UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

May 7, 2012

EA-11-224

Mr. Michael J. Pacilio
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION - NRC INTEGRATED INSPECTION REPORT 05000277/2012002 AND 05000278/2012002

Dear Mr. Pacilio:

On March 31, 2012, the U. S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The enclosed integrated inspection report documents the inspection results, which were discussed on April 20, 2012, with Mr. Thomas Dougherty, Site Vice President, and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one NRC-identified finding and two self-revealing findings of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. Additionally, a licensee-identified violation, which was determined to be of very low safety significance, is listed in this report. However, because of the very low safety significance, and because they are entered into your corrective action program (CAP), the NRC is treating these findings as non-cited violations (NCVs), consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest any NCVs in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the PBAPS. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I, and the NRC Resident Inspector at the PBAPS.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Paul G. Krohn, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Docket Nos.: 50-277, 50-278
License Nos.: DPR-44, DPR-56

Enclosure: Inspection Report 05000277/2012002 and 05000278/2012002
w/Attachment: Supplementary Information (Attachment 1)
Inspection Manual Chapter 0609, Appendix M, Table 4.1
(Attachment 2)

cc w/encl: Distribution via ListServ

In accordance with Title 10 of the *Code of Federal Regulation*s (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.:	50-277, 50-278
License Nos.:	DPR-44, DPR-56
Report No.:	05000277/2012002 and 05000278/2012002
Licensee:	Exelon Generation Company, LLC
Facility:	Peach Bottom Atomic Power Station, Units 2 and 3
Location:	Delta, Pennsylvania
Dates:	January 1, 2012 through March 31, 2012
Inspectors:	S. Hansell, Senior Resident Inspector A. Ziedonis, Resident Inspector J. Furia, Senior Health Physicist A. Rosebrook, Senior Project Engineer
Approved by:	Paul G. Krohn, Chief Reactor Projects Branch 4 Division of Reactor Projects

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SUMMARY OF FINDINGS

IR 05000277/2012002, 05000278/2012002; 01/01/2012 - 03/31/2012; Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3; Post Maintenance Testing and Identification and Resolution of Problems.

The report covered a three-month period of inspection by resident inspectors and an announced inspection by a senior health physicist. This report documents one NRC-identified and two self-revealing non-cited violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, “Significance Determination Process” (SDP). The cross-cutting aspect associated with the findings were determined using IMC 0310, “Components Within the Cross-Cutting Areas.” Findings for which the SDP does not apply may be Green, or be assigned a severity level after NRC management review. The NRC’s program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, “Reactor Oversight Process,” Revision 4, dated December 2006.

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

- Green. The inspectors determined that PBAPS did not establish measures to promptly identify and correct a condition adverse to the quality related to the emergency diesel generator (EDG) control power circuit. The performance deficiency (PD) constituted a Green, self-revealing NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." Specifically, measures established to identify and correct chronic control power light socket assembly internal faults were inadequate. Consequently, on February 18, 2012, the E-1 EDG local control power station experienced a short circuit event during control power indicating light bulb replacement. PBAPS entered into this issue into the corrective action program (CAP) via issue report (IR) 1328736.

  This finding was more than minor because it was associated with the equipment performance attribute of the Mitigating System cornerstone, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events and prevent undesirable consequences. Using IMC 0609, Attachment 4, “Phase 1 – Initial Screening and Characterization of Findings,” the inspectors determined that this finding was of very low safety significance (Green) because it did not represent an actual loss of safety function for a single EDG train for a duration greater than its Technical Specification (TS) allowed outage time, and did not screen as potentially risk significant due to an external initiating event.

  The inspectors determined that this finding had a cross-cutting aspect in the area of problem identification & resolution (PI&R), CAP, because PBAPS did not take appropriate corrective actions to address the adverse trend associated with chronic EDG control power circuit faults in a timely manner, commensurate with its safety significance [P.1(d)]. (Section 1R19)

- Green. The inspectors determined that PBAPS did not promptly identify and correct residual heat removal (RHR) heat exchanger (HX) graphoil gasket leaks. The PD constituted a Green, self-revealing NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action.” Specifically, measures established to identify and correct previous graphoil gasket leaks were inadequate to correct the condition adverse to quality.

Consequently, on February 16, 2012, the Unit 2 'C' RHRHX shell cover lower flange graphoil gasket failed during testing, rendering the 'C' RHR subsystem inoperable. PBAPS entered this issue into CAP via IR 1327477.

This finding was more than minor because it was associated with the equipment performance attribute of the Mitigating System cornerstone, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events and prevent undesirable consequences. Using IMC 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors determined that this finding was of very low safety significance (Green) because it did not represent an actual loss of safety function for a single RHR train for greater than its TS allowed outage time, and did not screen as potentially risk significant due to an external initiating event.

The inspectors determined that this finding had a cross-cutting aspect in the area of PI&R, CAP, because PBAPS did not thoroughly evaluate previous graphoil gasket failures used in RHR HX applications to ensure the resolution addressed the cause and extent of condition [P.1(c)]. (Section 1R19)

- Green. The inspectors identified a PD that was determined to be a finding of very low safety significance (Green) involving a NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure by PBAPS to take timely corrective action to correct a condition adverse to quality and the inability to comply with Design Technical Specification (TS) 4.3.1.1.b which requires, in part, that spent fuel pool (SFP) storage racks are designed and maintained with k_{eff} less than or equal to 0.95. Specifically, although PBAPS was aware of degradation of neutron absorbing material (Boraflex) within the SFP storage racks since at least 1996, PBAPS did not take effective measures to adequately monitor or manage the degradation to assure sufficient margin to criticality was maintained. Rather, in 2010, PBAPS deferred corrective actions in the SFPs until 2014 based on an operability determination (OD) that concluded sufficient margin would exist until that time. However, the NRC concluded that the OD did not accurately project the rate of boron degradation, and used several non-conservative assumptions. In June 2011, after addressing the errors in the OD, PBAPS declared 117 spent fuel bundle rack storage cells inoperable since the estimated Boraflex degradation indicated that PBAPS had exceeded design TS 4.3.1.1.b.

  The PD was more than minor because it was similar to IMC 0612, Appendix E, "Examples of Minor Issues," Example 3.j, which considers that an issue is more than minor if an engineering calculation error results in a condition where there is now a reasonable doubt on the operability of a system or component, or if significant programmatic deficiencies were identified with the issue that could lead to more significant errors if uncorrected.

  Using IMC 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors attempted to evaluate the risk significance of this issue. Applying the guidance in Table 3b, the inspectors made the assumption that the risk associated with this PD most appropriately impacted the Initiating Events cornerstone. A Region I Senior Reactor Analyst (SRA) determined that there were no probabilistic risk assessment tools currently available to adequately assess the risk of a SFP criticality event. Consequently, the inspectors followed the guidance in the Phase 1 SDP screening worksheet, Table 3b, Step 6, which states, in part, that where the SDP guidance is not adequate to provide reasonable estimates of a finding's significance, use IMC 0609, Appendix M, "SDP Using Qualitative Criteria."

Using Appendix M, the inspectors identified criteria and associated considerations that supported the overall qualitative risk assessment. On April 3, 2012, a Significance and Enforcement Review Panel (SERP) was conducted involving staff from Region I, the Office of Nuclear Reactor Regulation, and the Office of Enforcement to discuss the significance of this event. The SERP determined the PD and subsequent consequences resulted in a condition of very low safety significance (Green), based on an assessment using Appendix M attributes. This finding was also determined to have a cross-cutting aspect in the area of Problem Identification and Resolution - Evaluation [P.1(c)]. Specifically, Exelon did not properly evaluate a condition adverse to quality for operability in that the 2010 OD did not accurately predict the rate of Boraflex degradation and whether the issue challenged current SFP operability [P.1(c)]. (Section 4OA2)

Other Findings

One violation of very low safety significance that was identified by Exelon was reviewed by the inspectors. Corrective actions taken or planned by Exelon have been entered into the CAP. This violation and the corrective action tracking number is listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 2 began the inspection period at 100 percent power. On January 14, 2012, operators reduced power to approximately 55 percent power to perform planned testing on control rods, main turbine valves, and main steam isolation valves; and to perform planned reactor feed pump (RFP) maintenance. The unit was returned to 100 percent power on January 15, where it remained until the end of the inspection period, except for brief periods to support control rod insertion and recovery associated with planned maintenance.

Unit 3 began the inspection period at 100 percent power. On January 28, 2012, operators reduced power to approximately 55 percent power to perform planned testing on control rods, main turbine valves, and main steam isolation valves; and to perform planned RFP maintenance. The unit was returned to 100 percent power on January 29, where it remained until the end of the inspection period, except for brief periods to support control rod insertion and recovery associated with planned maintenance.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 - 1 sample)

Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors performed a review of PBAPS's response to high wind speeds in excess of 40 miles per hour on March 26, 2012. The review focused on the operability of emergency core cooling systems (ECCS), reactor building (RB) ventilation system, north and south electrical switchyard equipment, and site activities that could be impacted by the high winds. The inspectors reviewed operating procedure OP-AA-108-111-1001, Revision 6, "Severe Weather and Natural Disaster Guidelines," control room alarm response card ARC-317 30C212R K-5, "RB Hi-Lo Differential Pressure," TSs, control room logs, emergency action level (EAL) entry conditions, and the CAP to determine how the high winds impacted these systems, and to ensure PBAPS personnel had adequately prepared and responded to the challenges. The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability and availability of the systems during the high wind conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04 - 5 samples)

Partial System Walkdowns (71111.04Q - 5 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following five systems:

- Unit 3 'B' loop core spray (CS) system during 'A' loop unavailability for planned maintenance on January 3, 2012
- Unit 3 'B' loop RHR system during 'A' loop unavailability for planned maintenance on January 9, 2012
- Unit 2 reactor core isolation cooling (RCIC) system during high pressure coolant injection (HPCI) system unavailability for planned maintenance on January 19, 2012
- Unit 3 HPCI system with RCIC system unavailable for planned maintenance on January 24, 2012
- Unit 3 'A' loop RHR system during 'B' loop unavailability during planned maintenance on January 31, 2012

The inspectors selected these systems based on their risk-significance relative to the Reactor Safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the updated final safety analysis report (UFSAR), TSs, work orders (WOs), condition reports (CRs), and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted system performance of their intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether PBAPS staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05 - 6 samples)

.1 Resident Inspector Quarterly Walkdowns (71111.05Q - 5 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that PBAPS controlled combustible materials and ignition sources were controlled in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for

out-of-service (OOS), degraded or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Unit 3 RB, 'B' and 'D' CS rooms, elevation 91'-6 inches on January 4, 2012 (fire zones 13A and 13B)
- Unit 3 RB, 'B' and 'D' RHR pump and HX rooms, elevations 91'-6 inches and 116' on January 5, 2012 (fire zones 9 and 10)
- Unit 2 RB, RCIC room, elevation 88' on January 19, 2012 (fire zone 60)
- Unit 3 RB, 'A' RHR pump and HX rooms, elevation 91'-6 inches and 116' on January 30, 2012 (fire zone 12A)
- E-1 and E-3 EDG rooms on February 9, 2012 (fire zone 132)

b. Findings

No findings were identified.

