December 17, 1999

Mr. J. Langenbach
Vice President and Director
GPU Nuclear, Inc.
Three Mile Island Nuclear Station
P. O. Box 480
Middletown, Pennsylvania 17057-0480

SUBJECT: NRC INSPECTION REPORT 05000289/99010

Dear Mr. Langenbach:

On December 4, 1999, the NRC completed a resident inspection at your Three Mile Island Unit 1 reactor facility. The enclosed report presents the results of that inspection which the resident inspectors discussed with you and your staff during the December 9, 1999, exit meeting.

Your staff operated the unit safely during the inspection period. Conduct of operations and maintenance activities was generally good. Your staff responded well to several minor equipment deficiencies identified during the inspection. Your continued efforts to improve the quality of maintenance activities are noted.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC Public Document Room (PDR).

No reply to this letter is necessary. We appreciate your cooperation.

Sincerely,

Original Signed By:

Peter W. Eselgroth, Chief
Projects Branch 7
Division of Reactor Projects

Docket No.: 50-289

Enclosure: NRC Inspection Report No. 50-289/99-10

cc w/encl:
M. J. Ross, Director, Operations and Maintenance
D. Smith, PDMS Manager
M. Laggart, Manager, Licensing and Vendor Audits
E. Fuhrer, Manager, Nuclear Safety and Licensing
E. L. Blake, Shaw, Pittman, Potts and Trowbridge (Legal Counsel for GPUN)
TMI-Alert (TMIA)
Commonwealth of Pennsylvania

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REGION 1

Docket No.	05000289
License No.	DPR-50
Report No.	99010
Licensee:	GPU Nuclear, Inc.
Facility:	Three Mile Island Station, Unit 1
Location:	P. O. Box 480 Middletown, PA 17057
Dates:	October 24, 1999 through December 4, 1999
Inspector:	Wayne L. Schmidt, Senior Resident Inspector Craig W. Smith, Resident Inspector
Approved by:	Peter W. Eselgroth, Chief Projects Branch 7 Division of Reactor Projects

EXECUTIVE SUMMARY

Three Mile Island Nuclear Power Station
Inspection Report No. 05000289/99010

This inspection included aspects of licensee operations, maintenance, and plant support. The report covers a six week period of resident inspection.

GPU Nuclear (GPUN) operated Three Mile Island Unit 1 (TMI) safely at 100 percent power throughout the inspection period.

Operations

Operators failed to follow administrative procedural requirements in two instances during the conduct of an evolution to vent the "A" core flood tank on November 20. Although no valves were found out of position as a result, this issue illustrated a lack of formality in the conduct of evolutions and weaknesses in the processes in place to prevent mispositioning events. This was considered a minor violation. (Section O1.1)

Maintenance

GPUN identified several instances where work steps performed during the overhaul of MU-P-1B in 13R were not performed in accordance with the vendor technical manual, as required by the plant maintenance procedure referenced in the job order work package. The failure to adhere to the procedure requirements was a minor violation. Upon returning the pump to service, the pump shaft mechanical seals were found to be leaking; however, the leakage rate was acceptable by plant technical specifications. (Section M1.1)

GPUN identified a loose wire in the "B" control rod drive alternating current reactor trip breaker control circuit that resulted in a loss of power to the shunt trip device for that breaker during routine surveillance testing. The condition was immediately corrected. The loose wire resulted from a poorly made electrical connection during a modification to the breaker control circuit during 13R. The failure to identify the poorly made connection during the modification process or through appropriate post-modification process was a minor violation. (Section M2.1)

GPUN classified the Integrated Control System (ICS) in its NRC Maintenance Rule program as needing improvement. The corrective actions relied on the existing preventive maintenance program for improving system performance. The scheduled on-line preventive maintenance for the ICS was not completed during the last cycle of operation. This was a weakness in GPUN's implementation of its NRC Maintenance Rule program for a system designated as needing improvement. The system engineer was aware of the schedule delays and documented in an engineering evaluation justification for extending the completion date of the on-line preventive maintenance into the next operating cycle. Some weaknesses were identified in the work package that implemented the on-line replacement of ICS modules. (Section M8.1)

Plant Support

Plant management identified a poor work practice concerning the use of electronic pocket dosimeters. This poor work practice could result in inaccurate dosimetry records and individuals not being aware of their personal dose history. GPUN management took actions to stop this poor work practice. (Section R1.1)

TABLE OF CONTENTS

Report Details

Summary of Plant Status

GPU Nuclear Inc. (GPUN) operated Three Mile Island Unit 1 (TMI) at 100 percent power throughout the inspection period.

