



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION I  
2100 RENAISSANCE BLVD., SUITE 100  
KING OF PRUSSIA, PA 19406-2713

February 10, 2016

Mr. Robert C. Braun  
President and Chief Nuclear Officer  
PSEG Nuclear LLC - N09  
P.O. Box 236  
Hancocks Bridge, NJ 08038

**SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 –  
INTEGRATED INSPECTION REPORT 05000272/2015004 AND  
05000311/2015004**

Dear Mr. Braun:

On December 31, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Salem Nuclear Generating Station, Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on January 21, 2016, with Mr. Ken Grover, Salem Plant Manager, and other members of your staff.

NRC inspectors 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.

The inspectors documented four findings of very low safety significance (Green) in this report. These findings involved violations of NRC requirements. Further, inspectors documented a PSEG-identified violation which was determined to be of very low safety significance in this report. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the 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 Salem Nuclear Generating Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding, or a finding not associated with a regulatory requirement 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 Salem Nuclear Generating Station.

R. Braun

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In accordance with Title 10 of the *Code of Federal Regulations* (10 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's Public Document Room or from the Publicly Available Records component of the NRC's Agencywide Documents Access and Management 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/**

Fred L. Bower, III, Chief  
Reactor Projects Branch 3  
Division of Reactor Projects

Docket Nos. 50-272 and 50-311  
License Nos. DPR-70 and DPR-75

Enclosure:  
Inspection Report 05000272/2015004  
and 05000311/2015004  
w/Attachment: Supplementary Information

cc w/encl: Distribution via ListServ

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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION I

Docket Nos. 50-272 and 50-311

License Nos. DPR-70 and DPR-75

Report Nos. 05000272/2015004 and 05000311/2015004

Licensee: PSEG Nuclear LLC (PSEG)

Facility: Salem Nuclear Generating Station, Units 1 and 2

Location: P.O. Box 236  
Hancocks Bridge, NJ 08038

Dates: October 1, 2015 through December 31, 2015

Inspectors: P. Finney, Senior Resident Inspector  
A. Ziedonis, Resident Inspector  
R. Barkley, Senior Project Engineer  
S. Chaudhary, Reactor Engineer  
A. DeFrancisco, Project Engineer  
J. Furia, Senior Health Physicist  
C. Lally, Acting Project Engineer  
R. Nimitz, Senior Health Physicist  
T. O'Hara, Reactor Engineer  
A. Siwy, Project Engineer

Approved By: Fred L. Bower, III, Chief  
Reactor Projects Branch 3  
Division of Reactor Projects

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## SUMMARY

Inspection Report (IR) 05000272/2015004, 05000311/2015004; 10/01/2015 – 12/31/2015; Salem Nuclear Generating Station (Salem), Units 1 and 2; Adverse Weather Protection, Maintenance Effectiveness, Problem Identification and Resolution.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. The inspectors identified two NRC-identified and two self-revealing findings of very low safety significance (Green), all of which were non-cited violations (NCVs). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and is determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated February 4, 2015. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5, dated February 2014.

### Cornerstone: Mitigating Systems

- Green. A self-revealing Green NCV of Technical Specification (TS) 6.8.1, "Procedures and Programs," as described in Regulatory Guide (RG) 1.33, Revision 2, February 1978, was identified when PSEG did not maintain an appropriate preventive maintenance (PM) schedule for Salem containment fan cooling units (CFCUs). Specifically, PSEG did not incorporate vendor recommendations and industry operating experience (OE) in 2003 when modifying PM schedules to delete motor air gap measurements for CFCUs. The 14 CFCU subsequently failed to start in low speed for scheduled testing on March 8, 2015. PSEG entered this in their corrective action program (CAP) as notification 20681031, replaced the 14 CFCU motor, completed an apparent cause evaluation (ACE), and re-initiated CFCU motor air gap measurement PMs.

PSEG's inadequate analysis of PM deletion was a performance deficiency within PSEG's ability to correct and should have been prevented. This issue was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and affects its cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors determined that the finding was of very low safety significance (Green) in accordance with IMC 0609, Attachment 4 and Appendix A, Exhibit 2, because the finding was not a design or qualification deficiency, did not represent a loss of safety system function, did not represent the loss of function for any TS system, train, or component beyond the allowed TS outage time, and it did not represent an actual loss of function of any non-TS trains of equipment designated as high safety significance in accordance with PSEG's maintenance rule (MR) program. The inspectors determined that there was no cross-cutting aspect associated with this finding since it was not representative of current PSEG performance. Specifically, in accordance with IMC 0612, the causal factors associated with this finding occurred outside the nominal three-year period of consideration and were not considered representative of present performance. (Section 40A2)

- Green. A self-revealing Green NCV of Title 10 of the *Code of Federal Regulations* (10 CFR) 50, Appendix B, Criterion XI, “Test Control,” and associated NCV of TS 3.3.1.1 was identified, with two examples, for not ensuring that all testing required to demonstrate that nuclear instrumentation (NI) would perform satisfactorily in service was identified and performed. As a result, inoperable Over-Temperature Delta-Temperature (OTDT) channels were not placed in the tripped condition within the timeframe required by TS limiting condition for operation (LCO) 3.3.1.1, on January 20 and April 21, 2015, respectively. PSEG entered this issue in their CAP and developed corrective actions to provide improved retest requirements for all maintenance performed on the NI system.

The inspectors determined that the failure to ensure the NI channels were operable upon restoration to service was a performance deficiency. The performance deficiency is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and affected its cornerstone objective to ensure the availability of systems that respond to initiating events to prevent undesirable consequences. Inspectors evaluated the finding’s significance in accordance with IMC 0609, Attachment 4 and Appendix A, and determined that the finding did not affect a single reactor protection system (RPS) trip signal to initiate a reactor scram and the function of other redundant trips or diverse methods of reactor shutdown, did not involve control manipulations that unintentionally added positive reactivity and did not result in a mismanagement of reactivity by operator(s). Therefore, the finding screened to Green, or very low safety significance. The finding has a cross-cutting aspect in the area of Human Performance, Documentation, because PSEG did not ensure that plant activities were effectively governed by comprehensive, high-quality, programs, processes and procedures. Specifically, subsequent to completion of calibration and replacement work and post-maintenance testing (PMT) per Instrumentation and Controls (I&C) surveillance procedures, work packages did not adequately address or specify activities related to verifying potentially affected RPS indications. [H.7] (Section 4OA2)

### **Cornerstone: Barrier Integrity**

- Green. Inspectors identified a Green NCV of TS 6.8.1, “Procedures and Programs,” when PSEG improperly implemented barrier controls in accordance with procedure CC-AA-201, “Plant Barrier Control,” Revision 5, during modification activities that impacted the flooding and radiological barrier design functions of the Unit 2 auxiliary building’s external boundary. In response, PSEG properly implemented appropriate plant barrier impairments for the area to include compensatory actions for the flooding and occupational radiation barrier aspects of the program, entered this in their CAP, and performed an apparent cause analysis.

This finding was more than minor because it was associated with the configuration control attribute of the Barrier Integrity cornerstone, and adversely affected the associated cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The finding was evaluated in accordance with IMC 0609, Attachment 4 and Appendix A, Exhibit 3, and determined to be Green since it did not represent a degradation of the control room barrier function despite representing a degradation of multiple barrier functions of the auxiliary building. This finding has a cross-cutting aspect in the area of Human Performance, Work Management, in that licensees implement a process of planning, controlling, and executing work to include the identification and management of risk and need for coordination such

that nuclear safety is the overriding priority. Specifically, PSEG did not properly plan and control work involving an impaired auxiliary building barrier to include coordinating with and ensuring awareness of different groups as well as incorporating risk insights, compensatory actions, and contingency plans. [H.5] (Section 1R01)

- Green. Inspectors identified a Green NCV of 10 CFR 50.65(a)(2) when control area ventilation (CAV) radiation monitor (RM) performance was not being effectively controlled through appropriate PM. Specifically, there were repetitive foil issues and a repeat maintenance preventable functional failure (RMPFF) during the monitoring period. PSEG placed the system in monitoring under 10 CFR 50.65(a)(1) and entered this in their CAP.

The issue was more than minor since it was associated with the barrier performance attribute of the Barrier Integrity cornerstone and adversely affected its objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The finding was screened in accordance with IMC 0609, Attachment 4 and Appendix A, Exhibit 3, where it screened to Green since it only represented a degradation of the radiological barrier function provided for the control room. The finding has a cross-cutting aspect in Human Performance, Conservative Bias, in that licensees take timely action to address degraded conditions commensurate with their safety significance and take a conservative approach to decision making. [H.14] (Section 1R12)

### **Other Findings**

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



## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On October 26, Unit 1 was reduced to approximately 81 percent power in support of planned turbine valve testing and installation of a pipe plug in the Unit 2 service water (SW) nuclear header to support maintenance. Power was restored to 100 percent on the morning of October 27, but was subsequently reduced to approximately 80 percent power later on the same day to reseal the pipe plug in the Unit 2 SW nuclear return header. Power was restored to 100 percent on October 28. On November 3, power was reduced to approximately 81 percent power in support of Unit 2 SW nuclear header maintenance. On November 12, power was restored to 100 percent. The unit remained at or near 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period at 100 percent power. The unit was shut down on October 22 for refueling outage 2R21. On November 23, Unit 2 was in Mode 3 and preparing for a reactor startup with shutdown bank control rods withdrawn. During troubleshooting of leakage by the seat of a relief valve on the boron injection tank, the relief valve lifted resulting in a reactor coolant system leak greater than 10 gallons per minute. An Unusual Event was declared based on exceeding this leakrate. The event lasted about one minute until the leak was isolated. Unit 2 transitioned to Mode 5 in response to an associated TS 3.0.3 entry. A reactor startup was commenced on November 27, the unit was synchronized to the grid on December 1 and 100 percent power was reached on December 5. The unit remained at or near 100 percent power for the remainder of the inspection period.

