U. S. NUCLEAR REGULATORY COMMISSION

REGION I

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Licensee:	PECO Energy Company P. O. Box 195 Wayne, PA 19087-0195	
Facility Name:	Peach Bottom Atomic Power Station Units 2 and 3	
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EXECUTIVE SUMMARY
Peach Bottom Atomic Power Station
Inspection Report 93-31

Plant Operations

PECO conducted activities safely at both units. The control room operators performed well, including good use of procedures, during normal operations and during several challenging events (Sections 2.1-2.4). The challenges included: the severe winter weather, degradation of one offsite power source, and a manual Unit 3 reactor scram following operator identification of degrading conditions in the main generator field excitation system. In one case, the control room supervisor's log did not provide adequate detail to ensure that subsequent shifts were aware that a generator field ground would not cause a turbine trip and subsequent reactor scram, as stated in an approved alarm response card (Section 2.4). Walkdown of the systems designed to provided N_2 to the Unit 3 containment indicated that operators were using the safety related post accident system during normal operation. The normal system was not in use because of system operational problems. The last time the normal system was used was November 1993 (Section 2.5). The residents will review the operation of these systems in a future report.

Maintenance and Surveillance

During routine surveillance testing on the high pressure coolant injection system an oil tubing compression fitting failed causing loss of remote speed control. An unresolved item **(93-31-01)** was opened to track PECO actions in resolution of issues surrounding the lack of guidance when making-up compression fittings on safety related systems.

PECO implemented a good program for maintenance during technical specification limiting condition for operation allowable out-of-service times, as demonstrated during emergency diesel generator and high pressure coolant injection system activities (Section 4.1).

Review of the newly implemented work control system showed that it provided increased flexibility. However, an unresolved item **(93-31-02)** was opened to follow PECO actions to ensure that communications between shift management were consistent and that work was properly reviewed and approved prior to issuance. Further, management needed to ensure that the expectations for individuals authorized to perform work were followed by the plant staff.

Less than adequate non-safety related maintenance activities on Unit 3 generator field components, caused a challenge to the operators and led to a manual reactor scram (Section 4.3).

Engineering and Technical Support

Two new modifications were found to have been properly installed and their operations properly proceduralized (Section 5.1). Two new primary containment H_2/O_2 analyzers were installed at Unit 3. While this modification met the accident design basis for the system the technical specification requirements for H_2/O_2 analyzer equipment operability during normal operation were not clear. The automatic standby gas treatment charcoal bed fire suppression system was removed and replaced with a manual system. This modification limits the possibility of inadvertent water intrusion on the charcoal, which can be damaged by moisture.

The installation of the reference leg back fill system at both units has been effective at preventing diverging reactor vessel water level indications. PECO determined through monitoring of the reference leg condensing chamber temperatures and subsequent testing that this system causes the condensing chambers to become gas bound more quickly. This is not a problem as long as the backfill system is operable. PECO provided the operators with specific guidance on action to be taken, including increased reactor vessel level instrument monitoring, if the backfill system should become inoperable (Section 5.2.2).

Assurance of Quality

PECO management took appropriate actions during severe weather conditions to reduce the risk of an unnecessary unit shutdown, by postponing surveillance testing. PECO also requested and the NRC granted enforcement discretion for allowing a surveillance test on the main steam radiation monitors to be postponed (Section 1.3).

PECO actions to review high pressure coolant injection system DC motor starting requirements and install temporary plant alterations resolved a previous item. While adequate actions were taken to correct deficiencies in the high pressure coolant injection DC motor control circuits it took four system failures, since October 1992, for PECO to correct the problems. This item remains open pending inspector review of the prioritization and suitability of previous PECO actions to address this issue.

PECO had not performed an analysis to determine that a shift manager or a control room supervisor could perform their required post accident activities, while performing the shift technical advisor position. PECO had previously requested a change to the technical specification to allow the dual role shift technical advisor/senior reactor operator (Section 2.6).

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DETAILS

1.0 PLANT ACTIVITY REVIEW (71707)*

1.1 PECO Energy Company Activities

The PECO Energy Company (PECO) conducted normal activities at Peach Bottom Atomic Power Station (PBAPS) Unit 2 (Unit 2) and Unit 3 (Unit 3) safely over the period. Unit 2 operated at 100% power at the beginning of the inspection period. On January 5, the 5A feedwater heater extraction steam isolation valve failed closed requiring operators to manually reduce power to approximately 70% (Section 2.3). PECO performed feedwater system maintenance and a rod pattern exchange, restoring power to 100% on January 11 where the unit operated for the remainder of the period. Unit 3 operated at 100% power for essentially the entire inspection period. On February 3, operators manually scrammed the unit following a main generator field ground alarm and indications of overheating of electrical components in the generator exciter circuit (Section 2.4).

1.2 NRC Activities

The resident and region based inspectors conducted routine and reactive inspection activities concerning operations (Section 2.0), surveillance (Section 3.0), maintenance (Section 4.0), engineering and technical support (Section 5.0), and plant support (Section 6.0). The inspectors conducted these activities during normal and off-normal (backshift) PECO work hours. There was a total of 11 and 4 hours of backshift and deep-backshift inspection hours, respectively.

The following specialist inspections also occurred during the report period:

Date	Subject	Report No.	Inspector
01/3 - 7/94	TRIP Procedures	94-01	Hansell
01/24 - 28/94	Rad Controls	94-02	Eckert

1.3 Response During Severe Winter Storms and Enforcement Discretion

During the inspection period the site was subjected to several severe winter storms including, extreme cold, high winds, and substantial snow and ice accumulation. Both units operated at 100% power through this time. On January 19, the Pennsylvania, New Jersey, and Maryland (PJM) grid load dispatcher informed PECO that the grid was experiencing degraded conditions due to the weather and that a grid voltage drop was likely. The Governor of Pennsylvania declared a State of Emergency on January 20, because of the degraded grid conditions. Due to these conditions, PECO desired to reduce any risk of an unnecessary plant shutdown to prevent

* The inspection procedure from NRC Manual Chapter 2515 that the inspectors used as guidance is parenthetically listed for each report section.

instabilities and possible loss of the grid. PECO determined that they would postpone surveillance testing which would place either unit in a half-scram condition, to reduce the risk of an unplanned scram. PECO reviewed the surveillance test schedule and determined that all half-scram tests but one could be postponed, using the TS allowed ± 25% of the required frequency, to a point where warmer weather was forecasted.