I. Operations

O1 Conduct of Operations (71707)

O1.1 Routine Control Room Activities

a. Inspection Scope

The shift operating crews performed routine activities safely and responded properly to annunciated alarms. The inspector observed routine conduct of operations including shift turnovers, daily Management Review Team (MRT) meetings, and control room operator performance.

b. Observations and Findings

During routine operator log review, the inspector identified that on November 20 control room operators directed the venting of the "A" core flood tank (CF-T-1A), to reduce system pressure to within the normal operating band, without having the controlling procedure in hand. The GPUN Administrative Procedure for procedure utilization (AP 1001G) required that for this evolution the individual performing the evolution shall have the procedure out and control the evolution through signoff of the executed steps. The completed procedure shall then be signed by the individual performing the evolution and reviewed and signed by a licensed operator. The inspector found that none of these administrative procedural requirements were completed for the venting of CF-T-1A on November 20.

The inspector identified that no entry was made in the Locked Valve Log for operation of the CF-T-1A vent valve (CF-V-3A) during the conduct of the venting evolution. CF-V-3A is normally shut during power operation, with the circuit breaker supplying power to the valve motor operator locked open. The locked open breaker for CF-V-3A was listed in the Locked Valve List maintained in the control room. The GPUN Administrative Procedure for control of locked valves (AP 1011) required that an entry be made in the Locked Valve Log each time the locked valve key was issued for the purpose of changing a locked valve's position, as was the case for CF-V-3A on November 20. However, no such log entry was made. In addition, the inspector noted that CF-V-3A was not listed in the GPUN Administrative Procedure for independent valve verification (AP 1067), although other core flood system valves, with similar consequence of mispositioning, were listed.

The inspector discussed the above findings with the shift supervisor. The shift supervisor stated he did conduct a pre-job brief with the crew prior to conducting the venting evolution. The inspector did not identify any valves that were found out of position as a result of not following the administrative procedural requirements and

considered this to be a violation of minor significance not subject to formal enforcement action. GPUN entered this issue into its corrective action process (CAP) as CAP 1999-1230.

c. Conclusion

Operators failed to follow administrative procedural requirements in two instances during the conduct of an evolution to vent CF-T-1A on November 20. Although no valves were found out of position as a result, this issue illustrated a lack of formality in the conduct of evolutions and weaknesses in the processes in place to prevent mispositioning events. This was considered a minor violation.

II. Maintenance

M1 Conduct of Maintenance (62707)

M1.1 Makeup Pump Shaft Seal Leakage

a. Inspection Scope

In September 1999, during the Cycle 13 refueling outage (13R), the "B" makeup pump (MU-P-1B) was overhauled and the rotating assembly was replaced. Coincident with this work, the inboard shaft seal was rebuilt with a new cartridge assembly and the outboard shaft seal was replaced with a new unit. When the pump was returned to service, both the inboard and outboard seals were leaking at a combined rate of approximately 2.4 gallons per hour (gph). Prior to the 13R overhaul, MU-P-1B operated with no visible signs of shaft seal leakage. On November 16, MU-P-1B was taken out of service to inspect and repair the shaft seals. Based on a recommendation from the seal vendor, both shaft seals were replaced and the pump was returned to service on November 17. Both shaft seals continued to leak, although at a slightly reduced rate. GPUN consulted with both the pump and shaft seal vendors to formulate an action plan to identify and fix the cause of the continued shaft seal leakage. The inspector reviewed GPUN's actions in response to continued shaft seal leakage on the "B" makeup pump (MU-P-1B).