## 1. REACTOR SAFETY

### **Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

1R01 Adverse Weather Protection (71111.01 – 1 sample)

#### External Flooding

##### a. Inspection Scope

During the week of October 1, the inspectors performed an inspection of the external flood protection measures for the Salem Unit 1 and Unit 2 electrical penetration areas, SW intake structure, and emergency diesel generators (EDGs). The inspectors reviewed TSs, procedures, design documents, and the Updated final safety analysis report (UFSAR), which depicted the design flood levels and protection areas containing safety-related equipment to identify areas that may be affected by external flooding. The inspectors conducted a general site walkdown of all external areas of the plant to ensure that PSEG erected flood protection measures in accordance with design specifications. The inspectors also reviewed operating procedures for mitigating external flooding during severe weather to determine if PSEG planned or established adequate measures to protect against external flooding events. Documents reviewed for each section of this inspection report are listed in the Attachment.

b. Findings

Introduction. Inspectors identified a Green NCV of TS 6.8.1, "Procedures and Programs," when PSEG improperly implemented barrier controls in accordance with procedure CC-AA-201, "Plant Barrier Control," Revision 5, during modification activities that impacted the flooding and radiological barrier design functions of the Unit 2 auxiliary building's external boundary.

Description. On August 26, 2015, inspectors were conducting a walkdown of Fukushima modifications being made to Unit 2 while in Mode 1. The inspectors entered the boric acid evaporator room from the auxiliary building exterior through two fully open, watertight doors. The inspectors noted that the room's interior wall had been removed and one could approach the auxiliary building radiological controlled area just beyond the room. No means of monitoring the air flow direction were observed. This room had been historically isolated on the exterior via the doors and on the interior via a metal panel wall. The inner wall was being converted into a doorway and a welder was welding in a door frame at the time. Given Salem TS 3.7.7 requires that auxiliary building differential pressure be slightly negative in Mode 1, the inspectors made the control room aware of concerns regarding operability of the auxiliary building differential pressure as well as the impairment of the barrier. Operators closed the outer watertight doors and entered the issue in their CAP (notification 20700779) where it was documented as a potential unmonitored release path. Both the original operability determination and a subsequent operability determination, performed on August 26 and September 9 respectively, said that there is a valid concern that the open doors locally may not allow the local area to be maintained at the required negative pressure. However, this was not measurable. Work continued on subsequent days until the inspectors walked the area down on or about September 10 and raised the concern again. The deficiency was corrected again by closing the outer watertight doors and the original notification (20700779) was populated with a requirement for a past functionality evaluation. The following day it was populated confirming its classification as a high energy line break (HELB) and flooding door and that the impairment required a plant barrier impairment (PBI). A separate notification (20702809) documented that the impairment had not received a PBI per CC-AA-201, "Plant Barrier Control Program," Revision 5. The notification comments also stated that cutting through the interior metal panel made the evaporator room part of the auxiliary building contiguous zone envelope.

PSEG's investigation and causal evaluation (20703929/70180039) determined that technicians had breached the metal panel that formed the interior wall of the evaporator room on or around November 11, 2014, and that the outer doors had been opened on numerous occasions from that time through September 2015. There was no temporary modification in associated logs and there was a potential flow path from the auxiliary building to the environment. PSEG determined that one apparent cause was inadequate procedural guidance that resulted in work planners not requesting a PBI, personnel not meeting the intent of the attendant requirement, and departments not requiring proof that TS 3.7.7 would be met prior to opening the doors. In response, the outer doors remained closed on September 10, until PSEG implemented appropriate PBIs for the area in support of future work. The PBIs included compensatory actions for the flooding and occupational radiation barrier aspects of the program.

CC-AA-201 provides guidance and clarification on actions to evaluate and compensate for impaired barriers, to include those for occupational radiation, ventilation, and flooding. Section 1.2 states that each of the credited functions needs to be evaluated when the plant barrier is impaired and explains that a PBI controls the identification and evaluation of a barrier to be impaired including installation, restoration, and any compensatory actions. Steps 4.2.1, 4.3.3, and 4.3.4 direct PSEG staff to determine the plant impact, implement compensatory actions, and ensure the actions are in place prior to obtaining operations management permission to impair the barrier.

CC-AA-201, Attachment 3, "Specific Review Guidance," provides directions for consideration of the various functions a barrier may perform and includes ventilation, flooding, HELB, and occupational radiation. Of particular note, for a ventilation boundary, the most limiting size shall be specified and should be based on the latest surveillance pressure testing results for the most limiting train serving a given boundary area. Impairing a barrier with openings that are, in aggregate, greater than maximum allowable penetration size is unacceptable.

Analysis. The inspectors determined that PSEG improperly implemented CC-AA-201 barrier controls during maintenance activities. This finding was more than minor because it was associated with the configuration control attribute of the Barrier Integrity cornerstone, and adversely affected the associated cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, improper barrier controls did not ensure the auxiliary building envelope remained an intact physical barrier or that appropriate compensatory measures were in place to protect the public from radionuclide releases. The finding was evaluated in accordance with IMC 0609, Attachment 4 and Appendix A, Exhibit 3, and determined to be Green since it did not represent a degradation of the control room barrier function despite representing a degradation of multiple barrier functions of the auxiliary building.

This finding had a cross-cutting aspect in the area of Human Performance, Work Management, in that licensees implement a process of planning, controlling, and executing work to include the identification and management of risk and need for coordination such that nuclear safety is the overriding priority. Specifically, PSEG did not properly plan and control work involving an impaired auxiliary building barrier to include coordinating with and ensuring awareness of different groups as well as incorporating risk insights, compensatory actions, and contingency plans. [H.5]

Enforcement. TS 6.8.1, "Procedures and Programs," states, in part, that written procedures shall be implemented covering the applicable procedures recommended in Appendix A of RG 1.33, Revision 2, February 1978. RG 1.33, section 9, "Procedures for Performing Maintenance," states, in part, that maintenance that can affect the performance of safety-related equipment should be properly preplanned and performed in accordance with written procedures, appropriate to the circumstances. PSEG procedure CC-AA-201 describes the requirements for plant design barrier controls during the performance of maintenance activities that can affect the performance of safety-related equipment. Contrary to steps in CC-AA-201, from November 2014 through September 2015, PSEG improperly implemented barrier controls while performing maintenance that could affect the performance of the auxiliary building envelope. In response, PSEG took corrective actions to properly implement barrier controls, entered this in their CAP via notifications 20700779, 20702809, and 20703929,

and performed an apparent cause analysis. Because this finding was of very low safety significance (Green) and was entered into PSEG's CAP, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC's Enforcement Policy. **(NCV 05000311/2015004-01, Inadequate Implementation of Auxiliary Building Radiological and Flood Barrier Impairment Controls)**

1R04 Equipment Alignment

.1 Partial System Walkdown (71111.04Q – 3 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit 1, 11 and 12 component cooling water trains following mispositioning on December 3
- Unit 2, Chemical and volume control system letdown during reactor vessel draindown on October 25
- Unit 2, Decay heat removal during integrated leak rate test (ILRT) on November 13

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 UFSAR, TSs, work orders, notifications, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted the system's performance of its 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 PSEG 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.

.2 Full System Walkdown (71111.04S – 1 sample)

a. Inspection Scope

On November 24, the inspectors performed a complete system walkdown of the charging system following restoration from the refueling outage and leaking boron injection tank relief valve. The inspectors reviewed operating procedures, surveillance tests, drawings, equipment lineup procedures, and the UFSAR to verify the system was aligned to perform its required safety functions. The inspectors also reviewed electrical power availability and equipment cooling, support functionality, and operability of support systems. The inspectors performed field walkdowns of accessible portions of the systems to verify system components and support equipment 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 PSEG staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization. Additionally, the inspectors reviewed a sample of related notifications and work orders to ensure PSEG appropriately evaluated and resolved any deficiencies.

b. Findings

No findings were identified.

1R05 Fire Protection

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 PSEG controlled combustible materials and ignition sources 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, degraded or inoperable fire protection equipment, as applicable, in accordance with procedures and discussed with station personnel the repair plans for degraded equipment.

- Unit 1, Spent fuel/component cooling heat exchanger and pump area on November 12
- Unit 1, Auxiliary feedwater (AFW) pumps area on November 12
- Unit 1, 460V switchgear rooms and corridor on November 12
- Unit 1, Charging pump on November 12
- Unit 2, Mechanical penetration area on November 10

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 identify internal flooding susceptibilities for the site. The inspectors' review focused on the Unit 1 and Unit 2 230V/460V switchgear. They verified the adequacy of equipment seals, 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. They assessed the adequacy of operator actions that PSEG had identified as necessary to cope with flooding in this area and also

reviewed the CAP to determine if PSEG was identifying and correcting problems associated with both flood mitigation features and site procedures for responding to flooding.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (711111.07A – 1 sample)

a. Inspection Scope

The inspectors reviewed the 21 CFCU main cooler readiness and availability to perform its safety functions. The inspectors reviewed the design basis for the component and verified PSEG's commitments to NRC Generic Letter 89-13, "Service Water System Requirements Affecting Safety-Related Equipment." The inspectors observed actual performance tests for the heat exchanger and/or reviewed the results of previous inspections. The inspectors discussed the results of the most recent inspection with engineering staff and reviewed pictures of the as-found and as-left conditions. The inspectors verified that PSEG initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the heat exchanger did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

1R08 In-service Inspection Activities (71111.08 – 1 sample)

a. Inspection Scope

The inspectors conducted a review of PSEG's implementation of in-service inspection (ISI) program activities for monitoring degradation of the reactor coolant system pressure boundary, risk significant piping and components, and containment systems during the Salem Unit 2 refueling outage (2R21). The sample selection was based on the inspection procedure objectives and risk priority of those pressure retaining components in systems where degradation would result in a significant increase in risk. The inspectors observed in-process non-destructive examinations (NDE), reviewed documentation, and interviewed PSEG personnel to verify that the NDE activities performed as part of the Salem Unit 2 ISI program were being conducted during Salem Unit 2 Interval 4, Period 1, Outage 2 of 2, in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI, 2004 Edition, no Addenda.

