U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-289/83-12

Docket No. 50-289

License No. DPR-50 Priority -- Category C

Licensee: GPU Nuclear Corporation

P. O. Box 480

Middletown, Pennsylvania 17057

Facility Name: TMI-1

Inspection At: Middletown, Pa.

Inspection Conducted: May 9 - June 24, 1983

Inspectors:

J Prell for
P. C. Wen, Reactor Engineer — 8/1/83 date

J Prell
J. Prell, Reactor Engineer — 8/1/83 date

Peter C. Wen for
H. Nicholas, Lead Reactor Engineer — 8/17/83 date

Peter C. Wen for
J. Chung, Lead Reactor Engineer — 8/17/83 date

Approved by:

Jim W. Chung
for L. H. Bettenhausen, Chief Test Program Section — 8-17-83 date

Inspection Summary: Inspection May 9-June 24, 1983 (Inspection Report 289/83-12)

Routine, unannounced inspection of licensee action on previous inspection findings, restart preoperational testing, restart startup testing program, and RCS leak rate. The inspection involved 195 inspector hours onsite and in-office procedure reviews by four region based inspectors.

Results: No noncompliances were identified.

## DETAILS

1. Persons Contacted

General Public Utilities (GPU) Nuclear Corporation

* W. D. County, QA Auditor
P. Dojka, I&C Engineer
H. F. Hansen, Procedure Coordinator
+*T. M. Hawkins, Manager, Startup and Test TMI-1
N. Hollerbush, Documents Supervisor
+ H. D. Hukill, Director, TMI-1
C. Incorvat, Lead QA Auditor
+ E. V. Kellogg, QA Specialist
M. Kendig, OQA Monitor
V. P. Orlandi, Lead I&C Engineer
+ R. E. Neidig, Jr., Senior Communication Representative
I. Porter, Startup and Test Supervisor
+*C. W. Smyth, TMI-1 Licensing Manager
* R. T. Trupasso, Nuclear Engineer
* W. S. Wilkerson, Lead Nuclear Engineer

U. S. Nuclear Regulatory Commission

+*R. Conte, Senior Resident Inspector
* F. Young, Resident Inspector

*denotes those present at the exit interview of June 3, 1983.
+denotes those present at the exit interview of June 24, 1983.

The inspectors also interviewed other licensee personnel during the inspection.

2. Licensee Action on Previous Inspection Findings

(Open) Inspector Followup Item (50-289/82-SC-03) as documented in inspection report 50-289/82-10, Modification Task NM-34, 480 Volt Bus Undervoltage Trip. This open item involves two modification tasks; Task NM-34, 480 Volt ES Bus Undervoltage Trip, and Task RM-22, Solidstate Undervoltage Relays. The modification to the in-plant electrical system is to protect safety related electrical equipment from degraded voltage due to offsite grid voltage fluctuation and interaction of the offsite and onsite emergency power systems. In addition, the modification assures that the undervoltage relays are operable to adequately protect the safety related electrical equipment from reduced capability as a result of sustained degraded voltage from the offsite electrical grid system and during transfers from offsite to onsite power source. This modification was accomplished by replacing all electromagnetic relays on the 4160 volt safety buses with new solid state instantaneous relays and timers. These relays will trip safety bus feeder breakers, initiate load shedding, and start the respective diesel generator.

The inspector reviewed the completed test procedure TP 426/2 Revision 0, dated approved on July 31, 1981, titled "4 kV ES Bus Undervoltage Relays - Functional Test," for test results review, evaluation and approval by the licensee. The completed test procedure was reviewed, evaluated and approved on August 24, 1981. A review of the requirements and commitments of the safety evaluation supporting Amendment No. 70, to the facility operating license No. DPR-50, as well as a revision of the completed test procedure TP 426/2 shows that only one half of the system has been tested and commits to the remainder of the system to be tested prior to restart.

