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Facility: Peach Bottom Atomic Power Station Units 2 and 3

Inspection Period: May 18, 1999 through June 28, 1999

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## EXECUTIVE SUMMARY

Peach Bottom Atomic Power Station  
NRC inspection Report 50-277/99-05, 50-278/99-05

This inspection report included aspects of licensee operations; surveillances and maintenance; engineering and technical support; and plant support areas.

### Operations:

- Unplanned engineered safety feature actuations occurred on both units due to the de-energization of the Unit 3 emergency auxiliary transformer during restoration of the 343 startup bus to the normal offsite power supply. The investigation for this event was excellent and provided detailed insights into its causes. The root cause of this event was unclear management expectations for controlling equipment configuration status. The lack of adequate written instructions for equipment status control resulted in a Severity Level IV violation that was treated as a Non-Cited Violation consistent with Appendix C of the NRC Enforcement Policy. (Section O1.2)
- Operators took prompt and effective actions in response to three off-normal conditions during the period: 1) a loss of power to the Unit 3 primary feedwater control computer, 2) a Unit 2 plant monitoring system computer interruption, and 3) a Unit 3 reactor core isolation cooling system high suction pressure alarm. Appropriate follow-up actions were completed or planned by station personnel. (Section O4.1)
- During March through April 1999, Nuclear Quality Assurance (NQA) performed a thorough assessment of Plant Operations Activities. The assessment was comprehensive and provided several insights into current operations performance. The most significant NQA assessment finding was the identification of an adverse trend in the effectiveness of corrective actions to preclude repetition of some deficiencies. (Section O7.1)

### Maintenance:

- During post maintenance testing, Instrumentation and Controls (I&C) technicians identified that they had not properly restored a core spray system flow transmitter to service following maintenance. Overall, the PECO investigation and corrective actions for this event were appropriate and identified that incorrect assumptions were made regarding restoration instructions and some actions stated in the clearance and tagging manual were not performed. (Section M1.2)

- Required station emergency lighting units were tested and inspected according to plant procedures and consistent with Appendix R requirements. Corrective maintenance was performed promptly. Maintenance action requests were not being reviewed for maintenance rule implications due to an action request database error that indicated the lighting units were not within the scope of the rule. This deficiency was entered into the corrective action program and corrected. (Section M2.1)

#### Engineering:

- During the past nine months, PECO engineering personnel have identified several subtle, historical non-conformances to the Peach Bottom Fire Protection Plan during their reviews of the fire protection program. These reviews have been notably comprehensive with appropriate corrective actions taken for deficiencies identified. The non-conformances with the Fire Protection Plan constituted a Severity Level IV violation that was treated as a Non-Cited Violation consistent with Appendix C of the NRC Enforcement Policy. (Section E2.1)

#### Plant Support

- PECO implemented effective programs in the areas of radioactive waste source evaluation, processing and handling, determination of radionuclide scaling factors, waste classification, and volume reduction efforts. PECO developed appropriate scaling factors for hard to detect radionuclides, performed appropriate radionuclide concentration averaging, and implemented waste volume reductions efforts. (Section R1.1)
- PECO implemented an effective radioactive waste and radioactive material packaging and shipping program and successfully shipped irradiated hardware and clean-up filters from its Unit 3 spent fuel storage pool. (Section R1.2)
- PECO thoroughly planned for the personnel diving in the Unit 2 spent fuel pool. The diving evolutions were carefully monitored by health physics personnel. PECO's excellent dose reduction efforts resulted in significantly lower than expected overall dose to the divers. (Section R4.1)



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## Report Details

### Summary of Plant Status

PECO operated both units safely over the period of this report.

Unit 2 began this inspection period at 100% power. On June 4, 1999, Unit 2 load was reduced to about 65% power for main condenser waterbox cleaning and various maintenance activities. Unit 2 was returned to full power on June 6 and remained at 100% for the rest of the period.

Unit 3 began this inspection period at 100% power. On June 11, 1999, Unit 3 load was reduced to about 65% power for scram time testing and other maintenance activities. Unit 3 was returned to full power on June 13. On June 25, 1999, Unit 3 load was reduced to about 85% power for a rod pattern adjustment and was returned to full power on June 26. Unit 3 remained at 100% for the rest of the period.

### I. Operations

#### **O1 Conduct of Operations<sup>1</sup>**

##### **O1.1 General Comments (71707)**

###### Load Drop Observations Unit 2

The inspectors observed operator performance during the Unit 2 load drop activities on June 4 - 6, 1999. Operators demonstrated good use of procedures and awareness of plant conditions. Very good peer checking and self-checking were observed during reactivity manipulations and performance of various system testing. Critical oversight of control room activities by supervision and management was evident when shift supervision identified that communications for some control room evolutions did not always meet expectations. The shift manager held discussions on this issue with the operators involved.

###### Load Drop Observations Unit 3

On June 26, 1999, the inspectors observed control room operators reduce Unit 3 load to 85% in order to perform a rod pattern adjustment. The operators performed reactivity manipulations in a deliberate, well-controlled manner. Procedure usage, peer checking, coordination with reactor engineering, and supervisory oversight were good. The inspectors also observed portions of the power ascension to 100% power and identified no concerns.

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<sup>1</sup> Topical headings such as O1, M8, etc., are used in accordance with the NRC standardized reactor inspection report outline. Individual reports are not expected to address all outline topics.

O1.2 De-energization of the 343 Start-Up (SU) Bus During Restoration and (Closed) Licensee Event Report (LER) 50-277(278)/2-99-004

a. Inspection Scope (71707)

During restoration of the 343 SU electrical bus to the normal offsite power source on May 21, 1999, the bus was inadvertently de-energized due to an open disconnect switch. Loss of this bus caused the automatic transfer of two Unit 2 and two Unit 3 4kV emergency buses to alternate power supplies and multiple engineered safety feature (ESF) actuations. The inspectors reviewed station log entries, operating procedures, and discussed this event with operations personnel and management. The inspectors also reviewed the Performance Enhancement Program (PEP) document and root cause investigation for this event.

b. Observations and Findings

During planned maintenance on the 343 SU bus, debris was observed in the circuit switcher located in the line from the normal 220 kV offsite power source to the 343 SU bus. Following completion of the planned maintenance, the system restoration activities were completed with the exception of the circuit switcher and a disconnect switch in the line, which were left open to allow removal of the debris.

