U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket/Report No.		50-277/95-26
License Nos.	DPR-44	
	DPR-56	50-278/95-26

Licensee: PECO Energy Company
P. O. Box 195
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Facility Name: Peach Bottom Atomic Power Station Units 2 and 3

Dates: October 15, 1995 - November 25, 1995

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EXECUTIVE SUMMARY
Peach Bottom Atomic Power Station
Integrated Inspection Report 95-26

Summary of Inspection Activities:

This report contains only resident inspector input, there were no other inspections during the period.

Overall Assurance of Quality:

Overall, PECO conducted activities at both units well. This included restart of Unit 3 from the refueling outage.

However, as discussed below the adequacy of modification and post-modification testing acceptance criteria continue to be a concern and were the subject of a violation.

Plant Operations:

Operators continued to respond to transients and equipment problems well. This included response to a partial loss of offsite power (Section 2.1), power operation with one feedwater heater train out of service (Section 2.2), and a loss of an operating circulating water pump (Section 2.6). Operators conducted Unit 3 restart activities well following the 1995 refueling outage. PECO management and staff responded well to numerous slow control rod scram time tests during Unit 3 restart activities (Section 2.5).

An unresolved item was opened to track PECO's corrective actions involving problems with the technical requirement manual fire impairment logging (Section 2.7) (Unresolved Item 95-26-01)

Operator involvement in a violation of technical specification for the drywell leakage monitor resulted from failure to adequately review and assess a change in calculated drywell leakage from a nominal 1.5 gpm to zero gpm following installation of a modification to the drywell drain pump control circuits. (Section 4.1)

Maintenance and Surveillance:

The maintenance department responded well in correcting an identified leak in the Unit 3 reactor water cleanup system (Section 3.1) and during performance of a high pressure coolant injection logic system functional test (Section 3.4). The inspector determined, based on a review of a PECO finding, that the operators, engineers, and shift management needed to pay more attention to acceptance criteria. Specifically, a reactor water cleanup valve had been stroked time tested and the results document as longer than the specified acceptance criteria. This was not identified until subsequent management review. (Section 3.3)

Engineering and Technical Support:

A violation was issued following identification of a poorly prepared modification to the drywell drain tank pump control instrumentation. This modification caused the Unit 3 drywell leakage indication to be inoperable for longer than allowed by technical specification. Specifically, engineering did not complete an adequate change review, which allowed the installation of components that did not function as designed. Also the post-modification testing did not identify the design deficiency. (Violation 95-26-02)

Plant Support:

Plant material condition appeared to be good. No issues were identified in the areas of radiation protection, security, or emergency planning. The inspector attended advance rad worker training and found that it provided the classroom based knowledge necessary for implementation of that program. It was noted that on the job training was still needed to allow implementation of these skills by a plant worker.

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DETAILS

1.0 PLANT ACTIVITIES REVIEW

1.1 PECO Energy Company Activities

The PECO Energy Company (PECO) safely operated Peach Bottom Atomic Power Station (PBAPS) Unit 2 (Unit 2) and Unit 3 (Unit 3) over the period.

Unit 2 began the inspection period operating at 100% power. Operators reduced reactor power to about 90% on October 22, in response to a loss of feedwater heating caused by a partial loss of offsite power. This loss resulted from an electrical grid 220 kV power line failure (Section 2.1). During the recovery from this event, PECO discovered that an existing '5B' feedwater heater (FWH) leak had degraded. PECO returned reactor power to 100% until October 26, when PECO reduced reactor power to 68% to isolate the 'B' FWH train and then limited Unit 2 power operations to 95% power (Section 2.2). On November 4, PECO declared the 'C' safety relief valve inoperable because of a leaking bellows (Section 2.3). On November 7, PECO returned the unit to 100% power after completing a safety evaluation allowing full power operation with one FWH train isolated (Section 2.2). Full power operations continued until November 20, when PECO reduced power to 95% to minimize vibration of the 2A reactor feed pump (RFP). The unit remained at this power until the end of the inspection period.