.2 Fire Brigade Drill (71111.05 - 1 sample)

a. Inspection Scope

The inspectors observed a fire brigade drill scenario on February 23, 2012. The drill involved a simulated fire in the Unit 3 turbine building, elevation 165', 4G4 electrical load center 13kV switchgear (fire zone 79A). The inspectors evaluated the fire brigades initial response time, proper retrieval of required gear and equipment, and implementation of fire-fighting strategies. The inspectors verified that PBAPS personnel identified deficiencies, openly discussed them in a self-critical manner at the debrief, and took appropriate corrective actions to improve performance. The inspectors evaluated the following attributes:

- Proper use of turnout gear and self-contained breathing apparatus
- Employment of appropriate fire-fighting techniques
- Sufficient fire-fighting equipment brought to the scene
- Effectiveness of command and control
- Search for victims and propagation of the fire into other plant areas
- Smoke removal operations
- Utilization of pre-planned strategies
- Adherence to the pre-planned drill scenario
- Drill objectives met

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 - 1 sample)

Internal Flooding Review

a. Inspection Scope

The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to assess susceptibilities involving internal flooding. The inspectors also reviewed the CAP

to determine if PBAPS identified and corrected flooding problems and whether operator actions for coping with flooding were adequate. The inspectors focused on the Unit 2 and Unit 3 RB closed loop cooling room areas to verify the adequacy of equipment seals located below the flood line, floor and water penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, control circuits, and temporary or removable flood barriers.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07 - 2 samples)

a. Inspection Scope

The inspectors reviewed the Unit 2 'B' CS room cooler and the Unit 3 'A' RHR HX maintenance on January 11, 2012, to determine the readiness and availability of both components to perform their safety functions. The inspectors reviewed the design basis for the components and verified PBAPS's commitments to NRC Generic Letter (GL) 89-13. The inspectors reviewed the results of previous inspections of the 2 'B' CS room cooler and similar room coolers. The inspectors discussed the results of the most recent inspections of both components with site engineering staff and reviewed pictures of the as-found and as-left conditions. The inspectors verified that the CS room cooler and RHR HX performance was within the limits of the acceptance criteria.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program (71111.11 - 2 samples)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator requalification testing on February 14, 2012, which included a main steam leak, primary containment isolation, and an anticipated transient without scram scenario. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Quarterly Review of Licensed Operator Performance in the Main Control Room

a. Inspection Scope

The inspectors observed the following activities in the main control room:

- Unit 2 power reduction from 100 percent to approximately 60 percent for planned maintenance and testing, removal of the 'C' RFP from service for planned maintenance, and scram time testing on nightshift from January 13, 2012 to January 14, 2012

The inspectors observed infrequently performed test or evolution briefings, pre-shift briefings, and reactivity control briefings to verify that the briefings met the criteria specified in Exelon's procedure HU-AA-1211, "Pre-Job Briefings," Revision 7. Additionally, the inspectors observed test performance to verify that procedure use, crew communications, and coordination of activities between work groups met established expectations and standards.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q - 3 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structures, systems, and components (SSCs) performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance WOs, and Maintenance Rule (MR) basis documents to ensure that PBAPS was identifying and properly evaluating performance problems within the scope of the MR. For each sample selected, the inspectors verified that the SSC was properly scoped into the MR in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by the PBAPS staff were reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that PBAPS staff was identifying and addressing common cause failures that occurred within and across MR system boundaries.

- Unit 3 safety/relief valve (SRV) maintenance in response to SRV 71B thread seal leakage on February 1, 2, and 3, 2012
- E-2 EDG planned maintenance outage from February 7 to February 10, 2012
- Unit 2 main steam leak detection channel 'B' failure on March 19, 20, and 21, 2012

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 - 6 samples)

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that PBAPS performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the Reactor Safety cornerstones. As applicable for each activity, the inspectors verified that PBAPS personnel performed risk assessments as required by 10 CFR 50.64(a)(4) and that the assessments were accurate and complete. When PBAPS performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the TS requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Planned maintenance on Unit 3 'A' loop of CS on January 4, 2012
- Planned maintenance on Unit 3 'A' loop of RHR and elevated plant risk on January 9, 2012
- Planned maintenance on Unit 3 HPCI system and elevated plant risk on January 18, 2012
- Planned maintenance on Unit 3 RCIC and elevated plant risk on January 25, 2012
- Planned maintenance on Unit 3 'B' RHR and elevated plant risk on January 30 and 31, 2012
- Unplanned Unit 3 half-scram condition and elevated plant risk on February 3, 2012

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 - 6 samples)

a. Inspection Scope

The inspectors reviewed six ODs for the following degraded or non-conforming conditions:

- Unit 3 SRV 71C leakage on January 6, 2012
- Unit 3 'A' RHR HX leakage on January 10, 11, and 13, 2012
- Unit 3 main turbine No. 2 control valve pressure switch failure that provides a signal to the reactor protection system (RPS) on January 30, 2012
- E-2 EDG loss of control power indication at the local room panel on February 8, 2012
- Unit 2 and Unit 3 control rod operability during a postulated seismic event on February 8, 9, and 10, 2012
- Unit 2 and Unit 3 safety-related 4 kilovolt buses in response to operating experience regarding a postulated loss of a single voltage phase on February 14 and 15, 2012

The inspectors selected these issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the

operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs and UFSAR to PBAPS's evaluations to determine whether the components or systems were operable. When compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were controlled properly by PBAPS. The inspectors determined, when appropriate, compliance with bounding limitations associated with the evaluations.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 - 2 samples)

Temporary Modifications

a. Inspection Scope

The inspectors evaluated the temporary modifications below to determine whether the modification affected the safety functions of systems that are important to safety. The inspectors reviewed modification documents associated with the upgrade and design change, discussed the modification with engineers, and observed portions of the installation to verify that the temporary modification did not degrade the current design bases, licensing bases, and performance capability of the affected systems.

- ECR 09-00301, Limerick low level radiation waste storage at PBAPS on February 15, 2012
- ECR 12-00063, Unit 3 drywell equipment drain sump design change on February 28 and 29, 2012

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 - 7 samples)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests (PMTs) for the maintenance activities listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure was consistent with the information in the applicable licensing basis and/or design basis documents (DBDs), and that the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed test data to verify that the test results adequately demonstrated restoration of the affected safety functions.

- Unit 3 'A' RHR HX flow verification after leak repair on January 10, 2012

- Unit 2 HPCI booster pump seal repairs on January 20, 2012
- Unit 3 RCIC motor-operated valve maintenance on January 26, 2012
- Unit 3 scram discharge volume level switch replacement on February 16, 2012
- EDG E-1 control power repairs on February 21, 2012
- Unit 2 'C' RHR HX leak repair on February 29, 2012
- Unit 2 main steam leak detection system on March 19, 2012

b. Findings

.1 Introduction. The inspectors determined that PBAPS did not establish measures to promptly identify and correct a condition adverse to the quality related to the EDG control power circuit. The PD constituted a Green, self-revealing NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." Specifically, measures established to identify and correct chronic control power light socket assembly internal faults were inadequate. Consequently, on February 18, 2012, the E-1 EDG local control power station experienced a short circuit event during control power indicating light bulb replacement.

Description. On February 18, 2012, during replacement of the local control power station indicating light bulb at the E-1 EDG, the replacement bulb failed a few seconds after installation. The inside of the panel was inspected, and it was identified that the light socket short circuited, which caused significant damage to the socket, melted the wiring on the neutral side of the socket, and also caused collateral damage to nearby wiring inside the control panel. The inspectors noted that this event did occur in an emergency preparedness vital area, but there was no fire associated with the event. Additionally, the local control power station contained wiring circuitry associated with EDG automatic start features. PBAPS operators determined that alternate indications for EDG control power demonstrated that there was no actual loss of control power. However, operators declared the E-1 EDG inoperable and unavailable for damage inspection, troubleshooting, and wiring repairs. PBAPS conducted inspections of all local wiring, and confirmed through electrical continuity testing that all features associated with EDG automatic start circuitry remained functional. Therefore, there was no actual loss of EDG safety function as a result of this event. The inspectors noted that PBAPS did replace several pieces of wiring due to insulation damage, and the light socket assembly was also replaced.

The inspectors noted chronic issues with EDG loss of local control power indication over several years. PBAPS performed an apparent cause investigation for the EDG control power indicating light bulb short circuit event, which included a summary of the historical issues with EDG local control power indication:

- 1993 - E-3 EDG local control power panel socket shorted out during light bulb replacement, causing wiring damage, which blew the control power fuse and made E-3 inoperable and unavailable. The light socket assembly was replaced.

- 2009 - E-4 EDG local control power panel socket shorted out during light bulb replacement, causing a small fire (which was extinguished in under 15 minutes) and wiring damage. The short circuit event occurred during an E-4 maintenance outage, thereby extending the period of inoperability for additional corrective maintenance activities. The cause of the event was attributed to aging of the control power socket assembly, as the assembly was original to the E-4 EDG. The control power light

assembly was replaced on the E-4, as well as all the EDGs as an extent of condition action. This constituted a missed opportunity to identify the 1993 event on E-3 and include it with the E-4 failure evaluation.

- 2010 - E-2 and E-3 control power light bulbs found extinguished in June. E-2 was found extinushed again in August. All bulbs were successfully replaced.

- 2011 - E-2 control power light bulb found extinguished in January (successfully replaced), February (no clear documentation of replacement), and April. Following identification in April, a CAP engineering investigation concluded that a poor connection was likely introduced during the 2010 socket replacement, and recommended replacing the fixture during E-2 planned maintenance in early 2012. This constituted another missed opportunity to identify the cause of the chronic adverse condition common to all the EDGs and correct the condition. Subsequently, the E-2 control power light bulb was again found extinguished in July, and successfully replaced. In November, the E-1 control power light bulb was found extinguished, and was successfully replaced.

- 2012 - E-1 control power light bulb found extinguished in January (no clear documentation of replacement), and again in early February. On February 18, E-1 control power light bulb was replaced and subsequently short circuited. The light socket assembly and bulb were replaced and an apparent cause investigation was conducted.

PBAPS's apparent cause investigation determined that the cause of the light socket failure was attributed to a sustained high energy electrical fault between the internal terminals of the incandescent light socket. The electrical fault was caused by long-term tracking and micro-arcing that occurred between the two internal incandescent lamp terminals, with carbon build up developing on the material surface of the terminals, thus developing a fault path along the two internal lamp terminals. PBAPS also concluded that moisture and contaminants from outside air in the EDG room would accelerate the development of the internal fault path. PBAPS concluded that a contributing cause of the February 18, 2012, E-1 short circuit event was attributed to the failure to take corrective measures to address chronic light socket assembly problems in a timely manner. Planned corrective actions to address this condition adverse to quality include modifying the current incandescent socket assemblies on all four EDGs to a light emitting diode (LED)-style socket assembly, which has lower current draw and voltage drop, thereby causing less micro-arcing and carbon collection. Additionally, PBAPS determined that the use of LED's will reduce the probability of a short circuit event due to an improved expected operating life compared to the incandescent-style indicating lights, as well as the lack of cold filament in-rush currents. The inspectors determined that PBAPS's planned corrective actions were appropriate to the circumstances.

Analysis. The inspectors determined that PBAPS not establishing measures to promptly identify and correct a condition adverse to quality related to the EDG control power circuit constituted a PD. Consequently, on February 18, 2012, the E-1 EDG local control power station experienced a short circuit event during control power indicating light bulb replacement. This finding was more than minor because it was associated with the equipment performance attribute of the Mitigating System cornerstone, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that response to initiating events to prevent undesirable consequences.

Specifically, the E-1 EDG was declared inoperable and unavailable, and local control power panel inspections revealed significant damage to the light socket, melted wire on the neutral side of the socket, and local wiring insulation damage. Using IMC 0609, Attachment 4, “Phase 1 – Initial Screening and Characterization of Findings,” the inspectors determined that this finding was of very low safety significance (Green) because it did not represent an actual loss of safety function of a single EDG train for greater than its TS allowed outage time, and did not screen as potentially risk significant due to an external initiating event.

