UNITED STATES NUCLEAR REGULATORY COMMISSION

REGION I

Inspection Report Nos.	50-387/92-16; 50-388/92-16
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:	June 1, 1992 - July 13, 1992
Inspectors:	G. S. Barber, Senior Resident Inspector, SSES D. J. Mannai, Resident Inspector, SSES L. M. Kay, Reactor Engineer, DRS

Approved By: S. Barber for J. L. White 8/7/92

J. White, Chief Date

Reactor Projects Section No. 2A,

Inspection Summary:

Areas Inspected: Safety inspections were conducted in the following areas: operations, radiological controls, maintenance/surveillance testing, emergency preparedness, security, engineering/technical support, safety assessment/quality verification, and Licensee Event Reports, Significant Operating Occurrence Reports, and open item followup.

Results: During this inspection period, the inspectors found that the licensee's activities were directed toward nuclear and radiation safety. An Executive Summary is included and provides an overview of specific inspection findings.

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EXECUTIVE SUMMARY

Susquehanna Inspection Reports

50-387/92-16; 50-388/92-16

June 1, 1992 - July 13, 1992

Operations (30702, 71707, 71710)

During a routine tour, the inspector observed operator response to a loss of the "B" reactor building (RB) chiller which caused the reactor water cleanup (RWCU) system to isolate on high demineralizer influent temperature. The inspector noted that the operators promptly recognized the high temperature alarms on the RWCU system. They quickly assessed indications and began to review and perform actions per ON-234-001, Loss of Reactor Building Chiller Water. Communication between personnel was clear and effective. Operator response to this event was good.

An engineered safety feature walkdown of the Unit 1 Core Spray Division 1 system was conducted during the period. The inspector determined the system was properly aligned and capable of performing its intended safety function. Overall, the system was maintained in good physical condition. Several minor deficiencies were identified. The licensee promptly took or planned corrective action.

The licensee began a controlled shutdown from 2% power at 2:45 p.m., June 13 due to overheating of the Unit 1 "B" offgas guard bed charcoal. Supplemental temperature monitoring showed a constantly decreasing trend after the bed was isolated. Since the guard bed overheating precluded the possibility of maintaining condenser vacuum, Unit 1 was shutdown and cooled down to cold shutdown conditions. The licensee formed an Event Review Team (ERT) to respond to this event. NRC review of this event noted a number of strengths and weaknesses. Strengths included a thorough and extensive review by the ERT, good interdeparmental cooperation and corporate engineering support, similar industry event review sampling, and a detailed investigation of the specific overheating mechanisms. Weaknesses were noted in the incomplete of recommendations from a 1987 guard bed overheating, the wording used on a caution tag that that contributed to the original saturation of the Unit 1 guard beds, and a long standing installation error that made the moisture removal mechanism of the guard bed drain traps ineffective. The licensee is taking actions to address all of the identified weaknesses. However, the licensee's failure to discover the long standing drain trap installation error was of concern because it indicates weakness in their followup to the 1987 overheating event. However, because of significant improvements in the licensee's root cause program and their prompt correction of the drain trap installation errors, this was identified as a non-cited violation.

Radiological Controls (71707)

Periodic inspector observation of station workers and Radiation Protection personnel implementation of radiological controls and protection program requirements did not identify any deficiencies. Individual workers and Health Physics personnel implemented radiological protection program requirements. Periodic inspector observation noted no inadequacies in the licensee's implementation of the radiological protection program.

Maintenance/Surveillance (61726, 62703)

The licensee effectively performed maintenance and surveillance activities. No scrams or engineered safety feature (ESF) actuations were attributable to surveillance or maintenance activities. One minor concern was identifed in the licensee's conduct of surveillances. An hourly firewatch was not established for approximately five hours during maintenance on the control room emergency outside air supply system (CREOASS) high temperature sensors when the fire protection deluge system was valved out of service. This reflected weaknesses in planning the activity. Minor administrative weaknesses were also identified during residual heat removal service water (RHRSW) discharge check valve disassembly/inspection.

Engineering/Technical Support (71707, 92720, 93702)

During the period, the NRC issued NRC Bulletin 92-01 and NRC Information Notice 92-46. The Bulletin and Information Notice detailed safety concerns about the use of Thermo-Lag 330 Fire Barrier installations. The licensee, in response to the bulletin, identified those locations where Thermo-Lag 330 was used for systems that provide safe shutdown capability. Compensatory measures, consisting of hourly firewatches, were established at those locations within the scope of the bulletin. Further licensee evaluation was underway at the conclusion of the inspection period. Future NRC inspections are planned.

Safety Assessment/Assurance of Quality (40500, 90712, 92700, 92701, TI 2515/113)

During the period, the inspector reviewed licensee actions and considerations to ensure reliable decay heat removal during outages. PP&L has expended considerable effort in this area. Many controls and procedures are in place relative to ensuring reliable decay removal during outages.

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Details

1. SUMMARY OF OPERATIONS

1.1 Inspection Activities

The purpose of this inspection was to assess licensee activities at Susquehanna Steam Electric Station (SSES) as they related to safety. Within each inspection area, the inspectors documented the specific purpose of the area under review, the 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, independent calculation, and selective review of applicable documents.

Abreviations are used throughout the text. Attachment 1 provides a listing of these abbreviations.

1.2 Susquehanna Unit 1 Summary

Unit 1 began the inspection period at 39% reactor power. The power reduction was due to maintenance of the "B" recirculation motor generator lube oil heat exchanger. Power ascension to 80% continued through June 6. At 1:25 a.m. on June 7, a controlled shutdown was initiated to allow work to be performed on the "A" reactor feed pump (RFP). At 6:10 p.m. on June 10, Condition 2 was entered when the reactor mode switch was placed in startup. Reactor power was held at 2% until the offgas guard beds were purged due to moisture problems. On June 13 the reactor was manually shut down. This shutdown was the result of elevated temperatures in the "1B" offgas guard bed. Contact temperatures at the bottom of the bed reached 400 degrees F indicating that the charcoal had overheated. This evolution is discussed further in section 3.2 of this report. On June 23, Condition 2, Startup, was entered. Subsequently, Condition 1 was entered at 4:41 a.m., June 24. On June 25, with reactor power at 80%, the "A" RFP was placed in service. At 5:05 p.m., June 26, the reactor reached 100% power. The unit continued to operate at 100% power at the close of the inspection. No engineered safety features (ESF) actuations occurred during the inspection period.