MU-P-1B is the normal source of reactor coolant system (RCS) makeup and reactor coolant pump shaft seal cooling during power operation. The "A" and "C" makeup pumps are normally in standby and receive an automatic start from the engineered safeguards actuation system to provide high pressure injection for the emergency core cooling system (ECCS). MU-P-1B serves as an alternate source of high pressure injection.

b. Observations and Findings

The inspector reviewed job order (JO) 163227 and interviewed GPUN maintenance and engineering personnel concerning the work on MU-P-1B performed during 13R. The JO referenced the GPUN corrective maintenance procedure for centrifugal pumps (1410-P-7) which required the work to be performed in accordance with the approved vendor

technical manual. The pump overhaul was conducted by contractor maintenance personnel with technical assistance provided by the pump vendor. Several deficiencies were identified with the work that was performed:

- On November 16, when MU-P-1B was taken out of service to investigate the cause of the abnormal shaft seal leakage, GPUN found the clearances on both the inboard and outboard seals to be outside the tolerance shown on the applicable vendor drawing (0.145 inches instead of the required 0.120 inches). Also, 3 of 4 set screws on the outboard bearing collar were loose and the pump shaft runout exceeded the vendor specification for acceptable shaft seal performance.

- GPUN review of the documentation provided by the pump vendor for the work performed during 13R showed the measurement and alignment of the clearances between the pump shaft and the outboard bearing housing were not done in accordance with the vendor technical manual.

- The GPUN corrective maintenance procedure for pump shaft mechanical seals (1410-P-11) was not referenced in the JO and not used in the conduct of the 13R shaft seal replacements. The procedure specified a preferred tolerance for the flatness on the makeup pump shaft seals. The exact, as-left condition of the replacement seals could not be determined from the documentation provided in the JO package.

The failure to follow the procedural requirement to perform the MU-P-1B in accordance with the applicable vendor technical manual constituted a violation of minor significance not subject to formal enforcement action.

Although a definitive cause for the continued shaft seal leakage was not identified, GPUN planned to replace both the inboard and outboard shaft seals on MU-P-1B with seals of an improved design, recommended by the seal vendor, as soon as parts are available in January 2000. At the end of the inspection period, MU-P-1B continued to operate, with identified shaft seal leakage of approximately 2.4 gph, with no apparent degradation in pump performance. The leakage was contained in normal plant drainage systems. Plant operators measured and recorded the leakage daily. No adverse trend, beyond the initial leakage, was identified.

GPUN evaluated the off-site dose consequences of the shaft seal leakage as being not significant. Plant Technical Specifications (TSs) restrict leakage from ECCSs components outside containment, which are required to contain post accident sump recirculation fluid, to no more than 15 gph. During 13R, GPUN measured the combined leakage of the other ECCS components subject to sump recirculation flow at 0.02 gph.

GPUN entered the degraded performance of the MU-P-1B shaft seals into its corrective action process as CAP 1999-1187. In response to the CAP, GPUN evaluated MU-P-1B as remaining operable to perform both its normal makeup and high pressure injection functions.

c. Conclusion

GPUN identified several instances where work steps performed during the overhaul of MU-P-1B in 13R were not performed in accordance with the vendor technical manual, as required by the plant maintenance procedure referenced in the job order work package. The failure to adhere to the procedure requirements was a minor violation. Upon returning the pump to service, the pump shaft mechanical seals were found to be leaking. Subsequent troubleshooting and repair of the pump shaft seals were unsuccessful in stopping the shaft seal leakage; however, the leakage rate was acceptable by plant technical specifications.

