U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-289/85-12

Docket No. 50-289

License No. DPR-50 Priority -- Category C

Licensee: GPU Nuclear Corporation
Post Office Box 480
Middletown, Pennsylvania 17057

Facitity At: Three Mile Island Nuclear Station, Unit 1

Inspection At: Middletown, Pennsylvania

Inspection Conducted: April 8, 1985 - May 6, 1985

Inspectors: E Conner for 5/24/85
R. Conte, Senior Resident Inspector (TMI-1) date

R. J. Urban 6/11/85
R. Urban, Reactor Engineer date

E Conner for 5/24/85
F. Young, Resident Inspector (TMI-1) date

Approved By: E L Conner 6/11/85
E. Conner, Chief, Reactor Projects date
Section No. 1A, Projects Branch No. 1
Division of Reactor Project

Inspection Summary

This routine safety inspection (203 hours) reviewed routine shutdown plant activities, including those related to steam generator tube repair hot functional testing and related event followup; emergency feedwater operability; plant modifications including those related to decay heat post-accident sampling and plant shielding; control of examinations; radiological exposure in excess of administrative limits; quality assurance assessment, restart readiness including valve lineups; and licensee action on previous inspection findings.

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Results

Licensee Management and the Quality Assurance Department continued their detailed involvement in plant activities. Overall, procedures were properly implemented during the Hot Functional Test period. A misunderstanding of the design basis operability requirements for backup air supply (banks of air bottles) for operation of emergency feedwater system valves was reviewed and resolved. Modifications were properly installed; but, in certain instances from a human factor viewpoint, more reliable equipment could have been provided in order to minimize radiological exposure. The licensee continued to implement hearing related commitments on the control of examinations. A radiological exposure event was properly reviewed by licensee personnel. The annual quality assurance assessment provided licensee management with information pertinent to performance strengths and weaknesses. The licensee continues to work on making the plant ready for restart. The licensee either initiated appropriate action or completed commitments related to previously identified inspection findings.

DETAILS

1.0 Introduction

This inspection report documents the activities conducted by the resident inspectors assisted by region-based personnel. The overall purpose of the inspection was to assess the licensee's activities as they relate to reactor safety and worker radiation protection for the shutdown mode and to assess plant readiness for the restart of TMI-1.

The inspectors made this assessment by reviewing information on a sampling basis through licensee interviews, actual observation of activities (where possible), measurement of radiation levels, and review of listed documents or records. Within each area, the inspector listed the specific purpose of review (or verification), scope of the review (or specific inspector activity) and findings.

2.0 Plant Operations During Long Term Shutdown

2.1 Routine Review

The resident inspectors periodically inspected the facility to determine the licensee's compliance with 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 log keeping practices;

-- implementation of radiological controls; and,

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

The inspectors focused on the following areas:

-- the control room during regular and backshift hours which included the selected sections of the shift foreman's log and control room operator's log for the period April 8, 1985, through May 6, 1985, and selected sections of other control room daily logs;

-- areas outside the control room on April 8 to 14 (daily) 16, 17, 24, 26, 27, 29 and May 3, 1985; and,

-- selected licensee planning meetings.

Based on the review of the various licensee activities noted above and, in particular, those activities noted in paragraphs 2.2, 2.3, and 2.4, the inspector identified no conditions adverse to nuclear safety or regulatory requirements.

Personnel stationed in the control room presented a posture of overall control of daily activities, including problem areas that needed resolution. The planning meetings indicated attentiveness to proceed safely with daily activities, including surveillance and maintenance, and to resolve any inter-department interface problems. Licensee upper management continued their detailed involvement in site activities.

2.2 Once Through Steam Generator (OTSG) Repairs

Between April 2, 1985, and April 12, 1985, the licensee plugged the remaining group of tubes with indications greater than 40% through-wall wastage. The indications were determined from Eddy Current Testing that was completed in the beginning of this year.

The inspector reviewed portions of Job Ticket packages CF849, CF850, CG348, and CG347. The review was to ensure that applicable administrative and maintenance procedures were established and implemented to address tube plugging. In addition, the work packages were reviewed to ensure that required post testing was performed.

Review of the work packages indicated that the licensee adequately performed the work and properly documented the task. However, the inspector noted that several calculations for percent wall thinning taken on one shift inside containment had been written in pencil and then written over in ink at a later time . The use of pencil for formal records was inconsistent with licensee past practice. Discussion with the engineer taking the data indicated that he did not have an ink pen inside containment on that shift. The inspector reviewed records from other shifts and found all the records to be written in ink. The calculations written in pencil were accurate and consistent with the values from other shifts. The inspector considered this an isolated case. Licensee representatives acknowledged the inspector's finding.

In general, the inspector noted Quality Assurance (QA) involvement in field observation and resolutions of technical issues that arose during that phase of OTSG repair.

