locker. The remainder of the brigade responded to the scene of the fire and proceeded to simulate fire extinguishment.

The inspector noted that no one was wearing respiratory protective equipment. TMI-1 T.S. 6.4.2 requires that the training of the brigade shall meet or exceed NFPA Standard No. 27 (1976 edition) training requirements. This standard requires the use of respiratory protective equipment during drills.

A review of the licensee's procedures for fire emergencies and drills identified that these procedures do not have the requirements to respond to drills wearing respiratory protection.

This is an apparent violation of the training requirements identified in NFPA 27 included in T.S. 6.4.2 (289/86-01-07).

7.6.3.2 Inadequate Fire Brigade Training Record Keeping

The inspector reviewed the fire brigade training records to ascertain compliance with licensing conditions set forth in a letter to NRC, dated January 7, 1984 (Hukill to Stolz). This letter iterates the revised fire protection program plan for TMI-1 and is a licensing basis document.

One requirement of the fire protection program is that fire brigade members should participate in drills quarterly but must participate in at least two drills per year.

The inspector observed that the method used to track the training given to firefighters is cumbersome and mistake prone. In reviewing less than a 10% sample of firefighter training, it was observed that few firefighters had fulfilled the drill attendance requirement "at regular intervals" for the year by participating in drills scheduled only a month apart. Existing NRC guidance specifies that drills be scheduled at regular intervals. The same review also identified one firefighter on the brigade eligibility list who did not have the required number of drills. The inspector noted that the licensee utilized an inefficient record keeping system. The inspector also noted the large size of the fire brigade. The inspector questioned the relationship between the cumbersome record keeping system, the large brigade size and the problems with attendance at fire drills. The above are collectively recognized as an unresolved item pending a detailed review of the licensee's training procedures in this area by Region I (289/86-01-08).

7.7 Facility Tour

The inspector examined fire protection water systems, including fire pumps, fire water piping and distribution systems, post-indicator valves, hydrants, and contents of hose houses. The inspector toured accessible vital and non-vital plant areas and examined fire detection and alarm systems, automatic and manual fixed suppression systems, interior hose stations, fire barrier penetration seals, and fire doors. The inspector observed general plant housekeeping conditions and randomly checked tags of portable extinguishers for evidence of periodic inspections. No deterioration of equipment was noted. The inspection tags attached to extinguishers indicated that monthly inspections were performed.

No unacceptable conditions were identified, except as follows.

7.7.1 Inoperable Fire Doors

The inspector observed that a number of doors labeled "fire doors" would not close automatically. The licensee explained that this is caused by air pressure differentials. The licensee committed to identify the doors involved and, if these doors are in fire walls, they will either be fixed or other compensatory measures will be taken in accordance with the TS requirements. This is an unresolved item (289/86-01-09).

In response to an NRC security inspector concern, the licensee initiated work on security doors that were also fire doors (see paragraph 6.8). Apparently, fire protection personnel were not factored into the pre-job planning phase and those actions would have derated the fire door. Subsequent to identification of the problem by a licensee operations engineer, appropriate corrective action was taken to maintain the door for both fire and security purposes. The inspector concluded that the operations engineer was quick to identify the problem, but the incident showed poor job planning by the maintenance department. The inspector had no further questions in this area.

7.7.2 Fire Drill and Page Systems Inoperability

For the fire drill observed by the inspector, the licensee provided the inspector with the drill scenario. The scenario involved a fire in the pressurizer heater cabinets switchgear located on the 322' elevation in the turbine building.

The inspector was stationed by the fire locker waiting for the drill to start. When the drill was announced, the inspector was not able to hear the announcement and the fire alarm was barely audible. Because of this system's malfunction, a member of the fire brigade also did not hear the announcement and did not respond. The licensee became aware of the system's malfunction and committed to have the system repaired and enhanced. The enhancement will include additional speakers to cover all plant areas and procedures for system surveillance. This is an unresolved item (289/86-01-10).

7.7.3 Fire Service Water use for Utility Purposes

The inspector observed that plant personnel are using water from hose stations to backwash and flush equipment. NFPA does not recommend this practice because prolonged operation of centrifugal pumps at shut off pressure or low flow rates may prove harmful to the pumps. Using the fire pumps in this manner will require additional maintenance and surveillance. Additionally, from a human factors engineering standpoint,

the operators may get used to seeing the pump running; so, if the pump starts because of either a broken main or due to a fire, either condition may not be quickly diagnosed.

This is an unresolved item pending review of the licensee's actions in this area by NRC Region I (289/86-01-11).

8. Licensee Event Report Onsite Review

The inspector reviewed Licensee Event Report (LER) No. 85-004-0, which was submitted to the NRC on December 26, 1985, in accordance with 10 CFR 50.73. The LER described a breach of a fire barrier during modification work to a makeup pump wall with a sealant or continuous fire watch posted as required by TS 3.18.7.

During this inspection period, the inspector reviewed the licensee's submitted report on the event. The report complied with 10 CFR 50.73 and accurately reported the facts of the event, properly evaluated the event, and accurately reflected the corrective actions taken. An underlying cause was that this was the first time in a number of years maintenance personnel did this type of work which is normally performed by contractors. The event did point out a need for closer supervisory scrutiny by the maintenance department and better communications with fire protection personnel.

9. Licensee Action on Previous Inspection Findings

The inspector reviewed licensee action on previous inspection findings to ensure that the licensee took appropriate action in response to the findings or by self-initiative and that the licensee's action was timely.