### Non-destructive Examination and Welding Activities (IMC Section 02.01)

The inspectors performed direct observations of NDE activities in process and reviewed records of the NDEs listed below:

#### ASME Code Required Examinations

- The inspectors reviewed a magnetic particle examination report, MT-15-001, of the Steam Generator (SG) 22 nozzle to shell weld. The inspectors also reviewed the PSEG magnetic particle testing (MT) procedure.
- The inspectors observed the manual ultrasonic examination of the nozzle to shell welds for two pressurizer safety valve welds: weld 4-PRN-1200-IRS and weld 6-PRN-1205-IRS. The inspectors reviewed the associated NDE examination reports and the procedure used to perform the examination. The inspectors determined that these examinations were completed in accordance with the requirements for ASME Code Class 1 piping.
- The inspectors reviewed the records of the bare metal visual examination (VT-2) of the bottom of the reactor pressure vessel lower head and instrument nozzle penetrations. The inspectors also reviewed the documentation of the condition of each nozzle penetration. No indications of boric acid leakage were observed.
- The inspectors reviewed a sample of five reports documenting the results of visual examinations from inside the Salem Unit 2 containment. These examinations were completed after PSEG staff removed selected shield panels. PSEG staff also measured the liner thickness via ultrasonic testing (UT) in several locations.
- The inspectors observed the UT examination of socket welds in valve 1.5-SJ-1222-48 elbow to pipe weld, and valve 1.5-SJ-1222-49 elbow to pipe weld. The inspectors determined that these inspections achieved the required coverage of the area of interest (100 percent was achieved).
- The inspectors reviewed certifications of the NDE technicians performing the examinations to verify whether the inspections were performed in accordance with approved procedures and that the results were evaluated by certified Level III NDE personnel.

#### Dissimilar Metal Weld Inspection of Mitigated Reactor Vessel Nozzles

During 2R21, PSEG staff completed phased array UT examinations (manual or automated) of six reactor vessel nozzles with dissimilar metal welds that were previously subjected to a mechanical stress improvement process (MSIP). The inspections were governed by Salem Unit 2 TSs, the ASME Boiler and Pressure Vessel Code, Section XI, 2004 Edition, as modified by 10 CFR 50.55a(b)(2)(xiv, xv and xiv), Code Case N-770-1, and the plant specific examination program plan. The inspectors reviewed the UT data from dissimilar metal welds in nozzle 23 hot leg, 24 hot leg, 21 cold leg, 22 cold leg, 23 cold leg, and 24 cold leg. The inspectors determined that each examination achieved greater than 90 percent coverage and that no recordable indications were detected. Each examination was also reviewed to determine whether the activities were performed

in accordance with ASME Code, Section XI, Appendix VIII, and Supplement 10, using qualified procedures, equipment, and personnel. The phased array UT examinations were reviewed to determine whether they met the ASME Code requirements.

#### Review of Originally Rejectable Indications Accepted by Evaluation

There were no samples available for review during this inspection that involved examinations with recordable indications that had been accepted for continued service during 2R21.

#### Repair/Replacements Consisting of Welding Activities

Notification 20647348 documented a condition in which weld flaws that exceeded the examination acceptance criteria for the repair of a support lug on reactor coolant pump 21. PSEG staff performed an engineering evaluation (60116663/10/5) of the condition and directed repair of the indications in accordance with the ASME Code. This evaluation directed surface grinding with specified limits while retaining the original contour of the weld followed by a more detailed, final examination. After completing blending of the flaw indications, PSEG staff performed an as-left penetrant examination to verify that no additional surface cracks existed in the support welds.

#### Westinghouse Steam Generator Primary Nozzle Inner Corner Regions Ultrasonic Inspection; 10 CFR Part 21 Report (ML15205A289)

In response to a report from the Electric Power Research Institute (EPRI) dated July 24, 2015, PSEG staff evaluated the coverage achieved in previous SG primary nozzle examinations. PSEG staff utilized revised modeling of the dimensions to identify the required weld coverage for the Salem Unit 1 SG primary nozzle inner corner region and for the Salem Unit 1 pressurizer nozzle inner radius examinations. PSEG staff re-examined the 22 SG nozzle to shell weld during 2R21 and obtained 100 percent coverage. Additionally, PSEG staff utilized revised modeling for the pressurizer relief nozzle and upon re-examination during 2R21, achieved 100 percent coverage of this weld also. The inspectors review verified the required weld coverage was identified and achieved.

#### Boric Acid Corrosion Control (BACC) Inspection Activities (IMC Section 02.03)

The inspectors reviewed the BACC program implementing procedures used to complete walkdowns, evaluate conditions, and to make complete repairs or maintenance. The inspectors determine whether actions were performed in accordance with PSEG procedures. The inspectors observed the identification and documentation of non-conforming conditions of boric acid leaks in the CAP with a focus on areas that could cause degradation of safety significant components.

The inspectors verified the adequacy of visual examination (VT2) results of the bare metal inspection of the Salem Unit 2 reactor pressure vessel lower head penetration nozzle welds that was performed by PSEG personnel during 2R21. The inspectors reviewed a sample of photos and visual examination documentation records to verify that no boric acid leakage was identified.



The inspectors verified that potential deficiencies identified were entered into PSEG's CAP and reviewed evaluations of the more significant deficiencies documented in notifications. The inspectors also reviewed the associated engineering evaluations for a sample of notifications to verify that equipment or components that were wetted or impinged upon by boric acid solutions were properly analyzed for degradation to determine their functions could be accomplished.

#### SG Tube Inspection Activities (IMC Section 02.04)

SG tube inspections were not performed during 2R21. The inspectors reviewed PSEG's degradation assessment report from the prior outage, 2R20, and the operational assessment report from 2R20 to determine whether evaluations in these documents were completed in accordance with applicable industry SG program guidance.

#### Identification and Resolution of Problems (IMC Section 02.05)

The inspectors reviewed a sample of notifications which identified NDE indications, deficiencies, and other nonconforming conditions since the previous refueling outage. The inspectors verified that nonconforming conditions were properly identified, characterized, evaluated, corrective actions identified and dispositioned, and appropriately entered into the CAP.

#### b. Findings

No findings were identified.

### 1R11 Licensed Operator Requalification Program (71111.11Q – 2 samples)

#### .1 Quarterly Review of Licensed Operator Requalification Testing and Training

#### a. Inspection Scope

The inspectors observed licensed operator simulator training on October 6 that included a SW bay leak with a loss main turbine lube oil and a reactor trip. 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 and reviewed the Unit 2 startup on November 27 from the refueling outage. The inspectors observed operator performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly 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 structure, system, and component (SSC) performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance work orders, and MR basis documents to ensure that PSEG 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 PSEG staff was 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 PSEG staff was identifying and addressing common cause failures that occurred within and across MR system boundaries.

- Unit 1, CAV RMs on September 15
- Unit 1, 1B EDG breaker failure to close on October 20
- Unit 1, 11 SG narrow range level transmitter failure on November 22

b. Findings

Introduction. Inspectors identified a Green NCV of 10 CFR 50.65(a)(1) and 10 CFR 50.65(a)(2) when CAV RM performance was not being effectively controlled through appropriate PM and RM performance was not monitored against PSEG-established goals in response. Specifically, there were repetitive Mylar foil issues and a RMPFF during the monitoring period.

Description. There are two RMs in each of the two CAV intakes. On Unit 1, the 1R1B-1 and 2R1B-2 RMs share the same intake. The RMs' scintillation detectors protrude through the top of the duct to expose the detector window to the intake process and their faces are covered with a Mylar foil to prevent ambient light entering the ventilation duct from affecting the detector. In this application, the detectors are normally exposed to ambient light entering the ventilation duct inlet screen. If the detector foil has degraded, light will cause the detector's background count rate to increase.

On April 20, 2013, control room ventilation shifted to the accident pressurized mode due to the 2R1B-2 RM going into alarm (notification 20608509). PSEG's ACE (70154084) included a causal factor that degradation of the 2R1B-2 detector foil resulted in an invalid high radiation signal. The associated cause was not identifying degraded component unreliability. PSEG determined this to be a maintenance preventable functional failure (MPFF) and created PMs on the 2R1B-2 to replace the detector Mylar foil every six months to prevent failure.

On August 6, 2013, PSEG documented a 2R1B-2 RM failure history review that showed six foil degradations since 2011, two of which were MR functional failures (MRFFs) (notification 20617427). The notification noted that the adverse trend may eventually lead to exceeding MR performance criteria of four MPFFs and zero RMPFFs in 36 months. The duration between these foil failures was approximately six months. Inspectors opined that the adverse trend was sufficient for PSEG to consider the potential that PMs were not effectively controlling maintenance and to wait for the performance criteria to be exceeded was not warranted. PSEG evaluated (notification 20617427) the system for monitoring under (a)(1), but determined that an adverse trend did not exist.

On September 8, 2013, a light was shined on RM 1R1B-1 during an inspection that caused counts to increase, the channel to alarm, and an actuation that shifted control room ventilation to the accident pressurized mode. PSEG determined that this was not a function failure (notification 20620721). Inspectors questioned PSEG on this given that ER-AA-310-1004, "Maintenance Rule – Performance Monitoring," Revision 10, Attachment 2, steps 1 and 15, say a failure that causes a safety system actuation is an MRFF and an unanticipated actuation of logic in the absence of a valid demand signal may be an MRFF. PSEG ultimately agreed and revised the issue to an MRFF (notification 20704643). PSEG subsequently evaluated this under a functional failure cause determination evaluation and determined that it was caused by degraded detector foil and was an RMPFF based on the previous actuation in April 2013.

Inspectors also reviewed several associated foil performance issues that challenged the effectiveness of PM.