The inspectors determined that this finding had a cross-cutting aspect in the area of PI&R, CAP, because PBAPS did not take appropriate corrective action to address an adverse trend in a timely manner, commensurate with its safety significance [P.1(d)]. Specifically, PBAPS did not take appropriate corrective actions to address the adverse trend associated with EDG chronic control power circuit internal faults.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states, in part, that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. Contrary to the above, prior to February 2012, PBAPS did not establish measures to promptly identify and correct a condition adverse to the quality of the EDG control power circuit. Specifically, measures established to identify and correct chronic control power light socket assembly internal faults were inadequate. Consequently, on February 18, 2012, the E-1 EDG local control power station experienced a short circuit event during control power indicating light bulb replacement. Because this finding was of very low safety significance and it was entered into the CAP via IR 1328736, this violation is being treated as an NCV consistent with the Enforcement Policy. **(NCV 05000277/2012002-01 and 05000278/2012002-01, Inadequate Corrective Action to Address Emergency Diesel Generator Control Power Circuit Chronic Internal Faults)**

.2 Introduction. The inspectors determined that PBAPS did not promptly identify and correct RHR HX graphoil gasket leaks. The PD constituted a Green, self-revealing NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action.” Specifically, measures established to identify and correct previous graphoil gasket leaks were inadequate to correct the condition adverse to quality. Consequently, on February 16, 2012, the Unit 2 'C' RHR HX shell cover lower flange graphoil gasket failed during testing, rendering the 'C' RHR subsystem inoperable.

Description. On February 16, 2012, during surveillance testing of the Unit 2 'C' RHR subsystem, the 'C' RHR HX shell lower flange gasket extruded, resulting in a continuous spray of water from the lower shell flange area. The leak rate was not quantified, and rendered the 'C' RHR subsystem inoperable thereby placing Unit 2 in a limited condition of operation (LCO) of 7-days per TSs. The surveillance testing was part of post-maintenance testing (PMT) to return the 'A’ loop of RHR to operation following planned maintenance. The 'A' subsystem had successfully completed its surveillance prior to the 'C' RHR HX leakage. The planned maintenance outage on the 'A' RHR loop had just entered day 4 of 7 of the LCO, and with the 'C' RHR pump inoperable due to the 'C' subsystem leakage, Unit 2 was in day 4 of the 7-day LCO with one RHR pump inoperable. No HX maintenance had been performed during the 'A' RHR loop maintenance outage.

PBAPS maintenance personnel removed the 'C' HX lower shell cover and discovered a graphoil style gasket, which is composed of thin layers of stainless steel embedded in graphite. The gasket had extruded in the northeast quadrant of the flange, and the HX flange face was discovered to have some areas of protruding metal on the edge of the gasket in the area of the failure. The remaining areas of the HX flange were in good condition, as well as the lower shell head flange.

The graphoil gasket was installed on the lower shell flange, as well as on the floating seating surface in 2009, during maintenance to replace the floating head due to internal tube-to-shell leakage. The RHR HXs are floating head type shell-and-tube HXs, which are designed to account for thermal expansion and contraction of the tube sheet over a wide range of fluid temperatures. The graphoil gasket was installed on the floating head in 2009 to accommodate the pitting and degradation of the floating head seating surface. Graphoil gaskets are more accommodating to surface imperfections than the original style soft iron gaskets that had been used previously on both the floating head as well as the lower shell cover flange.

In 2010, the 'C' RHR HX developed another internal leak on the floating head. An apparent cause evaluation determined that the graphoil gaskets are susceptible to accelerated erosion of the gasket seating surface due to the graphite and stainless steel foil construction of the gasket. The apparent cause evaluation (ACE) also determined that the lower torque requirements of the graphoil gasket were another contributor to the gasket failure. In 2010, the 'C' RHR HX floating head seating surface was machined to remove the pitting imperfections, and the original style soft iron gasket was installed on the floating head. The 2010 ACE assigned an action to only use soft iron gaskets on the floating heads, and remove all other style floating head gaskets from stock. However, the graphoil style gasket was installed on the RHR HX lower shell cover flange. Additionally, the action to remove the graphoil gaskets from stock was never performed, and had been assigned a lower level administrative code that does not require completion within the Exelon corrective action process.

The inspectors noted that PBAPS has a history of challenges in the area of RHR HX leakage:

- 2007 - Unit 3 'D' (3D) floating head leak repair, soft iron gasket used
- 2008 - 3 ‘D’ lower shell cover flange leak repair, soft iron gasket used
- 2008 - 2 ‘D’ floating head leak repair, graphoil gasket used
- 2009 - 2 ‘C’ floating head leak repair, graphoil gasket used on floating head and lower shell cover
- 2010 - 2 ‘C’ floating head leak. Floating head seating surface machined and soft iron floating head installed. Graphoil gasket installed on lower head shell flange.
- 2011 - 3 ‘A’ floating head leak. Seating surface machined, soft iron gasket installed. Graphoil lower head shell flange gasket installed.
- 2012 – 3 ‘A’ and 2 ‘C’ lower shell cover leaks. Small leak on 3 ‘A’ bottom head, head retorqued, leak stopped. Gasket extruded on 2 ‘C’ lower shell cover, replaced with soft iron gasket, leakage stopped.

Corrective action to address the February 16, 2012, 2 ‘C’ RHR HX leakage was completed prior to exceeding the 7-day LCO action statement. Following the 2012 graphoil gasket failure on the 2 ‘C’ RHR HX, PBAPS conducted another apparent cause investigation. PBAPS identified similar apparent and contributing causes from the 2010

evaluation related to graphoil erosion susceptibility and lower torque requirements of the graphoil gasket, and also identified additional causes related to torquing. Specifically, PBAPS determined that graphoil gaskets require additional torque passes following initial installation, especially given bolt relaxation and loss of preload following RHR HX fluid seasonal temperature changes and pressure changes during removal of the stayfill system for planned maintenance. Additionally, PBAPS determined that once a small leak develops across the graphoil gasket, the gasket is more susceptible to complete failure unless additional torquing is performed.

PBAPS noted that the 2012 leak from the 2 ‘C’ RHR HX followed the removal and subsequent return of the stayfill system from service. Prior to graphoil gasket failure, a small leak developed on the 2 ‘C’ RHR HX during ST of the 'A' RHR subsystem. Subsequently, when the 2 ‘C’ RHR pump was started for the 'C' subsystem surveillance, the 'C' graphoil gasket failed completely. PBAPS also noted that for the 3 ‘A’ RHR HX lower shell leak, the leakage was small and was corrected with additional torque passes. No additional torque passes were performed on the 2 ‘C’ HX following the identification of small leakage prior to 2 ‘C’ RHR pump start and complete gasket failure.

PBAPS concluded, via the 2012 ACE, that although the graphoil gaskets were rated for RHR HX system pressure and temperature, they were not the preferred gasket style for RHR HX applications. PBAPS has created corrective action assignments to remove the graphoil gaskets from stock, and also to replace the graphoil gaskets on the remaining RHR heat exchanges (3 ‘A’, 2 ‘D’ and 2 ‘C’) with the original style soft iron gaskets at the next appropriate maintenance opportunity. The inspectors noted that PBAPS has evaluated interim operation of the graphoil gaskets on the remaining RHR HXs, and determined that it is acceptable. The inspectors determined that PBAPS's corrective actions are appropriate to the circumstances.

Analysis. The inspectors determined that PBAPS's failure to establish measures to promptly identify and correct repetitive RHR HX graphoil gasket leaks constituted a PD. Consequently, on February 16, 2012, the Unit 2 'C' RHR HX shell cover lower flange graphoil gasket failed during testing, rendering the 'C' RHR subsystem inoperable. This finding was more than minor because it was associated with the equipment performance attribute of the Mitigating System cornerstone, and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Using IMC 0609, Attachment 4, “Phase 1 – Initial Screening and Characterization of Findings,” the inspectors determined that this finding was of very low safety significance (Green) because it did not represent an actual loss of safety function for a single RHR train for greater than its TS allowed outage time, and did not screen as potentially risk significant due to an external initiating event.

The inspectors determined that this finding had a cross-cutting aspect in the area of PI&R, CAP, because PBAPS did not thoroughly evaluate a problem such that resolution addressed the cause and extent of condition, as necessary [P.1(c)]. Specifically, PBAPS did not thoroughly evaluate previous graphoil gasket failures used in RHR HX applications, which resulted in the Unit 2 'C' RHR HX shell cover lower flange graphoil gasket failure on February 16, 2012.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states, in part, that measure shall be established to assure that conditions adverse to quality are

promptly identified and corrected. Contrary to the above, PBAPS did not establish measures to promptly identify and correct repetitive RHR HX graphoil gasket leaks. Specifically, measures established to identify and correct previous graphoil gasket leaks were inadequate to correct the condition adverse to quality. Consequently, on February 16, 2012, the Unit 2 'C' RHR HX shell cover lower flange graphoil gasket failed during testing, rendering the 'C' RHR subsystem inoperable. Because this finding was of very low safety significance and it was entered into the CAP via IR 1327477, this violation is being treated as an NCV consistent with the Enforcement Policy. **(NCV 05000277/2012002-02, Inadequate Corrective Action to Address Residual Heat Removal Heat Exchanger Graphite Gasket Leaks)**

1R22 Surveillance Testing (71111.22 - 7 samples)

a. Inspection Scope (5 routine surveillances and 2 in-service test samples)

The inspectors observed performance of STs and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied TSs, the UFSAR, and PBAPS procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following STs:

- Unit 2 RCIC logic system functional test on January 4, 2012 (in-service test)
- Unit 2 control rod scram time testing on January 14, 2012
- E-4 EDG fast start testing on January 23, 2012 (in-service test)
- Main stack radiation monitor function check on February 16, 2012
- Diesel-driven fire pump operability test on March 13, 2012
- 'A' Emergency service water pump, valve, unit cooler, and emergency cooling tower functional inservice test on March 14, 2012
- Flow testing of new diesel-driven high capacity portable pump on March 24, 2012

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 EP Drill Evaluation (71114.06 - 1 sample)

a. Inspection Scope

The inspectors evaluated the conduct of a PBAPS emergency exercise on March 27, 2012, to identify any weaknesses and deficiencies in the classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the simulator and technical support center to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with procedures. The inspectors also attended the simulator critique to compare inspector observations with those identified

by PBAPS staff in order to evaluate PBAPS's critique and to verify whether the PBAPS staff was properly identifying weaknesses and entering them into the corrective action program.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Occupational/Public Radiation Safety (PS)

2RS01 Radiological Hazard Assessment and Exposure Controls (71124.01)

a. Inspection Scope

The inspectors conducted walk downs of the facility, including radioactive waste processing, storage, and handling areas to evaluate material conditions and potential radiological conditions.

The inspectors selected containers holding nonexempt licensed radioactive materials that may cause unplanned or inadvertent exposure of workers, and verified that they were labeled and controlled.

The inspectors observed several locations where the licensee monitors potentially contaminated material leaving the radiologically controlled area, and inspected the methods used for control, survey, and release from these areas. The inspectors verified that the radiation monitoring instrumentation had appropriate sensitivity for the types of radiation present.

During tours of the facility and review of ongoing work, the inspectors evaluated ambient radiological conditions. The inspectors verified that existing conditions were consistent with posted surveys, radiation work permits, and worker briefings, as applicable.

b. Findings

No findings were identified.

2RS02 Occupational As Low As is Reasonably Achievable Planning and Controls (71124.02)

a. Inspection Scope

The inspectors reviewed pertinent information regarding plant collective exposure history, current exposure trends, and ongoing or planned activities in order to assess current performance and exposure challenges. The inspectors determined the plant's three-year rolling average collective exposure.

The inspectors determined the site-specific trends in collective exposures and source term measurements.

The inspectors reviewed site-specific procedures associated with maintaining occupational exposures As Low As is Reasonably Achievable (ALARA) which included a review of processes used to estimate and track exposures from specific work activities.

b. Findings

No findings were identified.

2RS05 Radiation Monitoring Instrumentation (71124.05)

a. Inspection Scope

The inspectors selected portable survey instruments in use or available for issuance. The inspectors checked calibration and source check stickers for currency, and assessed instrument material condition and operability.

The inspectors walked down area radiation monitors and continuous air monitors to determine whether they were appropriately positioned relative to the radiation sources or areas they were intended to monitor.

The inspectors selected personnel contamination monitors and small article monitors to verify that the periodic source checks were performed in accordance with the manufacturer's recommendations and licensee procedures.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, "PI&R," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that PBAPS entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended CR screening meetings.

b. Findings

No findings were identified.