On January 20 PECO requested and the NRC granted enforcement discretion that allowed the postponement of normal half-scram surveillance testing on the Unit 2 B and D main steam line radiation monitors. PECO based their request on the extreme cold weather, high electrical usage, and grid conditions. A large scale grid blackout could have affected the health and safety of the public because of loss of heating and electricity. PECO requested that the surveillance test period be extended to 7:00 p.m. on January 22. The test was originally scheduled for January 21.

NRC Region I with the concurrence of NRC Headquarters granted the discretion in accordance with NRC Inspection manual chapter 9900. PECO subsequently completed the testing at 9:06 a.m. on January 22 and submitted a formal letter documenting the reasons for requesting the discretion on January 24. This letter contained an adequate discussion of the reasons and provided a good technical basis for NRC granting of the discretion. Approval of this discretion was documented in an NRC letter from R. Cooper to PECO dated January 26, 1994.

2.0 PLANT OPERATIONS REVIEW (71707, 70710, 60710, 93702)

The inspectors independently found that operators conducted routine activities and responded to unplanned activities well. The inspectors found that the operating crews used procedures well. Operators responded well to several severe winter storms (Section 2.1). The inspectors observed good operator performance to a loss of a reactor protection motor generator set, loss of main steam tunnel ventilation, and failure of an offsite power transformer tap changer (Section 2.2). Operators successfully limited the effects of a loss of feedwater heating at Unit 2 (Section 2.3). The operating crew responded conservatively and scrammed Unit 3 on February 3, when the main generator field ground alarm annunciated and would not reset, and a plant operator (PO) found the discharge resister across the exciter field overheated (Section 2.4). Operators responded safely to a high pressure coolant injection (HPCI) system surveillance, during which the licensed reactor operator (RO) was unable to control system flow (Section 3.1).

The operations crews made correct determinations of safety system operability and reportability of identified conditions. The entry into and exit from technical specification (TS) limiting conditions for operation (LCOs) were adequately tracked and controlled. The inspectors routinely verified the operability of safety systems required to support given plant conditions at both units. Housekeeping at both units was good.

2.1 Response to Severe Weather

As a result of the degraded grid conditions (see Section 1.3) the control room operators reviewed special event procedure SE-11, "Loss of Off-site Power," as a precaution in the event the grid was lost. They also kept in contact with the load dispatcher to remain aware of grid conditions. The inspectors monitored control room activities and discussed the impact of the storm on plant operations and offsite power reliability with the control room staff. The operations staff remained cognizant of grid voltage drops and monitored the effects on both electrical start-up sources to ensure that the off-site power sources remained operable. The inspectors concluded that the response of the operations shift management, during the storm was good. PECO maintained acceptable staffing levels throughout the storm. PECO's security staff appropriately implemented their contingency plans in response to problems with the intrusion detection systems created by the storm. Some of the security protected area boundary compensatory measures implemented due to the snow accumulation remained in effect for several days.

2.2 Control Room Observations

On January 13 at Unit 3, operators used approved procedures following and in restoration from a loss of the B reactor protection system (RPS) motor generator set power supply. Following the momentary loss of power, as the RPS bus swapped to the alternate power supply, operators followed the procedures for restoring from the half-scram condition and the Group 3 outboard isolation valve closure. Subsequently, operators performed well and followed procedures in restoring RPS power to the motor generator set; again this included proper response to the half-scram and Group 3 outboard isolation valve closure, including secondary containment ventilation and containment atmosphere sampling system (airborne and H_2/O_2 analyzer) valves. The inspector found the procedures well written, providing the operators with adequate guidance and cautions. The inspector also reviewed PECO's position that actuation of the Group 3 outboard isolation valve closure was not an NRC reportable event. The inspector found this an appropriate implementation of 10 CFR 50.72/50.73, on the reportability of in-valid isolation signals.

On January 21 the operating shift performed well and followed procedures in response to a loss of ventilation flow in the Unit 2 main steam tunnel. This included increasing the high steam tunnel ventilation temperature trip setpoint to 250°F, as allowed by TS for up to 30 minutes. The operators performed well in restoration of the ventilation flow and in raising and then restoring to normal the high temperature isolation setpoints. The procedure for conducting this activity was clear and provided good guidance to the operators. The procedure included a step to calibrate the trip units following resetting them to normal. The operators did not perform this surveillance because it would have placed Unit 2 in a half-group 1 (main steam isolation valve) isolation situation during the extreme weather conditions (see Section 1.3). The inspector verified that this calibration was not specified in the technical specification and had no further questions.

On January 28 the operations staff responded very well to the failure of the #2 startup transformer (2SU) output voltage tap changer. This caused a lower than normal voltage on the transformer output and subsequently on the four emergency switchgear busses normally supplied from this source. Shift management declared the 2SU source inoperable. Operators performed the procedure for verification of off-site power alignment, which identified that the voltage on the emergency switchgear was lower than the necessary 4290 volts. This, along with a computer alarm for low voltage, caused the operators to enter a procedure for removing 2SU from service. This necessitated the starting of the four emergency diesel generators (EDGs) to allow switching of the loads without a loss of power to the emergency busses. The inspector observed that the operator performed well during the pre-starting and transferring evolutions at the E-2 EDG. The inspector observed that control room operators preformed well and followed procedures when: parallelling the EDGs with the affected emergency switchgear, opening the 2SU supply breakers, parallelling the EDG with 3SU, and securing the EDGs. Operators then removed 2SU from service for maintenance to correct the tap changer problem.

2.3 Feedwater Heater Isolation - Unit 2

On January 5, the 5A feedwater heater extraction steam isolation valve (AO-8121A) failed closed. This resulted in a minor positive reactivity insertion due to lower feedwater inlet temperature to the reactor vessel. The RO promptly entered General Procedure (GP)-9, "Fast Power Reduction" and reduced power to approximately 70%. During the power reduction, the RO noted that the 2A reactor feedwater pump (RFP) was not responding properly to the power reduction. The RO took manual control of the 2A RFP and noted erratic response. The operator then placed the 2A RFP on the hydraulic jack and observed the feedwater flow drop to zero, at which time, the control room shift supervisor (CRS) directed the RO to trip the 2A RFP. Following the 2A RFP trip, reactor water level dropped to 15 inches which initiated a reactor recirculation pump runback. The RO entered OT-100, "Reactor Low Level" and restored level. The inspector concluded through review of the operating logs and plant response data that the RO responded in a prompt and appropriate manner.