- April 21, 2014 - During as-found calibration of RM 1R1B-1, the detector was found high out-of-specification. PSEG determined this was not a functional failure (notification 20648168). PSEG's evaluation (70165736) determined that the as-found readings indicated a non-conservative response in relation to the alarm setpoint and the design action would have taken place in a non-conservative direction. Inspectors challenged PSEG on this and PSEG ultimately agreed this was an MRFF (notification 20704483). PSEG performed a functional failure cause determination evaluation and determined that this was an MPFF associated with high voltage settings.
- May 3, 2014 - 2R1B-2 failed low. PSEG's evaluation (70166405) determined there had been a check source misalignment when the detector foil was replaced the previous day and that this was an MPFF.

The NRC Enforcement Manual, Section 2.1.11 describes issues that are violations of 10 CFR 50.65(a)(2) to include not moving an SSC to (a)(1) when performance indicates that the SSC is not being effectively controlled through appropriate PM. The Enforcement Manual considers that a repetitive PM preventable functional failure would indicate that the licensee has not demonstrated the effectiveness of PM and consequently that SSC must be moved to (a)(1). Overall, during a 36-month period from September 8, 2013 to September 1, 2015, PSEG was tracking two MPFFs and zero RMPFFs for the Unit 1 CAV radiation monitoring system. Following inspector review and questions, there were four MPFFs and one RMPFF for the same period. This revision exceeded the PSEG-established performance criteria of four MPFFs and zero RMPFFs in 36 months. The inspectors noted that the PSEG criteria regarding RMPFFs was consistent with the NRC Enforcement Manual. The inspectors determined that, given the equipment performance problem of repetitive foil issues and the RMPFF, the Unit 1 CAV RM performance was not being effectively controlled through appropriate PM. In response, on September 1, 2015, PSEG placed the system in monitoring under 10 CFR 50.65(a)(1).

Analysis. Not demonstrating the effectiveness of PM in accordance with the requirements in 10 CFR 50.65(a)(2) and consequently moving the Unit 1 CAV RMs to enhanced monitoring in accordance with the requirements of 10 CFR 50.65(a)(1) was a performance deficiency. The issue was more than minor since it was associated with the barrier performance attribute of the Barrier Integrity cornerstone and adversely affected its objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, CAV RM reliability had exhibited an adverse trend based on repetitive degraded foil and functional failures. The finding was screened in accordance with IMC 0609, Attachment 4 and Appendix A, Exhibit 3, where it screened to Green since it only represented a degradation of the radiological barrier function provided for the control room.

The finding had a cross-cutting aspect in Human Performance, Conservative Bias, in that licensees take timely action to address degraded conditions commensurate with their safety significance and take a conservative approach to decision making. Specifically, PSEG did not identify a trend in degraded CAV RM performance and designate corresponding corrective actions and goals. (H.14)

Enforcement. 10 CFR 50.65 (a)(1), requires, in part, that the holders of an operating license shall monitor the performance or condition of SSCs within the scope of the rule as defined by 10 CFR 50.65 (b), against licensee-established goals, in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions. 10 CFR 50.65 (a)(2) states, in part, that monitoring as specified in 10 CFR 50.65 (a)(1) is not required where it has been demonstrated that the performance or condition of an SSC is being effectively controlled through the performance of appropriate PM, such that the SSC remains capable of performing its intended function. Contrary to the above, between September 8, 2013 and September 1, 2015, PSEG did not demonstrate that performance of the Unit 1 CAV RMs was being effectively controlled through the performance of appropriate PM in that a repetitive PM preventable functional failure occurred on September 8, 2013. Following the failure, PSEG did not monitor the performance or condition of the RMs against PSEG established goals as required by 10 CFR 50.65(a)(1) when the RMs performance was not controlled in accordance with 10 CFR 50.65(a)(2). In response, on

September 1, 2015, PSEG placed the system in monitoring under 10 CFR 50.65(a)(1) and entered this in their CAP as notification 20704643. Because the finding was of very low safety significance (Green) and entered into PSEG's CAP, this violation is being treated as an NCV in accordance with section 2.3.2 of the Enforcement Policy. **(NCV 05000272/2015004-02, Inadequate Maintenance Effectiveness of Control Room Ventilation Radiation Monitors)**

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 2 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 PSEG 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 PSEG personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When PSEG 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.

- Unit 1, TS 3.0.3 entry following control room emergency air conditioning system charcoal test failure on October 28
- Unit 2, Orange risk during reduced inventory on November 12

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 5 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions based on the risk significance of the associated components and systems:

- Unit 1, 12 control rod drive mechanism ventilation fan backup breaker on October 8
- Unit 1, Pressurizer power-operated relief valve limit switches on October 16
- Unit 2, Containment isolation valves leaking inside containment on November 20
- Unit 2, AFW storage tank make-up check valve back-leakage on December 28
- Common, operator work arounds on December 16

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 PSEG's evaluations to determine whether the components or systems were operable. The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by PSEG.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 1 sample)

Permanent Modifications

a. Inspection Scope

The inspectors evaluated Unit 2 containment outer equipment hatch concrete shield block removal. The inspectors verified that the design bases, licensing bases, and performance capability of containment was not degraded by the permanent modification as approved in:

- Design Change Package (DCP) 80112838, Containment Equipment Hatch Tornado Missile Evaluation S-C-CAN-SDC-2330, Revision 0

In addition, the inspectors walked down affected systems, interviewed operations, engineering and maintenance personnel, and reviewed modification documents associated with the design change. During this inspection, the inspectors verified that PSEG wrote notifications 20715581 and 20712428 to enhance procedural guidance for outer equipment hatch removal and post-storm inspection in response to questions and observations from the inspectors. Additionally, the inspectors noted that notification 20714946, "Reinstall the Unit 2 Hatch Blocks," was written by PSEG following Unit 2 maintenance and refueling outage 2R21.

b. Findings

No findings were identified.

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

a. Inspection Scope

The inspectors reviewed the PMTs for the maintenance activities listed below to verify that procedures and test activities adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure were consistent with the information in the applicable licensing basis and/or design basis documents, and that the test results were properly reviewed and accepted and problems were appropriately documented. The inspectors also walked down the affected job site, observed the pre-job brief and post-job critique where possible, confirmed work site

cleanliness was maintained, and witnessed the test or reviewed test data to verify quality control hold point were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- Unit 1, SW RM following failures in August, September, and October
- Unit 1, AFW room cooler SW inlet valve replacement on October 22
- Unit 1, Control room emergency air conditioning system charcoal replacement on November 8
- Unit 2, 22 diesel fuel oil transfer pump after FLEX modifications on October 6
- Unit 2, 2C EDG air rack booster solenoid valve repairs on October 19
- Unit 2, 22 Component cooling water pump following bearing/seal replacement on October 21
- Unit 2, 22 safety injection pump following operation without suction on November 18

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 2 maintenance and refueling outage (2R21), conducted October 22 through December 1. The inspectors reviewed PSEGs development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable TSs when taking equipment out of service
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that TSs were met
- Monitoring of decay heat removal operations
- Impact of outage work on the ability of the operators to operate the spent fuel pool cooling system
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of secondary containment as required by TSs
- Refueling activities, including fuel handling and fuel receipt inspections
- Fatigue management

- Tracking of startup prerequisites, walkdown of the primary containment to verify that debris had not been left which could block the emergency core cooling system suction strainers, and startup and ascension to full power operation
- Identification and resolution of problems related to refueling outage activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 2 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSC to assess whether test results satisfied TSs, the UFSAR, and PSEG 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 surveillance tests:

- Unit 2, High head cold leg throttling valve flow balance verification on October 27 (inservice test)
- Unit 2, ILRT during 2R21 refueling outage on November 13 (containment isolation valve test)

b. Findings

No findings were identified.

**2. RADIATION SAFETY**

**Cornerstones: Occupational and Public Radiation Safety**

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 – 1 sample)

a. Inspection Scope

The inspectors reviewed PSEG's performance in assessing and controlling radiological hazards in the workplace. The inspectors used the requirements contained in 10 CFR 20, TSs, applicable Regulatory Guides (RGs), and the procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the performance indicators for the occupational exposure cornerstone, radiation protection (RP) program audits, and reports of operational occurrences in occupational radiation safety since the last inspection.



### Radiological Hazard Assessment

The inspectors determined if there have been changes to plant operations since the last inspection that may result in a significant new radiological hazard for onsite workers or members of the public. The inspectors conducted walk-downs and reviewed radiologically significant on-going work, performed independent radiation surveys, and reviewed contamination and airborne radioactivity controls.

### Instructions to Workers

The inspectors toured the facility and reviewed: posting, labeling and control of radioactive material; use of Radiation Work Permit (RWP) controls for high radiation area (HRA) access; use of electronic personal dosimeters; controls for changing conditions; and radiological occurrences.

### Contamination and Radioactive Material Control

The inspectors observed the monitoring of potentially contaminated material leaving the radiological control area and reviewed the methods used for control, survey, and release of that material. The inspectors selected sealed sources from inventory records and assessed whether the sources were accounted for, tested for loose surface contamination, and were properly tracked relative to national source tracking requirements.

### Radiological Hazards Control and Work Coverage

The inspectors: evaluated in-plant radiological conditions; performed independent radiation measurements during walk-downs; and conducted observation of radiological work activities. The inspectors evaluated whether posted surveys, radiation work permits (RWPs), worker radiological briefings, and the use of continuous air monitoring and dosimetry monitoring were consistent with conditions. The inspectors examined the control of activated or contaminated materials stored within the spent fuel pools and the posting and physical controls for selected high radiation areas (HRAs), locked high radiation areas (LHRAs) and very high radiation areas (VHRA) to verify conformance with the occupational performance indicator.

### Risk-Significant HRA and VHRA Controls

The inspectors reviewed the controls and procedures for HRAs, VHRAs, and radiological transient areas in the plant.

### Radiation Worker and RP Technician Performance

The inspectors observed the performance of radiation workers and RP technicians with respect to their understanding of radiological conditions and implementation of program controls.

### Problem Identification and Resolution

The inspectors evaluated whether problems associated with radiation monitoring and exposure control were identified at an appropriate threshold and properly addressed in the corrective action program.

