UNITED STATES NUCLEAR REGULATORY COMMISSION

REGION I

Inspection 50-387/94-16; 50-388/94-17 Report Nos.

License Nos. NPF-14; NPF-22

Licensee: Pennsylvania Power and Light Company 2 North Ninth Street Allentown, Pennsylvania 18101

Facility Name: Susquehanna Steam Electric Station

Inspection At: Salem Township, Pennsylvania

Inspection Conducted:

July 19, 1994 - September 5, 1994

Inspectors:

Approved By:

D. J. Mannai, Acting Seniør Besident Inspector, SSES <u>9/27/9</u>4 Date J. White, Chief Reactor Projects Section No. 2A.

Scope: Resident Inspector safety inspections were performed in the areas of plant operations; maintenance and surveillance; engineering; and plant support. Initiatives selected for inspection were fire protection, Nuclear System Engineering System Review meeting, and Emergency Diesel Generator maintenance.

Findings: Performance during this inspection period is summarized in the Executive Summary. Details are provided in the full inspection report.

Violations: Fire doors were blocked open without the required administrative approval. The failure to establish continuous fire watches for degraded fire protection systems were identified as apparent violations. One non-cited violation was identified during Licensee Event Report (LER) review. It concerned the inadequate establishment of alternate sample for an inoperable turbine building sampler (LER 94-005-00).

Unresolved Items: One unresolved item regarding the inadvertent High Pressure Coolant Injection (HPCI) system steam supply isolation was identified.



EXECUTIVE SUMMARY

Susquehanna Inspection Reports

50-387/94-16; 50-388/94-17

July 19, 1994 - September 5, 1994

Operations

During the period, a lightning strike rendered the Simplex fire protection system inoperable on two occasions. Consequently, fire detection and suppression capabilities were impacted in safety-related areas of the reactor building, control structure and common plant areas of both units. Following the first event, Technical Specification requirements were not met when continuous fire watches were not implemented within one hour. Although several actions were taken in response to the event, actions to establish continuous fire watches was not implemented for several hours. Inadequate communications were a significant contributor. Following the second event, the plant staff rigorously pursued compliance with Technical Specifications. A Notice of Violation is being issued as a result of the occurrence and the performance weaknesses it represents. Section 2.2 pertains.

Maintenance/Surveillance

During restoration from the five year overhaul of the 'B' Emergency Diesel Generator, the water was discovered in the 'B' EDG lube oil system. Maintenance personnel determined the source of water was a leak internal to the turbocharger. The refurbished turbocharger was installed as part of the five year overhaul. The licensee is working with the vendor to determine the root cause. The licensee is rigorously pursuing root cause. The inspector will evaluate licensee resolution of the turbocharger leak during ongoing inspection activities. Section 3.1.1 pertains.

During the inspection period, the high pressure coolant injection (HPCI) system became inoperable when the HPCI system outboard steam supply isolation valve unexpectedly stroked closed when Instrumentation and Control (I&C) technicians performed a residual heat removal (RHR) equipment area differential temperature high channel calibration and connected a multimeter to the wrong terminals. This human error caused the valve closure. This item will remain unresolved pending NRC review of PP&L's completed investigation, including root cause of the event and corrective actions. Section 3.2.1 pertains.

Engineering/Technical Support

The inspector attended the Nuclear System Engineering (NSE) weekly system review meeting for the Standby Gas Treatment System (SGTS). The system engineer presented the system review information in a clear and effective manner. Nuclear Engineering management was actively involved. The inspector considered the system review meeting a strength of the engineering organization.

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Plant Support

During the period, the inspector identified, on two separate occasions, that a fire door was blocked open without the required administrative approvals. The inspector also noted that there were several licensee identified and documented examples of blocked open fire doors without required administrative approvals since January 1994. The instances indicate weaknesses in the implementation of the fire protection program and corrective action process. The recurring nature of this problem appears to indicate a lack of sensitivity to the safety function of fire doors. A Notice of Violation was issued as a result of these repetitive occurrences and the associated programmatic weaknesses they represent relative to plant safety. Section 5.3 pertains.

Safety Assessment/Assurance of Quality

The inspector reviewed two Licensee Event Reports (LERs) during the period. One non-cited violation was identified regarding a condition prohibited by Technical Specifications involving inoperable turbine building sampling system. Section 6.1 pertains.

