U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Report Nos.: 50-387/88-10 and 50-388/88-13

Docket Nos.: 50-387 and 50-388

License Nos.: NPF-14 and 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: May 8, 1988 - June 4, 1988

Inspectors: F. Young, Senior Resident Inspector, SSES
J. Stair, Resident Inspector, SSES

Approved By: A. Randy Blough, Chief — 6/20/88 Date
Reactor Projects Section No. 3B
Division of Reactor Projects

Inspection Summary:

Areas Inspected: Routine resident inspection of plant operations, physical security, plant events, surveillance, and Unit 2 refueling activities.

Results:

Routine review of maintenance and surveillance activities noted good control and performance. Licensee event reports (LERs) and monthly reports were complete and accurate. Repair of the feedwater sparger nozzle indicated good preparation and control of the evolution. Response of the plant and personnel to the Unit 1 automatic scram was good.

In general, adequate management involvement and attention was applied.

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DETAILS

1.0 Introduction and Overview

1.1 NRC Staff Activities

The purpose of this inspection was to assess licensee activities for the power operation and refueling/shutdown modes as they related to reactor safety and worker radiation protection. Within each area, the inspectors documented the specific purpose of the area under review, scope of inspection activities and findings, along with appropriate conclusions. This assessment is based on actual observation of licensee activities, interviews with licensee personnel, measurement of radiation levels, or independent calculation and selective review of applicable documents.

1.2 Unit 1 Summary

Unit 1 operated at full power until June 1 when the unit scrammed on a load reject signal as the result of a lightning strike. During a post-trip walkdown of the plant, operators discovered pipe leaks coming from a feedwater heater drain line and a main steam drain line header. At the end of the inspection period, the unit was in cold shutdown to replace sections of piping. Piping replacement is expected to be completed and startup to commence during the week of June 6, 1988 (See Detail 2.3).

1.3 Unit 2 Summary

Unit 2 remained shutdown in its second refueling outage throughout the inspection period. Planned startup is scheduled for June 15. During this period, the licensee effected repairs to one damaged feedwater nozzle and evaluated the remaining damaged nozzles as being acceptable for operation for Cycle 3 (See Detail 7.0).

1.4 Persons Contacted

During the course of the inspection, the inspector interviewed, discussed issues, and received information from various licensee employees.

Listed below are the senior people and/or those individuals who supplied substantive information. Members who attended the exit interview on June 9, 1988 are indicated by an asterisk.

W. Barberich, Manager of Licensing
* J. Blakeslee, Assistant Superintendent of Plant, SSES
F. Butler, Supervisor of Maintenance
* R. Byram, Superintendent of Plant, SSES
* P. Capotosto, Nuclear Quality Assurance
* M. Crist, Compliance Consultant
* T. Dalpiaz, Supervisor of Technical Support
* J. Doxsey, Reactor Engineering Supervisor
* A. Dominguez, Senior Results Engineer, Operations
* E. Figard, Supervisor of I&C/Computer
J. Fritzen, Supervisor of Radiological Operations
J. Graham, Assistant Manager, NQA - Operations
H. Keiser, Senior Vice President - Nuclear
D. Klinger, Acting Supervisor - Installation Engineering Group
* F. Malek, Personnel and Administration Supervisor
T. Markowski, Day Shift Supervisor
K. Mattern, Radwaste Power Production Engineer
D. McGann, Compliance Engineer
W. Morrissey, Supervisor of Radiation Protection Program
H. Palmer, Supervisor of Operations
R. Prego, Supervisor of Operations QA
H. Riley, Supervisor of Health Physics/Chemistry
* D. Roth, Senior Compliance Engineer
* R. Stotler, Supervisor of Security

2.0 Routine Periodic Inspections

2.1 Scope of Review

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

-- review of selected plant parameters for abnormal trends;

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

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

-- control of documents, including logkeeping practices;

-- implementation of radiological controls;

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

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

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

-- areas outside the control room; and,

-- selected licensee planning meetings.