M2 Maintenance and Material Condition of Facilities and Equipment (62707)

M2.1 Reactor Trip Breaker Shunt Trip Device Declared Inoperable

a. Inspection Scope

On December 2, during routine reactor trip breaker logic surveillance testing, the shunt trip power available indicating light on the "B" control rod drive reactor trip breaker (CRD-CB-11) was not lighted, as expected, during the testing sequence. Subsequent investigation identified a poorly made electrical connection on a test switch terminal connection which caused a wire to come loose during testing and interrupted power to the shunt trip device. The maintenance technician performing the test stated the shunt trip power available light was lighted, as expected, prior to starting the surveillance test procedure. The shunt trip device receives a trip signal from the reactor protection system and is energized to trip open the breaker. The connection was remade and the breaker was satisfactorily retested. The test switch terminal connections on the "A" control rod drive reactor trip breaker (CRD-CB-10) were visually inspected with no deficiencies identified. The inspector observed GPUN's actions in response to this event.

b. Observations and Findings

During 13R, GPUN performed a modification to both the "A" and "B" control rod drive reactor trip breakers that replaced the existing 3 position spring return test switch with a new 3 position maintained in all position test switch. The electrical configuration on the existing and replacement switches were identical, therefore no modifications to the control circuit wiring were required. The job order (JO 163448) contained instructions to determinate and remove the old switch and then reterminate the new switch using the existing control circuit wiring. The lifting and landing of the electrical connections was controlled by a plant maintenance procedure that required independent verification of each connection. The inspector reviewed the completed JO and found that the connection in question was independently verified. The proper location of the connection was verified, however the poor quality of the connection was apparently not noticed by either of the two maintenance technicians. The connection came loose during testing on December 2, resulting in a loss of power to the shunt trip device on CRD-CB-11.

The JO prescribed two post-modification tests to be performed prior to returning the system to service following completion of the modification. The tests were described in GPUN procedure 1420-EL-2, "Preoperational Startup Testing of Electrical Equipment," and included a check of the physical integrity of the installed equipment and a check of the electrical continuity of the modified circuit. GPUN identified no discrepancies as a result of the two post-modification tests that were performed. The inspector identified that the JO did not prescribe a termination integrity check be performed, although it was listed in 1420-EL-2 as an available test. The termination integrity check would have checked for tightness and mechanical strength of the test switch terminal connections.

GPUN entered this event into its corrective action process as CAP 1999-1202. The control rod drive reactor trip breakers have two diverse trip features, a shunt trip device and an undervoltage trip device. TS 3.5.1.7 required both trip features to be operable. The Plant Review Group (PRG) determined, as a result of the improper terminal connection, the shunt trip function of CRD-CB-11 most likely would not have functioned during a seismic event. Operators would have been alerted to the loss of power to the shunt trip device by a control room annunciator alarm. The PRG determined this event to be reportable to the NRC in accordance with 10 CFR 50.73, as a condition prohibited by the plant TSs.

GPUN's failure to identify the poorly made electrical connection, that resulted in the shunt trip device of CRD-CB-11 being declared inoperable, while installing the modification, or during the post-modification testing because a termination integrity check was not performed, constituted a violation of minor significance not subject to formal enforcement action.

c. Conclusions

GPUN identified a loose wire in the "B" control rod drive alternating current reactor trip breaker control circuit that resulted in a loss of power to the shunt trip device for that breaker during routine surveillance testing. The condition was immediately corrected. The loose wire resulted from a poorly made electrical connection during a modification to the breaker control circuit during 13R. The failure to identify the poorly made connection during the modification process or through appropriate post-modification process was a minor violation.

M8 Miscellaneous Maintenance Issues (62707)

M8.1 Integrated Control System Preventive Maintenance

a. Inspection Scope

The inspector reviewed GPUN's preventive maintenance program for replacement of control modules in the Integrated Control System (ICS). The ICS is a non-safety related system that provides fully automatic control of: reactor power (core thermal power) by positioning control rods; once through steam generator (OTSG) feedwater flow by positioning feed control valves; and generated electrical load by positioning the steam

valves supplying the turbine generator. The ICS functions following a reactor trip to control OTSG feedwater flow.

In May 1998, GPUN classified the system as needing improvement, in accordance with its program to implement 10 CFR 50.65, the Maintenance Rule. The ICS system engineer initiated CAP 1998-387 to document the change in status of the system and to track the recommended corrective actions to restore system performance. The corrective actions relied on the existing preventive maintenance program to improve system performance. The plan was reviewed and accepted by the GPUN Maintenance Rule Expert Panel in September 1998.

b. Observations and Findings

The inspector reviewed the status of GPUN's preventive maintenance plan for the ICS. The plan included a schedule for periodic replacement of ICS control modules with refurbished spares. The modules were evaluated for replacement with the plant operating at power. Modules that could not be replaced with the plant on-line were replaced in 13R.