PECO completed the tenth Unit 3 refueling outage at the beginning of the inspection period. Operators placed the mode switch to startup and the reactor achieved criticality on October 15. Operators synchronized the unit to the grid on October 17 (Section 2.4). While performing scram time testing during the power ascension, PECO entered a 24 hour shutdown technical specification (TS) limiting condition of operation (LCO) on October 18, after discovering slow control rods in a two-by-two array (Section 2.5). PECO repaired the control rods and exited the LCO. After reaching 100% power on October 22, operators reduced power to about 84% in response to the loss of the 220 kV grid power line event (Section 2.1). Full power operation continued until November 10, when PECO discovered, during a load drop for a control rod pattern adjustment, a reactor water clean-up (RWCU) regenerative heat exchanger leak on a four-inch pipe (Section 3.1). PECO removed the RWCU system from service, repaired the leak, returned the unit to 100% power, and operated at this power for the remainder of the period.

1.2 NRC Activities

The resident inspectors conducted routine and reactive inspection activities in several areas including: operations (Section 2.0); surveillance and maintenance (Section 3.0); engineering and technical support (Section 4.0); and plant support (Section 5.0). There were no Regional or Headquarters inspections over this period.

2.0 PLANT OPERATIONS REVIEW (71707, 92901, 93702)

The inspectors observed that operators conducted routine Unit 2 activities well, including operator response to the loss of the grid 220 kV power line (Section 2.1), plant operation with one FWH train isolated (Section 2.2), and identification of the leaking 'C' safety relief valve bellows (Section 2.3). To minimize excessive vibrations on the 2A RFP, PECO limited power operations to 95% on November 20. PECO was unable to identify the cause for the vibration and intends to address the problem during an upcoming planned outage.

The Unit 3 control room operators performed well during the reactor startup following the tenth refueling outage (Section 2.4). The inspectors noted good operator response during the loss of the grid 220 kV power line (Section 2.1), during the unexpected loss of the '3A' circulating pump (Section 2.6), and following identification of the RWCU leak (Section 3.1).

Operator involvement in post-modification testing and monitoring of the newly installed drywell drain sump pump control instrumentation was weak. This lead to a prolonged time where drywell leakage was not being monitored as required by technical specifications. (Section 4.1)

The operations crews made correct determinations of safety system operability and reportability of identified conditions. The crews adequately tracked and controlled entry into and exit from TS LCOs. The inspectors routinely verified the operability of safety systems required to support plant conditions at both units and did not identify any concerns. Housekeeping at both units was good.

2.1 Loss of One Offsite Power Source (220-34)

PECO operator's responded well on October 22 to an unexpected loss of the 220-34 offsite 220 kV electrical power source. The four safety-related 4 kV busses powered from the 3 emergency start-up (3SU) transformer, powered from 220-34 source, automatically transferred to the alternate offsite source and all systems responded as designed. The transfer of the offsite power sources resulted in several minor effects at both units, including a primary containment isolation system (PCIS) Group II half isolation, a half reactor protection system (RPS) scram signal, and a loss of feedwater heating. The operators promptly reset the PCIS and RPS logic systems and entered OT-104, "Positive Reactivity Insertion" to stabilize both units following the loss of feedwater heating.

PECO determined that a "B" phase fault to ground on an underground section of the line located between the terminal yard and the North switchyard caused the 220-34 line trip. PECO isolated the line, located the fault, and spliced in a new section of cable to replace the damaged cable. The system manager indicated that this was the only application for this particular type of cable in the PECO 220 kV electrical grid system. PECO sent the damaged section of cable to an independent laboratory to perform a failure analysis.

The inspector noted a minor performance deficiency in that the operators made the required 4-hour NRC non-emergency event notification approximately three hours late. PECO incorporated this issue into the performance enhancement program (PEP) evaluation generated for the event. The inspector concluded that PECO engineering, operations, and maintenance personnel responded well to this event.

2.2 5B Feedwater Heater Leak and Isolation - Unit 2

PECO operators and management responded well to increased internal tube leakage on the 5B FWH by isolating the affected FWH train on October 26. Following the loss of offsite power transient (Section 2.1), PECO found that the internal leakage rate increased and the drain and dump valves could not control the heater condensate level. Due to the degrading condition, PECO elected to remove the B FWH train from service by isolating extraction steam and securing condensate flow through the train as per system operating procedure SO-5.2.B-2, "Removing a Feedwater Heater From Service." The control room operators exercised caution throughout the evolution.

The inspector reviewed PECO's safety evaluation (50.59) which permitted power operation with one FWH train out-of-service (i.e., two heater trains in service), which addressed the loss of another heater train and the effects of the resulting asymmetric core inlet temperature on thermal limits and temperature effects on the reactor vessel feedwater nozzles. The 50.59 determined that a postulated loss of feedwater heating (LOFWH) accident with two FWH trains was more severe than the LOFWH transient originally described in the Updated Final Safety Analysis Report (UFSAR), but concluded that this transient was bounded by other analyzed transients and that operation up to 100% power was permissible.