1.3 Susquehanna Unit 2 Summary

Unit 2 operated at or near full power throughout the inspection period. Scheduled power reductions were conducted during the period for surveillance testing and maintenance. On July 11, while control rod scram time testing was in progress, operators received a rod drift alarm. Subsequent to identification of the malfunctioning rod, further rod drift was observed. The licensee was investigating this event at the close of this inspection. No reactor scrams or ESF actuations occurred in Unit 2 during the inspection period.

2. OPERATIONS

2.1 Inspection Activities

The inspectors verified that the facility was operated safely and in conformance with regulatory requirements. Pennsylvania Power and Light (PP&L) Company management control was evaluated by direct observation of activities, tours of the facility, interviews and discussions with personnel, independent verification of safety system status and Limiting Conditions for Operation, and review of facility records. These inspection activities were conducted in accordance with NRC inspection procedure 71707.

The inspectors performed 29.0 hours of deep backshift inspections during the period. These deep backshift inspections covered licensee activities between 10:00 p.m. and 6:00 a.m. on weekdays, and weekends and holidays.

2.2 Inspection Findings and Review of Events

2.2.1 Unit 1 Reactor Water Cleanup Isolation due to High Demineralizer Inlet Temperature

During a routine tour, the inspector observed operator response to a loss of the "B" reactor building (RB) chiller which caused the reactor water cleanup (RWCU) system to isolate on high demineralizer influent temperature. The isolation occurred at 9:54 a.m., June 16 concurrent with hanging blocking tags on the "A" RB chiller. When the RB chiller was lost, Reactor Building Closed Cooling Water (RBCCW) isolated, per its design, to the RWCU system non-regenerative heat exchanger. The loss of cooling water flow caused the high influent temperature trip at 140° F, and, as a result, both RWCU pumps tripped. RBCCW realigned to the drywell coolers to compensate for the loss of RB chill water flow. Drywell (DW) temperature and pressure peaked at 0.40 psig and 125.2° F, respectively, well within acceptable limits. Locally, personnel recognized the "B" chiller trip and reinstalled the recently removed states link (TBC-8) and restarted the "B" RB chiller after direction from the operators. A subsequent chiller trip occurred due to low refrigerant temperature. Once the condition cleared, the chiller was successfully restarted. Systems were reconfigured and the restoration of RWCU was considered. Operators did not restart RWCU because of the need to cooldown and fill and vent the system. The licensee determined the event was not reportable since it isolated on high temperature.

The inspector observed actions in the control room and noted that the operators promptly recognized the high temperature alarms on the RWCU system. They quickly assessed indications and began to review and perform actions per ON-234-001, Loss of Reactor Building Chiller Water. Communication between personnel was clear and effective. Questions arose on the ability to restore the RWCU system while hot, however, they were promptly resolved after consulting the RWCU operating procedure (OP-261-001). The inspector had no further questions.

2.2.2 Engineered Safety Feature System Walkdown - Unit 1 - Core Spray System Division I

During the inspection period the inspector independently verified the status of Unit 1 Core Spray System Division 1. The engineered safety feature system walkdown included the following:

- Verification of injection flow path to ensure the system was able to perform its intended safety function.
- Verification of proper electrical, mechanical and instrument lineups.
- Core Spray Loop "A" Control Board Panel 1C601 Verification of proper system standby alignment and system indications.
- Verification of as-installed system utilizing as-built drawings, system checklists and operating procedures.
- Verification of housekeeping and combustible material controls.
- Proper Core Spray Pump motor oil levels.

No major deficiencies were identified during the system walkdown. The inspector did, however, identify some minor deficiencies that required corrective action. The deficiencies were brought to the licensee's attention and are outlined below:

- Valve HV-152-F001A (Core Spray Pump A&C suppression pool suction) local indication indicates valve is fully closed. Control room indication (remote) indicates valve open as required.

  Per discussion with the core spray system engineer, the local position indication on the motor operator is not considered reliable and is not used in system operation. The licensee's valve group intent is to issue a memorandum that addresses this issue.

- Valve HV-152-FOO1A (Core Spray Pump A&C suppression pool suction) manual handwheel mounting assembly is missing two cap screws.

  The licensee issued a work authorization to correct the deficiency.

- Valve HV-152-FOO1A (Core Spray Pump A&C suppression pool suction) stem has scoring.

The licensee evaluated the stem scoring and determined that no immediate concern existed. A work authorization is being issued to retorque the valve packing and inspect for loss of packing at the next refueling and inspection outage.

- Cover for flow indicating switch FIS-E21-IN006A junction box for minimum flow valve has missing screw.

  The deficiency was corrected by the licensee. In response to the inspector's questioning, the licensee determined that this deficiency did not affect the environmental qualification of the component.

- Core spray Division 1 relay panel test jack E21A-J2A does not have a plastic protective/dust cover.

  The licensee also discovered additional missing covers on various ECCS test jacks. The licensee issued a work authorization to install the protective/dust covers on ECCS test jacks in all four relay rooms.

The inspector determined that the Unit 1 Division 1 Core Spray system was properly aligned in accordance with the operating procedure and able to perform its intended safety function. Notwithstanding the minor deficiencies, the system was maintained in good physical condition. The system was found to be very well labelled. Housekeeping and cleanliness in the spaces inspected was found to be acceptable. No additional inadequacies were identified.

2.2.3 Offgas Guard Bed Overheating

Overview

The licensee began a controlled shutdown from 2% power at 2:45 p.m., June 13 due to overheating of the Unit 1 "B" offgas guard bed charcoal. High temperatures (> 150 degrees F) were detected on the bottom inlet to the guard bed vessel at approximately 7:00 a.m., June 13 during offgas recombiner purging and resulted in localized monitoring of the "1B" guard bed temperature. The licensee believed that the initial temperature increase was attributable to residual heat buildup in the guard bed charcoal. The common recombiner purge was started at 10:00 a.m. to lower internal bed temperatures. When this purge was found to be ineffective at 11:20 a.m., the "1B" guard bed was isolated. A contact pyrometer was used to measure external vessel surface temperature and a portable instrument was installed to monitor the out-of-range installed instrumentation. Supplemental temperature monitoring showed a constantly decreasing trend after the bed was isolated. Since the guard bed overheating precluded the possibility of maintaining condenser vacuum, Unit 1 was shutdown and cooled down to cold shutdown conditions. Condition 4 was entered at 4:38 a.m., June 14. The licensee formed an Event Review Team (ERT) to respond to this event.