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Details

1. SUMMARY OF FACILITY ACTIVITIES

Susquehanna Unit 1 Summary

Throughout the inspection period Unit 1 operated at essentially 100% of rated thermal power with the exception of minor power reductions for surveillance testing and reduced electrical demand due to cool weather. On August 2, a lightning strike caused a failure of the Simplex Fire Protection system. Section 2.2 pertains. On August 9, a one hour emergency notification was made to the NRC when all offsite emergency notification sirens were inoperable due to telephone line problems. The sirens were inoperable from 2:05 p.m. until 6:16 p.m. Manual actuation of the sirens was possible by 2:35 p.m. The system was restored and successfully tested by 6:16 p.m. The NRC will evaluate the licensee's corrective actions as part of a future inspection.

On August 18, another lightning strike rendered the Simplex Fire Protection system inoperable. Section 2.2 pertains. On August 26, while performing residual heat removal (RHR) equipment area high differential temperature channel calibrations, technicians connected a multimeter across incorrect terminals causing the high pressure coolant injection (HPCI) system steam supply outboard isolation valve to close. The licensee made the required four hour NRC notification per 10 CFR 50.72. Section 3.2.1 pertains. On September 1 and again on September 2, reactor power was reduced to 80% to investigate and repair a suspect vibration probe on the 'A' reactor feed pump turbine (RFPT).

Susquehanna Unit 2 Summary

Unit 2 operated at full power throughout the inspection period with the exception of one planned downpower and minor power reductions for surveillance testing and reduced electrical demand caused by cool weather. The planned downpower to 40% was for condenser maintenance, reactor recirculation motor generator set '2B' maintenance, single loop testing and a control rod sequence exchange.

2. PLANT OPERATIONS (71707, 92901, 93702, 40500)

Plant Operations Review 2.1

The inspectors observed the conduct of plant operations and independently verified that the licensee operated the plant safely and according to station procedures and regulatory requirements. The inspectors conducted regular tours of the following plant areas:

Control Room

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Control Structure •

- **Emergency Diesel Generator Bays**
- Protected Area Perimeter
 - Security Facilities
- Unit 1 and 2 Turbine Buildings

Unit 1 and 2 Reactor Buildings

Engineered Safeguards Service Water Pump House



Control room indications and instrumentation were independently observed by NRC inspectors to verify plant conditions were in compliance with station operating procedures and Technical Specifications. Alarms received in the control room were reviewed and discussed with operators; and operators were found cognizant of control board and plant conditions. Control room and shift manning were in accordance with Technical Specification requirements.

During plant tours, logs and records were reviewed to ensure compliance with station procedures, to determine if entries were correctly made, and to verify correct communication of equipment status. These records included various operating logs, turnover sheets, blocking permits, and bypass logs. The inspector observed plant housekeeping controls including control and storage of flammable material and other potential safety hazards.

Inspections were performed on backshifts during July 19, 22, 26, 27, 1994 and August 5, 18, 20 and 22, 1994. Deep backshift inspections were conducted on July 20-21, 1994 (10:00 p.m. - 1:00 a.m.), August 27 (11:45 a.m. - 7:45 p.m.), and August 28 (10:15 a.m. - 4:15 p.m.)

2.2 Simplex Fire Protection System Failures

On August 2 at 9:31 p.m., a lightning strike rendered the Simplex fire protection system inoperable. As a result, fire suppression and detection capabilities were impacted in safety-related areas of both units and common areas. The licensee entered Technical Specification (TS) Limiting Condition for Operation (LCO) Action Statements for TS 3.3.7.9, 3.7.6.2, and 3.7.7. Significant Operating Occurrence Report (SOOR) 94-545 documented the event.

Subsequent to declaring the Simplex fire protection system inoperable, the licensee began to implement compensatory measures per TS requirements, which required the establishment of continuous fire watches within one hour. The site fire protection system engineer and I&C technicians were called in to support problem resolution. Shift supervision notified operations and station management that continuous fire watches could not be established in the one hour required by Technical Specifications. Roving fire watches were implemented while the list of affected fire zones requiring continuous fire watches was being prepared in parallel with troubleshooting to restore the Simplex panel to an operable status. At shift turnover time the next day, approximately 10 hours after the simplex fire panel was declared inoperable, the inspector discovered that the continuous fire watches required by TS were not established. Contrary to management expectations, operations failed to vigorously implement the required continuous fire watches. The inspector expressed concern to the licensee that actions to establish continuous fire watches had ceased. Following management involvement, the shift began rigorously establishing the required continuous fire watches to comply with Technical Specifications. At 11:00 a.m. on August 3, the licensee began to post the continuous fire watches. Subsequently, the simplex system was restored at 11:45 a.m.