The second paragraph on page 3 of the SER supporting Amendment No. 70, states ..."In the original test verification provided by Met Ed, no measured voltages were provided for the safety related motor control centers or 480 volt safety bus 1T. Met Ed has committed to providing the missing bus voltages to us after testing the onsite safety related electrical distribution system. This test which is scheduled for prior to restart will measure bus voltage and loading while the engineered safeguards loads are powered from the diesel generators. This information will then be used to verify the accuracy of the analyzed voltage drops between the previously verified buses and those that were missed." and the paragraph after number 8 on page 4 states, "Based on the above evaluation, we conclude that the proposed plant modifications for protecting safety related equipment from a potential degraded grid voltage and the proposed changes to Appendix A of the license meet our positions and therefore are acceptable. In addition, we find the station electrical distribution system voltages for TMI-1 is adequate and therefore we find it acceptable subject to the satisfactory completion of the verification tests of the analysis accuracy for those buses not previously verified."

Based on the above, this item will remain open.

3. TMI-1 Restart Preoperational Testing

3.1 References

-- Restart Project Organization and Responsibility Document

-- TMI-1 Startup and Test Manual

-- Recommended Requirements for Restart of TMI-1 Unit 1 (restart report) volumes 1, 2, and 3

-- TMI-1 Restart Report, Supplement 2, Operational QA Plan

-- TMI-1 Startup and Test Instructions

-- NUREG-0680 and Supplements 1, 2 and 3 TMI-1 Restart

-- RG 1.68, Initial Test Program for Water Cooled Nuclear Power Plants

3.2 Preoperational Test Program

Scope:

The inspector reviewed the overall preoperational test program for TMI-1 restart with the Startup and Test Manager, to determine completion status of test procedure preparation, test performance and test results evaluation. Only two procedures remain to be written; TP 233/3, Emergency Feedwater Flow Indication Cavitating Venturi and TP 377/2, Post Accident Hydrogen Monitoring Functional Test. Test performance remaining for modifications to systems and components will have to be performed during hot functional testing (HFT) and during power escalation testing (PET). The only remaining tests to be reviewed, evaluated and approved are those that will be performed during HFT and PET.

Findings:

The inspector noted that some preoperational and startup test procedures had been approved since the last inspection in this area. Some additional preoperational testing and completion of modifications of certain tasks had also been completed. The scope and findings of the reviews of these items are discussed below.

3.3 Preoperational Test Results Evaluation

Scope:

The inspector reviewed 4 completed preoperational test procedures, including 2 surveillance procedures, 26 supplemental generic test procedures and 20 generic test procedures, to ascertain whether uniform criteria are being applied for evaluating completed preoperational tests and to assure technical and administrative adequacy by the licensee's review, evaluation and approval of the completed procedures listed below.

Preoperational Test Procedures

-- Task RM-5D, TP 334/3 Revision 0, Approved January 17, 1983. Reactor Building Isolation On-Line Break. Test results approved April 19, 1983.

-- Task LM-23, TP 366/3 Revision 0, Approved December 18, 1981. Containment Post-Accident High Range Radiation Monitors RM-G22 and RM-G23-Calibration. Test results approved March 22, 1983.

-- Task LM-32, TP 622/1 Revision 0, Approved September 3, 1981. Diesel Generator Load Test. Test results approval February 24, 1983.

-- SP 1303-11-10 ES Emergency Loading and Power Transfer Test. Suveillance Test performed September 5, 1981, results approved September 13, 1981.

-- LM-42, SP 1300-3T, Decay Heat Check Valve Leak Monitor System, Instrument Calibration performed August 20, 1981, approved August 21, 1981. Surveillance performed August 29, 1981, results approved August 29, 1981.

-- RM22 and NM-34, TP 426/2 Revision 0, Approved July 31, 1981. 4kV ES Bus Undervoltage Relays - Functional Test Results approved August 24, 1981.

Supplemental Generic Test Procedures

-- Task LM-8A, TP 250/1.1 Revision 0, Approval November 4, 1980. Reactor Building Level Transmitter-Calibration. Test results approved March 20, 1981.

-- Task LM-13A, TP 250/4.1 Revision 0, Approved October 26, 1981. Emergency Feedwater Cavitating Venturi - Flush Test, results approved November 4, 1981

-- Task LM-13B, TP 250/1.1 Revision 0, Approval December 27, 1982. Main Steam Line Rupture Detection System Test, Test results approved February 7, 1983.

-- Task LM-38, TP 250/1.1 Revision 0, Approved April 7, 1982. Main Steam Bypass Valves MS - V4 A&B Test and Calibration, Test results approved June 7, 1982.