Attachment 2 provides a chronology of significant events.

Background

During the week following the unplanned shutdown to repair leaky feedwater pump steam isolation valves, June 6, heated air purges of the "1A" and "1B" guard beds were performed to remove residual moisture. First using low pressure air, and then, later, using instrument air. The licensee found that the "1B" bed was drying out but the "1A" was not. Plans were made to use the "2A" guard bed in conjunction with the "1B" to fulfill the need for two guard beds during a Unit startup. The "2A" would then be removed from service after power operation was established.

A final purge of the "1B" guard bed using 250° F air was being begun at 10:15 p.m., June 12, because conditions indicated that the "1B" bed was still slightly moist. At 5:15 a.m., June 13, the heater for the purge was turned off when the guard bed internal temperature reached 135° F. The purge flow was continued for an additional one-half hour and secured when internal temperatures indicated 120° F.

Unbeknownst to the licensee, temperatures began to increase and the main control room was subsequently notified that the "1B" guard bed temperature was offscale high (greater than 150° F). Initial investigation did not show the external tank wall to be hot. Thus, the licensee believed that the elevated temperatures were the result of residual heat from the recently completed drying purge and expected temperature to decrease once cool air flowed through the bed. The "1B" bed was aligned to the Unit 1 recombiner for an air purge as part of normal recombiner startup. At 11:00 a.m., the tank was monitored locally, and temperatures continued to be elevated with an increasing trend. As a result the "1B" bed was isolated.

Response Activities

The licensee promptly responded to this overheating to limit its effects by:

- Installing a temporary monitor in the radwaste control room to expand the scale for the in-bed temperature elements. A maximum temperature of 372° F was recorded at 12:26 p.m., June 13.

- Contact pyrometer readings of the guard bed were continued. Although a peak temperature of 762° F was recorded, the inbed temperature readings were believed to be more representative of the guard bed temperatures.

- Access to the guard bed room was immediately limited and administratively controlled by Operations.

- Emergency Activation Level Procedures were consulted and the licensee determined that Emergency Plan level entry was not required.

In addition, the licensee began a unit shutdown and cooldown from 2% power at 2:45 p.m., June 13 when the plant's ability to process condenser offgas was hampered. Cold shutdown conditions were entered at 4:38 a.m., June 14. An Event Review Team (ERT) was formed and a methodical review was begun. The inspector responded to the site on June 14 and noted that the review activities were well underway with good initial direction being given. Direct inspection of the guard bed vessel and discussions with involved licensee staff showed initial agreement with ERT team findings.

Event Followup

The licensee's ERT completed their initial review and documented their activities, root causes and corrective actions in a June 17, 1992 report. Their root causes and corrective actions are included as Attachment 3. Licensee Event Report 50-387/92-10-00 also documents the licensee's reporting of this event on a voluntary basis. The licensee concluded it was not reportable since the offgas system is non-safety related and performs no accident mitigation function. The inspector reviewed the licensee's reporting evaluation and noted no inadequacies.

Findings and Conclusions

The inspector directly observed many of the actions of the ERT, interviewed involved personnel, inspected the guard bed and surrounding areas, and reviewed the ERT report. Additional interviews were conducted and documents reviewed to assess the significance of the noted findings. Both strengths and weaknesses were noted.

Listed below were the noted strengths:

- The ERTs formation was timely and their efforts were well directed. The report was issued on June 22, nine days after the event. The use of a detailed timeline and a cause/effect flow chart was a noteworthy practice. The licensee's root cause investigation was thorough and comprehensive.

- During the event review, the interaction between departments was very good. At the site, maintenance, operations and engineering effectively coordinated their activities to assess any potential damage, confirm equipment alignments and performance, and to review operational practices. Corporate engineering support was strong and visible with engineers and managers participating on the ERT.

- Past industry events were reviewed for similarities. Three events were considered: Perry (9/4/88), Grand Gulf (2/27/88), Browns Ferry (7/7/77). No direct similarities were noted. However, the Browns Ferry event did identify spontaneous combustion as a likely cause. This directly supported PP&L's overheating explanation.

- The licensee's root cause investigation of the specific overheating mechanism of the offgas charcoal was very extensive. The licensee concluded that low temperature (125-150 F) oxidation results in a self-sustaining heating that can raise the charcoal temperature to its ignition temperature. This spontaneous combustion mechanism is affected by many factors: moisture, alternate wetting and drying, physical configuration, and heated air purges. Other factors also affect spontaneous combustion likelihood. Attachment 4 provides additional information.

Listed below were the noted weaknesses:

- A past similar guard bed overheating event occurred April 11; 1987. The licensee documented their root causes and corrective actions in a July 30, 1987 report and promulgated it in an August 11, 1987 memorandum. This report documented eight specific recommendations. Recommendations pertaining to limiting purge air temperature and guard bed differential pressure (DP) were implemented. However, additional recommendations pertaining to 1) installing a 150 scfm desiccant air dryer, 2) installing carbon monoxide monitors at the guard bed outlets, 3) installing filters on the guard bed inlets, and 4) replacing existing moisture instrumentation with that of a different design were not fully implemented. The failure to fully address these recommendations in the closeout of SOOR 1-87-108 limited the licensee's ability to detect, limit, or minimize the likelihood of a guard bed overheating. The licensee noted this weakness during their review of the June 13 event and has agreed to fully address them prior to SOOR 1-92-230 closeout.

- The inspector noted that licensee discovered that the drain traps that provide the last line of liquid intrusion protection to the guard beds were installed improperly. The normal entry and exit points were reversed, and thus, the drain trap was installed backwards. In addition, the elevation differences of the entrance and exit piping were not conducive to proper draining even if the drain trap orientation was proper. This configuration existed for all four guard beds and was believed to have been in error since initial construction. This weakness is considered significant because it indicates inadequacy in the preoperational testing program performed on the offgas system and the system walk down performed in response to the 1987 offgas guard bed overheating. The proper functioning of these drain traps may have either precluded this event from happening or limited its severity.

  Because of the long standing nature of this installation error and the failure of the licensee to discover this error in either their preoperational testing program or as a follow up action to their 1987 guard bed overheating, this was viewed as a significant weakness. However, because of significant improvements in the licensee root cause identification program, their prompt correction of the installation errors and their agreement to identify any other system potentially affected, this was a non-cited violation that met the requirements of 10 CFR 2, Appendix C, Section VII.B.