.2 Closed Unresolved Item (URI) 05000277&278/2010-004-01, Non-conservative TS and Potential Non-compliance Associated with Degraded Spent Fuel Pool Boraflex Panels (1 sample)

Inspection Scope

NRC Inspection Report 05000277 and 05000278/2010-004 opened an URI associated with a concern about the operability of the SFP due to degraded Boraflex panels. The inspectors closed this URI by reviewing Exelon and NRC documents including: Peach Bottom's 2007 License Amendment Request (LAR) to change TS 4.3.1.1.a; Peach Bottom's withdrawl letter for this LAR (ML101690377); Peach Bottom's operability evaluation 10-007, "corrective actions needed for SFP Boraflex degradation" (IR1127773); NRC TIA 11-004, "SFP criticality with 45% B-10 loss (Technical Evaluation, Revision 3 -IR 864431-15)," and LER 05000277/11-002. The inspectors assessed the technical adequacy of the operability evaluations, the use and control of compensatory measures, and compliance with the licensing and design bases. The inspectors also reviewed the compensatory actions taken by Peach Bottom after SFP cells were declared inoperable in June 2011.

On April 3, 2012, a Significance and Enforcement Review Panel (SERP) was conducted with personnel from Region I, the Office of Nuclear Reactor Regulation, and the Office of Enforcement to discuss the significance of this event.

The NRC identified a NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure by the PBAPS to take timely corrective action to correct a condition adverse to quality (CAQ) and failure to meet TS 4.3.1.1.b. This NCV is documented below. No additional findings were identified. URI 05000277 & 05000278/2010004-01 is closed.

a. Findings and Observations

Untimely Corrective Actions Resulted in SFP Boraflex Degradation Exceeding Design Limits

Introduction. The inspectors identified a PD that was determined to be a finding of very low safety significance (Green) involving a NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure by PBAPS to take timely corrective action to correct a condition adverse to quality (CAQ) and failure to meet TS 4.3.1.1.b which requires, in part, that SFP storage racks are designed and maintained with k_{eff} less than or equal to 0.95. Specifically, although PBAPS was aware of degradation of neutron absorbing material (Boraflex) within the SFP storage racks since at least 1996, the licensee did not take effective measures to adequately monitor or manage the degradation to assure sufficient margin to criticality was maintained. Rather, in 2010, PBAPS deferred corrective actions in the SFPs until 2014 based on an OD that concluded sufficient margin would exist until that time. However, the NRC concluded that the OD did not accurately project the rate of boron degradation, and used several non-conservative assumptions. In June 2011, after addressing the errors in the OD, PBAPS declared 117 cells inoperable since the estimated Boraflex degradation indicated that PBAPS had exceeded design TS 4.3.1.1.b.

Description. This issue was previously discussed in the 3rd quarter 2010 Integrated Inspection Report (50-277&278/2010004) as unresolved item (URI) 05000277, 278/2010004-01. Since the 1970s, the industry has been aware that Boraflex in an SFP environment degrades. In 1996, the NRC issued GL 1996-04, "Boraflex Degradation in SFP Storage Racks," to alert the industry to these concerns, and requested each licensee crediting Boraflex to provide the NRC with its plan to manage the degradation. PBAPS's plan involved using the analytical code, RACKLIFE, every six months to predict future degradation of Boraflex in its SFPs. In addition, to determine actual degradation levels, PBAPS implemented in-situ testing of 100 percent of its racks every four years using the B-10 Areal Density Gauge for Evaluating Racks (BADGER) tool. PBAPS used the BADGER results to benchmark the RACKLIFE predictions. It should be noted that the NRC has not, to date, approved the use of BADGER or RACKLIFE.

In 2000, PBAPS obtained a vendor analysis to determine the amount of Boraflex degradation that could occur while still meeting the regulatory sub-criticality design criterion of k_{eff} (i.e., the effective neutron multiplication factor) ≤ 0.95, as specified in TS 4.3.1.1.b. The analysis concluded that k_{eff} could be met in the SFPs with uniform degradation of up to 10 percent, when averaged across all panels in the spent fuel racks (equating to an average areal density of 0.0189 g/cm^2).

In June 2008, using the guidance in NRC Administrative Letter 98-10, PBAPS requested a license amendment to reduce the TS k_{inf} value (the neutron multiplication factor for an infinite array of fuel configured in the standard, uncontrolled, reactor geometry at cold conditions), based on BADGER/ RACKLIFE analyses which indicated that average Boraflex degradation in the PB2 SFP racks would exceed 10 percent in the fall of 2008. At that point, PB concluded the k_{inf} TS limit of < 1.362 would be non-conservative, meaning that compliance with that value would no longer assure that the in-rack k_{eff} limit of 0.95 would not be exceeded. On June 18, 2010, PBAPS withdrew the license amendment request, after several rounds of NRC requests for additional information (RAIs) to better understand how PB obtained and verified its analyses. A number of the RAIs were issued to address NRC questions related to the use of BADGER and RACKLIFE, which was being proposed for use as the new code of record.

In 2009, Region I issued a Severity Level IV (SL IV) NCV to PBAPS because the licensee was using analytic tools that were different than described in their UFSAR. Also, since August 2009 PBAPS has corrected the issue and has implemented an administrative control (documented in PBAPS's SFP and core fuel move process procedure) to ensure the most reactive fuel bundles (once burned fuel having spent two years in the reactor core) are not placed in a SFP rack cell that has > 20 percent boron carbide degradation. The NRC resident inspectors at PBAPS have verified that this administrative control has been followed and noted that since 2009, once burnt fuel assemblies were only present in the PB2 or PB3 SFPs for a maximum of 4.5 days during the refueling outages.

Subsequently, to address the now non-conservative TS k_{inf} limit and to evaluate the acceptability of the Boraflex degradation, PB conducted an OD of the SFPs. In the OD, PB concluded that, with administrative limits on the reactivity of the fuel added to the SFPs, K_{eff} would conservatively remain below 0.95 until the maximum Boraflex degradation reached approximately 45% in 2014. Specifically, PB determined that SFP storage cells loaded with fuel assemblies having a peak k_{inf} of 1.26 and with an areal density ≥ 0.01155 g/cm^2 (45% degradation) would continue to meet the TS requirement

for the SFP k_{eff} to be ≤ 0.95. It is noted that the most degraded rack cells are located in the PB2 SFP, and were measured using BADGER. The January 2010 data showed SFP rack storage cells degraded to an areal density of 0.0169 g/cm^2 (19.5%) and projected (by RACKLIFE) to have further degraded to 0.0146 g/cm^2 (30.5%*)* as of November 1, 2010.

During the 3rd quarter of 2010, the NRC resident inspectors at PBAPS reviewed PBAPS's OD, and concluded that assistance from NRC headquarters experts was needed to determine its technical adequacy and correctness. An URI was documented in the 3rd quarter integrated Inspection Report (05000277 & 05000278/2010004), and on January 25, 2011, Region I sent Task Interface Agreement (TIA) 11-004, requesting that NRC headquarters evaluate the OD and independently estimate when the PB SFPs' operability would be challenged.

Ultimately, the NRC determined that PB's OD and supporting documents did not provide reasonable assurance of SFP operability beyond 2014 without additional compensatory measures. Specific concerns included:

- PBAPS indicated that the degradation limit of 45 percent was determined using the minimum areal density reference value of 0.0210 g/cm^2, however, Nuclear Reactor Regulation (NRR) determined that the 45 percent limit actually appeared to have been arrived at using the average areal density reference value (0.0235 g/cm^2), indicating that PBAPS's 45 percent limit may be incorrect and non-conservative;
- It did not appear that PBAPS recalibrated the RACKLIFE predictions based on the BADGER results obtained in 2006, which could affect the results for subsequent predictions, including the prediction that operability would not be challenged until 2014;
- It did not appear that PBAPS performed a RACKLIFE analysis in 2011, and the degradation rate PBAPS used for this period inexplicably indicated that the degradation rate was decreasing;
- Between mid-2009 and early 2010, the degradation rate appeared to have significantly increased, and this trend was not carried forward in PBAPS's predicted future degradation rates; and
- PBAPS did not appear to have updated its OD with the RACKLIFE projection from November 2010, and the inclusion of this data could result in the degradation limit being reached earlier than PBAPS had predicted.

The NRC concluded that the Boraflex degradation limit in the PB2 SFP would not exceed PBAPS's OD degradation limit (0.01155 g/cm^2) until mid-2011. However, the NRC also determined that an areal density of 0.01504 g/cm^2 (36% of 0.0235 g/cm^2) would be a more appropriate minimum acceptable value, based on the NRC's analysis. As of November 2010, PBAPS determined that several Boraflex panels had already exceeded the above value.

On June 8, 2011, PBAPS determined that it no longer had reasonable assurance that all storage locations in the PB2 SFP remained capable of maintaining compliance with the TS limit of K_{eff} ≤ .095 under worst case design conditions. After performing a new analysis, PBAPS determined that as of November 2010, 117 cells in the PB2 SFP were inoperable, in that, if they were loaded with fuel higher than k_{inf} of 1.0473, the 0.95 keff limit would have been exceeded. PBAPS further determined that 27 additional cells

would be inoperable by the end of 2011 (a total of 144 cells out of 3819). This analysis also determined that the PB2 SFP racks first exceeded the TS limits in approximately the fourth quarter of 2008.

As of June 12, 2011, PBAPS had relocated the spent fuel assemblies from the 144 affected PB2 SFP cells and from 57 additional cells with reduced margin, and declared those cells inoperable. Additionally, PBAPS relocated 84 spent fuel assemblies within the PB3 SFP (although no PB3 SFP cells were determined to be inoperable). PBAPS also established additional administrative controls to govern the use of the affected cells so as to not exceed the subcriticality margin requirements. PBAPS is designing a SFP modification as a long-term corrective action. PBAPS issued Licensee Event Report (LER) No. 11-002 on July 29, 2011, to document the TS violation.

A follow-up PI&R sample inspection was conducted by the Region I Division of Reactor Safety Operations Branch during November 2011. PBAPS provided an updated analysis to the inspector which challenged one of the TIA's assumptions, claiming, in part, that PBAPS had been charged a redundant reactivity penalty. For design basis conditions, Exelon asserted that the max K_{eff} for the pool was 0.95002, using all the other TIA assumptions and BADGER data for June 2011. Notwithstanding, the inspectors identified the June 2011 BADGER data indicated 9 cells with 50% to 51% degradation.

In November 2011, during the PI&R sample inspection, DRS inspected PBAPS's compensatory actions taken and administrative controls in place, and determined that these actions were appropriate to ensure continued safe operations, until the issue can be addressed via PBAPS's proposed SFP Insert Modification and LAR (submitted to the NRC on November 3, 2011, and supplemented on December 22, 2011), which is currently under NRC review. This LAR also introduced a new code of record replacing the original Westinghouse criticality code of 1986 used in the current approved NRC SFP Safety Analysis. Using the updated computer code, PB would be able to demonstrate there is additional margin to the TS K_{eff} limit.

In February 2012, an NRC subject matter expert reviewed Exelon's assertion of a redundant reactivity penalty, and determined that Exelon's position was not valid and that the reactivity penalties imposed by the TIA were not redundant. In summary, neither the NRC TIA, the NRC evaluation of the PBAPS post-TIA Technical Evaluation, the 2010 PBAPS OD, nor the 2011 PBAPS Technical Evaluation supported compliance with TS 4.3.1.1.b for design case conditions.

Analysis. The failure of PBAPS to take timely corrective action to correct a CAQ is considered a PD that was reasonably within Exelon's ability to foresee and prevent. Specifically, PBAPS has been aware of degradation of neutron absorbing material (Boraflex) within the SFP storage racks since at least 1996 and did not take effective measures to adequately monitor or manage the degradation to assure sufficient margin to criticality was maintained. Rather, in 2010, PBAPS deferred corrective actions in the SFPs until 2014 based on an OD that concluded sufficient margin would exist until that time. However, the NRC concluded that the OD did not accurately project the rate of boron degradation, and used several non- conservative assumptions. In June 2011, measured degradation indicated PBAPS had exceeded design TS 4.3.1.1.b.