-- Task LM-42, TP 250/3.1 Revision 0, Approved August 7, 1981. Decay Heat and Core Flood Leak Rate Detection System Hydro. Test results approved August 20, 1981
TP 250/4.1 Revision 0, Approved August 7, 1981, Decay Heat & Core Flood Leak Rate Detection, Test results approved August 13, 1981.

-- Task LM-4B B, TP 250/1.1 Revision 0, Approved December 18, 1981. ICS VALVE Fail Position Modification Test, Test results Approved March 25, 1982.

-- TP 250/1.2 Revision 0, Approved October 7, 1982 Power Source Status Indication For MS-3 and 4, Test results approved October 11, 1982.

-- Task RM-22, TP 250/2.1 Revision 0, Approved October 9, 1980. ITE-27H Solid State Relays - Acceptance Test, Test results approved August 18, 1981.

TP 250/2.2 Revision 0, Approved October 9, 1980. ITE-27H Solid State Relays - Performance Test, Test results approved August 18, 1981.
TP 250/2.3 Revision 0, Approved July 23, 1981, ITE-27H Solid State Relays - Calibration Test, Test results approved August 18, 1981.
TP 250/2.4 Revision 0, Approved July 23, 1981, Securing 4160 V & 480 V Buses in Support of Tasks RM-22 & NM-34, Test results approved August 19, 1981.

-- Task NM-17, TP 250/3.1 Revision 0, Approved July 30, 1980. Hydro Test, Test results approved August 22, 1980
TP 250/3.2 Revision 0, Approved May 23, 1980. Hydro Test Test results approved July 24, 1981
TP 250/3.3 Revision 0, Approved September 9, 1980
TP 250/3.4 Revision 0, Approved December 3, 1980. Leak Test
TP 250/3.5 Revision 0, Approved December 9, 1980. Leak Test and Flush, Test results approved January 29, 1981.
TP 250/3.6 Revision 0, Approved February 17, 1981 Leak Test Test results approved April 9, 1983.
TP 250/3.7 Revision 0, Approved August 3, 1981, Flush and Hydro, Test results approved September 8, 1981.
TP 250/3.8 Revision 0, Approved July 18, 1981, Hydro Test, Test results approved August 21, 1981
TP 250/3.9 Revision 0, Approved April 1, 1981. Leak Check and Flush, Test results approved May 22, 1981.
TP 250/4.1 Revision 0, Approved July 30, 1980 Flush, Test results approved August 13, 1980.
TP 250/4.2 Revision 0, Approved February 17, 1981, Flush, Test results approved April 9, 1983.
TP 250/4.3 Revision 0, Approved May 23, 1980, Flush, Test results approved May 26, 1980.
TP 250/4.4 Revision 0, Approved February 13, 1980 Flush, Test results approved February 16, 1980.
113/D 412341 TP 250/3.1 Revision 0, Approved June 11, 1982 OTSG Layup Chemical Addition System - Leak Check and Flush, Test results approved July 12, 1982.

Generic Test Procedures

The generic procedures used in the preoperational and startup test program are:

TP 250/1 Generic Instrumentation.
TP 250/2 Testing of Electrical Equipment.
TP 250/3 Hydrostatic Testing
TP 250/4 Flushing Piping Systems.
TP 250/5 Testing of Mechanical Equipment.

A review was made of generic procedures 250/1 through 250/5, as applicable for the following modification task packages:

LM-7A, 8A, 8C, 13B, 26A, 26B, 29, 32, 33, 38, 42, 43B, and 43C. RM-4B, 13B, 13J, and 22 NM-34, and 113/D (412341).

The inspector reviewed the test results and verified licensee evaluation of test results by review of test change test exceptions, test deficiencies, "As-Run" copy of test procedure, QA inspection records, and test results evaluation and approval.

Findings:

No discrepancies were noted during review of the above listed test procedures and no open exceptions existed to any of the procedures. The inspector had no further questions on these items.

4. Restart Startup Test Program

4.1 Test Program Review

The inspector reviewed the TMI-1 restart startup test program for low power physics tests and power escalation tests during this inspection period. The sequence of tests, conduct of tests, interfaces between test engineers and station operating department, administrative control for the startup test program, establishment of acceptance criteria, and control of test and measurement equipment were discussed with licensee representatives.