Within this period, the licensee performed OTSG Hot Functional Testing (HFT). The HFT was to determine a new OTSG base line primary to secondary leakage. At the completion of the reporting period, the licensee was in the process of evaluating this data but preliminary calculations show that OTSG leakage to be less than one gallon per hour. Test results were preliminarily evaluated by inspectors as documented in Inspection Report 50-289/85-16. The final review of this information will be done in a subsequent report after the licensee submits a report on this testing in accordance with Licensee Condition No. 2.C.f.1.

2.3 High Tailpipe Temperature on the Power Operated Relief Valve

Between April 12 and 14, 1985, a high differential temperature (approximately 50° - 60°F) occurred for the tailpipe connected to the Power Operated Relief Valve (PORV). The differential temperature indicator measures the temperature difference between the Reactor Building ambient and the wall of the PORV tailpipe; the associated instrument string provides an alarm for differential temperature in excess of 30°F. The acoustic monitor and differential pressure instrumentation on the PORV tailpipe provided no indication of PORV leakage. This coupled with a slight increase in Drain Tank Temperature and RCS leakrate calculations, led licensee representatives to conclude that leakage occurred past the main disc of the PORV. Several attempts to better seat the main disc by PORV cycling failed to reduce the minute leakage (tailpipe differential temperature to less than 30°F). Subsequently, on April 14, 1985, licensee representatives shut the block valve in accordance with Emergency Procedure 1202-29. In accordance with the RCS cooldown procedure (conducted April 16-17, 1985), licensee representatives reported that they cycled the PORV and successfully seated the main disc such that PORV tailpipe differential temperature was less than 30°F.

During and subsequent to these events, the inspector reviewed EP 1202-29, Revision 26, March 7, 1985, "Pressurizer System Failure" to assure that licensee representatives:

-- properly implemented the applicable section (A) of the emergency procedure; and,

-- provided sufficient technical guidance to the operators in handling symptoms associated with PORV operability problems.

The inspector noted an inconsistency in Section A of the procedure for a leaking PORV. The immediate action requires the block valve to be shut without evaluating related symptoms to assure that there is definite leakage from the PORV. However, follow-up actions provide steps to evaluate and conclude whether a leaking PORV exists. The follow-up actions were more consistent with the intent of TS 3.1.12; it indicates that the block valve may be shut to reduce RCS leakage to within the requirements of TS 3.1.6. At the time of the PORV leakage, the licensee calculated RCS leakrates to be well within TS requirements.

Concurrently, the Manager of Plant Operations identified the inconsistency and initiated a procedure change request (PCR No. 1-OS-85-0284) to clarify the procedure. The Plant Review Group approved the PCR on April 30, 1985; the revised procedure will be issued shortly.

The inspector concluded operators properly implemented EP 1202-29 consistent with applicable TS requirements. Management involvement on the suspected PORV leakage was evident, and they took appropriate action to improve the applicable procedural guidance for a leaking PORV.

2.4 Inadvertent Drain Down of Boric Acid Mix Tank (BAMT)

On or about March 29, 1985, licensee representatives started Job Ticket (JT) CG-342 to troubleshoot a valve operator malfunction for a Makeup and Purification Valve (MU-V51). Electricians determined that the malfunction was due to a faulty diaphram which necessitated a transfer of the JT to Instrument and Control (I&C). The I&C Technicians stopped work on the valve for the weekend of March 30-31, 1985. The I&C Foreman discussed the stop work with the Operations Shift Foreman. Apparently, transfer of information on the status of the valve, which was open, were not clear. Further, the accompanying switching and tag order was not adequate to support isolation of MU-V51, due to personnel error.

During the same weekend, licensee representatives depressurized and drained down the RCS in preparation for OTSG tube plugging. When RCS water level dropped below BAMT level, gravity flow occurred from the BAMT through pumps CA-P1A/B, valves MU-V51 and MU-V78 and into the RCS through valves MU-V17 and 18. Eventually the BAMT level instrumentation provided an alarm on low level. Operators responded to the alarm and subsequently identified and isolated the improper flow path into the RCS.

Shortly thereafter, Operations Management initiated a "Plant Incident" review on the event in accordance with Administrative Procedure 1029, "Conduct of Operations." Licensee representatives completed that review and documented the results in Plant Incident Report (PIR) No. 1-85-003, dated April 2, 1985.

The PIR identified that maintenance personnel failed to properly use the tag application, that tag isolation was inadequate to isolate the job (reviewed by maintenance and operations personnel), and communications were not proper to adequately reflect the "open" status of the valve. Corrective actions included a review of the event with Operations and Maintenance Department personnel.

The inspector first became aware of the event on April 2, 1985, by reviewing the March 30 event log entry in the Shift Foreman's Log. Subsequent to the HFT, and during a review of HFT activities, the inspector discussed this event and other matters with the Plant Operation Manager who provided the subject PIR to the inspector. Operations Management expressed concern over the event and noted that the report identified no programmatic deficiencies and provided sufficient corrective actions.

The inspector concluded that there was adequate management attention and involvement in the event along with proper documentation of the event in a PIR for self review and corrective action. Being familiar with the licensee's program for protection of personnel and equipment, the inspector acknowledged the non-identification of a programmatic deficiency and attributed the event to a lack of attention to detail on the part of certain individuals. Licensee management oriented their corrective action toward the personnel who worked for the maintenance and operation department.