The PD was more than minor because it was similar to IMC 0612 Appendix E, "Examples of Minor Issues," Example 3.j, which indicates that an issue is more than minor if an engineering calculation error results in a condition where there is now a reasonable doubt on the operability of a system or component, or if significant programmatic deficiencies were identified with the issue that could lead to worse errors if uncorrected.

Using IMC 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors attempted to evaluate the risk significance of this issue. Applying the guidance in Table 3b, the inspectors made the assumption that the risk associated with this PD most appropriately impacted the Initiating Events cornerstone. A Region I SRA determined that there are no probabilistic risk assessment tools currently available to adequately assess the risk of a SFP criticality event. Consequently, the inspectors followed the guidance in the Phase 1 SDP screening worksheet Table 3b, Step 6, which states, in part, that where the SDP guidance is not adequate to provide reasonable estimates of a finding's significance, use IMC 0609, Appendix M, "SDP Using Qualitative Criteria."

Using Appendix M, the team identified criteria and associated considerations that supported an overall qualitative risk assessment. These criteria and considerations are provided in Attachment 2 to this report. The fact that multiple criteria were met in the Appendix M worksheet did not reflect on significance, and reflected only that they were items to be considered to assist management in reaching a significance determination.

On April 3, 2012, a Significance and Enforcement Review Panel (SERP) was conducted with personnel from Region I, the Office of Nuclear Reactor Regulation, and the Office of Enforcement to discuss the significance of this event. The SERP determined the PD and subsequent consequences resulted in a condition of very low safety significance (Green), based on assessment of Appendix M attributes and the factors (including actual conditions and design information) discussed below. The primary difficulty in this case was that the condition that was exceeded is a design TS which assumes worst case conditions, maximum fuel loading considerations, and a credible error (such as a dropped fuel assembly and mispositioning event). Furthermore, there is no TS action statement for the design TS to use as a guide for assessing risk. Since the degradation is bounded by the fourth quarter of 2008 (when the most degraded cells first exceeded the NRC TIA value of 36 percent degradation), the NRC determined that it is appropriate to consider the likelihood of actual SFP conditions reaching design conditions following that specific time period as well as the consequences of a potential criticality event to assess the risk.

PBAPS has been monitoring its entire SFPs since the mid 1990's with the most commonly used analytic software programs available to the industry (BADGER and RACKLIFE). Since August 2009, PBAPS has implemented an administrative control (documented in the PBAPS SFP and core fuel move process procedure) to ensure the most reactive fuel bundles (once burned fuel having spent two years in the reactor core) are not placed in SFP rack cell that has > 20 percent boron carbide degradation. The NRC resident inspectors at PBAPS have verified that this administrative control has been followed.

The NRC considered that the implementation of these controls in August 2009, prior to the identification of this issue and PBAPS's licensee event report (LER), has ensured

that the actual conditions in the SFPs never exceeded the K_{eff} 0.95 limit. Further, since exceeding the K_{eff} 0.95 design limit would require a critical configuration of 5-6 adjacent high energy cells, the NRC concluded that the probability that multiple mispositioning events could have occurred is minimal. In addition, PBAPS identified the refueling loading issue (i.e., concentration of high reactivity assemblies in the portion of the SFP closest to the reactor cavity) as the root cause of the highest degradation cells in the 2008 LAR. Further, PBAPS was aware of the issue and was taking steps to evaluate and address it, as evidenced by the administrative controls, the 2008 LAR, and the long term solution to install SFP rack boron inserts.

In addition, the NRC considered that based on the reactivity of the fuel that was actually used at PBAPS during this time period (fourth quarter 2008 to June 2011), the probability of meeting the design worst case assumptions and causing the TS K_{eff} limit to actually be exceeded was minimal. In the OD, PBAPS calculated that the TS K_{eff}, limit had been exceeded; assuming the SFP cells each contained the most reactive bundle that has ever been present at PBAPS. The licensee determined that this was GE11 9x9 fuel with an in-core K_{inf} of 1.2344. However, this type of fuel was last loaded in PB2 in 1994, and was removed from the core in 2000. The licensee determined that, during the time period in question, the highest K_{inf} value of any fuel used in either unit was no greater than in-core K_{inf} of 1.2165. Further, of the 201 PB2 SFP cells where fuel assemblies were removed, the 74 most reactive assemblies had peak reactivity (as calculated by PBAPS staff) of 1.0473. The NRC concluded that the likelihood of the K_{eff} limit being exceeded based on the reactivity values of the fuel assemblies actually present on site during this period of vulnerability was extremely low.

Given the above considerations, the NRC determined that this case was of very low safety significance (Green). This finding was also determined to have a cross-cutting aspect in the area of Problem Identification and Resolution - Evaluation (P.1(c)). Specifically, Exelon failed to properly evaluate a condition adverse to quality for operability, in that, the 2010 OD did not accurately predict the rate of Boraflex degradation and whether the issue challenged current operability.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” requires, in part, that conditions adverse to quality such as equipment deficiencies and malfunctions shall be promptly identified and corrected. Design TS 4.3.1.1.b states, in part, that, SFP storage racks are designed and shall be maintained with k_{eff} less than or equal to 0.95 if fully flooded with unborated water which includes an allowance for uncertainties as described in Section 10.3 of the UFSAR.

Contrary to the above, from the 4th quarter 2008 until June 2011, PBAPS failed to adequately identify or correct a condition adverse to quality involving Boraflex degradation in the SFP storage racks (10 CFR Part 50, Appendix B component, as stated in Section 10.3 of the UFSAR). Specifically, PBAPS deferred corrective actions in the SFPs until 2014 based on an OD that concluded sufficient margin would exist until that time. However, the NRC concluded that the OD did not accurately project the rate of boron degradation and used several non-conservative assumptions. In June 2011, after addressing the errors in the OD, PBAPS declared 117 cells in the Unit 2 SFP inoperable as of the fourth quarter 2008, which resulted in Unit 2 being in violation of TS 4.3.1.1.b. Because this finding is of very low safety significance and has been entered into the CAP via IRs 1127773 and 1225840, this violation is being treated as a Green NCV consistent with the Enforcement Policy, **(NCV 05000277, 278/2012-03, Untimely**

Corrective Actions Resulted in Spent Fuel Pool Boraflex Degradation Exceeding Design Limits).

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153 - 1 sample)
in accordance with NRC's Enforcement Policy

.1 (Closed) LER 05000277/2011-005-00: Inoperability of Offsite Power Circuit due to Design Weakness

On November 16, 2011, PBAPS determined, during design reviews, that a condition prohibited by TSs occurred as a result of two time periods within the last three years where the alignment of the two qualified circuits between the offsite transmission network and the onsite Class 1E AC electrical power distribution system did not comply with 10 CFR Part 50, Appendix A, General Design Criterion (GDC) XVII, "Electric Power Systems." It was determined that a lack of physical separation occurred, contrary to GDC 17, due to the auxiliary power supply for two TS offsite power source transformers, 00X011 and 00X005, being provided from a common power source. The cause of the event was attributed to an inadequate design of the auxiliary power to the 00X011 transformer, which was installed in the mid-1990s to provide the station with a third offsite power source that could be made available to feed a TS qualified circuit. PBAPS TS require only two operable offsite circuits to supply the Class 1E AC electrical power distribution system normal power operation. PBAPS entered this issue into the CAP. The inspectors verified that PBAPS has established interim controls to ensure that the 00X011 and 00X005 transformers are not simultaneously credited as part of the two TS operable qualified circuits. The enforcement aspects of this LER are discussed in Section 4OA7. This LER is closed.

4OA6 Meetings, Including Exit

Quarterly Resident Exit Meeting Summary

On April 20, 2012, the resident inspectors presented the inspection results to Mr. Thomas Dougherty, Site Vice President, and other PBAPS staff, who acknowledged the findings. Mr. P. Krohn, Chief, USNRC, Region 1, Division of Reactor Projects, Branch 4, attended this quarterly inspection exit meeting. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

4OA7 Licensee-Identified Violation

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which meets the criteria of the NRC Enforcement Policy for being dispositioned as an NCV(s).

- TS LCO 3.8.1, Condition A, requires that one inoperable offsite circuit be restored to an OPERABLE status within seven days during operational modes 1, 2 and 3. Condition G requires action, if the completion time for Condition A cannot be met, to place the unit in operational mode 3 within 12 hours. Contrary to the above, the offsite power circuit associated with transformer 00X011 was inoperable between March 18 and March 26, and May 10 and 28, 2010. Specifically, PBAPS determined that offsite power source transformers 00X011 and 00X005 were not designed with adequate physical separation to minimize, to the extent practical, a simultaneous

failure per the requirements of 10 CFR Part 50, Appendix A, Criterion XVII, "Electric Power Systems."

The inspectors determined that this finding was very low safety significance (Green), for both Peach Bottom Units 2 and 3, in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations" (IMC 0609A) using SDP Phases 1, 2 and 3. Phase 1 screened this finding to Phase 2 because it represented a loss of the 00X011 function, between May 10 and 28, 2010 (approximately 18 days), for longer than the TS LCO of 7 days. A Region 1 SRA conducted a Phase 3 analysis because the Phase 2 analysis, conducted by the inspectors using the Peach Bottom Pre-solved Risk-Informed Inspection Notebook, did not model the loss of a single offsite circuit.

The SRA used the Peach Bottom Standardized Plant Risk (SPAR) model, Version 8.18 dated September 10, 2009 and 8.17 dated July 8, 2009 for Units 2 and 3 respectively and SAPHIRE 8 to conduct the Phase 3 analysis.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Exelon Generation Company Personnel
T. Dougherty, Site Vice President
G. Stathes, Plant Manager
J. Armstrong, Regulatory Assurance Manager
T. Moore, Site Engineering Director
M. Herr, Operations Director
J. Kovalchick, Security Manager
P. Rau, Acting Work Management Director
R. Reiner, Chemistry Manager
R. Holmes, Radiation Protection Manager
J. Bowers, Training Director
B. Henningan, Operations Training Manager

NRC Personnel
P. Krohn, Branch Chief
S. Hansell, Senior Resident Inspector
A. Ziedonis, Resident Inspector
J. Furia, Senior Health Physicist

LIST OF ITEMS OPENED, CLOSED, DISCUSSED

Opened

None

Opened/Closed

05000277;278/2012002-01	NCV	Inadequate Corrective Action to Address Emergency Diesel Generator Control Power Circuit Chronic Internal Faults (Section 1R19.1)
05000277/2012002-02	NCV	Inadequate Corrective Action to Address Residual Heat Removal Heat Exchanger Graphite Gasket Leaks (Section 1R19.2)
05000277;278/2012-03	NCV	Untimely Corrective Actions Resulted in Spent Fuel Pool Boraflex Degradation Exceeding Design Limits (Section 4OA2.1)

Closed

05000277&278/2010-004-01	URI	Non-conservative TS and Potential Non-Compliance Associated with Degraded Spent Fuel Pool Boraflex Panels (Section 4OA2.2)
05000277/2011-005-00	LER	Inoperability of Offsite Power Circuit due to Design Weakness (Section 4OA3.2)

LIST OF DOCUMENTS REVIEWED

* -- Indicates NRC-identified

Section 1R01: Adverse Weather Protection

Procedures

CRs

Miscellaneous

Section 1R04: Equipment Alignment

Procedures
SO 14.1.A-3B COL, CS System Loop B, Revision 11
SO 10.1.A-3B COL, RHR System Setup for Automatic Operation Loop B, Revision 21
SO 13.1.A-2 COL, RCIC System, Revision 21
SO 10.1.A-3A COL, RHR System Setup for Automatic Operation Loop A, Revision 18