- A caution tag was hung on the OC145 to identify that the common recombiner condensate cooler drain valve (169084) was closed. However, the wording on the tag was confusing because it indicated that opening of the drain valve could cause a loss of Unit 1 main condenser vacuum. This valve (169084) was closed to compensate for seat leakage problems with an upstream automatic valve. It acted as a boundary between the Unit 1 and the common recombiner systems and prevented air intrusion from the vented common recombiner system from overloading the Unit 1 main condenser air ejector's ability to remove non-condensable gasses. However, this path would not exist when the common recombiner system was placed in service since it would no longer be vented. The operator that was starting up the common recombiner system did not recognize this distinction because of the confusing wording on the caution tag. As a result, this valve remained closed and caused the carryover of water droplets to the Unit 1 "B" guard bed. With the drain traps malfunctioning, this resulted in a soaking of the guard bed charcoal. The subsequent drying of the charcoal using the 250 F air from the low pressure purge skid increased the likelihood of self-sustaining charcoal oxidation. This oxidation reaction continued until ignition resulted.

  The licensee acknowledged that the caution tag wording did not accurately portray the need for 169084 valve closure. As a result, the licensee performed a tag-by-tag review of all caution tags in the plant to ensure that no other similar conditions existed. In addition, the licensee has agreed to review maintenance priorities established for systems with existing degradations/deficiencies where caution tags are used as compensatory measures. The inspector had no further questions.

3. RADIOLOGICAL CONTROLS

3.1 Inspection Activities

PP&L's compliance with the radiological protection program was verified on a periodic basis. These inspection activities were conducted in accordance with NRC inspection procedure 71707.

3.2 Inspection Findings

Observations of radiological controls during maintenance activities and plant tours indicated that workers generally obeyed postings and Radiation Work Permit requirements. No significant observations were made.

4. MAINTENANCE/SURVEILLANCE

4.1 Maintenance and Surveillance Inspection Activity

On a sampling basis, the inspector observed and/or reviewed selected 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.

4.2 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. 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.

These observations and/or reviews included:

-- WA 27153, Standby Liquid Control Discharge Pressure Gage Fluctuation Investigation Unit 1, dated June 30, 1992.

-- WA 20739, Residual Heat Removal Service Water Pump "A" (RHRSW) Unit 2 Discharge Check Valve disassembly for inspection, dated July 1, 1992.

-- WA 14909, Calibration Check of Control Room Emergency Outside Air Supply System "B" Train High Temperature Switches, dated 1 July, 1992.

-- SA 22059, Unit 2 Suppression Chamber Hydrogen Recombiner "B" Breaker Preventive Maintenance, dated July 8, 1992.

4.3 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.

These observations and/or reviews included:

-- SO-150-004, Reactor Core Isolation Cooling Quarterly Valve Exercising, dated June 24, 1992.

-- SI-250-215, Reactor Core Isolation Cooling Condensate Storage Tank Low Level Channel Functional Checks, dated June 29, 1992.

-- SO-153-004, Quarterly Standby Liquid Control Flow Verification Unit 1, dated June 30, 1992.

4.4 Inspection Findings

The inspector reviewed the listed maintenance and surveillance activities. This review noted that work was properly released before its commencement; that systems and components were properly tested before being returned to service and that surveillance and maintenance activities were conducted properly by qualified personnel. Where questionable issues arose, the inspector verified that the licensee took the appropriate action before system/component operability was declared. Except as noted below, the inspectors had no further questions on the listed activities.

4.4.1 RHRSW Pump "A" Unit 2 Discharge Check Valve Disassembly/Inspection

The inspector observed portions of RHRSW pump "A" check valve disassembly. Overall, performance of the maintenance activity was good, however, the inspector identified the following deficiencies:

- Step 3 of the work plan required the check valve to be manually stroked to verify free movement and then signed off performance of the step. The step was performed but not signed off.

- Check valve as found position was not recorded in the check valve data sheet as required.

- No official copy of the equipment release form was included with the work package as required by AD-QA-306. However, an unofficial copy of the equipment release form was included in the package.

- Air compressor and valve lapping machine did not have material control tags as required by AD-QA-552.

Overall the weaknesses identified did not affect performance of the valve maintenance. The inspector discussed the identified weaknesses with appropriate maintenance personnel. The licensee committed to reemphasize management expectations relative to planning and performance of maintenance activities.

4.4.2 Calibration Check of Control Room Emergency Outside Air Supply System (CREOASS) High Temperature Switches

On July 1, a calibration check of the control room emergency outside air supply system (CREOASS), high temperature sensors was performed. Overall, the performance of the physical work activity was good. However, an hourly fire watch was not established in a timely manner for an extended period of time (five hours). This licensee identified deficiency was documented in Significant Operating Occurrence Report (SOOR) 1-92-253. The operating service and yard (OS&Y) valve to the fire protection deluge system for the Control Room Emergency Outside Air Supply System (CREOASS) charcoal bed (DS-092) was closed without establishing the required fire watch. The equipment release form (ERF) was released at 5:00 a.m. However, the OS&Y valve was shut at 8:36 a.m. while hanging the required protective permit. When the work group went to perform the work at 1:25 p.m. they noted the required hourly fire watch had not been provided. The control room was notified and the work group immediately provided the fire watch. The fire watch was maintained until the work was completed.

The fire watch appeared to have been missed as a result of "N/A-ing" a required fire protection block of an equipment status form. Specifically, the work group originally submitted the computerized ready equipment release form (RERF) designating the "AD-QA-141 Form No." section as "N/A" and also did not include the required Fire Protection Systems Status Change (AD-QA-141) form. This form should have identified the requirement for the hourly fire watch. The plant scheduling department discovered that the required form was not included in the work package. Once notified, the work group submitted the required form. The inspector determined that the fire protection system for CREOASS was not required by Technical Specifications, and therefore, the delay in establishing the fire watch was considered an administrative oversight.

The licensee SOOR resolution provided the following assessment and corrective action. The fire watch was not required by Technical Specifications, and therefore, no Limiting Conditions for Operations were applicable. Blocking required for the surveillance removed the primary ignition services deenergizing the systems fan and heater. Thus, the likelihood of the fire was minimal. In addition, the RERF's which render OS&Y valves on CREOASS trains inoperable will be annotated to reflect the required fire protection requirements.