The Plant Operations Review Committee (PORC) accepted the 50.59 analysis, however, limited power operations to 95% based on a low pressure turbine blading vibration limit. PECO communicated their concerns with the turbine vendor and learned that this limit did not apply to the turbine design used at PBAPS. The PORC subsequently authorized restoration of Unit 2 to full power on November 7.

The inspector determined that the 50.59 safety evaluation adequately addressed the operation with only two feedwater heater trains. The PORC meeting minutes were well written, documenting the PORC's operational and thermal limit concerns. The inspector noted, however, a minor weakness in that the minutes did not clearly reflect the importance of the LP turbine blade vibration concern or that the LP turbine concern limited the unit to 95% power.

2.3 Safety Relief Valve Bellows Leak - Unit 2

On November 4 the operators received an alarm indicating possible leakage of the Unit 2 'C' safety relief valve (SRV) pilot valve bellows. Operators responded well to the alarm, entering the appropriate TS LCO action statement, which would have required a unit shutdo[illegible] in thirty days. Operations and engineering assessed the bellows alarm [illegible]ffecting the ability of the SRV to operate manually from the control r[illegible] response to an automatic

depressurization system signal. The inspector independently verified these results. Subsequently, PECO installed a temporary modification to remove the known bellows leakage signal from the control room annunciation alarm circuit, this allowed the reflash of the alarm if another bellows leakage switch became pressurized.

On November 22 PECO implemented the improved technical specifications (ITS) for SRVs on Unit 2. This revised technical specification allows two the SRV to be out of service and allowed PECO to clear the TS LCO imposed by the old TS. The inspector reviewed the implementation of this ITS section with the operators and found that it had been properly handled. PECO planned to investigate the cause of the bellow leakage alarm during the next unit shutdown.

2.4 Reactor Startup - Unit 3

The inspector observed that operators conducted re-start activities following the Unit 3 outage well. Operators communicated well during control rod manipulations and attempts to roll the turbine with steam.

2.5 Excessive Scram Times Identified During Testing - Unit 3

PECO responded satisfactory on October 18, when control rod scram time testing identified that the three fastest control rods in several two-by-two arrays exceeded the TS 5% insertion time limit. The control rods met all other insertion time limits including the 20%, 50% and the 90% limits. PECO entered the appropriate TS LCO action statements for the excessive average scram time for the three fastest control rods in a two-by-two array and declared these control rod inoperable and for more than one control rod inoperable in a five-by-five array. This would have required the unit to be placed in cold shutdown within 24 hours.

PECO attributed the slow control rod insertion times to hardening of the scram solenoid pilot valve (SSPV) diaphragms and replaced the SSPVs to satisfy all TS rod scram time requirements and exited the 24 hour TS LCO. The inspectors observed that PECO performed the SSPV replacement and scram time testing activities well.

The SSPV diaphragm hardening problem has been a generic industry concern and PECO had recorded scram time data on the most susceptible (based on service life) control rods during the manual reactor scram prior to the September 1995 refueling outage. The test results indicated that the SSPVs for five control rods needed to be replaced during the outage. PECO replaced these SSPVs and planned to replace the remaining susceptible valves in early 1996. Based on the October 18 testing, PECO accelerated its schedule for replacing the remaining susceptible SSPVs, and sent the suspect SSPV valve diaphragms to the vendor for analysis.

PECO investigated why the pre-outage testing had not identified the rod scram time problems discovered during the October 18 testing. PECO determined that the full core scram recorder start-up characteristics introduced a 0.060 second delay into the control rod scram time data. This test equipment

deficiency caused the control rods to appear faster than when tested individually, since during this testing the recorder is running, when the rod is scrammed. PECO installed a new computer-based system that will eliminate this type of data collection error during future testing.

The inspectors considered the safety significance of this event low since the first 5% of control rod movement inserts only minimal negative reactivity and because the other scram times (i.e. 20%, 50%, and 90%) remained within the required TS limits.