The planned maintenance work clearance was closed but no equipment status tags were hung on the circuit switcher or the disconnect switch because operations personnel assumed that a new switchyard clearance would control their status and restoration during the debris removal. As an interim measure, an administrative clearance was hung to address the circuit switcher position until the new switchyard clearance was issued. The administrative clearance did not address the disconnect switch.

A new switchyard clearance was not prepared and other controls were used during the removal of the debris which did not specifically address the disconnect switch. The operations coordinator, who had written the administrative clearance, thought the disconnect switch would be placed in the normal closed position using a particular station procedure to energize the electrical bus. However, the operations coordinator did not communicate this information to the operations crew that would be restoring the 343 SU bus to normal offsite power. The procedure used by the operations crew to energize the bus was different than that assumed by the operations coordinator and did not contain specific instructions to verify that the disconnect switch was closed.

Just prior to energizing the electrical bus, an equipment operator was sent out to inspect a breaker between the circuit switcher and the disconnect switch. The equipment operator noticed that the disconnect switch was open but he did not report this condition because he believed that the control room was just going to cycle the breaker and not energize the normal offsite power line. He had not been included in the pre-job brief.

The licensee's root cause for this event was unclear management expectations for control of equipment configuration status. Also, lack of documentation of equipment



status changes, poor shift turnover, failure to include the equipment operator in the system restoration pre-job brief, and an ambiguous operations procedure used for restoring the 343 SU source contributed to this event.

The inspectors noted during interviews of operations personnel that expectations for the control of the status of the disconnect switch were unclear. Some operations personnel stated that an equipment status tag should have been placed on the disconnect switch while it was open, while others stated that the disconnect switch position would be controlled by the switchyard clearance or procedures. The inspectors reviewed the procedures that controlled equipment status tags and administrative clearances and noted they were unclear as to exactly how equipment status was to be controlled when equipment is left in an off-normal position following system restoration. Operations management was aggressively implementing changes to clarify expectations for equipment status control.

The inspectors independently concluded that the licensee's root cause analysis was thorough. The inspectors noted that an event and causal factor flowchart was developed and an in-depth root cause analysis was performed. The corrective actions developed from this analysis were comprehensive. The inspectors performed an in-plant review of the LER. No additional concerns were identified.

Peach Bottom Units 2 and 3 Technical Specification 5.4.1 requires that written procedures be established, implemented and maintained for the activities listed in Regulatory Guide 1.33, which includes Equipment Control. Peach Bottom Operations Manual Section OM-C-10.6, "Equipment Status Tags," Revision 3, provided inadequate written instructions for administrative control of equipment out of its normal position following a system restoration. Consequently, operators did not maintain control of the off-normal position of the 3433 disconnect switch during restoration of the 343 SU bus to the normal offsite power supply. This led to the de-energization of the 3 EA transformer and subsequent multiple ESF actuations. This Severity Level IV violation is being treated as a Non-Cited Violation (NCV) consistent with Appendix C of the NRC Enforcement Policy. This violation is in the licensee's corrective action program as PEP I0009864. **(NCV 50-277(278)/99-05-01)**

c. Conclusions

Unplanned engineered safety feature actuations occurred on both units due to the de-energization of the Unit 3 emergency auxiliary transformer during restoration of the 343 startup bus to the normal offsite power supply. The investigation for this event was excellent and provided detailed insights into its causes. The root cause of this event was unclear management expectations for controlling equipment configuration status. The lack of adequate written instructions for equipment status control resulted in a Severity Level IV violation that was treated as a Non-Cited Violation consistent with Appendix C of the NRC Enforcement Policy.

**O4 Operator Knowledge and Performance****O4.1 Operator Response to Off-Normal Conditions****a. Inspection Scope (71707)**

The inspectors assessed operator response to three off-normal conditions. These conditions were: 1) a loss of power to the Unit 3 primary feedwater control computer, and 2) a Unit 2 plant monitoring system (PMS) computer interruption, and 3) a Unit 3 reactor core isolation cooling (RCIC) system high suction pressure alarm. The inspectors also reviewed the planned and completed follow-up actions and discussed them with station personnel.

**b. Observations and Findings**

On May 25, 1999, the Unit 3 reactor operator received a reactor low level alarm and noted that level was trending downward. The operator took prompt actions in accordance with plant procedures to reduce reactor power and to manually control reactor feed pumps until level had stabilized.

Instrumentation and Controls (I&C) and engineering follow-up was thorough. I&C personnel determined that power to the primary feedwater control computer had been lost due to a blown fuse. Further inspection of the fuse by the PECO laboratory revealed that it failed due to a mechanical defect rather than due to a high current or ground condition. Engineering personnel analyzed the automatic swap-over from the primary computer to the backup and initiated actions to enhance the tuning of the feedwater control program and thereby reduce the magnitude of a reactor level transient for this type of event.

On June 10, 1999, operators experienced a temporary loss of the Unit 2 plant monitoring system (PMS) computer. They reduced power slightly to ensure average power limits were not exceeded, since the average power monitoring function of PMS was no longer available. Operations personnel also made an event notification to the NRC per 10 CFR 50.72, because the computer problem resulted in a loss of the safety parameter display system, which is used for emergency assessment.

This event was entered into the corrective action system as Performance Enhancement Program (PEP) 10009936, and information systems personnel planned to perform a full root cause analysis. Preliminary investigation indicated that the computer interruption was caused by a hardware failure. This problem was not related to testing errors that caused a similar computer failure earlier this year.

On June 24, 1999, operators and control room supervisors responded effectively to a Unit 3 RCiC high suction pressure alarm. After the high pressure condition was corrected through use of the alarm response card, shift personnel continued to monitor the RCIC system for abnormal parameters.

Engineering determined that the condition was caused by leakage through the RCIC discharge valve (M0-3-13-21). The inspectors noted that the leakage did not create a high/low pressure interface issue or a challenge to system operability. Repair of the RCIC discharge valve was scheduled for the 3R12 outage in October 1999.

c. Conclusions

Operators took prompt and effective actions in response to three off-normal conditions during the period: 1) a loss of power to the Unit 3 primary feedwater control computer, 2) a Unit 2 plant monitoring system computer interruption, and 3) a Unit 3 reactor core isolation cooling system high suction pressure alarm. Appropriate follow-up actions were completed or planned by station personnel.