Also, the inspectors reviewed specific events in more detail as described in the sections that follow.

2.2 HPCI Inverter Failure (Unit 1)

On May 20, 1988, a High Pressure Coolant Injection (HPCI) out of service alarm and inverter failure status light were received in the control room indicating that the HPCI inverter had failed. Investigation by the licensee determined that two battery chargers which had been placed on equalize on May 19, caused a high 125 VDC bus voltage of approximately 144 VDC. This high bus voltage resulted in the voltage to the HPCI inverter exceeding the inverter high voltage trip setpoint. Coincident with the HPCI inverter failure, several annunciator power supplies failed due to the high DC bus voltage in conjunction with a high ambient relay room temperature. The high ambient temperature was caused by the failure of a supply fan heater temperature controller.

The licensee switched the battery chargers to float which reduced the charge to the bus to a nominal value of 125 VDC and shortly afterward, the HPCI alarm reset and the inverter was returned to service. The temperature controller was placed in manual and the failed power supplies replaced. Following adjustment of the chargers equalizing voltages to a lower value, the two battery chargers were switched back to equalize. Maintenance technicians subsequently repaired the relay room temperature controller and returned the supply fan heater control to automatic.

The inspector reviewed the significant operating occurrence report (SOOR) and discussed the details of the event with members of the plant staff. The inspector asked the licensee why failure of the temperature controller was not identified before the power supply failures occurred since a lower relay room ambient temperature may have prevented those failures. The licensee stated that the temperature controller failure was not identified earlier since the control room alarm for high return air temperature to the supply fan did not annunciate. The licensee is investigating the reason behind the annunciator failure in addition to evaluating whether this situation exists elsewhere in the plant. The inspector found the licensee's actions in response to the event appropriate and timely and will review the results of the licensee's evaluation.

2.3 Reactor Scram (Unit 1)

At 4:22 p.m. on 6/01/88, Unit 1 scrammed on a load reject signal from the local substation span reverse current protection relay. A zero ground fault on the Juniata to Albertis 500 kv line from a lightning strike produced the activation of this relay. The Juniata-Albertis 500 kv line was automatically de-energized until the ground had cleared. System ground fault signals are reflected to all 500 kv substations, including the plant's substation. The span protection relay is designed to recognize the origin of the fault signal and to open the unit breakers only when the fault is a local fault. The licensee concluded that a malfunction of the ground fault relay appeared to be the cause of the span protection relay activation.

The inspector reviewed the post trip response and attended various meetings which discussed the event and work to be performed prior to bringing the plant back on line. The inspector found the operators response to the scram to be in accordance with applicable procedures and to exhibit good knowledge of plant systems and system response to a scram. The plant responded as designed to the trip and no major equipment problems were experienced.

With the unit off-line, the licensee decided to inspect a new feedwater steam leak and repack selected valves with indicated steam leaks. Inspection of the steam leak on a two-inch feedwater heater drain line from the steam seal system evaporator indicated erosion at a transition connection to feedwater system valve (HV-10270C) had occurred. Inservice inspection of two similar transition pieces in the same pipe on feedwater system valves HV-10270 A & B indicated that pipe wall thinning also had occurred at these points. This line is designed to return condensed water from the steam seal system to feedwater heaters 2A, 2B, and 2C. Preliminary indication is that the pipe was exposed to a water/steam mixture that accelerated the

erosion of the piping. Additionally, the licensee discovered a five-foot section of main steam drip leg four inch piping downstream of flow element FE-10112 returning to the high pressure condenser which exhibited the same type of erosion. The licensee plans to inspect similar drain pipes in both units prior to either unit returning to service. The licensee is in the process of replacing the piping and valves associated with the identified wall thinning. The unit is scheduled to return to power on June 9 following replacement of the ground fault relay and eroded piping.

The inspector discussed the problems and corrective actions with the licensee and found the licensee's actions acceptable. The pipe replacement and licensee's final resolution will be reviewed in a subsequent inspection report.