PECO determined that a failed solenoid valve caused the extraction steam isolation valve problem. PECO replaced the solenoid valve and satisfactorily retested the extraction steam isolation valve. PECO performed troubleshooting on the 2A RFP and attributed the control problem to inadequate lubrication between the motor gear unit fulcrum nut and spindle. PECO lubricated this area and inspected the other RFP's for a similar problem. No additional lubrication deficiencies were identified. The inspector reviewed PECO's RFP troubleshooting activities and determined that they were adequate. The inspector was satisfied with PECO's response to this issue.

2.4 Manual Reactor Scram Due to Generator Field Ground - Unit 3

Operators took conservative action to manually scram Unit 3 on February 3 when a PO responding to a generator field ground alarm found the alternator-exciter (Alterex) field discharge resistor glowing red, causing the plastic cable tray above it to melt and possible damage to wiring. Unit 3 was operating at 100% power when the "Unit 3 Generator Field Ground" alarm window annunciated. The control room operators sent a PO to the Alterex Panel (30G006) to investigate the cause for the alarm. The PO found the generator field ground detection relay tripped and the exciter field discharge resistor energized. The control room operators immediately started a fast power reduction, inserting GP-9 control rods and then scrammed the reactor by placing the mode switch to shutdown. All systems responded as expected and the operators completed a normal reactor cooldown. PECO notified the NRC of the event via the Emergency Notification System (ENS). A review of the causes for this event is contained in Section 4.3 below.

The inspector interviewed the control room operators and reviewed their response to the event. The operators anticipated a plant shutdown following the PO's initial report concerning the discharge resistor and initiated the scram in a controlled and professional manner. The inspector determined that the operators actions were appropriate and safely executed.

In review of a previous generator field ground annunciator event the inspector found that the Control Room Supervisor (CRS) log and the appropriate alarm response card (ARC) were inconsistent. On January 28 the generator field ground alarm was received, the ARC for this condition stated that a generator trip and subsequent reactor scram should have occurred. The CRS at the time did not believe that this was true and researched the issue, finding that this was only an alarm condition and that no automatic action should have taken place. The CRS initiated an ARC revision request. The inspectors were concerned that the ARC revision process could have taken up to 2 weeks and that the CRS log did not provide sufficient detail. Specifically, the log did not provide information such that future shifts would understand that ARC 320-B5 was incorrect and that a generator field ground should not cause a generator trip and subsequent reactor scram. The lack of this information caused confusion on the following shift when I&C technicians wanted to troubleshoot the relay and the CRS refused to allow the work because he believed it would cause a generator trip as stated in the ARC. Operations and plant management agreed that this was a weakness and were reviewing the issue.

2.5 Engineered Safety System Walkdown

The inspector walked down the containment atmosphere dilution (CAD) and the containment atmosphere control (CAC) systems at Unit 3. Both of these systems function to allow operators to add nitrogen (N_2) to the containment; CAC during normal operation and CAD following an accident. The inspector found that the systems were both built as per the piping and instrument drawings and that operating procedures were appropriate. While there was no TS requirement to have the CAC system, the updated final safety analysis report stated that it was the normal method of adding N_2 to the containment. However, the inspector found that operators do not use the CAC system during normal operation to maintain drywell pressure and O_2 concentration, because of system operating problems. CAC was used last during containment inerting following completion of the outage in November 1993. At the time of the walkdown the CAC system was out-of-service, with the system inlet manual blocking valve shut and tagged with a special condition tag. The inspector will review the operation of the CAD and CAC systems in a subsequent report.

2.6 Review of Proposed Technical Specification Amendment

PECO has submitted a TS amendment request for both units, which would permit a change in the personnel allowed to fulfill the shift technical advisor (STA) role. Specifically, the change would allow performance of the STA function by either a separate person as is the current practice, or by the senior reactor operator (SRO) licensed CRS, or Shift Manager (SM), without a separate individual. If the CRS or SM performed the STA function, the inspector was concerned that the STA duties would interfere with their accident related duties of directing the emergency operating procedures (EOP) and emergency director (ED), respectively. The current shift staffing consisted of at least three SROs: the SM, the CRS, and the STA. The STA while holding an SRO license is not designated as shift management personnel because he is to provide an overview of accident conditions to shift management.

Upon review of the 10 CFR 50.59 safety evaluation the inspector found that PECO had not reviewed the specific effects of combining the SRO/STA functions. The evaluation only stated that the NRC had recommended the dual role STA/SRO in its 1985 position paper on the subject (Generic Letter 86-04). There was no discussion on how the SM and CRS, either of which could be the STA would perform their ED and EOP responsibilities while fulfilling the STA function. It concerned the inspector that this TS amendment could result in a reduction in control room staffing, that had not been analyzed.

During discussions, the operations manager, the plant manager, and the site vice-president (VP) stated that it was not their intent to staff the control room such that there would be only two SROs, one of whom was the STA. They intend to use three SROs, one of whom is the STA and not the SM or CRS. The inspector discussed with plant management the apparent discrepancy between the TS amendment and current staffing expectations. The site VP committed to resolve this issue. The inspector contacted the NRC project manager and stated that PECO was reviewing the control room staffing issue and the methods of implementing the STA function.

2.7 Mis-positioned Control Rod, Violation 93-15-01 (Closed)

When recovering from a load drop after performing corrective maintenance on June 24, 1993, the control room operators mis-positioned a control rod violating the direction given in GP-5, "Power Operations." The mis-positioned control rod was discovered about two hours later when the process computer aborted a demand for a P-1 print-out due to an asymmetrical rod pattern. PECO implemented appropriate interim corrective actions which included meetings to heighten personnel awareness and a procedure revision to GP-5.

The inspector reviewed the revised GP-5 and interviewed various members of the reactor engineering and operations staff regarding the revision made to the procedure. All staff members interviewed were aware of the new logging requirements necessary prior to any rod movement. A reactor engineer showed the inspector further clarifications for power increases made in procedure RE-31, "Reactor Engineer Startup/Load Drop Instruction." The inspector determined that PECO took adequate corrective action and closed this violation.