**O7 Quality Assurance in Operations**

**O7.1 Nuclear Quality Assurance Assessment of Plant Operation Activities (71707)**

During March through April 1999, Nuclear Quality Assurance performed a thorough assessment of Plant Operations Activities. Performance improvements were noted in the areas of narrative log keeping, communications, annunciator response, and operator rounds especially by equipment operators. NQA identified six Performance Enhancement Program (PEP) issues. The most significant PEP documented an adverse trend in the effectiveness of corrective actions to preclude repetition of deficiencies with the fuse control program, the operator aid program, shift turnover checklists, and the adequacy of operability determinations for penetration seals. The potential for the operations department to identify these issues was diminished since no self assessment was performed in 1998. Plant operations planned to perform a self assessment in 1999.

The inspectors reviewed the assessment and concluded that it was comprehensive and provided several excellent insights into current operations performance.

**II. Maintenance**

**M1 Conduct of Maintenance**

**M1.1 General Comments**

NRC Inspection Procedures 62707 and 61726 were used in the inspection of plant maintenance and surveillance activities. The inspectors observed and reviewed selected portions of the following maintenance and surveillance test activities:

<u>Maintenance Observations:</u>		<u>Observed On:</u>
R0629084	MO-3-14-005D Motor Operator PM	June 2, 1999
R0741329	E1 Emergency Diesel Generator (EDG) PM Inspection	June 7 - 9, 1999



M-003-215	Hydraulic Control Unit (HCU) On-line Maintenance	June 14 - 15, 1999
M-056-001	480 Volt Motor Control Center Circuit Breaker Assembly and Cubicle Terminal Maintenance	June 22, 1999

Surveillance Observations:Observed On:

SI2K-54-E33-XXFM	Functional Test of E33 4kV Undervoltage relays	June 04, 1999
SI2K-54-E43-XXFM	Functional Test of E43 4kV Undervoltage relays	June 04, 1999
ST-I-07G-101-2	Primary Containment Isolation System (PCIS) Group I Logic System Functional Test	June 05, 1999
ST-I-052-251-2	E1 EDG Post-Maintenance Instrumentation and Logic Test	June 11, 1999
SI2K-60F-757-XXCS	Calibration/Functional check of RPS Alternate Feed Relays	June 22, 1999
SI3A-2-MSL-A1FQ	Functional Test Main Steam Line High Flow Instruments of RPS "A" Card File	June 26, 1999
SI3A-2-MSL-C1FQ	Functional Test Main Steam Line High Flow Instruments of RPS "C" Card File	June 26, 1999

The work and testing performed during these activities was professional and thorough. Technicians were experienced and knowledgeable of their assigned tasks. The work and testing procedures were present at the job site and were generally effectively used. Good pre-job briefs were observed prior to the performance of the surveillance activities observed.

#### M1.2 Equipment Status Control Issue Associated with Instrumentation & Controls Work

##### a. Inspection Scope (62707)

The inspectors reviewed an event in which Instrumentation and Controls (I&C) personnel did not return a core spray system flow transmitter to service following maintenance.

The inspectors also reviewed maintenance records and discussed the event with I&C management.

b. Observations and Findings

On June 3, 1999, during post-maintenance testing, operators noted that the 3B core spray system flow indicator was reading zero flow with the pump running. I&C technicians checked the valve lineup and found the flow transmitter had been improperly left isolated following I&C maintenance the previous day.

I&C personnel investigated the event (PEP I0009906) and identified that a number of problems contributed to the improper restoration problems. Specifically, they determined that: 1) technicians incorrectly assumed that a clearance would restore the instrument to service, 2) I&C planners provided incomplete instructions for restoration, and 3) the clearance instructions did not isolate the instrument prior to closing the root valves.

A member of the work control center reviewed the investigation and identified additional problems. He found that non-compliances with the clearance and tagging manual also contributed to this event. Specifically, technicians did not enter required comments in the clearance, and clearance writers did not add appropriate information tags as directed by the manual.

The inspectors noted that this equipment status control event was identified during post-maintenance testing and did not result in any challenge to equipment operability. Thus, the inspectors concluded that the clearance and tagging manual non-compliances constituted minor violations not subject to formal enforcement action.

The inspectors noted that while the overall investigation of the event was adequate, the review by I&C personnel did not reveal some key issues. Corrective actions for this event were adequate and included discussions with I&C and Planning staff. In addition, I&C management planned to include this issue in the station's equipment status control initiative.

c. Conclusions

During post maintenance testing, Instrumentation and Controls (I&C) technicians identified that they had not properly restored a core spray system flow transmitter to service following maintenance. Overall, the PECO investigation and corrective actions for this event were appropriate and identified that incorrect assumptions were made regarding restoration instructions and some actions stated in the clearance and tagging manual were not performed.

**M2 Maintenance and Material Condition of Facilities and Equipment****M2.1 Safe Shutdown Emergency Lighting Review****a. Inspection Scope (62707)**

The inspectors reviewed testing and maintenance for Appendix R battery-powered emergency lighting units.

**b. Observations and Findings**

Instrumentation and Controls (i&C) personnel functionally tested emergency lighting units (ELUs) on an annual basis. The testing procedures check the function of the test button and verify that the emergency lights remain lit for at least eight hours, as required by Appendix R, while maintaining a minimum specified battery voltage. Plant personnel also performed routine inspections of the ELUs on a monthly basis. The inspectors observed a portion of an annual functional test and identified no concerns.

The inspectors reviewed several corrective maintenance action requests (ARs) that were written for deficiencies found during testing in May and June 1999. The inspectors noted that corrective maintenance was performed promptly, consistent with the requirements of the Peach Bottom Fire Protection Program.

The inspectors identified a deficiency in the implementation of the maintenance rule for the ELUs. Specifically, the inspectors noted that while the ELUs were considered to be within the scope of the maintenance rule, ARs were not being reviewed for maintenance rule implications. This occurred because ELUs were assigned an incorrect code in the AR database indicating that they were not in the scope of the maintenance rule. Engineering personnel corrected this condition, documented it in PEP I0009938, and reviewed other systems for generic implications. The inspectors determined that this maintenance rule implementation deficiency constituted a minor violation not subject to formal enforcement action.