The inspector had no additional comments.

3.0 Equipment Operability

The inspectors reviewed other selected areas which involved safety related equipment operability during the HFT.

In particular, while inspecting areas in the Emergency Diesel Generator Building, the inspector noted that one of the banks of air bottles ("A" Bank) for the Emergency Feed Water Two-Hour Backup Air Supply System was depressurized due to a pressure regulator malfunction. The Backup Air Supply System supplies air to selected EFW valves during an emergency. The valves are normally supplied air by the Instrument Air (IA) or Service Air Systems (SA). Both IA and SA systems were in continuous operation during HFT. The inspector then questioned the operability of the EFW loops supplied by the "A" air bank. Licensee representatives stated that they relied on the operability of the two instrument air compressors, two service air compressors (not considered to be safety grade) and a small capacity AC powered compressor (also not to be relied upon).

The TS definition states, "a system, sub-system, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendent instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, sub-system, train, component, or device to perform its function(s) are also capable of performing their related support function(s)." In light of this definition, the licensee's position appeared to be correct. However, the section of the FSAR addressing the Two-Hour Backup Air Supply System stated that the system was designed to be operable during a design basis earthquake with a loss of site AC. The only reliable source of air available to operate the

EFW valves would be the Two-Hour Backup Air Supply System assuming significant reactor decay heat generation. In order for two trains of EFW to be operable, both banks (A and B) of backup air would be required. Because the RCS heat input was due primarily to Reactor Coolant Pumps (and not reactor decay heat), the inspector determined that the EFW system would perform its safety function with the "A" bank depressurized. However, the inspector questioned the licensee representative's understanding of the operability requirements with respect to critical operations.

After review of this event by the licensee's Plant Review Group, the licensee agreed to require both banks of backup air to be operable before both trains of EFW are considered operable. However, the licensee stated however that they may still pursue a TS change to clarify this matter.

4.0 Modification Review

4.1 Post-Accident Sampling (PAS) Capability

NUREG-0737, Item II.B.3, specifies that licensees shall have the capability to promptly collect, handle, and analyze post-accident samples which are representative of conditions existing in the reactor coolant and containment atmosphere. Implementation of Item II.B.3 was inspected in Inspection Report 50-289/84-03. At that time the NRC staff questioned the licensee's ability to collect a representative Reactor Coolant System (RCS) sample under all accident conditions and modes of operation. The inspectors noted the flow through the PAS system relied entirely on RCS pressure. The licensee agreed to review this item (289/84-03-01) for atmospheric RCS pressure conditions.

The licensee completed their review and modified the system. The modification provided the capability to obtain a post-accident sample from the Decay Heat Removal System via the shielded reactor coolant sample line in the nuclear sampling room.

The inspector reviewed the new modification and numerous licensee letters against the criteria identified in NUREG-0737. The inspector determined that the PAS meets the basic requirements and adequately addressed the intent of the NUREG.

In addition to review of the modification documentation, the inspector witnessed a RCS sample drawn via the Decay Heat/Reactor Coolant Sample Cross Tie line. The licensee was able to obtain the required sample; however, during the valve lineup, several valve handles became loose and fell off in the operator's hand. Discussions with licensee representatives indicated that the valve handles were maintained in place by "allen" screws. It was noted that these screws quickly became loose. Because the operator would be in a high radiation field when drawing a sample, a problem of loose handles could add to his radiation exposure or require additional significant exposure on a post-accident situation to fix the handwheel problem. The licensee acknowledged the inspector's concern and stated that a possible solution would be to stake the allen screws. This is unresolved pending licensee corrective action to assure the handwheel remains in place during sampling evolutions. This action will be reviewed in a subsequent NRC inspection (289/85-12-01).

4.2 Plant Shielding Modifications

NRC Inspection Report No. 50-289/82-13 documented the in-plant review in support of the NRC safety evaluation for Task Action Plan (TAP) Item II.B.2, Plant Shielding. In addition to the review of the licensee's shielding study for adequacy, the inspector conducted a walkthrough of procedures used by operators in handling post- accident response activities. The inspector identified that for the evolution of boron precipitation control (long term recirculation), the operator needs to manually operate valves in the decay heat vault or at the decay heat shielded areas that would have prohibitive radiation fields. Exposures could result in excess of the 5 Rem guideline with potentially highly radioactive water in DH piping due to the Reactor Building Sump Isolation Valves (DH-V6A/B) being open.

The licensee's initially proposed resolution to the problem was to revise applicable procedures to preclude the prohibitive exposures (as a short term fix) and to modify manually operated valves (DH-64, 12A/B, 19A/B, and DC-V 2A/B, 65H/B) with remote operators by Cycle 6 Refueling (as a long term fix). Inspectors verified the procedural changes in NRC Inspection 50-289/83-01 and the Commission accepted the Cycle 6 modification commitment as noted in SECY 384A, dated December 6, 1982.