2.6 Loss of 3A Circulating Water Pump - Unit 3

The inspector observed that control room supervision and operators responded in an outstanding manner following an unexpected trip of the operating '3A' circulating water pump on November 6. Operators under the direction of the control room supervisor (CRS) quickly reduced reactor power to maintain condenser vacuum following the loss of the circulating pump. During the transient operators received indication that the non-safety related bus on which the circulating pump had been running had a low voltage. The operators had indication that the circulating water pump had tripped due to an undervoltage condition. This indication appeared to be faulty since the pumps which remained operating on that bus (i.e., condensate and recirculation) showed no increase in running amperage. However, the CRS remained concerned over the possibility that the recirculation pump operating on that bus could also trip on an undervoltage condition. Following discussions with the reactor engineer the CRS directed a power reduction to prevent the unit from entering regions of core instability if one of the operating recirculation pumps tripped. The inspector found the precautions taken by the operators to limit the effects of a possible loss of a recirculation pump consistent with a conservative approach to safety.

The CRS demonstrated outstanding command and control during the down power maneuver and the operator demonstrated excellent questioning attitudes. Operators communicated excellently during the placing of a feed pump into an idle condition. Reactor engineering support in the evaluation of changing reactor thermal parameters was excellent. PECO's investigation indicated that a broken fuse clip on the bus potential transformer caused a high resistance and the indicated low voltage.

2.7 Control of Fire System Impairments

PECO demonstrated less than adequate control of fire system impairments (FSI) during the inspection period. PECO discovered a fire system autocode box bypassed without the required FSI or continuous firewatch in the affected area. The continuous fire watch would have been necessary since the area had already been in a degraded fire state due to the presence of Thermolag-330 insulation material. PECO could not determine how long the box had been bypassed, however, a maintenance activity had been performed on the box about one month earlier. PECO promptly corrected the deficiency and initiated a PEP investigation. The inspector determined that the safety significance of the event was low because an hourly fire watch patrol was conducted due to the

Thermolag-330 concerns. However, the inspector also determined that the tracking of FSI LCOs for areas already affected by Thermolag had not been properly handled.

The inspector followed-up the apparent non-compliance to the fire protection program requirements by reviewing the operator logs, LCO log, FSI program, and station policies. The Technical Review Manual (TRM) specified the fire protection LCO requirements since early 1995, when they were removed from TS, as per the guidance in NRC Generic Letter (GL) 88-12, "Removal of Fire Protection Requirements from Technical Specifications."

PECO had declared the Thermolag fire barriers inoperable and established appropriate compensatory measures (hourly fire patrols) in response to NRC Bulletin 92-01, "Failure of Thermolag 330 Fire Barrier System to Perform Its Specified Fire Endurance Function" in July 1992. PECO initiated a TS LCO for the affected fire areas at that time that has remained opened until the present. The inspector found that the Thermolag documentation in the TS LCO log for each unit was confusing and did not clearly reflect the need to station continuous fire watches in these areas if an additional FSI was encountered. In discussions with the control room supervisor, the inspector determined that the LCO may have been confusing for the licensed operators. The operators assumed that the Thermolag LCO encompassed all possible FSIs in those areas, whether an hourly or continuous fire watch was required. PECO subsequently edited the LCO to clarify the required actions.

The inspector determined that the operators were not making LCO entries in the LCO log or control room unified log for TRM FSI LCOs. Guidance in OM-P-12.3, "Technical Requirements Manual," stated that TRM LCO conditions were to be entered and tracked similar to the TS LCO tracking process. PECO properly maintained fire protection LCOs for all areas except the Thermolag areas. The Operations Superintendent explained that it was the operations department's practice to track the LCOs using the FSI program. However, operators did not understand the requirements for the long-standing FSI LCO in the Thermolag areas. PECO changed the guidance in OM-P-12.3 to reflect that FSI LCOs would only be tracked with an FSI tracking form. The inspector found this tracking method acceptable.

The inspector reviewed with a PECO fire protection analyst the FSI procedure AG-CG-12.1, "Action for Fire Protection Impairments." The FSI initiator performs a required evaluation of the TRM to determine the compensatory actions needed for out of service fire protection systems. A licensed operator then reviews and approves the impairment. The inspector determined that this method of tracking TRM LCOs was satisfactory provided the AG-CG 12.1 requirements are followed.

The inspector determined that this item will remain open pending further review of PECO's PEP and corrective actions regarding the specifics of finding the autocode box bypassed. (URI 95-26-02)

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
2-95-006	10/22/95	Half Group II Isolation on Both Units due to Loss of One Offsite Power Source.
3-95-006	10/25/95	Licensed Reactor Power Exceeded Due to Calculation Software Problem

3.0 MAINTENANCE AND SURVEILLANCE TESTING (61726, 62703, 92902)

The inspectors routinely observed the conduct of maintenance and surveillance tests (STs) on safety related equipment. This involves the review of ongoing activities to ensure: the proper use of approved procedures and skills of the craft, the calibration of testing instrumentation, the qualification of personnel, and the implemented administrative controls including blocking permits, fire watches, ignition sources, and radiological controls.