#### b. Findings

No findings were identified.

### 2RS2 Occupational ALARA Planning and Controls (71124.02 – 1 sample)

#### a. Inspection Scope

The inspectors assessed PSEG's performance with respect to maintaining occupational individual and collective radiation exposures as low as is reasonably achievable (ALARA). The inspectors used the requirements contained in 10 CFR 20, applicable RGs, TSs, and procedures required by TSs as criteria for determining compliance.

#### Inspection Planning

The inspectors reviewed PSEG's collective dose history, current exposure trends, ongoing and planned work activities; post-job exposure reports, changes in the radioactive source term; and site-specific procedures associated with maintaining occupational exposures ALARA.

#### Radiological Work Planning

The inspectors selected and reviewed radiological significant work activities. For each of these activities, the inspectors reviewed: exposure estimates, exposure reduction requirements, dose reduction techniques, estimated dose goals, and use of respiratory protective devices.

#### Verification of Dose Estimates and Exposure Tracking Systems

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities.

#### Source Term Reduction and Control

The inspectors reviewed the current plant radiological source term and historical trend, plans for plant source term reduction, and contingency plans for changes in the source term as the result of changes in plant fuel performance or changes in plant primary chemistry. The inspectors reviewed source term predictions, tracking, and mitigation during the Unit 2 shutdown.

### Problem Identification and Resolution

The inspectors evaluated whether problems associated with ALARA planning and controls were identified at an appropriate threshold and properly addressed in the corrective action program.

#### b. Findings

No findings were identified.

### 2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 1 sample)

#### a. Inspection Scope

The inspectors reviewed the control of in-plant airborne radioactivity and the use of respiratory protection devices in these areas. The inspectors used the requirements in 10 CFR 20, RG 8.15, RG 8.25, NUREG/CR-0041, TS, and procedures required by TS as criteria for determining compliance.

#### Inspection Planning

The inspectors reviewed the UFSAR to identify ventilation and radiation monitoring systems associated with airborne radioactivity controls and respiratory protection equipment staged for emergency use. The inspectors also reviewed respiratory protection program procedures and current performance indicators for unintended internal exposure incidents.

#### Engineering Controls

The inspectors reviewed operability and use of both permanent and temporary ventilation systems; and the adequacy of airborne radioactivity radiation monitoring in the plant based on location, sensitivity, and alarm set-points.

#### Use of Respiratory Protection Devices

The inspectors reviewed the adequacy of PSEG's use of respiratory protection devices in the plant to include applicable ALARA evaluations, respiratory protection device certification, respiratory equipment storage, air quality testing records, and individual qualification records.

#### Self-Contained Breathing Apparatus (SCBA) for Emergency Use

The inspectors reviewed the following: the status and surveillance records for three SCBAs staged in-plant for use during emergencies; PSEG's SCBA procedures and maintenance and test records; the refilling and transporting of SCBA air bottles; SCBA mask size availability; and the qualifications of personnel performing service and repair this equipment.

### Problem Identification and Resolution

The inspectors evaluated whether problems associated with the control and mitigation of in-plant airborne radioactivity were being identified by PSEG at an appropriate threshold and were properly addressed for resolution in PSEG corrective action program.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment (71124.04 – 1 sample)

a. Inspection Scope

The inspectors reviewed the monitoring, assessment, and reporting of occupational dose. The inspectors used the requirements in 10 CFR 20, Regulatory Guides, TSs, and procedures required by TSs as criteria for determining compliance.

### Inspection Planning

The inspectors reviewed: radiation protection program audits; dosimetry occurrence and testing reports; and corrective action program documents.

### Internal Dosimetry

### Routine Bioassay (In-Vivo) and Internal Dose Assessment – Airborne Monitoring

The inspectors reviewed procedures to assess dose from internally deposited radionuclides, portal radiation monitors used as a passive monitoring system, the program for dose assessment based on airborne monitoring, and calculations of internal dose.

### Problem Identification and Resolution

The inspectors evaluated whether problems associated with occupational dose assessment were identified at an appropriate threshold and properly addressed in the corrective action program.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71124.05 – 1 sample)

a. Inspection Scope

The inspectors reviewed the accuracy and operability of radiation monitoring instruments that were used to protect occupational workers. The review was against criteria contained in 10 CFR Part 20, applicable Regulatory Guides and industry standards, TSs, and PSEG station procedures for determining compliance.

### Inspection Planning

The inspectors reviewed the Updated FSAR to identify radiation instruments associated with monitoring area radiation, airborne radioactivity, process streams, effluents, material/worker monitoring, and post-accident monitoring. The inspectors reviewed records of in-service survey instrumentation including: air samplers, small article monitors (SAM), radiation monitoring instruments, personnel contamination monitors, portal monitors, and whole-body counters. The inspectors reviewed procedures that govern instrument source checks and calibrations.

### Walk-downs and Observations

The inspectors conducted walk-downs of plant area radiation monitors; continuous air monitors (CAMs); and radioactive gaseous and liquid effluent monitoring systems. The inspectors assessed the material condition of these systems and that the monitor configurations aligned with the descriptions in the Offsite Dose Calculation Manual (ODCM) and the UFSAR. The inspectors checked the calibration and source check status of various portable radiation survey instruments and contamination detection monitors for personnel and equipment.

### Calibration and Testing Program

The inspectors reviewed the current detector and electronic channel calibration, functional testing results and alarm set-points for: radioactive gaseous and liquid effluent monitoring instruments and process instruments (1R41 A-D, 2R41 A-D, 1R44A, 1R12A, 1R18, 2R18, 2R37, 1R13A and B, 1R19); portal monitors; personnel contamination monitors; small article monitors; portable survey instruments; area radiation monitors; electronic dosimetry; air samplers; whole body counter, and CAMs.

### Instrument Calibrator

The inspectors reviewed the calibration standards used for portable instrument calibrations and response checks to verify that instruments were calibrated by a facility that used National Institute of Science and Technology traceable sources.

### Calibration and Check Sources

The inspectors reviewed the plant waste stream characterization to assess whether the calibration sources used were representative of the radiation encountered in the plant.

### Problem Identification and Resolution

The inspectors verified that problems associated with radiation monitoring instrumentation were identified at an appropriate threshold and properly addressed in the corrective action program.

#### b. Findings

No findings were identified.

2RS6 Radioactive Gaseous and Liquid Effluent Treatment (71124.06 – 1 sample)

a. Inspection Scope

Ground water Monitoring

The inspectors reviewed the ground water monitoring program. The review was against criteria contained in 10 CFR Part 20, 10 CFR Part 50, 40 CFR 190, applicable Regulatory Guides and industry standards, TSs/ODCM, and PSEG station procedures for determining compliance.

Air Cleaning Systems

The inspectors assessed whether surveillance test results for TS-required ventilation effluent discharge systems met acceptance criteria.

Problem Identification and Resolution

The inspectors assessed whether problems associated with the effluent monitoring and control program were being identified by PSEG at an appropriate; properly addressed for resolution; and corrective actions were appropriate.

b. Findings

No findings were identified.

2RS8 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation (71124.08 – 1 sample)

a. Inspection Scope

From October 19 through 23, 2015, the inspectors verified the effectiveness of PSEG's programs for processing, handling, storage, and transportation of radioactive material at Salem Units 1 and 2. The inspectors used the requirements of 49 CFR 170-177; 10 CFR 20, 37, 61, and 71; applicable industry standards; RGs; and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors conducted an in-office review of the solid radioactive waste system description in the UFSAR, the Process Control Program, and the recent radiological effluent release report for information on the types, amounts, and processing of radioactive waste disposed. The inspectors reviewed the scope of quality assurance audits performed for this area since the last inspection.

Radioactive Material Storage

The inspectors observed radioactive waste container storage areas and verified that PSEG had established a process for monitoring the impact of long-term storage of the waste.

### Radioactive Waste System Walk-down

The inspectors walked down the following items and areas:

- Accessible portions of liquid and solid radioactive waste processing systems to verify current system alignment and material condition
- Abandoned in place radioactive waste processing equipment to review the controls in place to ensure protection of personnel
- Changes made to the radioactive waste processing systems since the last inspection
- Processes for transferring radioactive waste resin and/or sludge discharges into shipping/disposal containers
- Current methods and procedures for dewatering waste

### Waste Characterization and Classification

The inspectors identified radioactive waste streams and reviewed radiochemical sample analysis results to support radioactive waste characterization. The inspectors reviewed the use of scaling factors and calculations to account for difficult-to-measure radionuclides.

### Shipment Preparation

The inspectors reviewed the records of shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency instructions, disposal manifest, shipping papers provided to the driver, and licensee verification of shipment readiness.

### Shipping Records

The inspectors reviewed selected non-excepted package shipment records.

### Identification and Resolution of Problems

The inspectors assessed whether problems associated with radioactive waste processing, handling, storage, and transportation, were identified at an appropriate threshold and properly addressed in PSEG's CAP.

#### b. Findings

A PSEG-identified violation is documented in Section 4OA7 of this report.

#### 4. OTHER ACTIVITIES

##### 4OA1 Performance Indicator Verification (71151)

##### .1 Mitigating Systems Performance Index (6 samples)

###### a. Inspection Scope

The inspectors reviewed PSEG's submittal of the Mitigating Systems Performance Index (MSPI) for the following systems for the period of October 1, 2014, through September 30, 2015.

- Units 1 and 2, Emergency AC Power System (MS06)
- Units 1 and 2, High Pressure Injection System (MS07)
- Units 1 and 2, Cooling Water System (MS10)

To determine the accuracy of the PI data reported during those periods, inspectors used definitions and guidance contained in Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment PI Guideline." The inspectors reviewed PSEG's operator narrative logs, notifications, MSPI derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

###### b. Findings

No findings were identified.