After various proposals and counter proposals, the NRC staff accepted a simplified resolution to the boron precipitation control problem as noted in its final TMI-1 safety evaluation, dated December 26, 1984. The staff accepted the installation of a reach rod for DH-V64, Auxiliary Pressurizer Spray Isolation Valve, to utilize existing shielding in that area of the plant for the "A" DH loop recirculation. Further the staff accepted the commitment to lock open DH-12B, Tie Isolation Valve from the RCS Drop Line, for RCS letdown (by gravity) to the RB Sump and "B" loop recirculation of water to the reactor core. The staff's acceptance was contingent on a post implementation inspection (by NRC Region I) of the conformance of the shielding review (for DH-V64) to NUREG-0737 requirements.

NRC Inspection Reports 50-289/84-03 and 84-16 documented the review of proper shielding for the post-accident sampling system (TAP II.B.3). In March 1985, the licensee essentially completed those commitments noted above for DH-V64 and DH-V12B (TAP II.B.2).

In addition to discussions with cognizant licensee personnel and observations in the plant, the inspector verified the proper implementation of the above noted commitments by:

-- reviewing the related modification package for DH-V64 for proper documentation in accordance with Administrative Procedure 1043;

-- again performing a sampling review and walkdown of applicable emergency and operating procedures (substantially revised since NRC Inspections 50-289/82-13 and 83-01) to assure that the results of the previous shield study and inspector verifications were not invalidated by procedure revision; and,

-- verifying procedure changes to assure that DH-V12B is locked open.

The inspector reviewed the following specific documents/records:

-- Modification Packages related to Budget Account (BA) 412394, DH-V64 Reach Rod;

-- Operating Procedure 1104-4, Revision 50, March 5, 1985, "Decay Heat Removal System;"

-- Abnormal Transient Procedure (ATP) 1210-6, Revision 5, March 8, 1985, "Small Break LOCA Cooldown;"

-- ATP 1210-7, Revision 6, March 8, 1985, "Large Break LOCA Cooldown;"

-- Annunicator Procedure E-1-8, Revision 2, January 4, 1984, "Borated Water Storage Tank Low Level;"

-- Emergency Plan Implementing Procedure (EPIP) 1003.9, Revision 4, December 3, 1984, "Radiological Control During an Emergency;"

-- OP 1104-13, Revision 16, April 2, 1985, "Decay Heat Closed Cycle Cooling System;"

-- OP 1102-1, Revision 75, March 20, 1985, "Plant Heatup to 525°F;" and,

-- OP 1103-32, Revision 14, July 9, 1984, "Decay Heat River Water System."

The DH-V64 Modification Package was complete. It reflected proper installation, drawings, and specifications. Pre-operational testing confirmed that consistent torque was applied to the valve using the newly installed reach rods. The test also demonstrated that containment isolation valve local leakrate was consistent with values assumed for normal operations. A walkdown of the reach rod assembly identified no deficiencies, and it confirmed that the licensee utilized the same shielding that inspectors previously found to meet NUREG-0737 requirements as noted in NRC Inspection Report 50-289/82-13.

As noted in previous inspections, the inspector found that applicable procedures effectively cautioned or warned operators on the hazard of operating certain manually operated isolation valves during the post-accident period and, in particular, during the long term boron precipitation control evolution. The procedures required that operators position other potentially inaccessible valves before opening DH-V6A/B (letting RB sump water into DH piping). The licensee revised the DH system emergency standby line up procedure to require DH-V12B to be locked open.

The inspector noted that the precautions and limitations section of DH system operating procedure (1104-4) were confusing with respect to operator guidance on throttling DH flow. It appeared that this section was inflexible on the use of valves for throttling when the DH Pump took suction from the RB sump; namely, it stated that DH-V19A/B were to be used to prevent pump runout. However, the boron precipitation control section of this Operating Procedure (OP) rightly cautions against the use of DH-V19A/B since they are manually operated and are in a potentially inaccessible area during the post-accident boron precipitation control evolution. Based on discussions with licensee personnel, the inspector learned that engineering personnel cautioned against the use of DH-V4A/B (the alternate means of throttling DH flow), since these valves are gate valves not normally designed for throttling. The legitimate engineering concern was not clearly stated in the procedure.

The inspector concluded that licensee management did not completely provide limitation/precaution guidance to operators in the operating procedure on use of DH-V4A/B versus DH-V19A/B considering radiological hazards and engineering concerns for the various preplanned evolutions in this procedure. Licensee representatives acknowledged the inspector's comments, and they initiated a revision to the operating procedure to clarify the guidance to the operators (PCR Nos. 1-02-85-295 and 296).

The inspector had no additional comments. Based on the above and previous reviews of licensee actions related to TAP II.B.2, Plant Shielding and TAP II.B.3 (in part) related to Post-Accident Sample System Shielding, the inspector considered TAP II.B.2 to be closed.