2.8 Licensee Event Report Update

The inspectors reviewed the following Licensee Event Reports (LERs), finding them factual and that PECO had identified the root causes, implemented appropriate corrective actions, and made the required notifications.

LER No.	LER Date	LER Title
2-93-16	1-20-94	Unit 2 HPCI Declared Inoperable During Surveillance Testing.
3-93-11	1-7-94	Surveillance Test Not Performed within One-hour Limit.

3.0 SURVEILLANCE TESTING OBSERVATIONS (61726, 71707)

The inspectors observed conduct of surveillance tests to determine if approved procedures were used, test instrumentation was calibrated, qualified personnel performed the tests, and test acceptance criteria were satisfied. The inspectors verified that the surveillance tests had been properly scheduled and approved by shift supervision prior to performance, control room operators were knowledgeable about testing in progress, and redundant systems or components were available for service, as required. The inspectors routinely verified adequate performance of daily surveillance tests including instrument channel checks, and jet pump and control rod operability tests. The inspectors found the licensee's activities to be generally acceptable.

3.1 High Pressure Coolant Injection System Inoperable During Surveillance - Unit 3

On January 24, the Unit 3 HPCI system was declared inoperable after the RO could not control system flow during surveillance testing. The RO placed the HPCI system in service as per ST-0-23-301-3, "HPCI Pump, Valve, Flow, and Unit Cooler Functional and In-Service Test." The HPCI turbine reached rated speed and flow within the required time; however, it would not respond when the RO attempted to reduce system flow with the flow controller in automatic or in manual. The CRS directed the RO to manually trip the HPCI turbine, declared the HPCI system inoperable, and notified the NRC via the ENS.

PECO's investigation identified that a .25-inch hydraulic control line had separated from a Parker-type fitting at the turbine's governor. The control line supplies 300 psig control oil from the governor to the remote servo, which closes the turbine control valve. PECO mechanics repaired the fitting, the system was retested satisfactorily, and the TS LCO was exited.

PECO engineers performed an evaluation of the hydraulic fittings associated with the HPCI control oil system. The system design originally used Parker fittings; but these have been gradually replaced with Swagelok fittings. The major difference between the two being that the Parker fitting flares the end of the tube to create a tight seal, whereas Swagelok uses a ferule nut. PECO engineers determined that repeated removal and uncontrolled torquing during refitting of the Parker fittings caused the wall thickness of the flared end to decrease over time. PECO engineers concluded that the thinned tubing wall and the repeated hydraulic effects during system start resulted in the tubing pulling out of the fitting. The inspector does note, however, that PECO engineers determined that both fittings (Parker and Swagelok) were suitable for application in the control oil system. In addition, PECO found that there was no significant negative trend involving similar-type fitting failures, based upon their review of station history and industry experiences.

PECO performed an inspection of the remaining HPCI control oil fittings for both units and found them properly secured. The Unit 2 control oil tubing was replaced in 1987, using all Swagelok fittings. On the Unit 3 HPCI turbine, however, three Parker fittings still exist. The fitting that pulled apart was the only Parker fitting subject to high oil pressure. The other two fittings are located on the low-pressure return to the oil reservoir. PECO management has initiated a modification to replace the Unit 3 control oil tubing as a long-term corrective action.

The inspector reviewed PECO's immediate response, engineering evaluation, and corrective actions taken for this event. He determined that the licensed operators took safe actions to secure the HPCI system and that the maintenance repair was appropriate. The engineering evaluation was good in that it revealed a possible failure mode involving the repeated removal and improper retorquing of compression fittings (Parker and Swagelok). The long-term corrective action to replace the control oil system on Unit 3 is also appropriate. The inspector determined that the safety significance of this event is low due to the frequency of the occurrence of this type and because it occurred during a surveillance test. The inspector did note, however, that the potential for similar failures exists in other systems. Further, there did not appear to be any specific guidance on how to fit-up compression fittings to ensure that the tubing was secure and undamaged during tightening. Maintenance department management realized the need for increased oversight during maintenance on these components and was reviewing the need for procedural guidance. This item was unresolved pending inspector review of PECO actions to address this issue. **(Unresolved Item 93-31-01)**

3.2 Low Pressure Coolant Injection Swing Bus Transfer Failure - Unit 3

The Unit 3 low pressure coolant injection (LPCI) swing bus failed to transfer to the alternate power source when the normal supply breaker was opened. The control room operators were performing surveillance test (ST)-0-010-405-3, "LPCI System Valves Swing Bus B Functional Test," on January 13 when the failure occurred. The swing bus supplies power to the LPCI B loop injection valve (MO-3-10-025B), and the B recirculation pump discharge valve (MO-3-02-053B), which reposition during an automatic LPCI system initiation. Shift management aborted the ST, declared the B LPCI loop inoperable, and commenced an investigation to determine the cause of the malfunction. The STA found contactor 42-1 in the swing bus transfer logic sticking. PECO I&C technicians mechanically exercised the contactor, after which the ST was performed again satisfactorily.

The technician noted that the contactor made a loud humming noise when it was reenergized. PECO replaced the contactor, reperformed the ST, and declared the LPCI system operable. The inspector determined that the corrective actions taken were appropriate.

3.3 Potentially Missed Surveillance

During the high electrical power usage period (see Section 1.3), PECO determined that it was not advisable to conduct turbine stop and control valve testing, since it would cause half-scram conditions. The surveillances for this requirement were postponed until after the power crisis was over. These STs were within the allowed grace period of ± 25% per TS.

PECO subsequently determined that a Unit 2 bi-weekly surveillance test on the average power range monitor (APRM) output as compared to the calculated thermal power by heat balance had not been completed. This occurred because the test was normally sequenced by the turbine stop and control valve testing to ensure that there was sufficient margin to the reactor scram setpoint before the valve testing. PECO evaluated this issue and determined that the APRM output and thermal power data recorded and reviewed on normal operating logs and by the reactor engineers was sufficient to meet the intent of the APRM output surveillance test. PECO documented this review on Performance enhancement program (PEP) I0001352 and determined that a surveillance requirement was not missed. The inspector reviewed the logs taken by operators and determined that they along with the logs taken by the reactor engineers assured that the APRM gain adjustment factors were appropriately set for the thermal power calculated by the heat balance. The inspector had no further questions.