##### .2 Occupational Exposure Control Effectiveness (1 sample)

###### a. Inspection Scope

The inspectors reviewed PSEG submittals for the occupational radiological occurrences PI for the fourth quarter 2014 through the third quarter 2015. The inspectors used PI definitions and guidance contained in the Nuclear Energy Institute Document 99-02, Revision 7, to determine the accuracy of the PI data reported. The inspectors reviewed PSEG's assessment of the PI for occupational radiation safety to determine if the related data was accurately reported. The inspectors reviewed personal dose alarms, dose reports, and dose assignments for any intakes that occurred during the time period reviewed to determine if there were any unreported PI occurrences. The inspectors also conducted walk-downs of various locked high and very high radiation area entrances to determine the adequacy of the controls in place for these areas.

##### .3 Radiological Effluent TS/ODCM Radiological Effluent Occurrences (1 sample)

###### a. Inspection Scope

The inspectors reviewed PSEG submittals for the radiological effluent TS/ODCM radiological effluent occurrences PI for the fourth quarter 2014 through the third quarter 2015. The inspectors used PI definitions and guidance contained in the Nuclear Energy Institute Document 99-02, Revision 7, to determine if the PI data was reported properly. The inspectors reviewed the public dose assessments (gaseous and liquid) for the PI for



public radiation safety to determine if related data was accurately calculated and reported. The inspectors reviewed PSEG's: issue reports and event reports generated during this time period to identify any potential occurrences such as unmonitored, uncontrolled, or improperly calculated effluent releases that may have impacted offsite dose. The inspectors reviewed gaseous and liquid effluent summary data and the results of associated offsite dose calculations for the time period to determine if indicator results were accurately reported.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 4 samples)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify PSEG entered issues into their 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 their CAP and periodically attended condition report screening meetings. The inspectors also confirmed, on a sampling basis, that, as applicable, for identified defects and non-conformances, PSEG performed an evaluation in accordance with 10 CFR 21.

b. Findings

No findings were identified.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a semi-annual review of site issues, as required by Inspection Procedure 71152, to identify trends that might indicate the existence of more significant safety issues. In this review, the inspectors included repetitive or closely-related issues that may have been documented by PSEG outside of the CAP, such as trend reports, PIs, major equipment problem lists, system health reports, MR assessments, and maintenance or CAP backlogs. The inspectors also reviewed PSEG's CAP database for the first through fourth quarters of 2015 to assess notifications written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRC's daily condition report review (Section 4OA2.1). The inspectors reviewed PSEG's trend reports to verify that PSEG personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

b. Findings and Observations

No findings were identified.

Adverse Trend in Equipment Reliability

Inspectors documented an adverse trend in equipment reliability in the second quarters of 2014 and 2015 (IRs 05000272; 311/2014003 and 2015002). During this semi-annual trend review, inspectors noted that this adverse trend continued. Supporting information included:

- PSEG procedure ER-AA-1200, "Critical Component Failure Clock," provides a high visibility indicator of component failures that have a significant effect on nuclear safety or power generation. The clock resets are a direct input into the station's equipment reliability index, and were above the number recorded in 2014 and twice PSEG's metric target for 2015.
- In 2014, PSEG acknowledged and inspectors documented an adverse trend in unplanned entries into TS LCOs (IR 05000272; 311/2014-005). In 2015, on Units 1 and 2, there were 20 and 18, unplanned LCOs, respectively, which is more than twice PSEG's metric target for each unit. PSEG determined that the main drivers of this trend were chillers and RMs and is taking actions to improve their overall system health.
- There were nine Salem licensee event reports (LERs) issued in 2015, eight of which were related to degraded equipment.

Trend in Missed Fire Watches

PSEG wrote notification 20666330 for a negative trend of seven missed firewatch roving inspections from January through October 2014. An action item was assigned to review the issues for potential program enhancements. The review identified less than adequate watch turnover, communication, and supervisory attention to detail were contributors. PSEG's conclusion was that no procedural or programmatic changes were required and the issues were communicated to station staff on February 12, 2015. Inspectors reviewed notifications associated with missed fire watches in 2015 and identified there were six missed fire watches from April through December 2015. Two of the six received formal evaluations and the causes of these missed roves were similar in nature to those observed in 2014. Corrective actions from the 2015 events included crew clock resets and stand downs, but these actions were inconsistent between events.

LS-AA-125-1002, "Common Cause Analysis Manual," Revision 7, step 2.2.1 states that the primary objective of a common cause analysis is to identify and eliminate the most prevalent cause of a continuing problem. The inspectors concluded that the continuing trend of missed fire watches warranted a common cause evaluation in accordance with the PSEG procedure. PSEG entered this trend in their CAP as notification 20714237 and planned to conduct a work group evaluation.

### Emerging Trend in Barrier Impairment Controls

Inspectors identified a potential adverse trend in barrier impairment controls. Specifically, there have been three inspector-identified Green NCVs on inadequate barrier controls in the last two years.

- IR 2013005-03, Inadequate HELB Barrier Control
- IR 2015001-02, Inadequate Corrective Actions for HELB Barrier Controls
- IR 2015004-01, Inadequate Auxiliary Building Radiological and Flood Barrier Impairment Controls

### Emerging Trend in Problem Evaluation

Inspectors identified an emerging trend in problem evaluation, principally in the timely completion of evaluations. Specific examples include:

- A third party identified that BACC evaluations on active leaks were not being completed in a timely manner and that repairs were deferred from the refueling outage without being evaluated to ensure suitability for continued operation (This issue was entered into the CAP as notification 20702939).
- The inspectors identified that work group evaluation (WGE) 70179985, which was performed to determine if process gaps contributed to the delays in the station's evaluation of a 2015 Part 21 Event Notification (EN) no. 51280, did not identify the station's non-compliance with LS-AA-115-1006, "Manual for Processing OE6 Documents (Vendor 10 CFR Part 21 Documents)," Revision 0. Specifically, step 4.3.3 and 4.3.5 require that a notification be written, and Operations be informed, when SSCs impacted by a Part 21 are identified to be installed in the plant. However, PSEG did not write a notification and notify Operations when limit switches were found to be installed in the Unit 1 power operated relief valves on August 18. The inspectors determined this issue was minor in accordance with IMC 0612, Appendix B, because the inadequacy of the WGE to identify a procedure non-compliance was not reasonably viewed as a precursor to a significant event, would not have the potential to lead to a more significant safety concern if left uncorrected, was not related to a PI, and would not adversely affect any cornerstone objective. PSEG entered this matter into their CAP as notification 20716275.
- Based on a review of immediate, prompt, and past operability determinations, the inspectors observed that:
  - An NRC-identified Green NCV (05000272; 311/2015-003) was documented for an inadequate operability determination associated with AFW flow rate.
  - Inspectors identified two immediate operability determinations that were cut-and-pasted from other operability determinations, but were not appropriate for the component being evaluated (notifications 20700130, 20701401, 20702267)
  - Inspectors identified that an immediate operability determination on a SW valve did not review its functionality when it was fastened to fire protection piping (notification 20704525).

- Inspectors identified that prompt operability determinations (PODs) were not being completed within the procedural goal of three business days. OP-AA-108-115 4.5.3 states, in part, that a prompt determination, when needed should be done without delay. In response, PSEG generated a temporary standing order, TSO 2015-20, that provided process guidance to capture incomplete PODs in the plan of the day (notifications 20703033, 20703358, 20703971 and 20704472).
- Inspectors identified that past operability determinations were untimely in supporting conclusions of LER reportability within sixty days. Specifically, these determinations were assigned due dates in excess of two months and were, at times, completed in two to three times the original assignment duration (notifications 20686335, 20686334, 20686333, 20686331, 20686330, 20689613, 20687540, 20630798, 20503202), requiring subsequent LER supplements.

The inspectors noted that while an adverse trend was identified, the issues were in PSEG's corrective action system and were individually and collectively found to be minor in significance in accordance with IMC 0612, Appendix B.

### 3. Annual Sample: 14 CFCU Failure to Start in Low Speed

#### a. Inspection Scope

The inspectors performed an in-depth review of PSEG's evaluation and corrective actions associated with failure of the 14 CFCU to start in low speed in March 2015 during periodic testing. Specifically, the inspectors reviewed condition reports, operator logs, ACEs, vendor manual and recommendations, and industry OE. Additionally, the inspectors evaluated the 14 CFCU failure analysis conducted by a vendor and a motor repair/refurbishment report for the 13 CFCU motor sent to another vendor in 2010. The inspectors assessed PSEG's evaluation, extent-of-condition review, completed and proposed corrective actions, and the appropriateness, prioritization, and timeliness of those actions to ensure that the scope of the review was adequate. Inspectors evaluated whether additions made to CFCU PM schedules were in accordance with vendor recommendations and that the additions addressed the concerns associated with the issue.

#### b. Findings and Observations

Introduction. A self-revealing Green NCV of TS 6.8.1, "Procedures and Programs," as described in RG 1.33, Revision 2, February 1978, was identified when PSEG did not maintain an appropriate PM schedule for Salem CFCUs. Specifically, PSEG did not incorporate vendor recommendations and industry OE in 2003 when modifying PM schedules to delete motor air gap measurements for CFCUs. The 14 CFCU subsequently failed to start in low speed for scheduled testing on March 8, 2015.

Description. The containment heat removal system consists of two subsystems: two trains of containment spray and five CFCUs. The CFCU system is designed to recirculate and cool the containment atmosphere during normal operations and a loss of coolant accident to ensure that containment pressure will not exceed its design value.

On March 8, 2015, the 14 CFCU was started in low speed to support scheduled testing. The 14 CFCU ran for approximately 30 seconds and then the low speed breaker unexpectedly tripped open on thermal overload. PSEG entered this in their CAP as notification 20681031. TS 3.6.2.3.a required the station to restore 14 CFCU to operable status within 7 days, or be in Mode 3 within the next 6 hours, and Mode 5 within the following 30 hours. PSEG performed troubleshooting, breaker replacement, and diagnostic testing, but was unable to determine and correct the cause of failure to start in low speed. As a result, Salem Unit 1 was shut down on March 15, 2015. PSEG entered this in their CAP as notification 20681031, replaced the 14 CFCU motor, completed an ACE, and re-initiated CFCU motor air gap measurement PMs.