The inspector concluded that the actual safety significance of the missed fire watch was low. However, it did indicate a weakness in planning the work activity. The licensee SOOR resolution was adequate. The inspector had no further questions.

5. EMERGENCY PREPAREDNESS

5.1 Inspection Activity

The inspector reviewed licensee event notifications and reporting requirements for events that could have required entry into the emergency plan.

5.2 Inspection Findings

No events were identified that required emergency plan entry. No other significant observations were made.

6. SECURITY

6.1 Inspection Activity

PP&L's implementation of the physical security program was verified on a periodic basis, including the adequacy of staffing, entry control, alarm stations, and physical boundaries. These inspection activities were conducted in accordance with NRC inspection procedure 71707.

6.2 Inspection Findings

The inspector reviewed access and egress controls throughout the period. No significant observations were made.

7. ENGINEERING/TECHNICAL SUPPORT

7.1 Inspection Activity

The inspector periodically reviewed engineering and technical support activities during this inspection period. The on-site Nuclear Systems Engineering (NSE) organization, along with Nuclear Technology (NPE) in Allentown, provided engineering resolution for problems during the inspection period. NSE generally addressed the short term resolution of problems; and scheduled modifications and design changes, by the Nuclear Modifications organization as appropriate, to provide long term problem correction. The inspector verified that problem resolutions were thorough and directed at preventing recurrences. In addition, the inspector reviewed short term actions to ensure that they provided reasonable assurance that safe operation could be maintained.

7.2 Inspection Findings

7.2.1 Thermo-Lag 330 Fire Rated Barrier

On June 24, 1992, the NRC issued NRC Bulletin 92-01, Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Conduits Free From Fire Damage. NRC Information Notice 92-46; Thermo-lag Fire Barrier Material Special Review Team Final Report Findings, Current Fire Endurance Tests, and Ampacity Calculation Errors, was also issued on June 23, 1992. The Information Notice was issued as a result of on-going concerns associated with indeterminate qualifications of Thermo-Lag 330 fire barrier installations.

The Bulletin required:

-- Plants that use either 1- or 3- hour performed thermolag 330 panels to identify those plant areas which use the material for protecting either small diameter conduits or wide cable trays (widths greater than 14 inches) that provide safe shutdown capability.

-- In those plant areas in which Thermo-Lag fire barriers are used to protect wide cable trays, small conduits, or both, the licensee should implement, in accordance with plant procedures, the appropriate compensatory measures, such as fire watches.

-- Provide a written notification stating whether it has or does not have Thermo-Lag 330 fire barriers installed in its facilities. Each licensee who has installed Thermo-Lag 330 fire barriers is required to inform the NRC, in writing, whether it has taken the above actions and is required to describe the measures being taken to ensure or restore fire barrier operability.

On July 1, the licensee, in response to the bulletin determined the locations where Thermo-Lag 330 fire barrier was installed. Compensatory measures were implemented for these locations consisting of hourly fire watches pending full evaluation of the bulletin. On July 9, the licensee declared Thermo-Lag 330 fire barrier installations on 3/4 inch conduits inoperable based on information contained and/or reference in the bulletin. Appropriate Technical Specification Limiting Conditions for Operation (LCO) were entered. The appropriate LCO action statements were met since the hourly fire watches were already established. Further licensee evaluation of the Thermo-Lag 330 fire barrier installations was in progress at the conclusion of the inspection period.

The inspector determined that the licensee's establishment of compensatory fire watches was consistent with suspect installations defined by the bulletin. In addition, the inspector noted that a detailed review of all Thermo-Lag 330 installations initiated by the licensee was appropriate. The licensee is considering additional testing on their site specific installation configurations. The inspector has no further questions at this time.

8. SAFETY ASSESSMENT/QUALITY VERIFICATION

8.1 Open Items

8.1.1 (Closed) Open Items 50-387/88-021-01 , 90-02-01 and 50-387/88-021-01, 90-02-01 Inadequate Circuit Breaker Testing Program

NRC inspection report 50-387/88-021 documented concerns regarding the licensee's failure to implement modifications for attaining an acceptable level of circuit breaker coordination for 480V breakers. Further concerns involved the lack of scheduled maintenance activities on Appendix R circuit breakers at the 480V load center level and below. Additionally, inspection report 50-387/90-02 addressed the concern for inadequate testing of molded case circuit breakers not covered by technical specifications.

In 1987, the licensee performed an analysis addressing circuit breaker coordination. This report, SEA-EE-040, Revision 1, identified necessary changes to be made for proper circuit breaker coordination. The inspectors noted that most of these modifications had been implemented, however, nine breakers had not been changed as required by the analysis. Subsequently, Engineering Work Request (EWR) No. 81474, dated December 6, 1988 was initiated to resolve the changes identified in the report. The inspectors noted that upon completion of the modifications to the nine breakers noted above, overall circuit coordination will be accomplished.

The inspector noted that EWR No. 81474 was completed on November 1, 1989. This EWR documented completion of the changes necessary for proper breaker coordination of the nine 480V circuit changes identified in SEA-EE-040. Circuit changes were dispositioned through Relay Setpoint Change (RSC) Notices as identified in SEA-EE-040.

Concerns were expressed in inspection reports 88-21 and 90-02 regarding the lack of scheduled maintenance for circuit breakers at the 480V load center level and below. Technical specification (TS) circuit breakers and circuit breakers above 480V are fully tested in accordance with maintenance and surveillance procedures. Non-TS circuit breakers and circuit breakers below 480V including molded case circuit breakers undergo preventive maintenance (PM) only. PM tasks include breaker cleaning, inspection, and breaker exercising to verify proper functionality. However, these PM tasks do not verify trip settings or calibrations.

The licensee conducted an extensive review of all testing performed on breakers. Based on this review, the licensee determined that existing surveillance procedures and PMs for many circuit breakers did provide adequate testing, inspection, and overhauls to assure breaker reliability. However, the licensee concluded a new formal program providing enhanced and additional maintenance tasks to encompass all circuit breakers was needed.