3.0 Surveillance and Maintenance Activities

On a sampling basis, the inspector selected several surveillance and maintenance activities to ensure that specific programmatic elements described below were being met. Details of this review are documented in the following sections.

3.1 Surveillance Observations

The inspector observed the performance of a surveillance test to determine that: the test procedure conformed to Technical Specification requirements; administrative approvals and tagouts were obtained before initiating the test; 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.

The following surveillance was reviewed:

-- SE-252-001, 18 Month HPCI System and Logic Functional Test, performed on June 3, 1988.

No unacceptable conditions were identified.

3.2 Maintenance Observation

The inspector observed portions of selected maintenance activity to determine that the work was conducted in accordance with approved procedures, regulatory guides, Technical Specifications, and industry codes or standards. The following items were considered 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 QC hold points were established where required; functional testing was performed prior to declaring the particular 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.

The following maintenance activity was reviewed:

-- Work Authorization (WA) V83814, Welding of Leaking Flanges to Primary and Secondary Steam Jets in Steam Jet Air Ejector Room, performed on June 3, 1988.

No unacceptable conditions were identified.

4.0 Licensee Reports

4.1 In-Office Review of Licensee Event Reports

The inspector reviewed LERs submitted to the NRC:RI office to verify that details of the event were clearly reported, including the accuracy of description of the cause and 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 followup. The following LERs were reviewed:

Unit 1

88-007-00 Emergency Diesel Generator 'E' Unplanned Automatic Start

88-008-00 Design Deficiencies Discovered During Appendix R Reanalysis

Unit 2

88-008-00 Two Fire Dampers Found Inoperable Due to Missing Fusible Link

The above LERs were found acceptable.

4.2 Review of Periodic Report

Upon receipt, a periodic report submitted by the licensee was reviewed by the inspector. The report was reviewed to determine that they included the required information; that test results and/or supporting information were consistent with design predictions and performance specifications; that planned corrective action was adequate for resolution of identified problems; and whether any information in the report should be classified as an abnormal occurrence.

The following report was reviewed:

-- Monthly Operating Report - April, 1988, dated May 13, 1988

The above report was found acceptable.

5.0 Core Reload Analysis (Unit 2)

As part of the outage, the licensee conducted fuel sipping to determine if any bundles contained leaking fuel pins. From the fuel sipping performed during this outage, the licensee found two General Electric bundles that contained fuel pins that appeared to be leaking. In order to maintain core symmetry, the licensee elected to replace these two bundles plus two additional bundles with four Exxon bundles. To support this changeout of four bundles, the licensee performed an additional safety evaluation in conjunction with the Technical Specification submittal addressing core reload. The licensee's fuel engineering group concluded that the new reload was still bounded by the original safety evaluation and concluded that it was acceptable to substitute the four new Exxon bundles for the four General Electric bundles.

To ensure that this change did not have an adverse impact on plant performance and safety, the inspector reviewed the internal safety evaluation associated with the substitution of the four bundles. Using the NRC core reload analysis as the basis, the inspector compared key parameters to determine if fuel characteristics have been changed in a less conservative direction. The inspector reviewed and discussed the core reload with the licensee to ensure the core arrangement was still bounded by the original core reload analysis.

The inspector concluded that based on selected parameters chosen and a review of the licensee's core reload safety analysis NL-88-007, the new core reload was bounded by the original reload analysis. The inspector had no further questions in this area.

6.0 Indication of Cracking on CRDM Hold Down Bolts (Unit 2)

As part of the control rod drive mechanism (CRDM) outage overhaul program, the licensee inspects the hold down bolts which fasten the CRDM to the vessel. There are eight carbon steel bolts per CRDM in which only two bolts 180 degrees apart are required to ensure the margin of safety assumed in the original plant design. Previous to the Unit 1 Third Refueling Outage, the licensee performed a limited visual inspection because the applicable ASME code section addressing acceptance criteria for this type of inspection was not completely developed. In previous outages, bolts which had any indication of corrosion were replaced with no further examination. In order to give better guidance to the field inspectors, the licensee's engineering group (NPE) developed an interim standard. This new standard was applied for the first time during the Unit 1 Third Refueling Outage. Due to an oversight by the licensee, this program had not been fully implemented until the current Unit 2 outage. The full significance of the inspection findings was not recognized until NPE started to review the results for this outage.