The inspector reviewed Test Procedure TP 700/1, Rev. 0, "Controlling Procedure for Low Power Physics Testing". This test procedure is the controlling document for heatup/low power physics testing. It will cover test and event performance beginning with the steam bubble formation in the pressurizer, continuing with plant heatup to 525F, 2155 psig; progressing to Zero Power Physics Testing, and ending with the 3 percent Low Power Natural Circulation Test.

The Startup and Test group (SU and T) is responsible for performance and documentation of startup testing. At the completion of all testing to be performed at the 525F temperature plateau, the Nuclear Engineering group will conduct Zero Power Physics Testing. The inspector reviewed Test Procedure RP 1550-01, Rev. 5, "Controlling Procedure for Physics Testing" and RP 1550-02, Rev. 5 (DRAFT), "Zero Power Physics Testing". The inspector verified that the initial criticality and zero power physics tests were properly sequenced. The zero power physics testing program includes tests for critical boron concentration, nuclear instrumentation operation, isothermal temperature coefficient measurement, rod worth measurement, ejected rod worth measurement, and shutdown margin demonstration. The details and findings of this review are described in Section 5.

After the completion of all required Zero Power Physics Testing, SU and T will take over and commence the Natural Circulation Test. The licensee committed to perform this test in response to NUREG-0737, Item I.G.1. The inspector reviewed the test procedure TP 700/2, Rev. 0, "Low Power Natural Circulation Test" and verified that the following tests were scheduled.

-- Determination of reactor power correction factors.

-- Integrated Control System (ICS) Once Through Steam Generator (OTSG) water level control and emergency feedwater injection test.

-- Verification of two-hour air supply capability of the bottled backup air supply.

-- Verify smooth transition to natural circulation flow.

-- Determination of the effect of decreased OTSG levels on natural circulation flow.

-- Verify that backup pressurizer heater can stabilize RCS pressure.

The detailed review of the individual tests contained in the test procedure TP 700/2 was not completed at this time.

After completion of TP 700/1, the test procedure TP 800/1, "Controlling Procedure for Power Escalation Testing" will become the controlling document. However, this procedure was not available during the inspection. The inspector reviewed the Power Escalation Testing reactor physics related test procedures. The details and findings of the review are described in Section 5. Other aspects of the Power Escalation Testing including all special tests and controlling procedure TP 800/1 along with technical content of TP 700/2 will be reviewed during a subsequent NRC inspection.

4.2 Startup Test Organization and Administration

The Startup and Test group under the direction of Manager, Startup and Test has responsibility for and control of the startup test activities. The Startup Test Engineers will direct performance of and complete documentation for testing of systems and components in accordance with approved procedures. Test Working Group (TWG) consists of one member and at least one alterate from SU and T, plant supervisory staff, NSSS supplier, and site quality assurance organizations. TWG has principal responsibilities of administrating the test program policies and requirements. It also has responsibility for reviewing and approving test procedures and completed test results.

The Startup Problem Report described in Test Instruction Number 7 of the Startup and Test Manual provides a means of identifying deficiencies and exceptions and tracking corrective actions. The inspector was told that the temporary change notice (TCN) as described in AP 1001-A "Procedure Review and Approval" will continue to be used as a request for temporary procedure change when time or plant conditions do not permit use of the normal procedure change request flow path.

The inspector reviewed the following documents:

-- TMI-1 AP 1047, Startup and Test Manual, Rev. 1, Approved 1-9-82.

-- TMI-1 AP1001-A, Procedure Review and Approval, Rev. 3, Approved 10-19-82.

-- TMI-1 TI-1, Test Procedure Documents, Rev. 3, Approved 1-28-82.

-- TMI-1 TI-2, Master Test Index, Rev. 1, Approved February 25, 1982.

-- TMI-1 TI-3, Control of Test, Rev. 1, Approved 11-17-81.

-- TMI-1 TI-4, Control of Test Records, Rev. 1, Approved 11-17-81.

-- TMI-1 TI-5, Briefing and Dry Run, Rev. 1, Approved December 18, 1981.

-- TMI-1 TI-6, Test Engineers Log, Rev. 1, Approved November 17, 1981.