The licensee has developed a formal circuit breaker testing program through the use of Preventive Maintenance Improvement Packages (PMIPs). PMIPs and other supporting documents constitute the Preventive Maintenance Improvement Program. This program is one aspect of PP&L's approach to reliability centered maintenance. The focus of reliability centered maintenance is that maintenance of plant components is based on risk assessment. This assessment is a measure of both a component's or system's safety function and ability to function as intended under given conditions for a specific period of time. PMIPs document the basis of plant equipment performance concluded from PM histories, failure histories from both plant specific and industry-wide information, and manufacturer's recommendations. PMIPs provide justification of breaker test methods and maintenance frequencies. At the time of this inspection, all PMIPs were complete and the development of a Maintenance Instruction (MI) was initiated. This MI will be supported by the PMIPs and outline Susquehanna's circuit breaker program in a controlled manner.

The inspector reviewed EWR M81474 and an associated RSC package for one of the nine similar 480V load center breakers previously discussed. The RSC appropriately reflected the necessary change identified in report SEA-EE-040. These changes assure proper circuit coordination. The licensee has developed a formal breaker maintenance program for all breakers from the 480V level down to the 125Vdc and 120 Vac levels. PMIPs were developed to enhance previously existing maintenance and surveillance procedures and establish a new and consistent breaker testing program. The inspector concluded these actions were appropriate and necessary changes previously identified were complete. Therefore, open items 50-387/88-021-01, 90-02-01 and 50-388/88-024-01, 90-02-01 are closed.

8.1.2 (Closed) Deviation 50-387/90-011-01 and 50-388/90-011-01 ARI Time Delay Relay Testing

NRC inspection report 50-387/90-011 documented the licensee's failure to perform a functionality test on time delay relays for the Alternate Rod Injection (ARI) system. (Deviation 50-387(388)/90-011-01). The ARI system uses separate scram air header block and vent valves independent of the reactor protection system to scram the reactor. The logic for this system has two divisions. Each division controls one series vent valve and one parallel block valve. Both divisions must actuate to scram the reactor. Each division of the ARI system utilizes a time delay relay to prevent reset of the logic for twenty five seconds. This delay is designed to ensure completion of the protective action. The FSAR, Section 7.2.3.1.4.3, states that channel calibrations, channel checks, and channel functional tests will be performed periodically during operation to demonstrate ARI reliability. The inspector noted that no periodic surveillance testing had been performed during plant operation.

The licensee stated that although periodic functional tests were not performed, post modification test results performed following initial installation demonstrated operability of the ARI system. Additionally, an ARI logic system functional test was performed eighteen

months after system installation to verify system operability. This test did not specifically verify operability of the time delay relays, however, it did verify operability of the system.

The licensee has changed the monthly ARI manual trip channel functional test procedure for each unit, SO-155-006 and SO-255-006, to include a functional test of the ARI time delay relays. These surveillances are performed on a monthly basis to ensure ARI system operability.

The inspector noted that the licensee's monthly surveillance procedure for the ARI channel functional test did verify the operability of the ARI time delay relays. The inspector concluded that this corrective action ensured that ARI could not be reset for the first twenty five seconds after its initiation. Based on the licensee's corrective actions to verify operability of the relays on a periodic basis, this deviation is closed.

8.2 (Closed) Temporary Instruction Reliable Decay Heat Removal During Outages (TI 2515/113)

The licensee has developed extensive controls and practices to ensure the ability to remove decay heat during outages. PP&L has expended considerable effort in this area and has been recognized for its efforts in the area of shutdown risk. The licensee's nuclear safety assessment group (NSAG), has conducted detailed studies of decay heat removal, operations with potential for draining the reactor vessel and analysis of alternate shutdown cooling. Much of the focus in maintaining decay heat removal capability and ECCS availability is in outage planning and scheduling. The Susquehanna Tactics for Excellence through Accountable Management (TEAM) manual provides the guidelines for schedule development, review and implementation during outages, as well as an extensive list of schedule development rules. The schedule development rules concern ECCS systems, decay heat removal capability and many other key safety issues. All work is scheduled by division to ensure plant safety is not compromised. The licensee also has controls for infrequent activities. These are controlled per NDAP-QA-0020, "Special, Infrequent or Complex Tests/Evolutions". The procedure requires increased management attention, special controls and requirements for any procedure that has been designated a special, infrequent or complex test/evolution.

The outage schedule package provides ECCS/shutdown cooling availability requirements in the schedule. Their scheduling methodology requires that the number of ECCS systems available exceed that required by Technical Specifications by one system. This is known as the N + 1 rule. Thus the actual schedule reflects which ECCS/shutdown cooling systems are available throughout the outage. The schedule is issued in three versions. The draft, preliminary and final version. Each revision undergoes extensive review by station management.

The licensee has developed a procedure to ensure forced circulation decay heat removal is maintained when required. The licensee utilizes general operating procedure, GO-100(200)-010, ECCS/decay heat removal in Condition 4, 5 or defueled, to provide instructions to ensure adequate decay heat removal and emergency core cooling is available. The procedure is performed at all times when in Conditions 4, 5 or defueled. The procedure contains an outage plant status log which includes such information by division as the following:

- Decay heat removal methods both normal and alternate
- ECCS available
- Core circulation methods
- ECCS/decay heat removal support systems which include:
  - -- Offsite AC power sources
  - -- Diesel Generators available
  - -- AC busses
  - -- DC sources
  - -- Emergency Service Water
  - -- Residual Heat Removal Service Water

Also listed are operations with potential for draining the reactor vessel/cavity in progress and ECCS requirements. The outage plant status log is required to be filled out by operations shiftly, when operability status is changed on equipment listed on the outage plant status log, and made changes between Condition 4 and Condition 5.

The licensee has also developed a comprehensive off-normal procedure ON-149-(249)-001 Loss of RHR shutdown cooling. The procedure provides actions to be taken in the event of a loss of shutdown cooling. The procedure sets forth conditions to establish natural circulation and requirements to monitor temperature.

Electrical work is divisionalized for AC and DC power sources. For example, after Division I electrical work is completed, the division is declared operable. Division II work is not begun until Division I is restored to an operable status. This divisionalized approach ensures AC and DC power supplies required for decay heat removal and ECCS are met when less than the full complement of power sources or switchgear is available. This divisionalized approach to scheduling electrical system outages assures plant safety. Additionally, "TEAM" manual rules required that caution be exercised during work planning and performance when

working on one emergency safeguard system (ESS) transformer to ensure the inservice transformer cannot be damaged by falling or moving equipment. The intent of this rule is to ensure off-site power supply risk is minimized while work is being performed on ESS transformer.