In the maintenance area the inspectors reviewed maintenance procedures, action requests (AR), work orders (WO), and radiation work permits (RWP). 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.

In the surveillance area the inspector reviewed test procedures and completed tests to verify the adequate demonstration of safety functions and that test acceptance criteria were met. During surveillance observations, the inspectors verified that tests were properly scheduled and approved by shift supervision prior to performance; control room operators were knowledgeable about testing in progress, and that redundant systems or components were available for service, as required. The inspectors routinely verified adequate performance of daily STs including instrument channel checks and the jet pump and control rod operability tests.

3.1 Reactor Water Cleanup System Leak - Unit 3

PECO responded well to isolate and repair a minor reactor water cleanup (RWCU) system leak. PECO located the leak on a four-inch diameter pipe integral with the RWCU regenerative heat exchanger. The approximate 120 drops per minute leak, located in the heat affected zone of a weld connecting a pipe elbow to the heat exchanger, presented minimal risk since it could be isolated by the RWCU system containment isolation valves.

PECO discovered the leak on November 9 during the performance of surveillance test (ST)-M-012-700-3, "RWCU Contaminated Piping Inspection", conducted to satisfy TS requirement 6.14. Subsequent to identifying the leak, PECO isolated the RWCU system on November 10, removed the insulation near the

suspected leak location, and identified the exact leak location. PECO replaced the affected pipe section to minimize personnel exposure during the repair activities and restored the RWCU system to service on November 12.

The affected piping was within the scope of NRC Generic Letter (GL) 88-01, "NRC Position On IGSCC In BWR Austenitic Stainless Steel Piping." PECO's immediate actions (pipe replacement and NRC notification) satisfied their commitments to NRC GL 88-01. PECO continued to investigate the cause for the pipe leak and reviewed any additional required actions.

3.2 Safety Relief Valve Testing - Unit 3

The inspector reviewed the data gathered on the safety relief valves (SRVs) during Unit 3 shutdown and restart following the 1995 refueling outage. The data indicated possible slight leakage from the 'E' SRV by an elevated tailpipe temperature (less than the 300 F alarm setpoint) and a rapid drop in tailpipe temperature during the shutdown depressurization. The inspector reviewed recent surveillance test data and the adequacy of the surveillance testing during operation and following restart and the test data received by PECO from their testing vendor.

With respect to the 'E' SRV the inspector could not determine conclusively if it had been leaking during operation. As found vendor testing of the pilot and main seat showed no leakage. However, following replacement and unit restart the tailpipe temperature was not as high as previously recorded prior to the unit shutdown.

Overall, the inspector found the SRV outage and post-outage testing adequate. However, with respect to the normal surveillance test, the inspector found that PECO did not trend SRV tail pipe temperatures to identify possible leakage. The only requirement was that the tail pipe temperature be between 120 and 300 F. The inspector discussed this observation with a PECO ISEG engineer who had made a similar assessment. PECO's system management was pursuing changes to improve the trending of SRV tailpipe temperatures.

3.3 Surveillance Data Review - Unit 2

On September 6, PECO operators and shift management personnel demonstrated less than satisfactory attention to detail during the performance and review of surveillance test ST-O-07G-480-2, "PCIS Normally Open Valves Functional Test." During the ST the operator measured and recorded an operating time of 20.41 seconds for the RWCU outlet valve (MO-2-12-068) which exceeded its maximum acceptance limit of 20 seconds. PECO shift management and staff personnel reviewed and approved the MO-2-12-068 test results without identifying this deficiency.

This normally open valve has a safety function to close for containment isolation. PECO discovered the test deficiency on October 30 during a valve operating data review. PECO declared the valve inoperable, secured the RWCU system, and placed it in its shut safety position. PECO then measured the valve operating time using a high accuracy method (VOTES) and determined that it met the allowed stroke time. PECO subsequently declared the valve operable

and restored the RWCU system to service. The inspector concluded that the event was of low safety significance since the valve satisfied its stroke time requirement when measured with the VOTES system.