**c. Conclusions**

Required station emergency lighting units were tested and inspected according to plant procedures and consistent with Appendix R requirements. Corrective maintenance was performed promptly. Maintenance action requests were not being reviewed for maintenance rule implications due to an action request database error that indicated the lighting units were not within the scope of the rule. This deficiency was entered into the corrective action program and corrected.



## M2.2 On-line Maintenance of the 2B Core Spray System

### a. Inspection Scope (62707)

During post-maintenance testing of the 2B core spray system, the inboard discharge valve failed to close. The inspectors observed the corrective actions to restore valve operation and discussed generic issues of this failure with engineering personnel.

### b. Observations and Findings

During the 2B core spray system maintenance outage, PECO experienced a one-day delay in restoring the system due to the inboard discharge valve failing to stroke closed during post-maintenance testing. Troubleshooting activities by maintenance technicians revealed that a breaker auxiliary contact failed to reposition. During the system maintenance outage, preventive maintenance for the breaker was performed, and the auxiliary contact had initially performed satisfactorily.

Engineering's response to the contact failure was comprehensive and included sending the breaker assembly to a testing laboratory for evaluation. The laboratory results indicated the probable cause of the failure was binding of the double-stack auxiliary contact.

The procedure used for retesting the breaker did not provide clear guidance to account for multiple starts of the motor-operated valve. Consequently, when the valve motor was started multiple times within a short period, the valve motor overheated, which resulted in tripping of the thermal overload relay. Subsequent checks verified no damage to the valve motor. Engineering planned to clarify the procedure to include the limits for stroking of this valve during testing so that the thermal overloads are not challenged.

### c. Conclusions

Maintenance and engineering actions in response to the failure of the 2B core spray system inboard valve to stroke closed were acceptable. However, operations and engineering did not account for the thermal effects of multiple cycles of the discharge valve motor operator during testing, which resulted in the motor tripping on thermal overloads.

### III. Engineering

#### **E2 Engineering Support of Facilities and Equipment**

##### **E2.1 Fire Protection Plan Non-Conformances (Units 2 and 3) and (Closed) EEI 50-277(278)/98-10-03 and LER 50-277(278)/2-99-003**

###### **a. Inspection Scope (37551)**

The inspectors reviewed four issues that were non-conformances with the Peach Bottom Fire Protection Plan. These issues were identified by PECO engineering personnel during a Fire Safe Shutdown (FSSD) review being performed in conjunction with Thermo-lag remediation work. The inspectors also discussed these non-conformances with engineering personnel.

###### **b. Observations and Findings**

###### **Fire Detection Systems Not Installed as Required in Several Unit 2 and 3 Areas**

Between March and October 1998, PECO engineering personnel identified five fire areas, containing cables for safety-related or safe shutdown equipment that did not have automatic fire detection systems as required by 10 CFR 50, Appendix R and the Updated Final Safety Analysis Report (UFSAR). Details of this issue are contained in NRC Inspection Report 50-277(278)/98-10, Section E2.1. The licensee submitted an exemption request to the Appendix R requirements for automatic fire detection in these areas in November 1998.

Engineering personnel determined that the Reactor Protection System (RPS) instrumentation in many of these areas could be totally lost due to a fire. Per the licensee's Fire Protection Plan, any fire affecting the RPS system will not prevent the reactor from being scrammed. The inspectors noted that the operability determination only addressed the loss of RPS cabling and did not address the impact of losing safe shutdown cables that were in these areas. However, many of the rooms in these areas contained automatic fire suppression systems that would alarm in the control room upon actuation. The inspectors determined that fires in any of the areas without any automatic fire suppression would not disable safe shutdown equipment necessary to place the units in hot or cold shutdown.

###### **Failure to Properly Address the Effects of Potential Flooding Caused by Fire-Induced Mis-Operation of High/Low Pressure Interfaces in Low Pressure Emergency Core Cooling Systems (ECCSs)**

On March 18, 1999, PECO engineering concluded that certain fires could result in spurious operation of High/Low pressure interface valves in the residual heat removal (RHR) or core spray (CS) systems. The sustained opening of these valves could result in flooding of the Unit 2 or Unit 3 sump pump rooms through low pressure system(s)

relief valves. Water damage to the instruments in these rooms could result in isolation of the HPCI or RCIC systems which were protected for FSSD.

The licensee determined that this deficiency was caused by inadequate engineering analysis of the FSSD program during High/Low interface over-pressurization reviews in 1986. The licensee also determined that this placed the plant outside the design basis due to the failure to maintain the provisions of the Fire Protection Program for High/Low pressure interfaces.

The licensee immediately established hourly roving fire watch inspections for the identified areas. Temporary plant alterations were subsequently installed on both units to remove power from one of the valves in each of the impacted High/Low pressure interfaces to isolate the water flow paths. The licensee planned to make a permanent physical change to the plant to correct this deficiency. In addition, PECO engineering reviewed four additional High/Low pressure interfaces at Peach Bottom that could be affected by potential flooding due to a fire. No concerns were identified with these interfaces.

The inspectors performed an on-site review of LER 2-99-003 and identified no additional concerns.

#### Lack of Analysis to Assure the Operability of Main Control Room Ventilation During All Appendix R Scenarios

On April 22, 1999, PECO engineering determined that there was no analysis to show that the main control room emergency ventilation (MCREV) supply fans would remain operable during an Appendix R fire. The FSSD analysis took credit for operation of one of the two supply fans during an Appendix R fire. However, subsequent to 1988-1989, the MCREV system was not included in the Appendix R analysis as protected equipment.

Elimination of outside air to the main control room during an Appendix R fire would allow the main control room temperature to exceed 114°F in approximately seven hours unless the operators took action and provided portable ventilation to the control room. At this point in the FSSD scenario, the unit(s) would at least be in hot shutdown and alignments to bring the unit(s) to cold shutdown would be completed. Existing PECO calculations and procedures relied on the operation of one of the main control room ventilation supply fans to keep the control room below 114°F. No procedures existed that directed operations personnel to take actions to alleviate the increasing temperature condition in the control room if the supply fans were inoperable. Also, portable ventilation and fans were not staged for the control room.