CRs
IR 1309106, Unexpected Torus Level Alarm

Section 1R05: Fire Protection

Procedures
PF-13A, Unit 3 RB, 3 'B' and 3 'D' CS Room - Elevation 91'-6"
PF-9, Unit 3 RB 'D' RHR Pump and HX Room, Elevation 91'-6" and 116', Revision 2
PF-10, Unit 3 RB, 'B' RHR Pump and HX Room, Elevations 91'-6" and 116', Revision 2
PF-60, Unit 2 RB RCIC Room, Elevation 88', Revision 2
PF-11, Unit 3 RB 'C' RHR Pump and HX Room, Elevations 91'-6" and 116', Revision 3
PF-12A, Unit 3 RB 'A' RHR Pump and HX Room, Elevations 91'-6" and 116', Revision 2
OP-AA-201-003, Attachment 1, Fire Drill Record, Revision 12, Performed 02/23/12
PF-79A, Unit 2 and 3 Turbine Building, Iso Phase Bus and Common Area – Elevation 135', Revision 7
RT-F-101-922-2, Fire Drill, Revision 3, Performed 02/23/12
TQ-AA-224-F020, Course Attendance Sheet, Revision 0, Performed 02/23/12
Miscellaneous
Fire Drill Scenario 2012-04, 4G4 Cubicle Fire, Fire Zone 79A
Historical List of Fire Drill Plant Locations Since 2010

Section 1R06: Flood Protection Measures

Drawings
M-28, RB Unit 3 Plan at Elevation 116,' Revision 11
M-2, General Arrangement Plan at Elevation 116,' Revision 20
M-3, General Arrangement Plan at Elevation 135,' Sheet 1, Revision 21

Procedures
EP-AA-1007, Radiological Emergency Plan Annex for PBAPS, Revision 22

CRs
1034515, Review Criteria for Table H2 Vital Area
1270600, EP to Review Criteria Used to Develop Table H2 Vital Area

Miscellaneous
DBD No. P-T-09, Internal Hazards, Revision 9
NEI 99-01, Methodology for Development of Emergency Action Levels, Revision 5
PB-PRA-012, Internal Flood Evaluation Summary Notebook, Revision 1
UFSAR Section 12.2.1 and 12.2.4

Section 1R07: Heat Sink Performance

Procedures
RT-I-O-033-632-2, CS Room Cooler Emergency Service Water Heat Transfer Test, Revision 11, Performed 01/05/12
RT-O-010-660-3, RHR HX Performance Test, Revision 9, Performed 01/11/12

Section 1R11: Licensed Operator Requalification Program

Procedures
OP-AB-300-1003, Boiling-Water Reactor Reactivity Maneuver Guidance, Revision 8
Attachment 1: Reactivity Maneuver Approval Cover Page
Attachment 2: Reactivity Maneuver Guidance Sheet
Attachment 5: Reactor Engineer's Evolution Plan / Guidance
OP-PB-300-1004, Core Flow Adjustment Guidelines, Revision 0

CRs
IR 1313350, Temporary Containment Recommended for Packing Leak
IR 1313561, Evaluate 2 'C' RFP Turbine Isolation Valve Maintenance for Next Outage
IR 1313570, Peach Bottom Unit 2 Control Rod 18-19 Is Missing "40" Position Indication
IR 1313572, Peach Bottom Unit 2 Control Rod 46-07 Missing "43" Position Indication
IR 1313575, Peach Bottom Unit 2 Position Indication Problems
IR 1313677, 2 'A' RFP Suction Valve M-2140A Stopped during Open Stroke
*IR 1313719, 2 'B' RFP Room Cooler 2DE046 Leak has Significantly Increased
IR 1313797, PSO5 End-of-Shift Critique
IR 1313824, Load Drop Communication Enhancement Needed
IR 1314016, PSO4 EOS Critique
IR 1315376, Unit 2 Load Drop REMA Critique

Miscellaneous
Reactivity Maneuver Plan PB2C19-30.0 for January 13 to 15, 2012

Section 1R12: Maintenance Effectiveness

Drawings
M-833, Q.A.D Instrument Nitrogen, Sheet 1, Revision 23
M-851, Q.A.D Mechanical Boiler, Sheet 1, Revision 37

Procedures
MA-MA-716-010-1008, WO Work Performance, Revision 5
OP-AA-106-101-1005, Quarantine of Areas, Equipment and Records, Revision 0
ARC 0AC097 B-2, Crankcase Pressure, Revision 2
M-052-002, Revision 35
ST-O-052-201-2, E1 Diesel Generator Slow Start and Full Load Test, Revision 19
SI2T-MIS-8457-B1CQ, Calibration/Functional Check of Channel B Group 1, 4 and 5 Primary Containment Isolation System Logic for TIS-8057B, Revision 14

CRs
IR 1267512, CHK-3-16A-33205B Leaks Through
IR 1267639, HV-3-16A-33170C has Leakage through Seat
IR 1267641, CHK-3-16A-33205C Leaks Through
IR 1268076, RV-3-02-071B Failed Leak Test during ST-M-01G-600-3
IR 1297946, Unit 2 SRV-71A Air OP Thread Seal Replacement Required in P2R19
IR 1297959, Unit 3 SRV-71L Air Operator Thread Seal Replacement Required in P3R19
IR 1297961, P3R18 SRV-71B Failed Air Operator Thread Discarded
IR 1319629, Unit 3 RV-3-02-071C
IR 1009644, Engine Exhaust Leak
IR 1076206, ST-O-052-411-2 Revision
IR 1084285, NER NC-10-041-Y LGS D23 Failure
IR 1319228, TI-70908D Low Out of Spec IAW SO 52A.8.A
IR 1319229, TI-010-143B Guage Faceplate Screen Vibrated Loose
IR 1322827, E-4 Standby Lube Oil Temp Lower Than Expected
IR 1323151, FM Found in Thermostat Element
IR 1323601, TS-7244B Requires Replacement
IR 1323614, E-2 EDG Grounding Conductor Requires Taping
IR 1323622, EOC Lock Tab Inspection Discovery
IR 1323666, Failed Bolts Inspection / E-2 Diesel
IR 1323749, FM Identified / 0BG012 Exhaust Muffler
IR 1324080, EOC Inspection Results - EDG Crankcase Oil Separator Bolting
IR 1324081, EOC Inspection Results - EDG Crankcase Oil Separator Bolting
IR 1324082, EOC Inspection Results - EDG Crankcase Oil Separator Bolting
IR 1324248, Acceptance Criteria Outside of Band / E2 Diesel
IR 1324271, TS-0595B Didn't Trip During R1165434 A01
IR 1324545, MCU Does Not Have a U1 to Ground
IR 1324381, E-2 EDG HX Inspection - Lessons Learned and Track
IR 1324586, E-2 Vertical Drive Lower Coupling Bushing Pitting
IR 1324657, Constant Failure of DG Lube Oil Temperature Switch
IR 1324749, E-2 CCR Relay Contacts
IR 1324832, E-22 Breaker Newly Installed CS is Binding When Manipulated
IR 1325063, Breaker 2 54 1606, E22 Breaker Tests/ASD CST Red Bulb Socket Threads
IR 1325109, ST-I-052-252-2 Aborted
IR 1325114, BP168 Fuel Oil Pump Did Not Start
IR 1325242, Oil Leak at Coupling Connection
IR 1325559, E2 Diesel Generator Engine Lube Oil Sump High Level Alarm

IR 1325572, TI-7273B Cylinder #6 Reading Low
*IR 1325888, LL - MWP Critique - Component Repair Not Correctly Identified
IR 1326416, Fasteners 116-39464 / LTA Form Fit and Function
*IR 1326940, Spring Plate Assemblies 114-63329
IR 1342458, Received a Half Group 1 Isolation in Unit 2
IR 1342458 Prompt Investigation Report
IR 1342531, Received a Half Group 1 Isolation in Unit 2
IR 1342599, Replace Fuse ATM10 for TIS-80547B

WOs / ARs
A1740714, Engine Exhaust Leak
R1196891, Replace Spring Plate Assembly
R1196892, Replace Spring Plate Assemblies
R1196886, Replace Spring Plate Assembly
R1196888, Replace Spring Plate Assembly

Miscellaneous
DBD P-S-18, Instrument Air and Nitrogen Systems, Revision 17
IR 1267512-02, Technical Evaluation for CHK-3-16-33205B(C) Leak Through During ST-M- 01G-600-3 Past Operability
IR 1267512-04, Apparent Cause Repot for CHK-3-16A-33205B Leakage
IR 1268076-02, Technical Evaluation for ADS SRV-71B Air Actuator Diaphragm Leak during ST-M-01G-600-3 Past Operability
IR 1268076-03, Equipment Apparent Cause Evaluation for Unit 3 SRV-71B Air Operator Diaphragm Leak
IR 1268076-24, Risk Assessment for SRV Thread Seal Replacement Timeliness
ME-213, ADS SRV Accumulator Sizing, Revision 0
NRC SER dated 05/14/84: NUREG 0737, Section II.K.3.28, Verify Qualification of Accumulators on ADS System Valves
PECO RAI Response dated 06/06/83: NUREG 0737, Section II.K.3.28, Verify Qualification of Accumulators on ADS System Valves
Peach Bottom LER 3-11-03, ADS SRV Actuator Diaphragm Thread Seal Leak
OTDM 1305288-08, Continued Operation with Unit 3 SRV 71-C Leakage
GEK-103892A, Figure 2-2, Steam Leak Detection Monitor Redundant Power Supplies and File Interlock - Functional Block Diagram
OE32012, Crankcase Vacuum Anomalies Identified After 'B' EDG Maintenance Outage (ANO1)
Unified Control Rood Log, Sunday, March 18, 2012, Night Shift
Unified Control Rood Log, Monday, March 19, 2012, Day Shift

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures
OP-AA-108-117, Protected Equipment Program, Revision 2
OP-PB-108-101-1002, Attachment A, PBAPS Protected Equipment Tracking Sheet for January 4, 2012
OP-PB-108-101-1002, Attachment A, PBAPS Protected Equipment Tracking Sheet for January 9, 2012
OP-PB-108-101-1002, Attachment A, PBAPS Protected Equipment Tracking Sheet for January 18, 2012
OP-PB-108-101-1002, Attachment A, PBAPS Protected Equipment Tracking Sheet for January 25, 2012
OP-PB-108-101-1002, Attachment A, PBAPS Protected Equipment Tracking Sheet for January 30 and 31, 2012

CRs
*IR 1324453, NRC Identified - Enhancement to Protected Equipment Practices

Miscellaneous
OP-PB-108-101-1002, Attachment A, PBAPS Protected Equipment Program Tracking Sheet: January 9, 18, 25, 30, 31, February 2, 2012

Section 1R15: Operability Evaluations

Procedures
M-010-002, RHR HX Maintenance, Revision 14
RT-O-010-660-3, RHR HX Performance Test, Revision 9

CRs
IR 1305288, SRV 71C Tailpipe Temperature Drop
IR 1319629, Unit 3 RV-3-02-071C
IR 734455, Water Leaking to Area Under 3 'D' RHR HX When 3 'B' RHR Pump Started
IR 131814, 3 'A' RHR HX Bottom Head Flange Leak
*IR 1312744, Difficulty in Securing a High Radiation Area Lock
*IR 1313260, Poor Housekeeping Standards
IR 1254027, Title: Part 21 SC 11-04 Seismic Impact on Channel Distortion
IR 1254155, Part 21 SC 11-04 Seismic Impact on Channel Distortion
IR 1325351, Revision to SC11-05 Seismic Input in Channel-Blade Guidance
IR 1325795, Unit 3 HCU Pressures High
IR 1189409, Evaluate Removing the 4 kV Non-Segregated Bus Hipot from Work Week 1112
IR 1319908 (Byron), Unit 2 Reactor Trip due to Electrical Fault and Unusual Event
IR 1322414, Fleet Review of Potential Design Vulnerability in Switchyard
IR 1325376, Peach Bottom Review of Byron Event
IR 1328139, NERC Standard PRC-005 Protection System Definition Change
IR 1335193, Corporate Review of Single Phase Op Evals Identifies Inconsistencies
IR 1335951, Corporate Project Team Assumption was Not Verified