5.0 Control of Examinations

On or about April 2, 1985, the licensee reported that a microfiche copy of TMI-1 auxiliary operator examinations had been found in the motorcycle parking lot near the TMI-2 Administration Building. In conjunction with Training Department Management, the Director of TMI-1 immediately confirmed that the security of the examinations were not compromised since the microfiche were records of graded final examinations in accordance with Procedure 6200-ADM-2600.01. However, the Director of TMI-1 expressed concern to the TMI Information Management Department (IMD), that a review should be performed to identify the circumstances that led to the particular microfiche being in an uncontrolled state.

The IMD documented their review in internal memorandum No. 7132-85-057, dated April 11, 1985. The microfiche contained April and May 1984 examinations for 19 TMI-1 auxiliary operator requalification examinations along with answer sheets, seating charts, review sheets, and attendance forms. The archival copy and working copy of the same microfiche were in the records storage vault at the TMI-2 Administration Building. The training department copy of that microfiche was also in the vault awaiting distribution to the Training Department. The copy found in the parking lot was an extra. The IMD never determined why personnel made the extra copy (perhaps for better quality to be discarded later at the local waste receptacle). The licensee representatives classified the information on the microfiche as "sensitive," apparently because of personal data on the forms, not for examination security purposes.

The IMD corrective actions included the establishment of an internal procedure to destroy by shredding or other means all extra copies of such documents. They placed the subject microfiche on file in the vault along with the above noted IMD report.

The inspector discussed the event with cognizant licensee management. He reviewed 6200-ADM-2600.01, Revision 2-00, dated November 30, 1984, "Control of Examination," and the above referenced internal memoranda.

The inspector concluded that licensee management properly reviewed the event and took appropriate corrective action. Management showed initiative in the timely reporting of the matter to the NRC resident office. Based on this review, the inspector concluded the licensee met the requirements of the control of examination procedure and, thereby, continued to implement their commitments made to the applicable Licensing Board in this area. The IMD developed adequate corrective actions to preclude loose copies of the GPU classified "sensitive" documents.

In a related event, the licensee reported that a TMI-2 contractor Security Guard was caught seeking help from another individual during a General Employee Training Examination on April 15, 1985. The training instructor/proctor immediately confiscated the examination and sent the guard back to the work supervisor. The licensee later reported that the individual was sent back to the contractor as unacceptable for employment at TMI.

The inspector discussed the event with the Director of TMI-1. The inspector concluded that licensee representatives properly implemented the Control of Examination Procedure.

The inspector has no further comments on these matters.

6.0 Radiographer Exposure in Excess of Administrative Limits

On February 8, 1985, the Radiological Controls Manager reported to the NRC Resident Office that a contractor radiographer's whole body exposure was in excess of a licensee administrative quarterly limit (1000 mRem) based on the reading of the January 1985 TLD (Thermoluminescent Dosimeter). Also, he initially reported that the "suspect" TLD reading was inconsistent with self-reading dosimetry. Licensee management restricted the radiographer from performing additional work in an RWP area until a radiological engineer completed an investigation into the matter (documented in Radiological Investigation Report (RIR) No. 85-001, dated February 7, 1985).

During this inspection the inspector reviewed RIR 85-001 to assure that:

-- the circumstances leading to the event were clearly identified and documented along with root causes; and,

-- adequate corrective action was proposed or taken along with any necessary measures to preclude recurrence.

This review included discussions with cognizant licensee personnel.

The RIR provided a sequence of events leading to the identifications of the subject exposure. During January 1985, the NES (Nuclear Energy Services) employee worked in two primary functions as an NDT (Non-destructive Test) technician performing inspections inside the OTSG and in the TMI-1 Intermediate Building at the EFW (Emergency Feedwater Piping) piping. For each of the functions the licensee provided him with separate dosimetry consistent with past practice to segregate OTSG exposure from other plant work exposure. In addition, he had NES supplied dosimetry. On February 6, 1985, licensee representatives read the "other plant work" TLD for the NES worker and entered the data into the computerized system. On an attempted entry into a TMI-2 RWP area, the licensee identified the NES employee's exposure for the quarter was 1150 mRem (in excess of the administrative limit of 1000 mRem but well less than the NRC limit of 3000 mRem). The individual was denied access to the TMI-2 area since licensee management had not approved exceeding the 1000 mRem exposure limit. They referred the matter to management for further review.

The RIR reflects extensive investigation by the licensee in an attempt to correlate SRD and TLD readings for both contractor and licensee supplied dosimetry. Licensee representatives verified proper operation and calibration of the TLD reading equipment. The SRD and TLD readings were correlated by 10% for the NES employee's OTSG work with an assigned dose of 457 mRem. The licensee's TLD for other plant work substantially disagreed with contractor dosimetry and licensee SRD readings along with co-worker exposure results. Further review revealed that the suspect TLD was not at the processing center for TMI-1 on two nights in January 1985; no one (including the NES employee) can adequately account for its whereabouts. Analysis of data from the TLD processing indicated that the exposure on the suspect TLD was due to a lower photon energy source from that used in radiography work (Ir-192). The licensee surmised that the suspect TLD was inadvertently exposed to an Ir-192 source. To be conservative, licensee management assigned the detected 693 mRem from the suspect TLD to the individual's exposure records.