The licensee initiated a comprehensive review of the event. Four previous Simplex system failures were identified since 1988. After these resulted in failure to comply with Technical Specification requirements. Two were due to lightning strikes. The last reportable event was on August 13, 1993 when the Simplex panel was lost due to a lightning strike.

Prior to permanent corrective actions being implemented for the August 2, 1994 event, another lightning strike rendered the system inoperable on August 18, 1994 at 7:00 a.m. The plant staff aggressively pursued implementation of compensatory measures. A draft response procedure being developed following the August 2, 1994 event improved implementation of compensatory measures.

On August 29, the licensee established a formal Event Review Team (ERT) to broadly review the Simplex failure events and to determine comprehensive corrective actions to prevent recurrence. The Event Review Team investigation was not fully completed at the end of the report period. The team did, however, determine initial root causes. They were: 1) inadequate corrective actions and actions to prevent recurrence for previous events, 2) inadequate communications between shift supervision and plant management, and 3) miscommunications between shift supervision and the site fire protection engineer.

The inspector determined that actions to comply with Technical Specifications were not rigorously pursued to completion by the operating shift. When plant management became fully aware that the required continuous fire watches were not yet established, plant staff was directed to aggressively pursue resolution of the issue. The inspector noted that the licensee's response procedures for loss of the Simplex system were not detailed enough to implement numerous continuous fire watches in a timely manner, given the magnitude of the simplex fire protection system failure. This was contrary to licensee management expectations for the corrective actions associated with the August 1993 event. Notwithstanding response procedure inadequacies, the failure of the operating shift to establish any continuous fire watches was a significant weakness. Actual safety significance of the events was low since roving fire watches were established, and, if needed, suppression systems affected by this event could be manually initiated. The formation of an ERT and their initial conclusions were considered a strength.

Although system modifications were implemented to harden the system in 1990, lightning strikes continue to affect system operability. The inspector was concerned, given the failure history, that compensatory measures were not effectively proceduralized to allow a timely determination of affected fire zones and, thus, timely implementation of fire watches. The ineffective communications that occurred during the operating shift's response to the event was also a contributor. The plant staff's failure to implement continuous fire watches required by TS is an apparent violation (VIO 50-387/94-16-01 Common).

3. MAINTENANCE AND SURVEILLANCE (62703, 61726, 92902, 40500)

3.1 Maintenance Observations

The inspector observed and/or reviewed selected maintenance activities to determine that the work was conducted in accordance with approved procedures, regulatory guides, Technical Specifications, and industry codes or standards.

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The following items were considered, as applicable, during this review: Limiting Conditions for Operation were met while components or systems were removed from service; required administrative approvals were obtained prior to initiating the work; activities were accomplished using approved procedures and quality control hold points were established where required; functional testing was performed prior to declaring the involved component(s) operable; activities were accomplished by qualified personnel; radiological controls were implemented; fire protection controls were implemented; and the equipment was verified to be properly returned to service.

Maintenance observations and/or reviews included:

- -- WA 43131, Support CRD Pump '2A' Repair, dated July 20, 1994.
- -- WA 43030, Fuel Line Component Replacement on the 'B' Emergency Diesel Generator, dated July 26.
- -- WA 43356, Remove Resin Heel From 'C' Condensate Demineralizer, dated August 17.
- -- WA 44057, Remove/Reinstall Turbocharger on the 'B' Emergency Diesel Generator, dated August 26.
- 3.1.1 'B' Emergency Diesel Generator Turbocharger Problem

On August 24, during restoration from a five year overhaul, water was discovered in the 'B' Emergency Diesel Generator (EDG) lube oil system while performing a jacket water flush. The licensee determined the source of water was a leak internal to the turbocharger. The turbocharger, which was refurbished by the vendor, was installed as part of the five year overhaul of the engine. The 'B' EDG had not yet been run with the refurbished turbocharger. SOOR 94-477 documented the event.

Maintenance personnel removed the water from the lube oil system. The refurbished turbocharger has been removed and returned to the vendor for a failure analysis. The old turbocharger has been reinstalled. The licensee, in concert with the vendor, is performing a root cause investigation of the failure.

The inspector expressed concern to licensee management regarding the potential for common mode failure of the EDGs pending the final bounding determination of root cause. The licensee, based on successful surveillance tests, system logs, lube oil analysis and operator rounds, concluded the other EDGs do not presently have water contamination of the lube oil system. The licensee is rigorously pursuing root cause. The inspector will continue to evaluate licensee resolution of the turbocharger malfunction as part of the SOOR resolution process.