4.0 MAINTENANCE ACTIVITY OBSERVATIONS (62703)

The inspectors observed portions of ongoing maintenance work to verify proper implementation of maintenance procedures and controls. The inspectors verified that the licensee adequately implemented administrative controls including blocking permits, fire watches, and ignition source and radiological controls. The inspectors reviewed maintenance procedures, action requests (AR), work orders (WO), item handling reports, radiation work permits (RWP), material certifications, and receipt inspections. During observation of maintenance work, the inspectors verified appropriate Quality Verification (QV) involvement, plant conditions, TS LCOs, equipment alignment and turnover, post-maintenance testing, and reportability review. The inspectors found the licensee's activities to be acceptable.

4.1 Limiting Condition for Operation Maintenance

The inspectors reviewed two safety related maintenance activities conducted during TS LCO allowable out-of-service times. The inspectors found that planning, scheduling, and conduct of these activities minimized the time that equipment was out-of-service. PECO plans system outages in accordance with AG-43, "Guideline for the Performance of System Outages." The inspector reviewed this procedure and noted that it provided good precautions, required adequate lead time for planning, and ensured that the proper engineering and maintenance personnel were involved in the planning process. This procedure requires that the plan should have the maintenance completed within 75% of the TS LCO time. The inspector concluded that the LCO maintenance activities were well conducted and that the planning process provided adequate controls.

4.1.1 Emergency Diesel Generator Maintenance

PECO performed a well scheduled and controlled 18-month maintenance outage on the E2 EDG, with both units operating at 100% power, using the TS LCO of 7 days. During the outage, PECO also installed an emergency service water (ESW) flow indication and performed a modification to remove a unnecessary solenoid vent valve in the air start system. Further, as a good practice, the PECO system manager followed up on a 10 CFR Part 21 report from the EDG manufacture on the starting air distributor cam, finding that this EDG did not have the cam that was subject to failure. The inspector reviewed the work package and its closure with the work control supervisor and found the activities properly documented and subsequently re-tested. The inspector did note that PECO had completed the TS required 24-hour EDG run before declaring the EDG inoperable for maintenance. Following the maintenance activities PECO performed the normal one-hour EDG operability test. The inspector questioned why the 24-hour test was not completed following the maintenance as was common industry practice. PECO stated that they wanted to be able to identify and correct any problems detected during the 24-hour run during the maintenance period. PECO was evaluating this practice.

4.1.2 High Pressure Coolant Injection Outage - Unit 2

PECO removed the Unit 2 HPCI system from service to perform a planned three day maintenance outage. The scope of the outage included testing and inspection of electrical and mechanical components. The inspector reviewed the outage activities and concluded that the maintenance planning process and maintenance performance were good. The inspector reviewed the outage plan and concluded that it conformed to the requirements of AG-43.

The inspector observed several of the HPCI maintenance activities and noted that they were generally well performed. PECO identified several minor component deficiencies during the inspection activities. The outage was conducted efficiently, however, an electrical maintenance procedural discrepancy caused a short delay in completing the breaker testing. Nonetheless, the outage was completed within approximately six hours of the planned outage length.

4.2 Work Control Process Review

The inspector reviewed the new work control process implemented at PBAPS on December 27, 1993. This process was designed to reduce the administrative burden on the SRO licensed CRS and to relieve control room overcrowding. Prior to this, the CRS processed all the maintenance and surveillance activities at both units. The work control process allows another SRO, the work coordination supervisor (WCS), to review, prepare for, and process activities in an office adjacent to the control room. On a normal shift there were two or three SROs who rotated in performing the CRS, WCS and Plant Operator Shift Supervisor (PSS) functions. Review of the operations department manual (OM) showed that the SM, the CRS, the WCS, and the PSS were considered shift management.

Review of procedure A-41 "Control of Safety Related Equipment, indicated that any member of shift management could authorize performance of a ST. For maintenance activities A-41, step 6.2.2.1 stated that two members of shift management shall grant permission to release equipment or systems for maintenance, one authorization shall be the duty CRS or SM.

The inspector reviewed a sampling of activities and discussed the new process with shift management personnel and had the following findings:

- The OM section 3.2, "Senior Licensed Operators," simply described the CRS and WCS responsibilities, not how they were expected to be implemented.

- That the WCSs interviewed had good understandings of current plant conditions through shift turnover briefings and turnover status sheets. The verbal communications from the WCS to the CRS were good for the shifts that the inspector observed.

- That several CRSs thought that STs were required to be authorized by the duty CRS or SM, and therefore, they would not have to rely on the WCS to tell them about the ST. The inspector found that, although not required, it was a common practice for the CRS to authorize STs. The inspector reviewed a sample of 57 STs and found that 40 of these had been authorized by the CRS.

- Six clearances (clearance numbers 93007159, 93006422, 93004843, 94000127, 94000255, 9300659) were reviewed and found to have been properly authorized.

- In several instances a CRS authorized work without another shift management authorization, these included; WO No. C0145112 "Relug Wires in 'UV' J Box 125V DC Distribution Panel" and WO No. C0150177 "Recalibrate and Loop Condensate Storage Task Level."

- In several examples, work was authorized by operations engineers, who held SRO licenses but were not members of shift management, these included: WO No. C145764 "Perform Static Votes Test RHR Loop 'A' Full Flow Test Line Block Valve Operator", and WO No. C0142010 "Replace Valve FT-3-10-111A Low Side Instrument Drain Valve".

- The CRSs indicated that the WCSs sometimes had a difference of opinion of what was important to tell the CRS. There have been instances where the WCS did not tell the CRS of released activities. These instances included; operations of the traversing incore probes, pulling fuses in an emergency core cooling system cabinet, work which caused a half scram, pulling intermediate range neutron monitor drawers, and several alternate shutdown panel alarms for entry into the cabinet.

- None of the CRSs had a list of the surveillance activities that the WCS planned to authorize or the maintenance activities planned. However, the CRSs knew the major activities that the WCS planned to process that could affect plant status. Most of the CRSs stated that they relied on the 5-Day Plan schedule. However, all of them indicated that the 5-Day Plan was unreliable because the schedule changes so frequently.