-- TMI-1 TI-7, Startup Problem Report, Rev. 1, Approved October 13, 1981.

-- TMI-1 TI-8, Test Plan, Rev. 0, Approved June 3, 1981.

-- TMI-1 TI-9, Prerequisite List, Rev. 1, Approved December 18, 1981.

-- TMI-1 TI-10, Training and Qualification of Personnel, Rev. 1, Approved August 18, 1981.

-- TMI-1 TI-11, Startup Document Distribution List, Rev. 0, Approved June 3, 1981.

-- TMI-1 TI-12, Non-Modified System Functional Test, Rev. 2, Approved November 17, 1981.

Based on the discussion with licensee representatives and examination and review of the above referenced documents, the inspector verified that the startup test program is defined and had adequate controls for the required testing.

No discrepancies were noted. The inspector had no further questions.

5. Physics Test Procedure Review

The inspector reviewed test procedures and discussed procedure content with licensee personnel to assure that the following criteria were met:

-- FSAR, Technical Specification, and specific licensee provisions (as applicable) were incorporated;

-- Procedure reviews and approval were performed in accordance with the licensee's administrative controls;

-- Test objectives are clearly stated;

-- Pertinent prerequisites are identified;

-- Acceptance criteria against which the test will be judged are clearly identified and the procedure requires comparsion of results with acceptance criteria;

-- Initial test conditions are specified;

-- Step by step instructions for the performance of the procedure are complete to the extent necessary to assure that test objective are met;

-- The procedure requires that temporary connections, disconnections or jumpers be restored to normal or reference their control by another procedure;

-- The procedure provides identification of personnel conducting the testing and evaluating test data.

The procedures which were reviewed and discussed are listed in the following:

-- RP-1550-01, Rev. 5, Controlling Procedure for Physics Testing.

-- RP-1550-02, Rev. 5 (draft), Zero Power Physics Testing.

-- RP-1550-04, Rev. 4, Power Imbalance Detector Correlation Test.

-- RP-1550-05, Rev. 3, Reactivity Coefficients at Power.

-- RP-1550-08, Rev. 4, Core Power Distribution Verification.

-- RP-1550-09, Rev. 0, Unit Acceptance Test.

-- SP-1301-5.3, Rev. 5, Incore Neutron Detectors-Monthly Check.

-- SP-1301-9.8, Rev. 5, Core Power Map Distribution.

-- SP-1302-1.1, Rev. 17, Power Range Calibration

-- SP-1303-1.2, Rev. 3, Reactor Coolant Flow Surveillance.

-- AP-1203-7, Rev. 14 (draft), Hand Calculations for Quadrant Power Tilt and Core Power Imbalance.

In RP-1550-04, the test limitations and precautions call for not exceeding technical specification power imbalance limits. However, the allowable axial offset range (Figures 1 and 2) used in determining excore/incore relationships does not clearly reflect this requirement. In AP-1203-7, a corrective action statement is not specified when excore detector imbalance exceeds the TS limits. A licensee representative has agreed to correct both items in the next test procedure revision. This is an inspector followup item for future inspection. (50-289/83-12-01).

Except for the specific comments above, the inspector had no further questions in this area. No items of noncompliance or deviation were identified.

6. Reactor Coolant System (RCS) Leak Rate

The inspector reviewed the RCS leak rate procedure, 1303-1.1, Revision 9, January 2, 1982, and discussed the errors in calculations and instrumentations, with cognizant licensee staff.

To improve the confidence level of the measured unidentified leak rate of 1 gpm, it was proposed to reduce the error to ±10% of the leak rate (±0.1 gpm).

The following items were discussed:

-- Narrow Range pressure instrument would be used for the RCS pressure.

-- RCDT temperature sensor would be installed.

-- The procedure would be improved to meet the target error of ±0.1 gpm.

7. Plant Tour

The inspector toured the control room and turbine building. The inspector observed work in progress and plant conditions.

No unacceptable conditions were identified.

8. Exit Interview

Licensee management was informed of the purpose and scope of the inspection at the entrance interview. The findings of the inspection were periodically discussed and were summarized on June 3 and again at the conclusion of the inspection June 24, 1983. Attendees at the exit interview are denoted in paragraph 1.