9.1 THIS PARAGRAPH CONTAINS SAFEGUARDS INFORMATION

AND IS NOT FOR PUBLIC DISCLOSURE, IT IS INTENTIONALLY LEFT BLANK.

The inspectors observed the licensee test all zones of the system and they functioned according to test procedures which conformed to general performance requirements.

9.2 (Closed) Violation (289/85-11-01): Individual not properly processed into the protected area at the screenhouse area

The security officer involved was appropriately disciplined. All security officers were reinstructed on the correct procedure for access control and signed a statement acknowledging this retraining. During this inspection, the inspectors observed several security officers process personnel into the PA at the screenhouse area and all were processed in accordance with the licensee's security plan and implementing procedures.

9.3 (Closed) Violation (289/85-11-02): Two security officers had not completed annual physical fitness testing. In January 1986, responsibility for scheduling physical fitness testing was transferred from the Training Department to the Security Department to provide better line control. A review by the inspectors on the status of training disclosed that physical fitness testing was current.

9.4 (Closed) Unresolved (289/85-17-01): Positive control of photo badges and key cards. The inspector initially reviewed the licensee's control of photo badges and key cards in Inspection Report 289/85-17. The item was considered unresolved pending further review of the applicable portions of the licensee's security plan. This review was performed as part of a later inspection (289/85-27-03). During this subsequent review, the inspector determined the unresolved item to be a violation. This item is being administratively closed and will be tracked as part of the noted violation.

As a result of this review, the inspector concluded that the licensee's actions were timely and appropriate to adequately resolve these issues, except as noted in paragraph 9.4. Appropriate enforcement action was taken in that case.

10. Exit Interview

The inspectors discussed the inspection scope and findings with the licensee management at a final exit interview conducted on February 7, 1986. In addition, an interim exit interview occurred in the security area on January 30, 1986. The following licensee personnel attended the final exit meeting:

G. Baker, Manager, Environmental Controls, TMI-1
J. Colitz, Plant Engineering Director, TMI-1
J. Enders, Lieutenant, TMI-1 Security
C. Incorvati, TMI-1 Audit Supervisor, Nuclear Assurance
D. Laudermilch, Protection Training Supervisor, TMI-1
R. Neidig, TMI-1 Communications
M. Nelson, TMI-1 Review Program Supervisor
T. O'Connor, Lead Fire Protection Engineer, TMI-1/2
S. Otto, TMI-1 Licensing Engineer, Technical Functions
F. Perry, Manager, Support Training, TMI-1
L. Ritter, Administrator II, Maintenance, TMI-1
M. Ross, Plant Operations Director, TMI-1
P. Sinegar, Administrator II, Maintenance, TMI-1
C. Smyth, Manager of Licensing, Technical Functions
R. Toole, Operations and Maintenance Director, TMI-1
H. Wilson, Preventive Maintenance Supervisor, TMI-1

The inspection results, as discussed at the meeting, are summarized in the cover page of the inspection report. Licensee representatives indicated that other than the security area none of the subjects discussed contained proprietary or safeguards information.

Unresolved Items are matters about which information is required in order to ascertain whether they are acceptable items, violations, or deviations. Unresolved item(s), discussed during the exit meeting, are documented in paragraphs 2.2.3, 3.1.4, 3.2.4, 4.1, 4.3, 7.6.3.2, 7.7.2, 7.7.3, and 9.4.

Inspector Follow Items are matters which were established to administratively follow open issues based on inspector judgement or on licensee/staff commitments prior to the TMI-1 restart. Inspector follow item(s), discussed during the exit meeting, are documented in paragraphs 6.8 and 9.1.

ATTACHMENT I

ADDITIONAL RESIDENT INSPECTOR COVERAGE

The NRC inspectors assessed the adequacy and effectiveness of operating personnel performance based on the inspectors' observations of operating activities to determine that:

-- operators are attentive and responsive to plant parameters and conditions;

-- plant evolutions and testing are planned and properly authorized;

-- procedures are used and followed as required by plant policy;

-- equipment status changes are appropriately documented and communicated to appropriate shift personnel;

-- the operating conditions of plant equipment are effectively monitored and appropriate corrective action is initiated when required;

-- backup instrumentation, measurement, and readings are used as appropriate when normal instrumentation is found to be defective or out of tolerance;

-- logkeeping is timely, accurate, and adequately reflects plant activities and status;

-- operators follow good operating practices in conducting plant operations; and,

-- operator actions are consistent with performance-oriented training.

The inspectors' observations included, but were not limited to, those reactor plant operation, maintenance, radiological controls and surveillance test activities listed below:

Operations

-- Control room observation of Control Room Operators (CRO), Shift Foremen (SF), and Shift Supervisors (SS)

-- Observation of turnover between SFs and auxiliary operators (AOs)

-- Observance of CRO and SF logs

-- Performance of plant shutdown and startup for bellows replacement observed in control room

-- Operational review of hot spot flush

-- Inspection of plant spaces

Maintenance

-- Maintenance associated with extraction steam line bellows replacement

-- Nondestructive examination of bellows

-- Reactor Protection System (RPS) Breaker shunt trip replacement

Radiological Controls

-- Locked high radiation doors

-- Radiation Work Permit posting

-- Weekly survey maps

Surveillance

-- RPS breaker testing and calibration

-- Power Operated Relief Valve surveillance data