The inspector found licensee review of the event to be adequate; licensee management continued to exhibit their detailed attention and involvement in matters affecting personnel radiological protection. Investigative actions were extensive and reasonably complete leading to plausible conclusions. The licensee was conservative in its final dose assessment for the contractor employee. The inspector acknowledged the licensee's conclusion that the event was not reportable with respect to 10 CFR 20, 21, 50, and the Unit 1 TS. Since this appears to be an isolated case of poor control by an individual of his assigned dosimetry, the inspector concluded that no programmatic problem existed.

7.0 Quality Assurance Effectiveness Review

On April 25, 1985, the inspector attended the Quality Assurance Department (QAD) presentation to licensee management on the 1984 Quality Assurance Annual Assessment. The QAD section leaders made presentations covering the following areas; QA engineering, site welding, site inservice inspection, quality control, operations QA, site audits, and QA system engineering. In addition to QAD representatives, a majority of the GPUNC Vice Presidents attended the meeting, including the Senior Vice President for GPUNC and Director/Vice President of TMI-1.

Although statistics and bar charts were available as performance indicators, the main topics of discussion focused on licensee performance strengths and weaknesses as viewed by each of the QA sections. There was an exchange of information for licensee management to understand the points being made especially for improvement in weak areas. Assignments were made for corrective actions in weak areas. The overall conclusion was that the organization possesses more strengths than weaknesses but the weaknesses need to be worked on in their resolve for excellence.

The inspector noted that the presentation encompassed the findings noted in the most recent TMI-1 SALP. However, QAD's presentation and discussion was much more detailed because of QAD's detailed involvement in site/corporate activities. The inspector concluded that the annual assessment continued to improve and provided licensee management with pertinent information with respect to organization performance strengths and weaknesses.

8.0 Restart Readiness

During the inspection, the resident inspectors assisted by region-based inspectors initiated a specific hardware review of selected areas to assess the readiness of the plant for startup. The selected areas were:

licensee's prerequisite list for hot functional testing/criticality (Flag "2B"); open material non-conformance reports or quality deficiency reports; surveillance program open exceptions and deficiencies and related outstanding regulatory retest equipment (so tagged); and important to safety system valve lineups. The objective was to identify equipment operability problems that would adversely affect safe operation of the facility.

A similar review was conducted in the preoperational test area and was documented in NRC Inspection Report 50-289/85-16. Other areas such as open job tickets and outstanding modification incomplete work list items will be reviewed during future inspections closer to criticality, if approved.

Results of this review are documented below:

8.1 Prerequisite List

The inspector reviewed the GPUN restart package titled "TMI-1 Restart Readiness Prerequisite Listing Flag 2B Hot Functional/ Critical Testing." It is an extensive and updated package identifying those items that need to be addressed prior to restart. The licensee has tentatively scheduled the Flag 2B meeting for May 9, 1985. At that time, all items in the restart package are scheduled to be complete and therefore signed off. To date, many items have already been completed. However, any decisions made by the Commission could impose further restart requirements and this could be routinely reviewed by Region I.

8.2 Quality Assurance Hardware Items

Within the scope of this review, the inspector specifically reviewed the status of Material Non-Conformance Reports (MNCRs), Quality Deficiency Reports (QDRs), Exceptions and Deficiencies (E&Ds), and Regulatory Retest Tags (RRTs). MNCRs deal with hardware related problems and QDRs deal with software related problems. All MNCRs and QDRs affecting restart have been reviewed and closed out by the licensee.

E&Ds and related RRTs are created during surveillance testing. Deficiencies are equipment problems or malfunctions or failing to complete a surveillance test by the late performance date. An exception is a procedure change that does not alter the scope or intent of the procedure. RRTs are tags displayed in the control room on equipment that requires testing at a time later than scheduled. The RRT system is used as a backup to the E&Ds so that operations personnel will question the operability of that particular piece of equipment. The inspector determined that approximately 50 E&Ds were open and that certain E&Ds affected operability of important to safety equipment. Licensee representatives acknowledged the inspector's comments and stated that the outstanding E&Ds list will be reviewed before criticality to assure no adverse condition exists with respect to important to safety equipment operability. This area will continue to be routinely reviewed by the NRC Resident Office.

8.3 Valve Lineup Verifications

As part of the validation of the TMI-1 readiness for restart, the NRC staff independently verified the position of safety-related valves. The inspector, with the aid of an Auxiliary Operator, verified the position of valves listed in the following operating procedures:

-- Operating Procedure 1104-38, "Reactor Building Emergency Cooling Water System (RBECW);"

-- Operating Procedure 1104-30, "Nuclear River Water System (NRW);"

-- Operating Procedure 1104-32, "Decay Heat River Water System (DHRW);"

-- Reactor Building Integrity per Operating Procedure 1101-3, "Containment Integrity and Access Limits;" and,

-- Startup Breaker Checklist per Operating Procedure 1107-2, "Emergency Electrical System."

In general, the inspector found the valve list to be accurate and it reflected the proper position for valves checked. The inspector did note several inconsistencies as discussed below.