In March 2002, PSEG evaluation 80039649 was initiated to assess the requirement to check CFCU motor air gaps. PSEG indicated that air gaps had not been an historic site problem. PSEG's CFCU maintenance procedure SC.MD-CM.CBV-0001, "Removal and Installation of CFCU Motor Bearing Replacement and Motor Power Lead Insulation," stated that air gap measurements were only being taken for tracking and trending information and that air gap numbers were not acceptance criteria. PSEG's evaluation concluded it was acceptable to discontinue the PM requirements to check CFCU motor air gaps.

Westinghouse Reactor Containment Fan Cooler Technical Manual, referred to as PSEG Vendor Technical Document 139970, recommends motor air gaps be checked every 3 years during motor disassembly to permit detailed visual inspection and electrical tests. This allows for an inspection of the rotor, a search for cracked bars and end rings, both in the end body and at the joints, evidence of arcing in the slots, and changes in the core structure. Industry OE was disseminated on October 31, 1997, from a plant that had the same CFCU motors, detailing service-related fatigue cracking of CFCU motor stator welds on multiple motors. Additional relevant industry OE was disseminated on May 5, 2007, reporting evidence of rubbing between the stator and rotor and discovery of four cracked welds on the drive end of the stator. This latter OE was communicated to the industry to advocate continued surveillance on motors used in similar installations.

PSEG procedure NC.ER-AP.ZZ-0010, "Equipment Reliability Process," Revision 1, effective in March 2002, ensured that an equipment reliability plan is implemented to modify operating practices, the PM program, or the elements of Precision Maintenance. Contrary to the guidance in Attachment 1, "Preventive Maintenance Change Request," PSEG did not properly review and incorporate industry OE for CFCU motor failures that were disseminated both before and after PSEG's deletion (in 2002) of air gap measurements, vendor-recommended PMs, and evaluation of the impact of CFCU failure on regulatory compliance.

Analysis. PSEG's inadequate analysis of PM deletion was a performance deficiency within PSEG's ability to correct and should have been prevented. This issue was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and affects its cornerstone objective to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, deletion of the PM to measure CFCU motor air gaps was a direct contributor to PSEG's inability to detect stator degradation of the 14 CFCU motor prior to its failure to start in low speed on March 8. The inspectors determined that the finding was of very low safety significance (Green) in accordance with IMC 0609, Attachment 4 and Appendix A, Exhibit 2, because the finding was not a

design or qualification deficiency, did not represent a loss of safety system function, did not represent the loss of function for any TS system, train, or component beyond the allowed TS outage time, and it did not represent an actual loss of function of any non-TS trains of equipment designated as high safety significance in accordance with PSEG's MR program.

The inspectors determined that there was no cross-cutting aspect associated with this finding since it was not representative of current PSEG performance. Specifically, in accordance with IMC 0612, the causal factors associated with this finding occurred outside the nominal three-year period of consideration and were not considered representative of present performance.

Enforcement. TS 6.8.1, "Procedures and Programs," states, in part, that written procedures shall be established, implemented and maintained covering the applicable procedures recommended in Appendix 'A' of RG 1.33, Revision 2, February 1978. RG 1.33, Revision 2, February 1978, Section 9, "Procedures for Performing Maintenance," states, in part, that PM schedules should be developed to specify inspections of equipment. Contrary to the above, from 2003 until 2015, PSEG's PM schedules for CFCUs were not developed consistent with vendor guidance and industry operating experience that subsequently resulted in the 14 CFCU failure to start in low speed on March 8, 2015. Consequently, this resulted in plant entry into, and ultimate expiration of, a seven day TS required action and a forced plant shutdown. PSEG entered this in their CAP as notification 20681031, replaced the 14 CFCU motor, completed an ACE, and re-initiated CFCU motor air gap measurement PMs. Because this finding was of very low safety significance (Green) and was entered into PSEG's CAP, this violation is being treated as an NCV consistent with section 2.3.2.a of the NRC's Enforcement Policy. **(NCV 05000272/2015004-03, Improper PM Deletion Resulted in Plant Shutdown Required by TSs)**

.4 Annual Sample: 2015 RPS and Nuclear Instrumentation System (NIS) Component Failures

a. Inspection Scope

The inspectors performed an annual in-depth review of component failures associated with the RPS and NIS systems that occurred in 2015. This included reviews of several notifications, including 20692341 (Four NIS failures lead to unplanned LCOs), and common cause evaluation 70177445 (Multiple module failures lead to unplanned LCO entries). The inspectors reviewed related CAP documents, control room logs, work packages, surveillance procedures, MR evaluations, and associated LERs, as applicable. The inspectors also interviewed engineering, operations, and I&C personnel experienced in the component failures and responsible for corrective actions associated with licensee evaluations.

b. Findings and Observations

Introduction. A self-revealing Green NCV of 10 CFR 50, Appendix B, Criterion XI, "Test Control," and an associated NCV of TS 3.3.1.1 was identified, with two examples, for not ensuring that all testing required to demonstrate that NI would perform satisfactorily in service was identified and performed. As a result, inoperable 2N44 and 1N44 OTDT

channels were not placed in the tripped condition within the timeframe required by TS LCO 3.3.1.1, on January 20 and April 21, 2015, respectively.

Description. On January 20, 2015, I&C technicians conducted a calibration of channel 2N44 Power Range (PR) NI. Approximately three days later, on January 23, operators identified low indication of the high differential band pen on the axial flux distribution (AFD) recorder. The AFD monitor was declared inoperable based on the inaccurate reading and appropriate compensatory measures were taken. Upon analyzing the AFD recorder for a past operability review, PSEG determined that the channel became inoperable, and the AFD had made the step change following channel calibration on January 20 when the 24NM306 NI system isolator failed. Upon discovery of the isolator failure, on January 26, operators declared OTDT channel 4 inoperable and placed it in the trip condition in accordance with TS 3.3.1.1 Action 6, which requires that an inoperable OTDT channel be placed in a tripped condition within 6 hours. The OTDT Channel 4 protection circuit was inoperable for over five days, since the time of the isolator failure, without being placed in a tripped condition, contrary to TS 3.3.1.1. PSEG's ACE (70173374) determined, in part, that a less than adequate channel check was performed following calibration of the PR NI channel, and that maintenance procedures did not sufficiently ensure that surveillance testing was effective to demonstrate that the channel was fully operable when returned to service. Operators had performed shift logs on AFD channels during the period of January 20 through 23, in accordance with S1.OP-DL.ZZ-0003, Attachment 1, "Control Room Log (Modes 1-4)", and AFD had been noted as satisfactory throughout the period of inoperability while the discrepancy existed. A MR performance criteria assessment performed for Channel N44 PR under work order 70173371 determined that its unavailability performance criterion was exceeded since the January event added an additional 137 hours against a threshold of 80 hours per 18 month period. Unavailability time was attributed to an inadequate retest and return to service following maintenance. Action AI-EVAL-00085-01 was initiated to write notifications to provide improved retest requirements for all maintenance performed on the NI system, to include channel checks of all downstream signals prior to returning to service.

On April 21, PSEG replaced the upper detector current meter on PR NI channel 1N44. Approximately a day later, operations personnel noted that the AFD recorder had made a step change. On April 23, troubleshooting was performed which identified that the as-found voltage at the input to the isolator that feeds the AFD recorder, the OTDT channel, and the Delta Flux indicator, was below the expected value, indicating that the isolator output was out of range and had caused PR NI channel 1N44 inoperability. On April 23, upon discovery of channel inoperability, operators entered TS 3.3.1.1 Action 6, and placed the inoperable channel in a trip condition within 6 hours. The channel detector was subsequently adjusted and operability of channel IV power range AFD was restored on the same day. For the past operability review, engineering analysis determined that the overall effect of the as-found voltage offset indicated that OTDT Channel 4 had been inoperable since replacement of the upper detector current meter on April 21 and the timeframe of inoperability exceeded that specified in TS 3.3.1.1. PSEG WGE 70175956, determined, in part, that appropriate surveillance testing for the 1N44 channel maintenance should have included SC.IC-DC.NIS-0024, "Power Range N44 Channel Detector Current Adjustment," which was not performed until April 23. The evaluation also indicated that the NI system maintenance procedures would be updated to improve the retest requirements following maintenance. Notification 20686645, initiated following

the April event, recommended retest operations for any NI system work include a check of AFD in addition to channel checks.

Although the AFD discrepancies were identified as a result of operators' focused observation during the course of performing normal duties, the AFD discrepancies were not observed at the as-scheduled, in-process, opportunities that were subsequent to channel restoration or within the first shift performance of S1.OP-DL.ZZ-0003 logs. During the January calibration maintenance activity, 2N44 channel restoration occurred approximately three days prior to identification of the AFD discrepancy, and during the April meter replacement maintenance activity, 1N44 channel restoration occurred at 3:00 p.m. on April 21, 2015, and the AFD discrepancy was identified on April 22, 2015 at 1:37 p.m. Each of these identification timeframes were over the duration of a shift.

MA-AA-716-012, "Post-Maintenance Testing," Revision 20, states in section 3.1.4 that PMTs are to be commensurate with the maintenance work performed. Section 3.1.7 states that existing surveillance test procedures be given consideration for verification of operability of equipment following maintenance. PSEG initiated 45 notifications and work orders corresponding to 45 NI system surveillance/maintenance procedures to ensure appropriate checks are performed prior to restoring channels to service following maintenance. By September 30, 2015, orders 70177257 and 70177258, for maintenance on N35 Intermediate Range (SC.IC-FT-NIS-0013) and N36 Intermediate Range (SC.IC-FT.NIS-0014), respectively, had been modified to include additional indication checks such as computer points, Safety Parameter Display System points, specific narrow range channel checks, and NI checks. Additional corrective actions included reviewing WGE 70175696, developed in response to the April event, with planners during a June 2015 planning roll out meeting, ensuring an open work order associated with NI system work on 1N42 included appropriate PMT requirements, and assessing procedure MA-AA-716-012 for potential enhancements.