The licensee issued a Shift Update Notice to inform operations personnel of this condition and the actions that were necessary if the MCREV supply fans were inoperable during a fire. Portable ventilation and fans were also provided. The licensee planned to make formal procedural revisions to provide additional guidance for the loss of the



supply fans and Action Request A1205843 was generated to provide final disposition for this condition.

Fire-Induced Closure of a Vacuum Breaker Isolation Valve Could Affect HPCI Operability in Certain Appendix R Scenarios

On June 16, 1999, PECO engineering determined that fire-induced damage to a motor control center sub-panel could cause the spurious closure of the Unit 2 HPCI vacuum breaker isolation valve. This may preclude the ability to cycle HPCI on and off remotely during the Appendix R fire scenario that damages this sub-panel. Closure of this valve could cause water from the torus to be drawn into the HPCI turbine exhaust line due to condensation of steam present when the system is cycled off. This may result in water entering the HPCI turbine and/or a waterhammer event upon HPCI re-start. This fire scenario required HPCI for reactor vessel level control in hot shutdown.

Engineering personnel concluded that this condition had the potential to cause a failure of the HPCI system to operate post-fire and constituted a non-compliance with Appendix R separation requirements. The licensee determined that this deficiency was caused by inadequate engineering analysis of the FSSD program during the 1986 review. The licensee also determined that this placed the plant outside the design basis since closure of the vacuum breaker could prevent multiple starts of HPCI as required by this Appendix R scenario.

Operations and engineering personnel determined that the HPCI system remained operable for all other required fire scenarios and design basis plant transients. They noted that this condition does not affect the initial HPCI injection function, but may preclude system restart.

As an immediate corrective action, PECO established hourly roving fire watch inspections for the affected fire area. Engineering personnel were evaluating follow-up actions, including options for a permanent modification to correct this deficiency.

Summary

The inspectors verified that all initial corrective actions for these deficiencies were properly implemented. The inspectors noted that each of these non-conformances resulted from inadequate engineering analysis of Fire Protection Plan issues. The original analyses for these issues occurred at least nine years ago. The inspectors noted that the current reviews of the Fire Protection Plan ensured that appropriate levels of engineering expertise were applied to Appendix R and FSSD reanalyses. The inspectors determined that these reviews provided very good examination of the Peach Bottom Fire Protection Program, including the FSSD.

Peach Bottom Atomic Power Station Units 2 and 3 Facility Operating Licenses (DPR-44 and DPR-56) require that the licensee implement and maintain in effect all provisions of the Fire Protection Plan as described in the UFSAR. Contrary to this requirement, PECO engineers identified four non-conformances to the Fire Protection Plan. These

non-conformances included fire detection systems not being installed, failing to properly address the effects of flooding caused by fire induced mis-operation of High/Low interfaces in low pressure ECCSs, potential inoperability of MCREV supply fans during a fire, and potential inoperability of Unit 2 HPCI due to fire-induced damage affecting power to a vacuum breaker isolation valve. The NRC determined that these non-conformances constituted a Severity Level IV violation of the Units 2 and 3 Facility Operating Licenses. The NRC concluded that these issues were of low risk significance and that station personnel took prompt and effective corrective actions as described above and in NRC Inspection Report 50-277(278)/98-10, Section E2.1. This Severity Level IV violation is being treated as a Non-Cited Violation (NCV) consistent with Appendix C of the NRC Enforcement Policy. This violation is in the licensee's corrective action program as PEPs 10009023, 10009584, 10009737, and 10009946. **(NCV 50-277(278)/99-05-02)**

c. Conclusions

During the past nine months, PECO engineering personnel have identified several subtle, historical non-conformances to the Peach Bottom Fire Protection Plan during their reviews of the fire protection program. These reviews have been notably comprehensive with appropriate corrective actions taken for deficiencies identified. The non-conformances with the Fire Protection Plan constituted a Severity Level IV violation that was treated as a Non-Cited Violation consistent with Appendix C of the NRC Enforcement Policy.

#### IV. Plant Support

### **R1 Radiological Protection and Chemistry (RP&C) Controls**

#### **R1.1 Radioactive Waste Sources and Processing Systems, Radionuclide Scaling Factors, Waste Classification, and Volume Reduction Efforts**

a. Inspection Scope (86750)

The inspectors reviewed and discussed the following matters:

- sources of radioactive waste at the station, current waste generation rates, and volume reduction efforts
- processing (as appropriate) and handling of the waste
- the development of scaling factors for difficult to detect and measure radionuclides
- the classification and packaging of radioactive waste
- processing of non-radioactive/non-contaminated trash shipped for disposal
- implementation of applicable NRC Branch Technical Positions (BTPs) on waste classification, concentration averaging, waste stream determination, and sampling frequency,
- current waste streams and their processing relative to descriptions contained in the UFSAR and the station's approved Process Control Program (PCP)

- reporting of changes to the PCP, and updating of the UFSAR to reflect changes (as appropriate)
- injection of noble metals into the Unit 2 reactor coolant and its impact on the 10 CFR Part 61 waste classification analyses.

The review was against criteria contained in 10 CFR 20, 10 CFR 61, 10 CFR 71, the UFSAR, the PCP, and applicable NRC Branch Technical Positions. The inspector interviewed various waste processing personnel including waste system managers and reviewed applicable documentation. The inspector also met with cognizant chemistry personnel to discuss impact of noble metals addition on reactor coolant radionuclide concentrations.

b. Observations and Findings

There were no significant changes in PECO's waste streams or processing methodology. PECO was processing its waste consistent with information contained within its UFSAR, PCP and applicable procedures. The UFSAR and PCP were updated as appropriate with changes properly reported. PECO performed sampling and analysis of the various waste streams (as appropriate); developed radionuclide scaling factors consistent with NRC Branch Technical Positions; and implemented applicable NRC BTPs on waste classification, concentration averaging, waste stream determination and sampling frequency.

Radioactive waste shipped for disposal was properly classified and packaged consistent with 10 CFR 61.55 and 10 CFR 61.56.