Breaker verification of Procedure 1101-3 found all breakers to be in their proper positions except the breaker for three welding receptacles. This lineup lists the position of breakers for systems when containment integrity is required (plant temperature greater than 200°F). However, since the plant was in a shutdown condition, the inspector expected the welding receptacle breakers to be in the closed position. The inspector also noted several inconsistencies in how components were listed on the checklist The licensee acknowledged the inconsistencies and is revising Procedure 1101-3 to address these discrepancies.

In the review of the NRW valve lineup, several deviations from normal system valve arrangements were noted related to the low heat loads on the system. In addition, the inspector noted that a mechanical jumper (temporary cross connect piping from NRW outlet Header Vent to the DHRW Loop A Vent) was present. The cross connect is used to supply cooling water to the DHRW Loop A heat exchanger since the DHRW system cannot be adequately throttled to handle the unusually low decay heat load. All deviations were clearly explained to the inspector.

Several deviations in the lineup of the DHRW system were noted. Most were due to the unique plant conditions. However, valves DR-V-38A/B on DR-P-2A and 2B minimum flow lines were found closed. These pumps supply bearing lube water to the DHRW pumps. Since lube water was not being supplied by these pumps but rather by the filtered water system (non-safety grade), these valves did not need to be open for the shutdown condition. The subject valves were opened by the auxiliary operator so that the lube water for the pumps was supplied by their normal water supply, rather than the non-safety grade filtered water system.

In general, the inspector found valve lineups/breaker position to be in accordance with licensee's plant procedure. The inspector had no further questions concerning the valve lineups.

9.0 Follow-Up on Previous Inspection Findings

The following items were reviewed to assure that the licensee took adequate corrective action in a timely manner and/or met their commitments as stated in applicable inspection reports.

9.1 (Open) Unresolved (287/84-07-03) Review Licensee's Management Submittal to NRC Staff - OTSG Preoperational Testing.

See paragraph 2.2.

9.2 (Closed) Unresolved (289/82-13-03) and Task Action Plan Item II.B.2: Manually Operated Valves with Remote Operators for Shielding Consideration during Post-Accident Long Term Recirculation

See paragraph 4.2.

9.3 (Closed) Unresolved (289/84-03-01) and Task Action Plan Item II.B.3 (in part): Provide Capability to Obtain a Post-Accident RCS Sample at Low Pressure Conditions

See paragraph 4.1.

9.4 Closed) Inspector Follow Item (289/84-19-02): Provide Additional Training on Entire Electro-Hydraulic Control and Nuclear Instrumentation

An inspection conducted on August 27-30, 1984, concluded that adequate augmented training had not been provided by the licensee in two of the thirteen topical areas identified during the February 1984 Operational Readiness Evaluation (50-289/84-05). An inspection of these two areas, control functions of the Electro-Hydraulic Control System (Item 10) and predicting indications on Nuclear Instrumentation (NI) during a reactor startup (Item 13), included a review of lesson plans, training received in the Basic Principles Trainers (BPT) and weekly quizzes. The following is our assessment of licensee conducted training for the two topic areas.

-- Control functions of the EHC System: Lesson Plan, No. 11.2.01.026, Electro-Hydraulic Control System, provided adequate augmented training in this area. The lesson plan details the function of the EHC system and components, turbine trips, set points, flow paths, and control functions. The retention of this training by the operators was demonstrated by the results of the weekly quizzes which were found to be comprehensive and adequate to evaluate the level of knowledge of the operators. One operator who failed the quiz was provided with retraining and passed a second quiz.

-- Predicting indications on Nuclear Instrumentation (NI) during a reactor startup: Lesson Plan No. 11.6.01.002, Approach to Criticality - Peak Xenon and manipulations on the BPT provided adequate augmented training in this area. The lesson plan includes NI response to reactivity changes due to boron or rods during an approach to criticality. During the BPT manipulations, the operators predicted and observed the results of reactivity additions on the NI indication for a sub-critical reactor.

Operators have received adequate (performance oriented) augmented training in both topic areas (Items 10 and 13). The weekly quizzes were well written and adequately assessed the operators' knowledge of the subjects.

9.5 <u>(Open) Unresolved (289/85-08-01): Evaluate Limitorque Operator Deficiencies</u>

NRC Inspection Report 50-289/85-08 documented a review of various licensee actions in response to IE Information Notice No. 84-10, "Motor-Operated Valve Torque Switches Set Below the Manufacturer's Recommended Value." Although the licensee internally reviewed test results for December 1984 testing of selected valves, the licensee performed no formal safety evaluation of the apparently significant deficiencies (Code 1 Category) identified by its vendor. They committed to perform such an evaluation within 90 days of March 8, 1985. As of March 22, 1985, the licensee completed that review; during this inspection, the inspector reviewed that evaluation in conjunction with additional discussions with cognizant licensee personnel.