The licensee makes use of temporary power for various safety related systems during outages. Outage risks of these applications are minimized by performing safety evaluations and installing them in accordance with approved procedures.

The licensee maintains DC power for diesel generator excitation by transferring 125 volt DC loads to alternate supplies during battery maintenance and testing. This ensures diesel generator operability.

When performing maintenance, systems are considered out of service without the need for the operator to manually control automatic functions. However, off normal procedures for loss of electrical power supplies require operators to confirm automatic functions occur and specify actions to be taken in the event that systems/components do not function automatically.

Operating Procedure (OP-AD-326), Operations with a Potential for Draining the Reactor Vessel Cavity (OPDRV/OPDRC) imposes restrictions on operations with a potential to drain the vessel/cavity. Its purpose is to identify those operations and provide administrative controls for operations with potential for draining the reactor vessel/cavity. The procedure requires all OPDRV/OPDRC to be listed on the outage plant status log in accordance with GO-100-010 ECCS/Decay Heat Removal, in Conditions 4, 5 or defueled, and a PORC approved safety evaluation of the activity. The procedure also requires an attachment to be filled out that ensures ECCS systems, AC electrical and DC electrical power distributions systems required are available as well as secondary containment integrity maintained. Outage management is required to review the outage schedule for compliance with this procedure. Normal outage planning schedules operations with a potential for draining the reactor vessel at a time with the fuel completed offloaded from the core.

The information detailed above represents some of the significant actions and considerations the licensee has taken to ensure reliable decay heat removal capability during plant outages.

This inspection closes TI 2515/113.

9. MANAGEMENT AND EXIT MEETINGS

9.1 Resident Exit and Periodic Meetings

The inspector discussed the findings of this inspection with station management throughout and at the conclusion of the inspection period. 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.

9.2 Inspections Conducted By Region Based Inspectors

Date	Subject	Inspection Report No.	Reporting Inspector
7/6-9	Operator Licensing	92-18	D. Florek
6/22-26	I & C Surveillance	92-17	L. Cheung

ATTACHMENT 1

Abbreviation List

AD - Administrative Procedure
ADS - Automatic Depressurization System
ANSI - American Nuclear Standards Institute
ASME - American Society of Mechanical Engineers
CAC - Containment Atmosphere Control
CFR - Code of Federal Regulations
CIG - Containment Instrument Gas
CRDM - Control Rod Drive Mechanism
CREOASS - Control Room Emergency Outside Air Supply System
DG - Diesel Generator
DX - Direct Expansion
ECCS - Emergency Core Cooling System
EDR - Engineering Discrepancy Report
EP - Emergency Preparedness
EPA - Electrical Protection Assembly
ERT - Event Review Team
ESF - Engineered Safety Features
ESS - Emergency Safeguard System
ESW - Emergency Service Water
EWR - Engineering Work Request
FO - Fuel Oil
FSAR - Final Safety Analysis Report
HVAC - Heating, Ventilation, and Air Conditioning
ILRT - Integrated Leak Rate Test
I&C - Instrumentation and Control
JIO - Justifications for Interim Operation
LCO - Limiting Condition for Operation
LER - Licensee Event Report
LLRT - Local Leak Rate Test
LOCA - Loss of Coolant Accident
LOOP - Loss of Offsite Power
MSIV - Main Steam Isolation Valve
NCR - Non Conformance Report
NDI - Nuclear Department Instruction
NPE - Nuclear Plant Engineering
NPO - Nuclear Plant Operator
NQA - Nuclear Quality Assurance
NRC - Nuclear Regulatory Commission
OI - Open Item
OOS - Out-of-Service
PC - Protective Clothing
PCIS - Primary Containment Isolation System

PMR - Plant Modification Request
PORC - Plant Operations Review Committee
PSID - Pounds Per Square Inch Differential
QA - Quality Assurance
RB - Reactor Building
RCIC - Reactor Core Isolation Cooling
RG - Regulatory Guide
RHR - Residual Heat Removal
RHRSW - Residual Heat Removal Service Water
RPS - Reactor Protection System
RWCU - Reactor Water Cleanup
SGTS - Standby Gas Treatment System
SI - Surveillance Procedure, Instrumentation and Control
SO - Surveillance Procedure, Operations
SOOR - Significant Operating Occurrence Report
SPDS - Safety Parameter Display System
SPING - Sample Particulate, Iodine, and Noble Gas
TS - Technical Specifications
TSC - Technical Support Center
WA - Work Authorization

ATTACHMENT 2

Unit 1 "B" Offgas Guard Bed Charcoal Overheating

Chronology of Events

Date	Time	Description (Inspector assessment in parentheses)
10/01/91	--	Valve 169084 installed per DCP 90-3004 to provide redundant manual isolation of drains from the common offgas recombiner condensate cooler to the Unit 1 main condenser.
05/06/2	--	Valve 169084 closed due to leakage past upstream air operated common recombiner condensate drain valve cooler, HV-16997. Yellow tag hung on 169084 that says "HV 16997 Leaks by, could cause loss of vac. on U1 if unisolated."
06/06/92	0125	Mode switch taken to shutdown to repair leaky steam valves for "A" feedwater pump (unrelated problem).
--	0338	Unit 1 offgas hydrogen (H_2) reading trends offscale high (>5%) control room recorder.
--	0418	Grab sample confirms 6.6% H_2. Began realigning common recombiner in place of Unit 1 recombiner.
--	0510	Common recombiner placed in service. Recombiner inlet and outlet pressures are oscillating. (Pressure oscillations were later attributed to excessive moisture carryover due to a backup of liquid from the condensate cooler. Valve 169084 had not been opened to drain moisture because of confusing wording on the yellow tag (YT 1-92-374)).
--	0600	"A" Offgas Guard Bed placed in service to support common recombiner startup. "B" Guard Bed already in service. (This bed became saturated with water).
--	0830	Unit 1 "B" offgas chiller tripped. (Moisture removal became the sole function of the guard beds. The drain traps on the guard beds were ineffective at removing moisture because they were installed backwards).