3.2 Surveillance Observations

The inspector observed and/or reviewed the following surveillance tests to determine that the following criteria, if applicable to the specific test, were met: the test conformed to Technical Specification requirements; administrative approvals and tagouts were obtained before initiating the surveillance; testing was accomplished by qualified personnel in accordance with an approved procedure; test instrumentation was calibrated; Limiting Conditions for Operations were met; test data was accurate and complete; removal and restoration of the affected components was properly accomplished; test results met Technical Specification and procedural requirements; deficiencies noted were reviewed and appropriately resolved; and the surveillance was completed at the required frequency.

Surveillance observations and/or reviews included:

- -- SO-249-002, Quarterly RHR System Flow Verification, dated August 18, 1994.
- -- SO-256-001, Weekly Control Rod Exercising, dated August 19.
- -- SI-013-248, Semi-Annual Functional Test of Fire Protection Ionization Detectors in Fire Zone 026-H Control Room, dated August 27.
- 3.2.1 HPCI Isolation Caused by Human Error

On August 25, 1994, while I&C Technicians were performing residual heat removal (RHR) system equipment area differential temperature high channel calibrations, a multimeter was connected to the wrong terminals. This resulted in the HPCI system steam supply outboard isolation valve stroking closed. Operators verified no valid leak or high temperature condition existed and reopened the valve to restore the system to an operable status in accordance with the system operating procedure.

At the conclusion of the inspection period, station personnel had not completed their investigation of this event. This item will remain unresolved pending NRC review of PP&L's corrective actions (URI 50-387/94-16-02).

4. ENGINEERING (71707, 37551, 92903, 40500)

4.1 Nuclear System Engineering System Review Meeting

The inspector attended the Nuclear System Engineering (NSE) System Review meeting for the standby gas treatment system (SGTS). The system engineer discussed system availability, performance, areas of concern, material condition, deficiencies, modifications and enhancements. The system engineer appeared very knowledgeable of system performance and design. The presentation was clear, concise and comprehensive. Engineering and operations management attended the meeting. Although usually present, Maintenance was not represented at this meeting. The Vice-President - Nuclear Engineering maintained a healthy questioning attitude throughout the meeting. Several followup actions were required as a result of these questions.

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The inspector concluded that the weekly System Review meeting concept was an engineering strength. System performance is reviewed with management and long term corrective actions and performance improvements are planned for implementation. The meeting facilitates direct management involvement with system performance issues. However, the inspector observed action items are not formally documented. The licensee is considering the need to document follow up actions. The inspector had no further questions.

5. PLANT SUPPORT (71750, 71707, 92904, 40500)

5.1 Radiological and Chemistry Controls

During routine tours of both units, the inspectors observed the implementation of selected portions of PP&L's radiological controls program to ensure: the utilization and compliance with radiological work permits (RWPs); detailed descriptions of radiological conditions; and personnel adherence to RWP requirements. The inspectors observed adequate access controls to various radiologically controlled areas and use of personnel contamination monitors and frisking methods upon exit from these areas. Posting and control of radiation and high radiation areas, contaminated areas and hot spots, and labelling and control of containers holding radioactive materials were verified to be in accordance with PP&L procedures. Workers complied with radiation work permits and appropriately used required personnel monitoring devices. Health Physics technician control and monitoring of these activities was satisfactory. Overall, the inspector observed an acceptable level of performance and implementation of the radiological controls program.

5.2 Security

Implementation of the physical security plan was routinely observed in various plant areas with regard to the following: protected area and vital area barriers were well maintained and not compromised; isolation zones were clear; personnel and vehicles entering and packages being delivered to the protected area were properly searched and access control was in accordance with approved licensee procedures; security access controls to vital areas were maintained and persons in vital areas were authorized for entry; security posts were adequately staffed and equipped, security personnel were alert and knowledgeable regarding position requirements, and written procedures were available; and adequate illumination was maintained. Licensee personnel were observed to be properly implementing and following the physical security plan.

5.3 Fire Door Blocked Open

On July 20 at 2:40 p.m., while conducting a routine tour, the inspector discovered fire door 44, Common Equipment Room to CRD Pump Area, in the 656' elevation of the turbine building, blocked open. A warning was painted on the floor that read "Do Not Block - Fire Door Zone." The inspector notified the control room. Shift supervision promptly dispatched an assistant unit supervisor (AUS) to unblock the door. A compensatory hourly firewatch was in place for an existing door deficiency. However, Nuclear Department Administrative Procedure, NDAP-QA-0441, Fire Protection System Status Control, requires that if a fire protection system or equipment is removed from service or impaired, a Fire Protection Systems Status Change (FPSSC) form, NDAP-QA-0441-1, and separate Equipment Release Form (ERF) be issued. This is to ensure the impairment is controlled and required compensatory measures are implemented. This activity was not performed to support blocking open Fire Door (FD) 44.