Current waste generation rates and volume reduction efforts were similar to the previous inspection but a slight increase in volume of buried waste was noted due to modification of processing for economic issues.

c. Conclusions

No violations or safety concerns were identified. PECO implemented effective programs in the areas of radioactive waste source evaluation, processing and handling, determination of radionuclide scaling factors, waste classification, and volume reduction efforts. PECO developed appropriate scaling factors for hard to detect radionuclides, performed appropriate radionuclide concentration averaging, and implemented waste volume reduction efforts.

R1.2 Radioactive Material Transportation Activities

a. Inspection Scope (86750)

The inspectors selectively reviewed the following aspects of PECO's radioactive waste and radioactive material packaging and shipping activities;



- radioactive waste shipping records for shipments made since the previous inspection
- implementation of applicable shipping requirements, including completion of waste manifests
- implementation of the Certificates of Compliance for NRC approved shipping casks including limiting package contents consistent with C of C requirements and leak testing of packaging
- use of NRC approved shipping casks
- implementation of recent NRC and DOT shipping rule changes.

The review was against criteria contained in 10 CFR 61, 10 CFR 71, 49 CFR 100-199, disposal facility licenses, and applicable Certificates of Compliance for shipping casks. The inspector performed selected hand calculations to verify waste classification.

The inspectors reviewed shipments of low specific activity (LSA) material, small quantities of material, general radioactive material shipments and shipments of irradiated metals for disposal. The inspectors observed and reviewed surveys performed on an LSA shipment in preparation and verified training and qualification of personnel involved as well as the calibration of survey instruments used to perform the surveys. The inspectors also verified completion of training and qualification of personnel handling, processing, and shipping radioactive materials relative to NRC Bulletin 79-19 and applicable DOT Hazmat training requirements.

b. Observations and Findings

PECO implemented an effective radioactive waste packaging and shipping program. Individuals involved in shipping activities were knowledgeable of applicable requirements and used up-to-date regulations and licenses for verification of compliance. PECO was aware of recent NRC and DOT rule changes and implemented them, as appropriate.

Of particular note was PECO's efforts during the period November 1998 through January 1999 to clean-out its Unit 3 spent fuel pool of irradiated metals. Numerous QA surveillances were performed during the activity to monitor the adequacy of controls and implementation of procedures. PECO implemented good radiological controls for this activity and packaged and shipped approximately 50,000 curies of highly radioactive irradiated metals including clean-up filters. PECO used appropriate shipping casks and implemented shipping requirements. PECO maintained an ongoing written narrative of this activity and held a post-job critique, including a post-job ALARA review, to identify areas for improvement. One individual involved in the waste packaging activities on January 5, 1999, had not attended the required NRC Bulletin 79-19 training before performing work. This matter is discussed in Section R5 of this report.

Packaged radioactive material shipped to offsite vendors for processing or burial were properly packaged and shipped. Survey documentation for the shipments was clear and clearly indicated conformance with applicable requirements. Program procedures required verification of Certificate of Compliance requirements for radioactive waste shipping casks, radioactive waste shipment driver instructions provided for maintenance of exclusive use shipments, and emergency notification information was properly included with advance notifications properly made.

c. Conclusions

No violations or safety concerns were identified. PECO implemented an effective radioactive waste and radioactive material packaging and shipping program and successfully shipped irradiated hardware and clean-up filters from its Unit 3 spent fuel storage pool.

**R2 Status of RP&C Facilities and Equipment**

a. Inspection Scope (86750)

The inspectors viewed accessible portions of the station's radioactive liquid and radioactive solid waste collection, processing, and storage systems/locations (e.g., Radwaste Building, Low Level Waste Storage Facility and storage areas exterior to the station). The inspectors reviewed storage and handling practices, reviewed general condition of facilities and equipment, and interviewed personnel involved with various waste handling and processing activities. The inspectors reviewed control and storage of radioactive material relative to 10 CFR 20.2006, Control and Storage of Radioactive Material, and general storage practices relative to NRC Bulletin 81-38. The inspectors performed selected radiation surveys at packaged radioactive material and waste storage areas.

b. Observations and Findings

The locations toured were generally clean and well maintained. Tanks were periodically inspected, station leaks were aggressively pursued for repair and shielding and decontamination (as appropriate) was performed to minimize ambient radiation dose rates. Storage locations for radioactive materials were properly posted, barricaded, and secured (as appropriate).

PECO collected and processed various liquid waste in drums (e.g., mop water) to preclude unnecessary impact on plant waste processing systems. Liquid and wet wastes were processed using small filter demineralizer units and various drying techniques. The activities were conducted on the 165' elevation of the Radwaste Building and were performed in accordance with procedures. Two drums of debris/dirt were observed to be stored in the area of liquid drummed waste processing. Although properly marked and labeled the drums were not included in PECO's computerized waste tracking programs and had apparently remained in the area for approximately two years unknown to supervisory personnel. The drums and their contents were subsequently incorporated into the tracking programs for review of disposal options. PECO reviews did not identify any additional drums.

PECO established designated waste collection points at various areas of the station for specified waste types, including a new waste collection point (116' Turbine Building) known as the Radwaste Enclosure for collection and sorting of waste. Drums of radioactive material and waste were stored in the area for subsequent processing. A drum of no longer used radioactive sources was observed stored in the area. Although the dose rates were low (less than 10 millirem/hr at the waste storage barricade line), the drum had been in the area for some time under evaluation for disposal options and was

creating elevated dose rates for workers in the area and personnel traversing the area. PECO concurred in this observation and initiated reviews of the matter.

c. Conclusions

No violations or safety concerns were identified. PECO's waste processing, handling, and storage areas were generally clean and well maintained. Waste storage areas were properly posted, barricaded and secured.

**R3 RP&C Procedures and Documentation**

a. Inspection Scope (86750)

The inspectors reviewed and discussed changes in radioactive waste processing, handling, storage, and transportation procedures and programs since the previous inspection in this area (NRC Combined Inspection Nos. 50-277;278/98-08). The inspectors compared as found processes and methods to that described within the PCP and UFSAR.

b. Observations and Findings

There were no significant program changes identified in the area of waste processing, storage, handling, and shipping. PECO updated its UFSAR and PCP to reflect recent organizational changes and areas of responsibility and authority as well as reporting. PECO also updated its procedures to reflect changes in DOT and NRC waste shipping requirements. PECO was processing, handling, and storing radioactive waste consistent with UFSAR and PCP descriptions.

c. Conclusions

No violations or safety concerns were identified. PECO maintained its radioactive waste processing, handling, storage and transportation program descriptions current. As-found processes, practices, and methodology were consistent with program descriptions and updated as appropriate.