3.4 High Pressure Coolant Injection Logic System Functional Test

On November 6, PECO performed well during the high pressure coolant injection (HPCI) logic system functional test on Unit 2. PECO designed the procedure to satisfy the TS requirements for testing the HPCI steam line high flow timers, system initiation, auto isolation, and simulated automatic actuation logics. The inspector observed portions of the test and noted a good questioning attitude by test personnel. For example, when an unexpected alarm occurred after a step involving a jumper installation, test personnel reviewed the HPCI logic drawings (M-1-S-36) and verified that the alarm occurred after the correct step in the test procedure (ST-I-023-100-2). The inspector independently reviewed the HPCI logic drawings and verified that the alarm occurred correctly after the jumper installation. The procedure step to verify that the alarm occurred was a few steps after the step to install the jumper. PECO personnel noted a change to rearrange the step sequence in the procedure, along with other improvements to the procedure, on a plant procedure improvement system (PPIS) form. The inspector also observed that test personnel were knowledgeable and test instrumentation was within its calibration periodicity.

The inspector reviewed several sections of the test procedure to verify test adequacy, including: reactor low water level initiation relays, reactor high water level trip relays, hotwell drain isolation, suction valve interlocks and high torus level, and steam line space high temperature isolation. The inspector determined that each section reviewed, adequately tested the necessary logic components to perform its intended function.

4.0 ENGINEERING AND TECHNICAL SUPPORT ACTIVITIES (92903, 37551)

The inspectors routinely monitor and assess licensee support staff activities. During this inspection period, the inspectors focused on the activities discussed below.

4.1 Drywell Sump Modification - Unit 3

PECO performed a modification on the drywell floor drain and equipment drain pump control instrumentation that unknowingly caused the inoperability of both drywell leakage detection systems. The modification replaced aging pump control instrumentation with new electronic equipment. Several failures of the normal design process caused the new pump control instruments not to function as designed including: a flawed design assumption based on, poor understanding of the equipment application and of previously installed instrumentation; and inadequate post-modification testing. Further, operators did not identify that the drywell leakage detection system had not been functioning (i.e., indicating zero drywell leakage) for nearly two days.

Background:

The Peach Bottom drywell leakage monitoring system consists of two tanks (equipment drain and floor drain) located in the drywell that collect water leakage from components in the drywell and the associated instrumentation that controls the pumps and measures the amount of water pumped. These two tanks are adjacent to one another and will overflow to each other. Each tank has two pumps, normally controlled automatically by tank level probes, that discharge tank contents out of the drywell to the radioactive waste system for processing. Instrumentation monitors and records the total flow from the pumps on each tank. Instruments in the control room display this totaled flow. Operators record and use the difference in total flow over a four hour period to calculate drywell leakage as required by TSs. The calculated floor drain tank flow rate is "unidentified" leakage, since its comes from any number of water sources in the drywell. The calculated equipment drain tank flow rate is "identified" leakage since its sources are known specific drain points in the drywell. The TSs require action based on specified unidentified, identified, and total leakage limits. The Operations department documents the readings and calculated leakage information every four hours in ST O-20-560-2/3.

Resistance level probes in each tank and associated resistance comparative circuitry start and stop the drain pumps to control tank levels. There are two specific level points that control the starting of the drain pumps in each tank: hi level - the lead pump will start and hi-hi level the lag pump will start. Both pumps will automatically stop when the instrument senses the low level. The control instrument starts and stops the pumps based on changes in resistance between a common probe and the three other probes (hi, hi-hi, and low level). The common probe is always immersed in water, the other three probes are positioned at their respective levels. The controller uses changes in resistance, due to water level, between the three other probes and the common probe to sense tank level and control the pumps. When water covers the hi or hi-hi level probes it completes the circuit between the specific probe and the common probe. The instrumentation compares the resistance between the probes and a fixed resistor installed in the instrument. When the water is not covering a probe the resistance between the common probe and the high level probe is very high, when the water covers the high level probe the resistance drops to a point that is inversely proportional to the conductivity of the water (i.e., high conductivity (dirty water) low resistance low conductivity (clean water) high resistance). For the hi and hi-i probes, if the resistance observed by the instrument is lower than the fixed resistor the pump will start. When tank level reaches the low level point the pumps stop.

Event Review:

PECO began the modification work on the floor drain pump controller between 2000 and 2400 on October 23, by pumping down the floor drain tank and electrically tagging out the level controller and pumps. This made the floor drain tank leakage detection system inoperable. Prior to the isolation of this system the leakage had been calculated at approx. 0.1 gpm unidentified. With the floor drain sump inoperable ST O-20-560-3 required that all leakage be treated as unidentified and the floor drain tank would eventually overflow

to the equipment drain tank. To be conservative, the ST required that the equipment drain tank leakage be assumed as equal to the floor drain leakage. Thus the total leakage recorded in the ST was approximately twice the 1.5 gpm from the equipment drain or 3 gpm. While isolated, floor drain water level increased due to the 0.1 gpm inflow.