WOs / ARs
A1649789, Water Leaking to Area Under 3D RHR HX When 3B RHR Pump Started
A1840231, 3A RHR HX Bottom Head Flange Leak

Miscellaneous
OTDM 1305288-08, Continued Operation with Unit 3 SRV 71-C Leakage
Operability Evaluation 08-001, IR 734455-02, 3D RHR HX Leakage, Revision 1
Unified Control Room Log, Tuesday, January 10, 2012, Day Shift
Active LCO Tracking Log 2-TS-0082
Active LCO Tracking Log 3-TS-11-0073
Operability Evaluation 11-003, IR 1254155-04, Seismic Effects on BWR Control Rod SCRAM at Low Reactor Pressures
Unified Control Room Log, Wednesday, October 12, 2011, Day Shift
Beaver Valley LER 2007-002, Undetected Loss of 138 kV 'A' Phase to System Station Service Transformer Leads to Condition Prohibited by Plant TS
Operability Evaluation 12-002, IR 1325376, Byron Loss of Single Voltage Phase Impact Review, Revision 0
OTDM for Removal of Non-Segregated Bus Hipot Testing from Work Week 1112

Section 1R18: Plant Modifications

Procedures
SI3F-20A-354-XXCQ, Calibration Check of Drywell Equipment Floor Drain Sump Flow Instruments FT 3-20-354, FQ 3-20-527 and FR 3-20-528, Revision 6

CRs
IR 1326437, PBAPS Readiness Review for LGS Resin Receipt Identified Gap
IR 1326472, Potential Discrepancy in EC for LSCS IRSF
IR 1335754, Unit 3 Drywell Equipment Drain Sump Hi-Hi Alarm Received

WOs / ARs
CO240090, C0240090, Receive Resin Liners / Support

Miscellaneous
ECR 09-00301, PB LLRWSF – Support of License Amendment Request
PBAPS License Amendment 280, Limerick LLRW Storage at Peach Bottom, Attachment 3: Technical Report Supporting ECR 09-00301
ECR 12-00063, Unit 3 'B Drywell Equipment Drain Sump TCP
FT-3-20-354 Instrument Calibration Sheet, Revision 3
TCP ECR 12-00063, 50.59 Review Coversheet Form for Unit 3 Drywell Equipment Drain Sump Jumper

Section 1R19: Post-Maintenance Testing

Drawings
M-365, P&ID: HPCI System, Sheet 1, Revision 62
E-5-7, Electrical Schematic Diagram - Standby Diesel Engine Generators, Sheet 1, Revision 50
M-315, P&ID: ESW and HPSW Systems, Sheet 1, Revision 68
M-361, P&ID: RHR System, Sheet 1, Revision 81

Procedures
ACPS 12-02-002, HPCI MO-16 Closed to Stop HPCI Turbine, Performed 01/20/12
ST-O-013-301-3, RCIC Pump, Valve, Flow and Unit Cooler Functional and In-Service Test, Revision 37, Performed 01/26/12
ST-O-023-301-2, HPCI Pump, Valve, Flow and Unit Cooler Functional and In-Service Test, Revision 58, Performed and Aborted 01/20/12
TC 12-006: Add Verification that TSV is Closed and Turbine Trip Alarm Prior to Closing MO-14, ST-O-023-301-2, HPCI Pump, Valve, Flow and Unit Cooler Functional and In-Service Test, Revision 58, Performed and Aborted 01/21/12
CH-426, HPSW System Sampling and Isotopic Analysis, Revision 13
M-10-002, RHR HX Maintenance, Revision 12
RT-O-010-610-2, 2 'A' RHR HX Leak Test, Revision 7
SI3L-3-231-D2C2, Calibration Check of Scram Discharge Volume Level High Instrument LS 3-3-231D &E, Revision 6, Performed 2/16/12
ST-O-010-301-2, 'A' RHR Loop Pump, Valve, Flow and Unit Cooler Functional and Inservice Test, Revision 34, Performed and Aborted on 02/16/12
ST-O-010-301-3, 'A' RHR Loop Pump, Valve, Flow and Unit Cooler Functional and Inservice Test, Revision 30, Performed on 01/10/12

CRs
IR 1312144, HO-3-23C-5513 HPCI Turbine Stop Valve
IR 1315669, O/B Mechanical Seal Leak on 20P033 - 60 DPM
IR 1315842, Unit 2 HPCI Booster Pump, Minor Leakage at Seal Flush Fitting
IR 1316318, Found HPCI Turbine Stop Valve Remote Trip Solenoid Bad
IR 1316324, C&T Emergent Clearance Required for Unit 2 HPCI Trip SV
IR 877635, Power Available Light at Diesel Generator Panel
IR 1079942, E-2 Diesel Generator (DG) Control Power Light is Not Lit
IR 1172024, E-2 DG Control Power Light on DGP Not Lit
IR 1236210, E-2 DG Control Power Light Out at Engine Panel
IR 1311985, E-1 EDG Control Power Light Out at Diesel Gage Panel
IR 132228, E-4 DG Control Power Light Out at Diesel Gage Panel
IR 1328736, CP Light was Replaced and Immediately Blew
IR 1337417, E1 DG Gauge Panel Control Power Light Not Lit
IR 1338642, PSO1 End-of-Shift Critique for Night Shift 3/6 - 3/8
IR 1080382, DPI-2-10-130A Indication Lowering with 2A HPSW Pump in Service
IR 1080382, 2 'C' RHR HX Shell to Tube Leakage
IR 1084973, 2 'C' RHR Exceeded MR (a)(1) Limit
IR 1085385, Unexpected Alarm during 2 'C' RHR Clearance Activities
IR 1091477, Clarification Required for Allowable ESF Leakage
IR 1112617, Action Level 1 Entered for Unit 2 Reactor Water Influent
IR 1115196, 2 'C' RHR HX Floating Head Gasket Failure
IR 1311814, 3 'A' RHR HX Bottom Head Flange Leak
IR 1327477, 2 'C' RHR HX Leak
IR 1328500, EOC Inspection of 3AE024 Needed due to 2CE024 Leakage
IR 1329431, 2 'A' RHR TSA Not Within 10%
IR 1332906, 2 'C' RHR HX Shell Cover Gasket
IR 1342685, Maintenance 2012 Required Reading - RR 12-011

WOs / ARs
Clearance 12000004, Perform System Window Work for RCIC TSA
C0217330, Replace Level Switch LS-3-03-231D

Miscellaneous
IR 1328736-06 Apparent Cause Report, E-1 EDG Control Power On Light Socket Failure
OE35548, Control Power Indicating Light Fixture Failure in EDG System (Peach Bottom)
ECR 08-00052, New RHR HX Gasket
OE32459, Update - Action Level 1 Entered due to RHR HX Leak (Peach Bottom)
OTDM - IR 1080382, 2 'C' RHR HX Shell to Tube Leakage
ACMP IR 694879, 3 'A' RHR HX Shell-to-Tube Leakage
IR 1080382-04, Technical Evaluation of Maximum Allowable RHR HX Shell-to-Tube Leakage
IR 1327477-04 Equipment Apparent Cause Report, 2 'C' RHR HX Shell Cover Gasket Leakage
UFSAR Table 4.8.1, RHR System Equipment Design Data
UFSAR Table 10.7.1, HPSW System Equipment Data

Section 1R22: Surveillance Testing

Procedures
ST-R-003-485-2, CRD Scram Insertion Timing of Selected Control Rods
SI2R-63F-050-A1FQ, Main Stack Rad Monitor RY-0-17-050A Functional Check, Performed 01/26/12

ST-C-095-859-2, Determining of Total Noble Gas Release Rate, Revision 8
ST-O-37D-370-2, Diesel Driven Fire Pump Operability Test, Performed 03/13/12
TRT 12-029, Flow Testing of 00P434, Diesel Driven High Capacity Portable Pump, Performed 03/24/12
ST-O-33-300-2, ESW Pump, Valve, Unit Cooler, and ECT Fans Functional Inservice Test, Performed on 3/14/12
ST-O-052-414-2, E4 Diesel generator Fast Start and full Load Test, on 1/23/12
ST-I-013-100-2, RCIC Logic system Functional Test, Revision 17, Performed 01/04/12

CRs
IR 1270514, GE Action Level Threshold Values Beyond Effluent Rad Monitor
IR 1324991 (Limerick), Opex Review for IR 1270514 Identifies Historical EAL Issue
IR 1337904, FR-3805 Black Pen Failed Max Differential Pressure Spread Check
IR 1340718, 2 'A' Vent Stack Sample Flow Elevation Above Expected Value
IR 1341126, ST-O-033-300-2 ESW PVF Unsat Steps

Miscellaneous
Main Stack and Vent Stack Isokenetic Flow Design Data System Folder
Sorrento Electronics Letter to PECO, dated September 13, 1996: Review of Isokenetic Design Data Associated with the Main Stack and Vent Stack
PLOT-5063-H03, Licensed Operator Training: Radiation Monitoring System
TRM 3.6 and Bases: Post-Accident Monitoring Instrumentation

Section 1EP6: Drill Evaluation

CRs
1347195, 1347059, 1346984, 1346979, 1346978, 1346975, 1346971, 1346969, 1346966, 1346956, 1346953, 1346905, 1346895, 1346866, 1346856, 1346826, 1346767, 1346758, 1346710, 1346696, 1346877, 1346897, 1346965, 1346974, 1346977, 1347327, 1347348, 1347830, 1347839, 1347902

Miscellaneous
DRP Policy 6: Plant Transient Response and Event Follow-up, Dated 06/08/09
DRP Policy 13: Resident Inspector Guidance, Dated 08/20/09
Exelon Nuclear Emergency Preparedness Briefing, PBAPS, Dated 03/27/12
IRP 103055, Technical Assessment Specialist – Resident Inspector
NRC Participant Briefing for Peach Bottom Emergency Exercise
Peach Bottom Unit 2 and 3 Plant Systems and Risk Briefing
Peach Bottom Emergency Exercise Participant Handbook
Region 1 Incident Response Program Orientation Package

Section 2RS02: Occupational ALARA Planning and Controls

CRs
01290147; 01290161; 01290175; 01290165; 01290559; 01290566; 01290573; 01290577; 01289452; 01289452; 01290597; 01290621; 01293402; 01295559; 01309506; 01310959

Miscellaneous
PBAPS 3R18 Radiation Protection Refueling Outage Report

Section 2RS05: Radiation Monitoring Instrumentation

CRs
01307688; 01307696; 01313272

Section 4OA2: Identification and Resolution of Problems

CRs
*IR 1310297, LS-AA-2080 Needs to be Corrected (SSFF NRC ROP PI)
*IR 1310098, Door 239 Not Making Up Closed Limit Switch
*IR 1312144, HO-3-23C-5513 HPCI Turbine Stop Valve
*IR 1312673, NRC Local Observation of 3 'A' RFP
*IR 1333802, Spalling at Bottom of West Wall in Unit 3 Bowling Alley
*IR 1333989, SV-2-36B-2929 is Buzzing
*IR 1339709, NNOE for IR 1220525 – Assignment 4 was not Published
*IR 1340887, Operator Action Should be Added to MSPI Basis Document
*IR 1345509, PSO5 EOS Critique from Day Shift 3-23 to 3-25 (NRC Identified Recirc MG Set Oil Leaks)

Section 4OA3: Follow-up of Events and Notices of Enforcement Discretion

Miscellaneous
Peach Bottom LER 3-11-03, ADS SRV Actuator Diaphragm Thread Seal Leak

Section 4OA7: Licensee-Identified Violations

Drawings
AB-198809-22, Single Line Diagram - Station Light & Power & D.C. Control 500 kV Substation, Sheet 1, Revision 22
E-1, Single Line Diagram - Station Electric, Sheet 1, Revision 51

Procedures
MA-MA-716-010-1008, WO Work Performance, Revision 5
OP-AA-106-101-1005, Quarantine of Areas, Equipment and Records, Revision 0