**R4 Staff Knowledge and Performance in RP&C**

**R4.1 Personnel Diving in Unit 2 Spent Fuel Pool**

a. Inspection Scope (71750)

The inspectors reviewed PECO's preparations and observed personnel diving in the Unit 2 spent fuel storage pool. Personnel were required to dive in the pool to modify structural braces in the cask storage area to facilitate placement of the TN-68 dry cask. The inspectors also discussed the diving evolutions with cognizant licensee personnel and reviewed applicable documentation.



b. Observations and Findings

PECO thoroughly planned and prepared for the diving in the Unit 2 spent fuel pool. PECO used a dedicated day shift work crew, vacuum-cleaned the dive area, used high resolution cameras for monitoring the activity, implemented live-time monitoring of the diver, and implemented High Radiation Controls consistent with guidance contained in NRC Regulatory Guide 8.38, Appendix A (e.g., use of physical barriers and limit length of diver tethers). PECO also collected and reviewed all applicable NRC Information Notices associated with diving activities or applicable unplanned exposure potentials. Of particular note was the efficient coordination of activities due to PECO's inter-departmental planning efforts. PECO used a special procedure and developed action, communication, and job-abort matrices.

The inspectors observed close monitoring of the diver both visually and through live-time electronic dosimetry. Detailed surveys were performed of the dive area following a thorough clean-out and frequently throughout the approximately week-long effort. The inspectors noted that PECO's excellent dose reduction efforts resulted in significantly lower than expected overall dose to the divers.

c. Conclusions

PECO performed thorough planning for personnel diving in the Unit 2 spent fuel pool. The diving evolutions were carefully monitored by health physics personnel. PECO's excellent dose reduction efforts resulted in significantly lower than expected overall dose to the divers.

**R5 Staff Training and Qualification in RP&C**

a. Inspection Scope (86750)

The inspectors reviewed initial and continuing training provided personnel involved in radioactive waste generating, processing, and handling activities. This included personnel who receive, handle, generate, process, or ship radioactive materials. The inspectors also reviewed the training of personnel handling mixed waste. The review was against criteria contained in NRC Bulletin 79-19, Packaging of Low Level Radioactive Waste for Transport and Burial and 49 CFR 172, Subpart H training. The inspectors reviewed training records, lesson plans and discussed training with cognizant PECO personnel. Specific aspects reviewed included identification and testing of hazmat employees covered under 49 CFR 172.702(a), requalification training, and documentation of training completion. The inspectors discussed waste processing and shipping activities with cognizant personnel and evaluated personnel knowledge and areas of responsibility.

The evaluation of licensee performance was based on review of training materials, discussions with personnel and review of applicable records.

b. Observations and Findings

PECO continued to provide annual training to personnel in accordance with NRC Bulletin 79-19 guidance. The training specified in 49 CFR 172, Subpart H was also provided to these individuals and records of training were maintained. Personnel involved with radioactive waste activities were interviewed and were knowledgeable of procedure requirements applicable to their assigned areas of responsibility.

During a previous inspection (50-277;278/98-08), a worker performing cask loading operations as a crane operator was identified that had not attended PECO's a-priori specified NRC Bulletin 79-19 training. PECO placed this matter in its corrective action program and took actions to identify all workers needing specific NRC Bulletin 79-19 training and included the training expectations in affected groups' training matrices.

On January 5, 1999, a worker from the maintenance group assisted in packaging a cask of irradiated metals for disposal. The worker performed double verification of the torque value of radioactive waste shipping cask head bolts. The worker had not received the NRC Bulletin 79-19 training listed in his training matrix. PECO had provided this individual the 49 CFR 172, Subpart H hazmat training and the individual was under direct oversight by personnel who had received the training. PECO was reviewing the effectiveness of its corrective actions at the time of the pool cleanout. This matter had minor safety significance. However, the failure to ensure that the worker had received proper training prior to performing work associated with packaging and shipping radioactive material is a minor violation of procedure AC-CG-26.4, Revision 7, which requires that supervisors assure that assigned work is performed by trained and qualified staff. Technical Specification 5.4.1 requires establishment and implementation of procedures. PECO included this matter into its corrective action process with other items for improvement identified during its corrective action effectiveness review (PEP No. I0009892, dated May 28, 1999). This minor violation is not subject to formal enforcement action.

c. Conclusions

Personnel involved in waste activities received training as specified in NRC Bulletin 79-19 and 49 CFR 172, Subpart H and exhibited good knowledge of procedure requirements. A minor violation associated with one individual involved in waste packaging activities, who had not received applicable training, was identified and included in PECO's corrective action system.

**R6 RP&C Organization and Administration**

a. Inspection Scope (86750)

The inspectors reviewed the current radioactive waste processing organization, its staffing and its responsibilities and authorities against criteria contained in UFSAR Chapter 13, and applicable PECO procedures. The inspectors evaluated PECO's performance in this area by discussion with cognizant personnel and review of documents.

b. Observations and Findings

PECO reorganized its chemistry and radioactive waste groups to combine these organizations and also incorporated non-radioactive waste handling and monitoring activities into the organization. PECO created and staffed the position of Chemistry/Radwaste Manager. The individual assigned to this position did not fully meet the qualifications of Chemistry Manager. PECO established a transition plan for this individual in accordance with administrative procedures and designated a fully qualified individual to act as Chemistry Manager. PECO performed a 10 CFR 50.59 evaluation to change the organization and updated applicable procedures and the UFSAR.

c. Conclusions

No violations or safety concerns were noted. PECO updated its administrative documents to reflect recent organization changes in its chemistry/radwaste organization. PECO also implemented its administrative controls to designate an acting Chemistry Manager pending full qualification of the Chemistry/Radwaste Manager.