The inspector concluded that the flexibility allowed by the process for work authorization combined with a lack of formal communications between shift management could lead to incompatible surveillance or maintenance activities being conducted simultaneously. Further, although none of these examples discussed above resulted in any problems, the inspectors were concerned with non-shift management personnel authorizing work. This practice could have significant safety implications. The inspectors discussed these instances with operations department management, who shared the concerns over the implementation of the system. The issue of the control of safety related work was considered unresolved pending review of PECO's actions to enhance communications and ensure that the prescribed personnel are properly authorizing work. **(Unresolved Item 93-31-02)**

4.3 Generator Field Ground - Unit 3

PECO's electrical maintenance staff performed troubleshooting activities to determine the cause of the main generator ground, inspected the exciter field breaker, and tested the generator field ground detection relay. PECO identified two equipment problems during the post-scram investigation of the February 3 event. The first problem was that carbon tracking (carbon dust buildup with subsequent current flow) was found on the bus bars that supply current to the main generator field, which could have led to the ground. The second problem involved a small spacer that was missing on the reverse side of the exciter field breaker. The inspector observed these activities and discussed the findings with various members of the PECO engineering and technical staffs.

PECO found that the bus bars associated with the main generator field were coated with carbon dust that had accumulated due to the wear of the field's carbon brushes. The carbon dust caused carbon tracking to occur, creating the ground. The inspector discussed the cleanliness of the bus-work with nuclear maintenance division (NMD) personnel, responsible for generator, maintenance during outages. Many preventive maintenance (PM) activities were performed for the alterex components during the last refueling outage; however, the field bus bars were not cleaned because a PM to clean the bus bars does not exist. Cleaning of alterex components does always occur when the alterex house is disassembled for major maintenance. The NMD personnel agreed that a PM to clean the bus-work should be developed.

The inspector observed I&C troubleshooting activities of the generator ground detection relay. The I&C technicians found that the General Electric (GE) type PJG11F relay was fully functional. After an earlier alarm event of the generator ground detection relay that occurred on January 28 (see Section 2.4), I&C technicians also found that the relay was slightly out of calibration. However, the I&C technicians found that a constant vibration coupled with a low resistance to ground but higher than the trip setpoint, would cause the relay to trip. PECO has determined that a constant vibration did occur at the Alterex Panel and the carbon tracking did cause a low resistance to ground.

PECO's inspections of the exciter field breaker identified that a small spacer that was attached to the reverse side of the breaker was missing. The spacer opens a spring-to-close shorting contact that places a discharge resistor across the exciter field. The contact closes when the breaker is removed from the cabinet shunting any remaining or generated potential when the generator is out of service and rotating on the turning gear. The GE type AKF-2-25 breaker had been replaced with the spare breaker from the warehouse during the recent refueling outage. PECO believes that the spacer may have been removed from the breaker during maintenance. The inspector found in his review of PECO's and the breaker vendor's procedures that the spacer was not addressed, although the contact arrangement was represented on the alterex exciter system elementary diagram (Drawing No. 44D300054, sheet 1). PECO temporarily changed maintenance procedure M-528-001, "Preventive Maintenance of GE Type AKF DC Circuit Breakers" to ensure that the spacer was installed and independently verified. PECO determined that the discharge resistor had been energized since the start-up from the refueling outage.

The inspector agreed with PECO's determination that carbon tracking found on the main generator field bus bars had caused the generator field ground. Also, that the missing spacer on the exciter field breaker had caused the discharge resistor to be energized the entire time the generator was on the line. The inspector determined that the combination of these problems resulted in this event; however, these problems individually would have caused minor challenges to plant operation. The inspector concluded that less than adequate preventive maintenance practices, on these non-safety related systems, contributed to this event. PECO's corrective actions taken were appropriate. The inspector had no further questions.

5.0 ENGINEERING AND TECHNICAL SUPPORT ACTIVITIES (37700)

5.1 Modification Implementation Review

The inspectors reviewed two recent modifications; new H_2/O_2 analyzers at Unit 3 and installation of manual fire suppression capability on the common standby gas treatment system (SBGT) charcoal filter bed. The H_2/O_2 analyzer modification installed two separate instruments to provide the monitoring of the drywell and torus atmosphere. Each of these monitors was designed to allow normal monitoring of the drywell and torus O_2 concentration and post-accident monitoring of drywell H_2 concentration. The inspector found that the system had been installed per the as-built drawings. The inspector reviewed the TS change made to allow this installation. TS Table 3.2.F for surveillance monitoring stated that there are two instruments. The table referenced action statements for instrument indication of H_2 levels, one indication 30 day LCO, no indication 7 day LCO. The inspector found that during normal operation only one of these analyzers was actually drawing a sample from the containment and indicating H_2/O_2 levels, while the other instrument was in standby. Further, during calibration of the analyzers there were no indications in the control room, since one instrument was being calibrated and the other was in standby. The inspector discussed this with the system manager, who stated that the initial intent of the design was to have one instrument in service with the other in standby and that the standby instrument was operable, but not actually sampling.

The inspector reviewed the design intent of a post-accident H_2 monitor and found that a primary containment Group 3 isolation (low reactor vessel water level) would cause the instrument to be isolated from the containment and that operators would have to re-open valves to allow the analyzers to function in the post-accident mode. The TMI action plan item states that the instruments should be able to provide indication within 30 minutes of an accident. The inspector found that the operating procedures should allow this to be done.

Based on this review the inspector found that the design of the system met the intent of the TMI action plan item and technical specifications. However, the inspector found that the action statements as stated in TS Table were not clear as to the needed indications of H_2 and O_2 levels during normal operation. PECO was reviewing this issue and will resolve it before submitting a TS change to allow this modification to be conducted at Unit 2 in the fall of 1994.

The inspector walked down the modification conducted on the SBGT system charcoal filter bed fire suppression system and found that it was properly installed. The inspector also found that operators properly controlled the TS LCO on the SBGT system during installation. This system will prevent the inadvertent initiation of the system, which could lead to an unfiltered release path from SBGT and/or damage to the trains. Review of the operating procedures showed that they were properly implemented.

5.2 Previous Open Items

5.2.1 High Pressure Coolant Injection Motor Starting Relays, Unresolved Item 93-25-02 (Update)

During this period, PECO took actions to correct previous problems with time armature (TA) resistance relays in the HPCI system DC motors. These relays were initially installed in all HPCI DC motor controllers (motor operated valves (MOV) and auxiliary oil pump (AOP)) to limit the starting current surge. Each relay contains several contacts as follows: one or more normally closed (open with relay energized) contacts which insert and remove the armature starting resistances and a physically independent normally open (closed with relay energized) auxiliary contact. This auxiliary contact prevents the motor start relay from energizing if the TA relay is not energized (i.e., if resistances were not in the armature circuit).