If a bolt fails the visual acceptance criteria, the interim standard requires a close examination for cracking and wear. Using this new criterion, the licensee found indication of corrosion stress cracking on approximately 27 percent of all the bolts in Unit 2 (1480) examined. The location of the bolts with indications appears random and not related to length of time in service or heat number. Laboratory analysis noted the cracks typically were linear circumferential cracks under the bolt head, less than 1/16 inch in length. The licensee's resolution for Unit 2 was to replace all the CRDM bolts.

For Unit 1 the licensee performed an engineering analysis that determined continued operation with these bolts in service is acceptable. This is based in part on laboratory analysis of Unit 1 CRDM bolts replaced in the last outage. The same type of indications were noted on these bolts. Testing of several bolts with crack indications determined that the yield strength of these bolts was still above the limit for minimum yield strength for new bolts. The licensee plans to replace the Unit 1 CRDM bolts during the next refueling outage.

With the assistance of Region I and NRR metallurgists, the inspector reviewed and discussed the licensee findings and course of action. The inspector found the licensee course of action appropriate. Because of the potential generic applicability, the inspector requested that the licensee document their findings and forward a copy of the completed report to the NRC. The licensee agreed to submit their final report and it will be reviewed at that time.

7.0 Feedwater Sparger Nozzle Damage (Unit 2)

On April 23, during installation of the steam separator into the reactor vessel, the steam separator impacted two feedwater spargers, resulting in damage to six feedwater sparger nozzles. The review of the licensee's initial corrective action and evaluation was documented in Combined Inspection Report 387/88-09; 388/88-09. Final action required by the licensee was completed during this period.

Final engineering evaluation elected to weld repair the feedwater sparger nozzle that had a tear. The remaining five damaged nozzles evaluated determined that the nozzles could be used in the condition they were in with no adverse effect on plant safety.

The engineering review determined that the repair and subsequent return to service did not cause any unreviewed safety question or place the plant in a condition that would adversely affect safety. The licensee has elected to instrument the reactor vessel in the area of the thermal sleeves in order to detect any increased leakage past the thermal sleeves.

The actual weld repair on the torn nozzle was performed in place under water. The underwater weld was an overlay type weld designed to direct the feedwater out the nozzle end alleviating the possibility of cold water impinging on the vessel. The weld was performed in four dives, weld preparation, first weld overlay, second overlay, and post weld. Inspection was performed by an underwater camera.

With the assistance of Region I and NRR metallurgists, the inspector reviewed the licensee's weld repair methodology. In addition, the inspector reviewed the applicable station procedure that controlled the repair. Selected portions of the job setup, welding, and post-job evolutions were witnessed. The health physics aspect of the underwater repair was reviewed separately and documented in Inspection Report 50-388/88-12.

The inspector noted that adequate controls were in place to ensure proper repair and restoration of the feedwater sparger nozzles. Preliminary review by the inspector concluded the "as left" condition of the five nozzles plus the repaired nozzle would not have an adverse effect on plant safety for the next cycle. This conclusion was partially based on the assumption that no significant leakage would occur around the feedwater sparger thermal sleeve. The monitoring of this leakage will be periodically reviewed by the inspector during the next cycle. In addition, the NRC Office of Nuclear Reactor Regulation (NRR) will independently review the licensee's safety evaluation to verify that no adverse safety condition may be introduced by the "as left" condition. The inspector considers the review of this event complete unless subsequent review by NRR identifies additional concerns.

8.0 Exit Meeting

On June 9, 1988, the inspector discussed the findings of this inspection with station management. 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. At the conclusion, the licensee acknowledged the NRC findings and did not disagree with the findings or their characterization.