CRs
IR 1297961, P3R18 SRV-71B Failed Air Operator Thread Discarded
IR 1282238, Unanalyzed Conditions for Start-Up Transformer Auxiliaries
IR 1299506, Unanalyzed Condition for Start-Up Transformer Auxiliaries

Miscellaneous
IR 1268076-02, Technical Evaluation for ADS SRV-71B Air Actuator Diaphragm Leak during ST-M-01G-600-3 Past Operability
IR 1268076-03, Equipment Apparent Cause Evaluation for Unit 3 SRV-71B Air Operator Diaphragm Leak
Peach Bottom LER 3-11-03, ADS SRV Actuator Diaphragm Thread Seal Leak
Licensed Operator Training PLOT 5051, Offsite Electric Power System
OE35345, Inoperability of Qualified Offsite Power Circuit due to Identification of Historical Design Weakness (Peach Bottom)
Peach Bottom LER 2-11-05, Inoperability of Qualified Offsite Power Circuit due to Design Weakness
Active LCO Tracking 0-TS-0042, Potential TS 3.8.1 Entry

LIST OF ACRONYMS

ACE	apparent cause evaluation
ADAMS	Agency wide Documents Access and Management System
ADS	automatic depressurization system
AR	action request
BADGER	B-10 Areal Density Gauge for Evaluating Racks
BWRs	boiling water reactors
CAP	corrective action program
CAQ	condition adverse to quality
CFR	Code of Federal Regulations
CRs	condition reports
CS	core spray
DBD	design basis document
EDG	emergency diesel generator
DG	diesel generator
EOC	end-of-cycle
FW	feedwater
GL	generic letter
HPCI	high pressure coolant injection
HX	heat exchanger
IMC	inspection manual chapter
IP	inspection procedure
IR	issue report
LCO	limited condition of operation
LED	light emitting diode
LERs	licensee event reports
MR	maintenance rule
NCV	non-cited violation
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
OOS	out-of-service
PARS	publicly available records
PBAPS	Peach Bottom Atomic Power Station
PD	performance deficiency
PI	performance indicator
PI&R	problem identification and resolution
PMT	post-maintenance test
OD	operability determination
RAIs	requests for additional information
RB	reactor building
RCIC	reactor core isolation cooling
RFP	reactor feed pump
RHR	residual heat removal
RTP	rated thermal power
SDP	significance determination process
SERP	Significance and Enforcement Review Panel
SFP	spent fuel pool
SLIV	Severity Level IV
SRA	Senior Reactor Analyst
SSCs	structures, systems, and components

SRV	safety relief valve
STs	surveillance tests
TIA	Task Interface Agreement
TRM	technical requirements manual
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
URI	unresolved item
WOs	work orders

IMC 0609, APPENDIX M, TABLE 4.1

Qualitative Decision-Making Attributes for NRC Management Review

1. The SDP is the preferred path for determining the significance of findings in the Reactor Oversight Process.
2. IMC 0609, Appendix M is provided for use when the existing SDP guidance is not adequate to provide a reasonable estimate of the significance.
3. IMC 0609, Appendix M could be used for this case. Appendix M utilizes a qualitative significance determination process. In this case, 7 of 8 attributes have some level of applicability.

Decision Attribute	**Applicable to Decision?**	**Basis for Input to Decision – Provide qualitative and/or quantitative information for management review and decision making.**
Finding can be bounded using qualitative and/or quantitative information?	Yes	PB staff acknowledged that a condition prohibited by TS occurred since a K_{eff} of <0.95 could not be assured, assuming the NRC TIA uncertainties and assuming worst case fuel loading (K_{inf} = 1.2344). PBAPS acknowledges that the period of TS non-compliance exposure existed from the 4th qtr. 2008 until the 2nd qtr. 2011. Actual conditions in the PB2 SFP can be demonstrated to be less severe than the design basis assumed conditions. Of the 201PB2 SFP cells where fuel assemblies were removed, the 74 most reactive contained 9x9 assemblies (discharged after one cycle), with peak reactivity calculated by PBAPS staff to have a K_{inf} of 1.0473. The peak reactivity of any fuel type ever loaded at PBAPS was for GE11 9x9 fuel, with an in-core K_{inf} of 1.2344. The last GE11 9x9 fuel was loaded in PB2 in 1994, once-burned in 1996 and discharged in 2000. The peak cold, uncontrolled lattice reactivity of any fuel for either unit was no greater than incore K_{inf} of **1.2165** for the subject time period. The K_{inf} of 1.2165 is the highest 10x10 K_{inf} to date for either reactor, and Exelon verified that only 10x10 fuel has been used in PB2 and PB3 from 2008 to present. PB established Administrative Controls that were incorporated in its SFP and core fuel move process procedure in August 2009. These administrative controls prohibit loading fuel into cells with >20%

		degradation. These controls were followed and verified for the 2010 PB2 refueling outage. It was also verified that during the exposure period, fresh first burn assemblies were only in the SFPs for a maximum duration of 4.5 days during refueling outages. Per a 1993, NRC-approved license amendment request (LAR), a minimum areal density of 0.0210 g/cm^2 allows a K_{inf} of up to 1.362 to ensure $K_{eff} \leq 0.95$. K_{inf} of 1.362 is the limit specified in the design TS. Assuming worst case fuel loading for actual fuel used in the core, Max K_{inf} is 1.2344. For these conditions, PB's OD determined K_{eff} would remain < 0.95 if the areal density did not exceed 0.01155 g/cm^2 (45% degradation). NRR's TIA determined that 0.01504 g/cm^2 (36% degradation) would be a more appropriate limit than the 0.01155 g/cm^2 from the PB OD (45% degradation). At the time of the TIA, the peak panel degradation for the degraded cells was 41.24%. This would be considered to be Category II degradation (on a scale of I-III) of the neutron absorbing material barrier. PB's SFP safety analysis only credits the neutron absorbing barrier; however, PB does control SFP configuration (dispersed checkerboards pattern IAW B5B guidance) and established a K_{inf} limit. NRR considered the latter to be configuration controls. The June 2011 BADGER data, used by Exelon in their post-TIA Technical Evaluation, showed maximum degradation in 9 cells measured to be between 50% and 51%. This was consistent with the NRC's projections in the TIA and is greater than Exelon's 45% acceptance criteria.
Defense-in-Depth affected?	Yes	The term "defense in depth" is commonly associated with the maintenance of the integrity and independence of the three fission product barriers. In this case, defense in depth would be the measures to ensure an SFP inadvertent criticality event did not occur. An SFP criticality event is prevented by design features, and there are no mitigating systems or procedures at PB to cope with such an event. The design features credited to prevent an SFP criticality include limits to the number of spent fuel assembles allowed to be stored, limits to the maximum

		Kinf of the fuel assemblies stored in the SFP, the geometry of the SFP, and the neutron absorbing material in the storage racks. In this case the neutron absorbing material (Boraflex) was degraded to the point that the Boron areal density was below that assumed by the design criticality analysis. Thus, a defense in depth feature for preventing a SFP criticality event was degraded and could not perform the intended safety function for the design case conditions. However, actual conditions in the SFP did not approach design conditions due to the actual Kinf of the assemblies in the SFP and loaded in the core during the exposure period being significantly less that the maximum Kinf assumed in the design case. Thus, design case conditions could not have existed in the SFP during the exposure period, and the actual safety function was not lost.
Performance Deficiency effect on the Safety Margin maintained?	Yes	The design TS for SFP racks to ensure subcriticality ($k_{eff} \leq 0.95$ for all SFP loading conditions) could no longer be reasonably assured for 117 cells that contained spent fuel assemblies. Thus, the margin to criticality could not be assured, and safety margin was reduced. Design case Keff was calculated by NRR at 0.9658 using 45% degradation. Using the June 2011 Badger data (51% degradation), design case Keff would have been 0.9738. Under actual SFP conditions, there was significant margin to 0.95, based upon the Kinf of fuel bundles actually present in degraded cells since 2009 being significantly lower than the design Kinf of 1.2344. Of the 201 PB2 SFP cells where fuel assemblies were removed, the 74 most reactive contained 9x9 assemblies (discharged after one cycle), with peak reactivity calculated by PB staff to have a Kinf of 1.0473.
The extent the performance deficiency affects other equipment.	No	While SFP Boraflex degradation is occurring in both the PB2 and PB3 SFP racks, only PB2 cells are currently inoperable. No other equipment is affected by this condition.
Period of time (exposure time) affect on the performance deficiency.	Yes	Several PB2 fuel storage locations became inoperable in the fourth quarter of 2008 and remain inoperable to the present day. PB2 had refueling outages in the fall of 2008 and 2010, during this time period. Exelon has been aware of Boraflex degradation issues since 1996,

		and in 2007 projected that several cells would no longer meet the design assumptions of the current license, and that TS 4.3.1.1.a (Kinf limit of 1.362) would become non conservative. However, corrective actions were untimely in that the most degraded locations remained in service through June 2011. Administrative limits were put in place in August 2009, limiting the Kinf of bundles placed in the degraded SFP cells. No single burn assemblies were stored in these locations since 2009. Compensatory actions such as removing spent fuel assemblies from these cells and establishing more restrictive admin limits were completed on June 12, 2011. These actions have been inspected by the NRC and determined to be appropriate to ensure safe operation.
The likelihood that the licensee's recovery actions would successfully mitigate the performance deficiency.	Yes	There are no systems designed to mitigate a SFP criticality event. Rather, only design features are credited for demonstrating public health and safety by preventing occurrence of such an event. However, licensee compensatory actions and administrative limits to remove fuel from the affected locations, ensure a dispersed fuel pattern, and to administratively prohibit the future use of the affected locations appear to be appropriate to ensure a sufficient margin to a SFP criticality event is maintained, given the current SFP conditions.
Additional qualitative circumstances associated with the finding that regional management should consider in the evaluation process.	Yes	A. This is a violation of a design TS. As indicated below, by definition, a violation of a design TS due to degradation of a design feature is safety significant. 10 CFR 50.36 (c) (4): Design features. Design features to be included are those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered in categories described in paragraphs (c) (1), (2), and (3) of this section. The underlying basis for this design TS is 10 CFR 50.68 which states, in part: (1) Plant procedures shall prohibit the handling and storage at any one time of more fuel assemblies than have been determined to be safely subcritical under the most adverse moderation conditions feasible by unborated water. (4) If no credit for soluble boron is taken, the k-effective

		of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. If credit is taken for soluble boron, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. It is noteworthy, that the CFR language uses the word 'must.' This stresses the safety significance of maintaining compliance. B. By design, a criticality analysis is done to show sufficient margin to criticality under the worst case permissible moderator conditions and fuel loading and DBA occurring. Thus the probability of an SFP criticality can be assumed to be zero if the TS is met. This assumption cannot be made if the TS is not met. C. In 2007, Exelon submitted a LAR to change the Kinf value in TS 4.3.1.1a in order to gain additional margin. In response to issues raised by the NRC technical reviewers, Exelon made several supplemental submittals to the LAR before it was withdrawn by a letter dated June 18, 2010 (ML 101690377). A significant flaw in the modeling was identified by NRR. However, PB made similar non-conservative assumptions in the operability determination to support operability from 2009 - 2014. D. This issue is similar in nature to the White findings issued to Palisades and Turkey Point. Note that in the Turkey Point case, only 2 cells were affected. In the Palisades case, it is not known how many were affected, because the licensee only analyzed a sample (1.7%) of its SFP rack panels. E. The issue is also similar to two examples of Severity Level III violations in Supplement VI (Fuel Cycle and materials operations) of the previous revision of the NRC Enforcement Policy: C11: "A system designed to prevent or mitigate a serious safety event: (a) Not being able to perform its intended function under certain conditions; or (b) Being

		degraded to the extent that a detailed evaluation would be required to determine its operability" C12: "Changes in parameters that cause unanticipated reductions in margins of safety" Violations of SL III significance in traditional enforcement may be considered to comport with White risk significance under the SDP.