Since October 1992 there have been four instances where mis-operation of these TA relay auxiliary contacts affected HPCI operability. Specifically:

- In two instances (October 15, 1992, reactor scram at Unit 3 and a March 2, 1993, reactor scram at Unit 2) HPCI would not have restarted after operators secured HPCI injection following automatic initiation and restoration of vessel level.

- On January 25, 1993, the Unit 3 HPCI was declared inoperable, when the normally open outboard injection valve (MO-20) would not reopen following closure during a surveillance test.

- On November 13, 1993, the Unit 3 HPCI was declared inoperable, when the normally closed injection valve (MO-19) would not open during surveillance testing.

The inspectors reviewed these four instances with respect to safety significance. In the two cases where the systems had injected following reactor scrams, the HPCI systems operated as designed at the time of the scrams. Further, the failures to restart following the system being secured was not safety significant, since operators would not have secured the system if it was necessary. The failure of MO-20 and MO-19 to open, were not significant since they were identified during surveillance testing and since the automatic depressurization system and low pressure cooling systems where operable at the time. Further, for each instance PECO took appropriate actions to correct the individual problems, inspected the other TA relays to ensure that the auxiliary contact would function, and properly reported them to the NRC.

Following the January 25 and March 2, 1993, problems, PECO began a review of HPCI performance issues. The inspectors found that on April 22, 1993, PECO installed a temporary plant alteration (TPA) 3-23-93-10 on the Unit 3 HPCI AOP starting circuit, which bypassed the TA auxiliary contact and allowed tl motor to start with the resistance in the circuit, but without the verification of the TA auxiliary relay.

Following review of the November 1993 MO-19 event the inspectors questioned why TPAs similar to 3-23-93-10 where not appropriate for the other MOVs and AOPs, at either unit. PECO generated engineering work requests to allow engineering review of the TA relay issue. Site engineering then determined that TPA 3-23-93-10 may not have been adequately reviewed with respect to battery loading. Since the TPA removed the TA auxiliary contact verification of the starting resistors the AOP may have started without the resistances in the circuit, thus increasing the initial starting current. On January 14, 1994, PECO removed the TPA from the Unit 3 AOP. The engineering review subsequently showed that Unit 3 HPCI was operable, with respect to battery loading with this TPA installed.

PECO conducted a comprehensive review identifying what motors required starting resistances in their circuits and how the DC loading would be affected. The evaluation concluded that none of the MOVs required starting resistance, since their starting torque was below 150 ft-lbs. For the AOPs, it was determined that the resistances were desirable, for motor protection, but that it was not necessary to have the TA auxiliary contact ensure their use. Thus, the worst case battery loads were based on no starting resistance in the MOVs or AOPs.

Engineering then looked at the most limiting case with respect to the batteries, which ended up being a system start if the normally open outboard injection valve (MO-20) was closed for surveillance testing. In this case with the other normally closed valves needing to open and the AOP starting without its resistances the battery would have been overloaded. PECO implemented actions to ensure that the battery would not be overloaded by ensuring that the HPCI system would not automatically start when MO-20 was shut. This was done by having an operator take the AOP control switch to the pull-to-lock position before MO-20 was shut and having the operator standby to open MO-20 and place the AOP to start if a start condition occurs.

Following this analysis, TPAs were installed which jumpered out the TA relay auxiliary contact on all HPCI MOVs and AOPs, at both units. PECO plans to remove the TA relays from the MOVs in a subsequent modification and to perform a modification to the AOP starting circuits that will install a new starting circuit.

During review of this issue, the inspectors found that PECO previously performed a modification (5125) in 1989, which removed the starting resistances from MO-19, MO-20, and the normally closed steam admission valve (MO-14). This was done because the motor actuators did not develop sufficient thrust and torque to ensure that the valves would come open under worst case DC power distribution and environmental conditions. In these cases, the TA relay was physically left in the breaker enclosures with the auxiliary contacts in the circuit. The modification left the TA relay performing no required function, other than to close its auxiliary contact to energize the motor relay.

The inspectors found that these TPAs were appropriate and should correct the HPCI system reliability concerns with respect to the TA relays. However, the item remains unresolved pending inspector review of the engineering calculations on battery loading and the following issues:

- Adequacy of engineering review of modification to MO-14, MO-19, MO-20, at both units, which removed starting resistances, but left TA auxiliary contacts in the circuit.

- Engineering priority of actions to reduce the TA relay failures between March 1993 and January 1994.

- Adequacy of engineering review and assumptions used in development of TPA 3-23-93-10.

This item remains open.

5.2.2 Reactor Vessel Water Level Indication Divergence - Unit 2; Unresolved Item 92-07-02 (Closed)

This item concerned divergence between reactor vessel water level instrument channels due to non-condensible gas buildup in the condensing chambers and reference leg leakage. PECO installed a reference leg backfill modification (See Inspection Report 93-17) designed to maintain the reference legs full of water and purged of non-condensible gases.

The reference leg backfill system maintains reference leg inventory but does not prevent the buildup of non-condensible gases in the condensing chamber. PECO reviewed condensing chamber temperature data for both units and determined that all reactor level instrument condensing chambers were gas bound. Review of this data showed that backfill system operation lessened the time required for this binding to take place. This is potentially caused by the relatively cool backfill water condensing steam in the reference leg return line, allowing more rapid concentration of non-condensible gases in the condensing chambers. The inspectors observed satisfactory reactor vessel level performance while the condensing chambers were gas bound and concluded that the reference leg backfill modification has been effective.

PECO conducted testing to determine the effects of removing the reference leg backfill system from service and noted that a three inch divergence between the reactor level instrument channel developed within approximately three hours. This was caused by the gas bound condensing chamber not being able to condense enough steam to make up for leakage from the reference leg tubing when the backfill system was secured. PECO issued a required reading bulletin to alert the plant operators to this potential problem and on action to be taken, including increased reactor vessel level instrument monitoring, if the backfill system should become inoperable. Additionally, PECO indicated that enhanced procedural guidance would be developed for operation with the backfill system out of service.

The inspectors concluded that PECO implemented an effective modification to address the concerns identified in this item and have utilized available data to provide good engineering support of plant operations. This item was closed.