The work order installing the new instrumentation provided post-installation testing and post-modification acceptance testing. Between 1600 and 2000 on October 25, I&C technicians completed the installation of the floor drain tank level modification and completed the installation testing procedure. This procedure required that technicians jumper and short across the instrument sensor cabling. This jumpering simulated a very low resistance being sensed by the detector and the instrumentation performed as designed. The work order activity for the post-modification test specified "verify normal pump out rates per ST O-20-560-3." In the four hour period where reenergization of the floor drain leakage detection system occurred, operators logged an approximate 300 gallon pumpout of the floor drain tank. This would be approximately equal to the cumulative leakage over the period that the system was out of service. The work control supervisor, after observing the pumpout, determined that the post-modification testing was complete and closed the work order. Operations assumed at this point that the floor drain tank pump control system and the flow monitoring instrumentation was operable.

Between 0400 and 0800 on October 26, the operator pumped down and removed the equipment drain sump pump control instrumentation from service. Due to the 1.5 gpm inflow, the equipment drain tank overflowed into the floor drain tank, as indicated by a 200 gallon floor drain tank pumpout, between 1600 and 2400 on October 26. After this recorded pumpout, there were no additional pumpouts from the floor drain tank due to overflow from the equipment drain tank. I&C technicians performed the same post-installation testing on the equipment drain system as conducted on the floor drain instrumentation. The work order again required verification of normal pumpout rates per the ST. Following reenergization of the equipment drain tank instrumentation between 1600 and 200 on October 27 the instrumentation did not initiate a pumpout of the equipment drain tank, even though it was full and overflowing.

Operators noticed that the floor drain and equipment drain leakage readings were questionable in preparation of starting the next weeks ST O-20-530 on Sunday October 29. At that point they manually started the equipment and floor drain pumps and pumped approximately 6000 gal of water to rad waste. This water had accumulated in both sumps since the 200 gallons pumpout of the floor drain tank on October 26.

Once the operator identified the problem, PECO implemented proper compensatory measures including a requirement to manually run the drain pumps to pump out each sump every two hours. PECO engineering also took action to review and correct the design deficiency and provide improved post-modification testing.

Assessment:

The inspector determined the following during review of this event:

- By the nature of the normal inputs the floor drain tank water conductivity will be higher than the equipment drain tank water conductivity. This is why the floor drain pump controllers functioned to pump the 500 gallons. As the equipment drain tank overflowed to the floor drain tank the water conductivity dropped to the point that the resistance generated by the probes was higher that the fixed resistor. The conductivity of the equipment drain water was never sufficient to allow the probes to sense the tank level.

Engineering:

- Engineering personnel did not fully understand the importance of selecting the correct fixed resistor for installation in the new resistance comparative instrumentation. PECO failed to properly assess the needed fixed resistance in the drywell application. Vendor documentation stated that the user should choose a resistor of a higher value than specified, based on the type of fluid being monitored. The higher the conductivity of the water (i.e., the dirtier it is) the lower the needed resistance. The engineering change request (ECR) used to develop the modification PECO engineering specified a 10 K ohm resistor for the application. The vendor recommendation specified 10 K ohm to be the lowest level resistor possible and was specified for monitoring high conductivity water.

- PECO adequately reviewed the new control instrumentation as a suitable design equivalent for the old controller. However, preinstallation walkdowns did not identify that the initial instrumentation had a 2.2 mega ohm fixed resistor installed. The change from a 2.2 mega ohm resistor to the 10 K resistor was not assessed.

- Post-installation testing did not mimic the resistance actually generated by the level probes, since it inserted a near zero resistance. There was no attempt to determine how much resistance the level probes actually developed and to use this value when testing the instruments.

- Post-modification testing did not provide specific acceptable criteria and did not test the entire scope of the modification. The testing did not provide objective acceptance criteria for pump operability verification. Further, the specified testing did not test all the functions, including the hi-hi lag pump start.

Operations:

- Operators did not identify that the floor drain tank had not pumped out since the initial pumpout due to equipment drain overflow nor did they notice that the equipment drain tank did not pumpout following restoration of the system.

- The operators did not log the removal or return of either sump instrumentation.