Date	Time	Description (Inspector assessment in parentheses)
--	0900	"B" Guard Bed removed from service. The "A" Guard Bed remained in service. (Isolation of the "B" Guard Bed occurred within 30 minutes after the chiller trip. This limited the moisture entrainment by the "B" bed).
--	0945	Valve 169084 found closed and yellow tagged. Motive Steam jet an ejector (SJAE) condenser and recombiner condenser high level alarms received.
--	1000	Valve 169084 opened. Motive SJAE and recombiner condenser valves full open to drain excessive inventory.
--	1445	Unit 1 shutdown initiated from 2% power because of inability to establish normal offgas flow.
--	1518	"A" Guard Bed removed from service.
--	1520	"B" Guard Bed placed in service.
06/07/92	1140	"A" and "B" Guard Beds isolated.
--	1555	"A" Guard Bed purge initiated from installed purge skid using low pressure air heated to 250 degrees F.
--	2230	Purge stopped to repair leaky safety valve (PSV). (Total purge time approx.=6.5 hrs).
06/08/92	0025	Restarted "A" Guard Bed purge. PSV repair complete.
--	0400	Purge stopped to repair loader solenoid. (Total purge time approx.=10.5 hrs).
06/06/92	0037	Purge started after loader solenoid repair.
06/10/92	0815	Purge stopped based on excessive purge time with internal charcoal temperatures plateauing in the 90°F range. (Total purge time approx.=42 hrs)
--	0845	"B" Guard Bed purge started.

Date	Time	Description (Inspector assessment in parentheses)
--	1520	"B" Guard Bed purge stopped to transfer air supply from LP air to instrument air. (Instrument air is dried, and its use was a licensee initiative to accelerate 1B bed drying)
--	1630	"B" Guard Bed purge initiated using instrument air
6/11/92	1125	"B" Guard Bed purge completed with internal temperature = 120 F
--	1516	dP on "A" guard bed >10" of water. dP on "B" guard bed = 3.5" of water (1B was drying out. 1A remained water saturated)
6/12/92	1700	Plan established to purge "A" guard bed until 2400. If not dry, Unit 2 "A" bed to be used in place of Unit 1"A" bed.
--	2215	jBegan a confidence purge of the "B" guard bed since it had been 36 hours since last purge and the bed temps did not reach 150 F per OP-172-001.
6/13/92	0515	"B" guard bed temp = 135 F. Turned off heater.
--	0545	Stopped cooling purge. Temp= 120 F (Internal TI-17183).
--	0700	"1B" guard bed temp > 150 F (TI-17141B) (Believed to be due to residual heat released from the heated air purge).
--	0900	"1B" bed surface temperature was <u>not</u> hot to the touch. Inlet temp = 80 F Adsorber inlet temp = 70 F.
--	1000	Started offgas recombiner purge. Expected guard bed temps to drop because of the cooling effect of process flow.
--	1100	"1B" guard bed bottom surface temperatures were 350 - 400 F. Local surface temperature 406 F.
--	1101	Stopped guard bed purge due to hight temperature.
--	1115	Isolated "1B" guard bed.
--	1135	Contact reading at vessel bottom was >62 F. (This indication was believed to be anomalous)
--	1150	Temporary monitor installed for in-bed temperatures. Current temperature was 366 F.
--	1445	Began shutdown and cooldown due to inability to maintain condenser vacuus. Detailed licensee investigation of overheating begun.

IV. EVENT ANALYSIS

An Event Review Team was formed to analyze this occurrence, identify the causes, and recommend corrective actions.

1. Team Members were:

(Intentionally Blank)

2. The primary analysis technique utilized by the team was Cause and Effect. The results of this analysis are included in Attachment 3.

V. ROOT CAUSES

1. Less than adequate procedural guidance and training for guard bed purge.

   a. Oxidation process not understood and addressed
   b. Criteria for dry bed not clear
   c. Criteria for the need of a purge verses continued bed operation.

2. Less than adequate procedural guidance for change out versus purge drying of wet guard beds.

3. Less than adequate procedural guidance and training for addressing a recombiner that trips on Hi Hydrogen.

4. Operator missed Yellow Tag sticker at 0C145 identifying valve 169084 closed.

5. Less than adequate guidance on Yellow Tag forms 1-92-374 and 1-92-159.

6. HV 16997, and HV 16982 leaked by and had not been repaired.

7. Less than adequate follow up and action from the 1987 1B Guard Bed fire.

VI. CORRECTIVE ACTIONS AND ACTIONS TO PREVENT RECURRENCE

Items for startup:

1a. Develop guidance for operation of offgas guard beds considering (NSE):

- indications of moisture content and hi temp
- criteria for removal of bed from operation
- criteria for purge drying (when?)
- criteria for charcoal changeout.

b. Incorporate guidance into appropriate procedures and training (OPS).

2a. Develop guidance for proper and safe removal of H2 from isolated recombiner including restart (NSE).

b. Incorporate guidance into appropriate procedures and training (OPS).

3. Provide additional clarification to yellow tags 1-92-374 and 1-92-159 (OPS).

4. Repair HV 16997 and HV 16982 (MAINTENANCE).

5. Reorient the drain traps on Unit 1 guard beds (MODIFICATIONS)

6. Replace charcoal in Unit 1 A and B guard beds (MAINTENANCE).

7. Repair moisture indicators (MAINTENANCE).

8. Check proper operation of chiller drains and holdup line drain pots (MAINTENANCE).

9. Investigate for the presence of water in the main charcoal adsorber tanks (MAINTENANCE).

10. Revise GO-100/200-005 and OP-172/272-001 to eliminate removal of primary steam jets from service during shutdown (OPS).

Long Term Items:

11. Analyze samples of charcoal removed from the 1B Guard Bed for the presence of contaminants (NSE).

12. Develop guidance for purge drying of charcoal guardbeds considering this event and technical material related to charcoal ignition (NSE).

b. Incorporate guidance into appropriate procedures.

13. Review all open yellow tags for adequate guidance and control (OPS).

14. Review the final report and SOOR from 1987 and incorporate actions into Actions to Prevent Recurrence for this event (NSE/TECHNOLOGY).

b. Reevaluate system modifications recommended from the 1987 event. Specifically:

- A means to better detect the presence of fire in a guard bed such as wide range temperature detectors, guard bed surface temperature detectors or carbon monoxide monitors.
- Installation of a desiccant air dryer on the offgas purge skid.
- Utilization of nitrogen for purge drying saturated guard beds.
- Installation of filters on the inlet to the guard beds.

15. Evaluate drain trap orientation and operation on all station systems (NSE).

16. Evaluate priority of work items having an open yellow tag (OPS).

17. Reorient the drain traps on Unit 2 guard beds (MAINTENANCE).