Replacement of 127 modules that could be worked on-line was scheduled to be completed during the previous operating cycle. Due to manpower shortages and scheduling difficulties this work was not completed. At the end of the inspection period, only 52 of the modules were replaced. The system engineer was aware of this and documented in an engineering evaluation request, dated August 30, the acceptability of extending the date for completing the on-line module replacements from the previous operating cycle to March 2000. The system engineer recommended increased monitoring of ICS system performance noting that the number of ICS module failures increased during the previous operating cycle. The inspector found the failure to complete the ICS module replacements on schedule a weakness in GPUN's implementation of the NRC Maintenance Rule for a system designated as needing improvement (pursuant to 10 CFR 50.65 (a)(1)).

The inspector reviewed the job order (JO 141365) work package that implemented the on-line module replacements during the previous operating cycle and noted some weaknesses:

- Many of the data sheets for the set-up and calibration of the replacement modules had hand-written acceptance criteria with no annotation as to where the values came from or who entered them.

- The JO was over two years old, having been opened in October 1997. The job supervisor stated he had been cognizant of the work activities, but no supervisory reviews had been annotated in the work package for the completed module replacements. Supervisory reviews are normally conducted during the JO closeout process. The extended period of time between performance of field work activities and formal supervisory review was viewed as a weakness.

c. Conclusions

GPUN classified the ICS system in its NRC Maintenance Rule program as needing improvement (pursuant to 10 CFR 50.65 (a)(1)). The corrective actions relied on the existing preventive maintenance program for improving system performance. The scheduled on-line preventive maintenance for the ICS was not completed during the last cycle of operation. This was a weakness in GPUN's implementation of its NRC Maintenance Rule program for a system designated as needing improvement. The system engineer was aware of the schedule delays and documented in an engineering evaluation justification for extending the completion date of the on-line preventive maintenance into the next operating cycle. Some weaknesses were identified in the work package that implemented the on-line replacement of ICS modules.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls (71750)

R1.1 Radiation Work Permits

While observing an MRT meeting on November 16, the inspector became aware of a poor work practice within the Operations Department concerning the use of electronic pocket dosimeters (EPD). The inspector noted that this poor work practice could result in inaccurate dosimetry records and individuals not being aware of their personal dose history. For this instance, no inaccurate dosimetry records were identified. The inspector was concerned that individuals within operations management were aware of this practice and did not correct it prior to the CAP being written. The MRT directed that an Event Alert be prepared concerning this poor work practice and that supervisors discuss this with their workers. The inspector considered the corrective actions taken appropriate.

V. Management Meetings

X1 Exit Meeting Summary

Following completion of the inspection period, the resident inspectors conducted an exit meeting with GPUN managers on December 9. GPUN staff comments concerning the issues in this report were documented in the applicable report sections. No proprietary information was included.

INSPECTION PROCEDURES USED

IP62707	Maintenance Observation
IP71707	Plant Operations
IP71750	Plant Support

ITEMS OPENED, CLOSED AND DISCUSSED

Opened:
None

Closed:
None

Discussed:
None

LIST OF ACRONYMS USED

13R	Cycle 13 refueling outage
AP	Administrative Procedure
CAP	Corrective Action Process
CFR	Code of Federal Regulations
ECCS	Emergency Core Cooling System
EPD	Electronic Pocket Dosimeter
gph	gallons per hour
GPUN	GPU Nuclear, Inc.
ICS	Integrated Control System
JO	job order
MRT	Management Review Team
NRC	Nuclear Regulatory Commission
OTSG	Once Through Steam Generator
PDR	Public Document Room
PRG	Plant Review Group
RCS	Reactor Coolant System
RWP	Radiation Work Permit
TMI	Three Mile Island Unit 1
TS	Technical Specification