- Operators did not identify that the surveillance testing was indicating 0 gpm leakage for over a day when it previously had been consistently about 1.5 gpm. Further, it appeared that operators did not fully comprehend the effects of equipment drywell drain tank overflow.

- Operators did not identify that the post-maintenance testing was inadequate to demonstrate operability.

- Operators did not enter a potential LCO, as is their practice, when removing one train of a two train system required to be operational by TSs.

Following identification, operations took appropriate action and PECO engineering modified the instrumentation by installing a 2.2 mega ohm fixed resistor and corrected the previous post-modification testing problems. The modified ECR provided enhance guidance on the proper fixed resistor and the modified work order provided very good post-modification testing instruction which tested all applicable functions.

The inspectors determined that because the equipment and floor drain pump control circuitry was not operational the drywell leakage monitoring system was not operational and did not meet TSs requirements. Drywell leakage was not adequately monitored from the removal of the equipment drain system from service until operators began manually pumping the drywell sumps. The TSs allow this condition for 24 hours before requiring a unit shutdown in 12 hours. The poor modification and failure of operations to identify the abnormal zero leakage indication caused the unit unknowingly to be operated and not shutdown within 36 hours of both leakage detection systems being made inoperable. Failure to initiate the shutdown violated TS 3.5.6. **(Violation 95-26-02)**

4.2 Single Failure Review of Scram Discharge Instrument Volume

The inspector determined PBAPS did not have a single failure vulnerability in the scram discharge instrument volume (SDIV) high level reactor scram logic. The inspector reviewed this area in response to single failure deficiencies reported at other operating BWRs. At the susceptible BWRs, a single failure concurrent with a hi-hi level in the SDIV, could fail to generate a full reactor scram. The hi-hi SDIV level scram ensures that the entire scram discharge volume contains sufficient capacity to accommodate the water discharged during a reactor scram.

At the affected BWRs, there are two SDIVs, an east SDIV and a west SDIV. The water discharged during a scram from the CRDs on the east side of the reactor empties into the east SDIV and the water discharged during a scram from the CRDs on the west side of the reactor empties into the west SDIV. Each of the SDIVs has four hi-hi level sensors. The four sensors on the east SDIV each send a signal to two of the RPS subchannels and the four sensors on the west SDIV each send a signal to the remaining two RPS subchannels. If a hi-hi level occurs in only one of the SDIVs, concurrent with a failure of one of the associated subchannel relays to de-energize, then only one of the subchannel relays will de-energize. This would not produce a reactor scram since the one-out-of-two taken twice logic is not satisfied.

At Peach Bottom, each unit has only one SDIV with two lines emptying into it from the north and south header accumulator banks. There are four level sensors at the 50 gallon hi-hi level that each send a signal to one of the four RPS subchannels. If a hi-hi level occurs in the SDIV concurrent with a failure of one of the subchannel relays to de-energize, then the remaining three RPS subchannels will still de-energize. This would produce a reactor scram since the one-out-of-two-taken-twice logic is satisfied. The inspector determined that PBAPS did not have the single failure design deficiency discussed above.

4.3 Closed - Inappropriate Temporary Procedure Change (Unresolved Item 94-21-01)

The inspector identified that a temporary change (TC) allowing the emergency cooling water pump to act as a spare emergency service water pump may have changed the intent of the original procedure. This would not have been allowed with a TC and would have required a procedure revision. PECO agreed with the inspector that the TC to AO-48.2, "Using the Emergency Cooling Water Pump as an Emergency Service Water Pump," could be considered an intent change and stated that they would conduct additional training in this area and review the administrative procedures.

PECO reviewed and revised the screening matrix in administrative procedure A-3, "Temporary Changes to Procedures." The matrix is a check list of the types of changes that may or may not be made with a TC. The revision enhanced the matrix to clarify when to initiate a procedure revision. With this revision to the TC process, a training package has been provided to the work force as required reading. These corrective action satisfied the inspector and this item was closed.

5.0 PLANT SUPPORT (71750, 92904)

5.1 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.

5.2 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 PECO's activities to be acceptable.

5.3 Advanced Radiation Worker Training

The inspector attended the advance radiation worker class room training course finding that it supplied the basis level of knowledge to allow an individual to conduct basis radiation protection tasks (i.e., radiation and contamination surveys). The inspectors did note that in order to complete and utilize the ARW training requires on the job demonstration of these skills.

6.0 MANAGEMENT MEETINGS (71707)

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.