**R7 Quality Assurance in RP&C Activities**

Inspection Scope (86750)

The inspectors reviewed audits, assessments, and surveillances of the radioactive waste handling, processing, storage, and transportation programs as well as audits of the Process Control Program. The inspectors also reviewed audits of the training and qualification of personnel involved in radwaste processing, handling, storage and shipping activities. Further, the inspectors reviewed audits of the adequacy and effectiveness of the corrective action program in the area of radwaste processing, handling, storage, and transportation activities.

The inspectors reviewed selected completed audit checklists and final audit results. The review was against criteria contained in UFSAR Appendix D, Quality Assurance Program, and applicable station audit and surveillance procedures.

b. Observations and Findings

PECO performed audits consist with guidance contained in UFSAR, Appendix D. The audit scope was reviewed and commented on by Nuclear Review Board members who were determined to have expertise in the area audited. Technical specialists were used to perform audits and surveillances. The audit activities were performance based and areas for improvement and correction were entered into PECO's corrective action programs. PECO performed self-assessments of radioactive waste shipments. PECO also provided documented audits of the training and qualification of personnel performing radioactive waste processing, handling, or shipping activities.

Assessment LAR 99-001, conducted early 1999, evaluated health physics, chemistry, radiochemistry and radwaste personnel training. The results of the assessment were combined with other station training audits. Although the completed audit checklist contained areas for improvement, the audit summary did not provided a clear and



comprehensive summary of the areas for improvement. The areas for improvement associated with personnel involved in radwaste activities were, however, included in a management performance enhancement program (MPEP) report as part of a corrective action review process.

A Quality Assurance (QA) surveillance of liquid effluent sampling (PSR 98-120, dated August 12, 1998), identified a concern in the technique for compositing samples for offsite radionuclide analysis. A liquid sample was not shaken and sediment was observed to have settled in the composite sample possibly resulting in underestimating the insoluble radioactivity released. This matter was isolated to one technician who independently composited liquid samples during the period March - July 1998. This matter had minor safety significance in that tank activities were low, affected chemistry technicians were re-instructed, and a procedure revision was made to ensure proper sample mixing. At the time of the inspection, PECO had not reevaluated previous releases for potential error attributable to the sampling practice associated with the one technician. PECO subsequently completed the review and concluded that liquid releases were well within limits; there was no potential for significant release of unquantified radioactivity and that given the low concentration of radioactivity in liquid releases, the likelihood of exceeding liquid release limits was negligible in that tanks sampled by the technician exhibited trace radioactivity. This was identified and properly evaluated by the licensee and appropriate remedial actions were taken. The NRC concluded that no violation of regulatory requirements resulted.

c. Conclusions

PECO audits of radwaste activities were consistent with UFSAR requirements and were generally performance based. Corrective actions were incorporated into PECO's corrective action system.

## V. Management Meetings

### **X1 Exit Meeting Summary**

The inspectors presented the results of the inspection to members of licensee management on July 7, 1999. The licensee acknowledged the findings presented. No proprietary information was identified by PECO.

### **X2 Review of Year 2000 Readiness of Computer Systems**

The staff conducted a review of Y2K activities and documentation using Temporary Instruction (TI) 2515/141, "Review of Year 2000 (Y2K) Readiness of Computer Systems at Nuclear Power Plants." The review addressed aspects of Y2K management planning, documentation, implementation planning, initial assessment, detailed assessment, remediation activities, Y2K testing and validation, notification activities, and contingency planning. The reviewers used NEI/NUSMG 97-07, "Nuclear Utility Year 2000 Readiness," and NEI/NUSMG 98-07, "Nuclear Utility Year 2000 Readiness Contingency Planning," as the basis for this review. The results of this review will be combined with the results of other reviews in a summary report to be issued by July 31, 1999.

## INSPECTION PROCEDURES USED

IP 37551	Onsite Engineering Observations
IP 61726	Surveillance Observations
IP 62707	Maintenance Observations
IP 71707	Plant Operation
IP 71750	Plant Support Activities
IP 86750	Solid Radioactive Waste Management and Transportation of Radioactive Waste

## ITEMS OPENED AND CLOSED

Opened/Closed

50-277(278)/99-05-01	NCV	Inadvertent Loss of the 3 Emergency Auxiliary (EA) Transformer During 343 Start-Up (SU) Bus Restoration
50-277(278)/99-05-02	NCV	Fire Protection and Fire Safe Shutdown Plan Non-Conformances (Units 2 and 3)

Closed

50-277(278)/2-99-003	LER	Failure to Maintain the Provisions of the Fire Protection Program to Properly Address the Effects of Flooding Caused by Fire Induced Mis-Operation of High/Low Pressure Interfaces in Low Pressure Emergency Core Cooling Systems
50-277(278)/2-99-004	LER	Multiple Unplanned Engineered Safety Feature (ESF) Actuations During A Planned Electrical Bus Restoration Following Maintenance Activities
50-277(278)/98-10-03	EEI	Fire Detection System Non-Conformances (Units 2 and 3)

## LIST OF ACRONYMS USED

AR	action request
ARC	alarm response card
ALARA	as low as is reasonably achievable
BTP	branch technical position
CFR	code of federal regulations
CS	core spray
DOT	Department of Transportation
EA	emergency auxiliary
ECCS	emergency core cooling system
EDG	emergency diesel generator
EEI	escalated enforcement issue
ELU	emergency lighting unit
ESF	engineered safety feature
FSSD	fire safe shutdown
HAZMAT	hazardous materials
HCU	hydraulic control unit
HPCI	high pressure coolant injection
I&C	instrumentation and controls
LER	licensee event report
LSA	low specific activity
MCREV	main control room emergency ventilation
MPEP	management performance enhancement program
NCV	non-cited violation
NRC	Nuclear Regulatory Commission
NQA	nuclear quality assurance
ODCM	offsite dose calculation manual
PBAPS	Peach Bottom Atomic Power Station
PCIS	primary containment isolation system
PCP	process control program
PDR	public document room
PECO	PECO Nuclear
PEP	performance enhancement program
PMS	plant monitoring system
QA	quality assurance
RADWASTE	radioactive waste
RCIC	reactor core isolation cooling
RHR	residual heat removal
RP&C	radiological protection and chemistry
RPS	reactor protection system
SO	system operating
SU	start-up
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeter
TS	technical specifications
UFSAR	updated final safety analysis report
VIO	violation
Y2K	Year 2000