The inspector noted that since January 1, 1994 there were four documented licensee identified examples of blocked open fire doors without following procedural requirements. The affected plant locations included Standby Liquid Control (SBLC) Penetration Room (SOORs 94-037 and 94-246), and Main Steam Pipe Tunnel (SOOR 227). SOOR 94-154 documented the same fire door 44 was blocked open twice without the required administrative approvals on March 4 and March 7, 1994. The inspector also noted there were other examples of fire doors being blocked open without necessary compensatory measures or administrative approvals prior to 1994. Again on August 23, the inspector identified that fire door 44 was blocked open without the necessary administrative authorization. Shift supervision issued SOOR 94-475 documenting the inspector identified unauthorized fire door blockage.

Previously, inspector considered the licensee identification and documentation of the previous fire door blockage problems a strength. The licensee, in response to earlier events, had concluded previous corrective actions were ineffective. The licensee formed a team to resolve the blocked open fire door issue. However, the performance indicates continuing ineffective corrective actions for previous events and lack of sensitivity to the safety function of fire doors on the part of station personnel. The actual safety significance of the events was low since roving fire watches also patrolled the affected areas as part of their rounds. However, fire doors, which are fire rated barriers, function to prevent the spread of fire. The NRC and licensee identified examples of the failure to properly implement fire protection system status control as required by NDAP-QA-0441 is a significant condition adverse to quality. The ineffective corrective actions to preclude repetition of improperly blocked open fire doors is a violation of 10 CFR 50 Appendix B Criterion XVI. (VIO 50-387/94-16-03).

6. SAFETY ASSESSMENT/QUALITY VERIFICATION (40500, 90700, 90712, 92700)

6.1 Licensee Event Reports

The inspector reviewed LERs submitted to the NRC office to verify that details of the event were clearly reported, including the accuracy of the description of the cause and the adequacy of corrective action. The inspector determined whether further information was required from the licensee, whether generic implications were involved, and whether the event warranted onsite follow up. The following LERs were reviewed:

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Unit 1

94-005-00 Unit 1 Turbine Building Sampler for Particulate, Iodine, and Mobile Gas (SPING) Alternate Sampling, Disconnected On March 8, 1994, it was determined that the alternate continuous sampling required by Technical Specification 3.3.7.11 Action 112 for an out-of-service turbine building SPING was not completed as required. Chemistry personnel discovered the sample tubing from the SPING vent to the alternate pump suction became disconnected. TS Action 3.3.7.11 Action 112, which required continuous sampling of iodines and particulates, was not met from 10:15 a.m. - 1:35 p.m. on March 8. Sample results before and after the event indicated that releases were less than the lower limit of detection. The licensee concluded there was no unmonitored release during the time of suspect sampling. Corrective actions included clamping the sample tubing.

The inspector agreed with the licensee's reportability analysis and considered corrective actions adequate. This violation will not be subject to enforcement action because the licensee's effort in identifying and correcting the violation met the criteria specified in Section VII.B(2) of 10 CFR Part 2, Appendix C.

94-011-00 Reactor Water Cleanup (RWCU) System Isolation on High Differential Flow

On July 7, 1994, the Unit 1 RWCU system isolated on high differential flow. The high differential flow was caused by leakage past a maintenance boundary valve. NRC Inspection Report 50-387/94-11 documented the event.

7. MANAGEMENT AND EXIT MEETINGS (30702)

7.1 Resident Exit and Periodic Meetings

The inspector discussed the findings of this inspection with PP&L station management throughout the inspection period to discuss licensee activities and areas of concern to the inspectors. At the conclusion of the reporting period, the resident inspector staff conducted an exit meeting summarizing the preliminary findings of this inspection. Based on NRC Region I review of this report and discussions held with licensee representatives, it was determined that this report does not contain information subject to 10 CFR 2.790 restrictions.

7.2 Other NRC Activities

On August 8-10, and 15-16, 1994, an NRC Region I Reactor Engineer conducted an engineering inspection. Inspection results will be documented in NRC Inspection Report 50-387/94-17, 50-388/94-18.

On August 8-10, NRC Region I conducted an initial license examination. Examination results are documented in NRC Inspection Report 50-387/94-15, 50-388/94-16.

On August 29-31 and Sept 1-2, an NRC Region I Security Inspector performed a Safeguards Inspection. Results will be documented in NRC Inspection Report 50-387/94-18; 50-388/94-19.