The vendor classified the deficiencies identified during the torque and torque/limit switch testing of December 1984 into four code categories with Code 1 being the most significant--"strongly recommend that the condition noted be corrected immediately in order to assure continued reliable functioning of the valves(s)." The other code categories were problems that were more minor in nature in that they could wait for the next shutdown (assuming an operating plant), warranted further review/evaluation during the next scheduled maintenance, or the information was provided for information purposes only indicating a long range degradation potential. Accordingly, the licensee used the system provided by Administrative Procedure 1044, "Event Review and Reportability Requirements," to evaluate all of the vendor identified Code 1 deficiencies. Licensee representatives discussed the evaluation at Plant Review Group Meeting No. 85-16, dated March 11, 1985. Licensee conclusion of the evaluation was that no unreviewed safety question existed and that the deficiencies were not reportable in accordance with 10 CFR 50.72 or 50.73.

At the time of the PRG meeting, the licensee resolved all Code 1 deficiencies for the specific safety and non-safety related valves tested. Licensee representatives reported that even with the Code 1 deficiencies the valves still operated properly. A specific valve problem was backseating which was corrected by limit switch adjustments at the time of testing. (In general, the motor control circuit stops the motor in the open direction by limit switch actuation.) Another individual valve problem was a suspected loose lock nut on DH-V2 which was inspected and found to be tight. An additional individual valve problem was RC-V1, Pressurizer Spray Valve, not seating. This is by design because of its frequent open/shut use during operation. The three remaining common problems were:

-- bypass limit switch setting adjustments in a majority of the valves tested;

-- torque switch setting adjustment in all valves tested; and,

-- grease in the spring pack.

The licensee's qualitative evaluation addressed each of these common problems in terms of valve operability. The bypass limit switch (LS) bypassed the open torque switch to prevent an inadvertent shutdown of the motor in case a high torque was needed to get the valve off of its seat. The LS adjustment was to increase the length of time the bypass was in effect. Licensee representatives reported that none of the higher than normal opening torques for any of the valves exceeded the torque switch setting; therefore, the valve would have continued to open even if the LS bypass was not in effect. The TMI-1 past practice of having open torque switch settings slightly greater than the closing torque switch settings was condusive toward valve opening on demand independent of the bypass limit switch setting.

The licensee also evaluated the torque switch adjustment problem as not adversely effecting operability. Of the 22 valves tested, 18 valves had torque switch settings that were above minimum valve for closing thrust (independently determined by another vendor for design basis conditions in which the valve must be operated) and below maximum closing thrust allowed. (In general, the motor control circuit stops the motor in the close direction on torque switch to assure proper seating of disc.) Two other valves closing torque switch settings were 5-10% below minimum, which was evaluated as not significant since the valve properly operated in this condition. One other valve was approximately 30% low, which was high enough to question its operability; that particular valve had no engineered safeguard function and it did operate properly during testing. All torque switch adjustments were made by the vendor to assure a mid-position ("fine tuning") of the torque switch operating lever which serves to actuate either open and close direction torque switches.

The licensee's evaluation acknowledged the problem of potential for a hydraulic lock of the torque operating mechanism due to grease in the spring pack. This has not been a problem at TMI-1, apparently, due to preventative maintenance checks on these operators since one valve had the problem many years ago.

The licensee representatives concluded the design/engineering problems of certain operators do not effect operability. They stated that the generic problems with valve operators will be resolved and that additional industrial experience will be factored into this resolution.

The inspector questioned the licensee on the aggregate of the deficiencies (although evaluated as not adversely affecting operability) for the set of valves tested. Licensee representatives stated the sampling of valves tested was not random but prejudiced toward those particular valves that exhibited problems most frequently in the past. Pending additional "state of the art" valve testing developments, the licensee expressed confidence that deficiencies adversely affecting valve operability do not exist for the remaining valves (those not tested in December 1984) and they reiterated their past position that the preventive maintenance and surveillance programs were adequate to detect valve operability problems.

Based on the above, the inspector verified that the licensee fulfilled its commitment to properly evaluate the Code 1 valve operator deficiencies. This item remains unresolved pending additional review and/or testing by the licensee to assure that valves with "Limitorque" operators are operable during design basis conditions.

10.0 Exit Interview

The inspectors discussed the inspection scope and findings with licensee management at the exit interview conducted on May 6, 1985. The following licensee personnel attended the meeting:

- -- E. Eisen, Project Engineer
- -- C. Hartmen, Manager, Plant Engineer
- -- H. Hukill, GPUN, Director, TMI-1
- -- C. Incorvati, GPUN, TMI Audits Supervisor
- -- R. Neidig, Jr., TMI-1 Communications
- -- M. Nelson, Plant Review Group
- -- S. Otto, TMI-1 Licensing Engineer
- -- L. Ritter, Administrator, Plant Operations
- -- M. Ross, Plant Operations Manager
- -- C. Smyth, TMI-1 Licensing Manager
- -- R. Toole, Operations & Maintenance Director, TMI-1

As discussed at the meeting, the inspection results are summarized in the cover page of the inspection report. The licensee representatives indicated that none of the subject matter discussed contained proprietary information. Also, discussed were licensee plans for making the plant physically ready to support criticality.

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 4.1 and 9.