5.2.3 Emergency Service Water Design Basis, Unresolved Item 92-32-01 (Closed)

The licensee identified in December 1992, that the breaker for the 'A' ESW pump sluice gate was incorrectly left in the closed position for about two months. This resulted in a concern that the ESW system was in a condition outside that assumed in the licensee's analysis demonstrating compliance with 10 CFR 50, Appendix R. Earlier inspector review concluded that an Appendix R concern did not exist due to fire watches being in place for the Thermo-Lag concerns. The licensee and the NRC inspectors identified several specific weaknesses during follow-up to this event. The licensee initiated an in-house investigation (RE/EIF) to track the implementation of their corrective actions. During the current period, the inspector reviewed the remaining corrective action items.

PECO completed the implementation of their corrective action in January 1994. The inspector concluded that PECO had identified all other administratively controlled Appendix R components and marked them in the control room with a half red and half black dot to signify the valve is open but de-energized. A modification to remove control power, for the sluice gates on both units, from the control room has been initiated and is undergoing review. Further, an operator aid has been placed on the main control room panel and at the breaker compartments for all Appendix R valves to inform the operators that they are Appendix R concerns. Lastly, operators have received training on the significance of these corrective actions and concerns. The inspector determined that PECO took adequate corrective actions for these items and concluded that this item was closed.

5.2.4 Secondary Containment Testing, Unresolved Item 93-24-03 (Update)

The inspectors reviewed PECO's program for maintaining secondary containment (SC) integrity and identified concerns regarding the containment capability testing, and the operation of the access doors in the reactor building airlock, and restoration of breeches that would have rendered the SC inoperable.

The inspector considers that PECO's responses to containment capability testing and reactor building airlock operation issues are adequate. PECO revised their containment capability test procedure to include the reactor building airlock system. PECO then successfully performed the revised test to confirm secondary containment integrity. The inspectors noted that PECO increased management attention towards enforcing proper operation of the reactor building airlock system. Additionally, PECO indicated that it would review the TS requirements regarding the airlock system as part of the TS upgrade project. The inspector was satisfied with PECO's response to this issue and considers the above two issues closed. However the restoration of secondary breeches issue remains open pending further review.

5.2.5 480 VAC Circuit Breakers Operability, Unresolved Item 93-15-03 (Closed)

During an inspection of 480 volt AC breakers in July 1993, a PECO operator noticed that the terminal block hold-down bolts were missing. The NRC was concerned that the breakers were not in an analyzed condition with respect to seismic qualification. PECO initiated an investigation to determine the extent of the problem, the cause, and the long-term corrective actions.

PECO performed an engineering evaluation of the seismic impact on a motor control center (MCC) panel to determine whether or not the induced vibration forces were of sufficient magnitude and capable of separating the two halves of the terminal strip if the hold down bolts were missing. PECO also performed tensile pull-out testing on two terminal strips, of differing vendors, to determine the separating forces at the corporate metallurgy laboratory. PECO compared the results of the laboratory test to the calculation and found that a seismic force four times greater than the calculated force was necessary to cause separation.

PECO determined that all breakers were operable. The electrical group has identified eleven breakers where plastic tie-wraps, presently holding down the terminal strip, need to be replaced with hold down bolts. This is planned to be completed when the parts necessary are received. The inspector reviewed the test report, seismic calculation, and corrective actions and determined that PECO has sufficiently addressed this issue, which is closed.

5.2.6 Emergency Diesel Generator High Fuel Oil Differential Pressure

The inspector found that appropriate actions were taken to identify the cause for a high fuel oil filter differential pressure on the E2 EDG on October 12, 1993 (See Inspection Report 93-24). These actions initially included swapping filter cartridges and analyzing the contents, this disclosed that the filters were not actually clogged. During subsequent EDG surveillance testing an operator noticed similar alarms. Investigation showed that with the EDG operating in its test mode the governor motor operated potentiometer (MOP) had dead spots. Thus, as the control room operator changed EDG speed, the potentiometer would send a null signal to the governor when it hit a dead spot, causing the governor to want to close the fuel racks; then as the dead spot was passed the governor would want to send more fuel flow, causing the high differential pressure. The MOP was subsequently replaced. The inspector found that this corrective maintenance was clearly documented and that subsequent re-testing was appropriate. Further, the inspector reviewed the governor control system and found that the MOP would not have been in the circuit during a EDG start on a loss of power or loss of coolant accident condition. The inspector had no further questions.

6.0 PLANT SUPPORT (71707, 90712)

6.1 Radiological Controls

The inspectors examined work in progress in both units to verify proper implementation of health physics (HP) procedures and controls. The inspectors monitored the ALARA (As Low As Reasonably Achievable) program implementation, dosimetry and badging, protective clothing use, radiation surveys, radiation protection instrument use, handling of potentially contaminated equipment and materials, and compliance with RWP requirements. The inspectors observed that personnel working in the radiologically controlled areas met applicable requirements and were frisking in accordance with HP procedures. During routine tours of the units, the inspectors verified that a sampling of high radiation area doors were locked, as required. All activities monitored by the inspectors were found to be acceptable.

6.1.1 Failure to Implement Health Physics Procedures, Violation 93-15-05 (Closed)

The violation concerned multiple inspector identified examples where the licensee failed to properly implement their HP procedures. Subsequently, PECO identified additional examples where HP procedures were not properly implemented and the NRC issued violation 93-27-01. The potential significance of these instances was similar, therefore 93-15-05 is being closed and the licensee's corrective actions will be reviewed along with 93-27-01.

6.2 Physical Security

The inspectors monitored security activities for compliance with the accepted Security Plan and associated implementing procedures. The inspectors observed security staffing, operation of the Central and Secondary Access Systems, and licensee checks of vehicles, detection and assessment aids, and vital area access to verify proper control. On each shift, the inspectors observed protected area access control and badging procedures. In addition, the inspectors routinely inspected protected and vital area barriers, compensatory measures, and escort procedures. The inspectors found the licensee's activities to be acceptable.

7.0 MANAGEMENT MEETINGS (71707,30702)

The resident inspectors provided a verbal summary of preliminary findings to the station management at the conclusion of the inspection. During the inspection, the inspectors verbally notified PECO management concerning preliminary findings. The inspectors did not provide any written inspection material to the licensee during the inspection. The licensee did not express any disagreement with the inspection findings. This report does not contain proprietary information.