Analysis. The inspectors determined that not ensuring the NI channels were operable upon restoration to service was a performance deficiency. The performance deficiency is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and affected its cornerstone objective to ensure the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, PR NIs protect the reactor by monitoring neutron flux and generating appropriate reactor trip input signals to the RPS. Had the inoperability of the NI channels been realized upon restoration of the channels following maintenance, corrective measures would have been taken in a timelier manner to minimize NIS unavailability. NIS unavailability crossed the MR performance criteria threshold in 2015 as a result of the performance deficiency. Inspectors evaluated the finding's significance in accordance with IMC 0609, Attachment 4 and Appendix A, and determined that the finding did not affect a single RPS trip signal to initiate a reactor scram and the function of other redundant trips or diverse methods of reactor shutdown, did not involve control manipulations that unintentionally added positive reactivity and did not result in a mismanagement of reactivity by operator(s). Therefore, the finding screened to Green, or very low safety significance.

The finding has a cross-cutting aspect in the area of Human Performance, Documentation, because PSEG did not ensure that plant activities were effectively governed by comprehensive, high-quality, programs, processes and procedures. Specifically, subsequent to completion of calibration and replacement work and PMT per



I&C surveillance procedures, work packages did not adequately address or specify activities related to verifying potentially affected RPS indications. [H.7]

**Enforcement.** 10 CFR 50, Appendix B, Criterion XI, requires, in part, that a test program shall be established to assure that all testing required to demonstrate that components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. TS 3.3.1.1, Action 6 states that with the number of operable channels one less than the Total Number of Channels, startup and/or power operation may proceed provided the inoperable channel is placed in the trip condition within 6 hours. Contrary to the above, PSEG did not ensure that all testing required to demonstrate that NIs would perform satisfactorily in service was identified and performed. As a result, inoperable OTDT channels were not placed in the tripped condition within the timeframe required by TS LCO 3.3.1.1 on January 20 and April 21, 2015. Further, the channels were not placed in the trip condition until discovery of discrepancies in AFD readings and troubleshooting revealed channel inoperability on January 26 and April 23, 2015, respectively. Because this deficiency was of very low safety significance (Green) and was entered in PSEG's CAP, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000272; 311/2015004-04, Inadequate Post Maintenance Testing on OTDT Channels)**

5. Annual Sample: 12 Steam Generator Feedwater Pump (SGFP) Control Oil Leak Evaluations and Follow-up Actions

a. Inspection Scope

The inspectors performed an in-depth review of PSEG's evaluations and corrective actions associated with two ACEs (70171710 and 70174924) related to the 12 SGFP increased vibrations. ACE 70171710 was completed to evaluate the causes of a four gallon per minute oil leak from a pipe flange weld associated with its control oil system. This leak occurred on November 27, 2014, during plant start-up. PSEG staff completed corrective actions to weld repair the affected portion of the non-safety balance of plant control oil pipe prior to increasing power.

The following week, PSEG staff correlated increased vibration at the 12 SGFP low pressure stop valve location with loosening of turbine exhaust hood tie-rod nuts and the previous pipe leak. Under notification 20671511, PSEG staff conducted troubleshooting and identified up to 60 mils of vibration displacement on the 12RS15 (low pressure stop valve) control oil piping. PSEG staff conducted further troubleshooting on the 12 SGFP; they also noted the turbine rotor had been removed and inspected and the pump base was shimmed during the previous refueling outage to provide for alignment. PSEG staff evaluated the problem and concluded the oil leak and elevated vibrations were likely due to changes in the structural resonance of the turbine/pump skid such that a resonant speed was introduced during normal operating speed. PSEG completed several additional reviews of the vibration data and concluded the shim change or a locked pump/turbine coupling condition was causing the vibrations.

PSEG staff implemented Adverse Condition Monitoring (ACM) 14-015, in accordance with their procedures starting December 20, 2015. This document provided direction to operators in response to 12 SGFP turbine inboard and outboard bearing indications

entering the “alert” or “danger” bearing vibration levels. This document also provided for daily review of vibration data by engineering staff. ACM 14-015 was revised several times over the next six weeks.

In response to gradual increasing vibrations on the turbine inboard radial bearing, PSEG staff conducted a planned plant down power on March 7, 2015, removed the 12 SGFP from service, removed the shims, and returned the 12 SGFP to service. After further monitoring, PSEG staff concluded the removal of the shims was not effective in reducing vibrations. Subsequently, on March 12, 2015, PSEG staff observed a one liter per minute oil leak on 12 SFFP oil piping at a threaded connection upstream of the 1SV84 trip solenoid operating valve and reported the condition to operators, who down powered Salem Unit 1 to 61 percent and removed 12 SGFP from service. PSEG replaced the 12 SGFP coupling and in April 2015, during a planned plant down power, added turbine balance weights which corrected the vibration condition. PSEG staff completed ACE 70174924 to evaluate their performance in not precluding a second oil pipe leak on March 12, 2015, which resulted in an unplanned down power condition.

The inspectors assessed PSEG’s problem identification threshold, problem analysis, extent of condition reviews, compensatory actions, and the prioritization and timeliness of corrective actions to determine whether PSEG staff was appropriately identifying, characterizing, and correcting problems associated with the 12 SGFP lube increased vibration condition and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the guidance in PSEG's CAP.

b. Findings and Observations

No findings were identified.

The inspectors determined PSEG staff conducted a causal factor analysis in accordance with their procedures in sufficient detail to identify the causes of the 12 SGFP control oil leak on March 12, 2015. PSEG staff determined their process for developing ACM 14-015 was not strict enough to result in a consistent, systematic approach to make decisions. In this instance, ACM 14-015 included actions for engineering personnel to monitor vibration trends. The individuals involved utilized an industry document to derive a 20 mil vibration value to determine acceptability of vibrations that was not described in ACM 14-015. PSEG staff subsequently determined in ACE 70174924 that the 20 mil value may have been appropriate for welded joints, but was not appropriate for threaded joints (the oil leak on March 12, 2015, occurred at a threaded joint).

PSEG staff completed corrective actions to revise their procedure for developing ACMs (OP-AA-108-111) to define technical products developed as part of ACMs, require pre-job briefs for developing ACM related technical products, require references be included if limits are derived, require a review, informed by the risk identified during the brief, for ACMs that result in technical products, and improve tracking and approval chains for ACM versions through the use of CRs. PSEG staff further tracked actions under notification 70171710 to analyze the 12 SFP turbine upon removal in a future refueling outage to identify the causes of the initial rotor imbalance and enhance their maintenance procedures and processes.

The inspectors determined PSEG's overall response to the two control oil pipe leaks associated with the 12 SGFP was commensurate with the safety significance, was timely, and included appropriate corrective actions. Regarding the second oil pipe leak, the inspectors concluded that the industry reference used by PSEG staff to derive vibration limits appeared reasonable. The inspectors determined that a performance deficiency existed because PSEG staff did not develop vibration limits in accordance with this self-imposed standard. Although this performance deficiency contributed to an unplanned plant power change on March 12, 2015, it was considered minor because the condition did not challenge any critical safety function as a plant trip did not occur and the component involved is non-safety-related.

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 5 samples)

.1 Plant Events

a. Inspection Scope

For the plant event listed below, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant event to appropriate regional personnel, and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that PSEG made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR Parts 50.72 and 50.73. The inspectors reviewed PSEG's follow-up actions related to the event to assure that PSEG implemented appropriate corrective actions commensurate with their safety significance.

- Unit 2, Unusual Event on November 23

b. Findings

No findings were identified.

.2 (Closed) LER 05000272/2014-006-001: Manual Reactor Trip Due to Main Power Transformer Low Oil Level

a. Inspection Scope

On October 19, 2014, while performing a Unit 1 shutdown in preparation for a refueling outage, PSEG initiated a manual reactor trip due to concerns with the 1B main power transformer. All control rods fully inserted and AFW actuated as designed in response to low SG levels. The 1B main power transformer leak was repaired and tested satisfactorily during the outage. Additionally, PSEG performed a root cause analysis of this event. This issue and the circumstances of the reactor trip were reviewed as part of a supplemental inspection using Inspection Procedure 95001 that was documented in IR 05000272/2015-009. Since this event was part of a planned shutdown/trip in preparation for a refueling outage, PSEG reported this event to the NRC as an eight hour notification (i.e., a valid auxiliary feedwater system actuation occurred). However, PSEG later determined that the notification should have been made as a four hour report

since this trip was initiated prior to the specified procedural step due to deteriorating transformer conditions. The inspectors did not identify any new issues during the review of the LER. The enforcement aspects of this issue were documented IR 05000272; 311/2014-005. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.3 (Closed) LER 05000272/2015-003-00: Plant Shutdown Required by Technical Specifications

a. Inspection Scope

On March 8, 2015, the 14 CFCU was declared inoperable following a trip of its low speed breaker on thermal overload protection during a scheduled surveillance test. Unit 1 entered TS 3.6.2.3, action a., for inoperability of one CFCU. Because PSEG was unable to identify and correct the cause of the low speed breaker trip within the 7 day TS allowed outage time, Unit 1 entered Mode 3 (Hot Standby) on March 15, and Mode 5 (Cold Shutdown) on March 16. Subsequent PSEG troubleshooting identified failed motor stator support welds which allowed contact between the rotor and the stator on low speed startup and consequent tripping of the associated breaker. The 14 CFCU motor was replaced. Inspectors reviewed the LER, the associated ACE, walked down plant equipment, and interviewed PSEG staff. The enforcement aspects of this issue were documented in section 4OA2.3 of this report. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.4 (Closed) LER 05000272/2015-004-00: Condition Prohibited by Technical Specifications for One Channel of Over-Temperature Delta-T Inoperable

a. Inspection Scope

On April 21, 2015, an upper detector current meter on PR NI channel 1N44 was replaced. Approximately a day later, operations personnel noted that the AFD recorder had made a step change. On April 23, troubleshooting identified that the as-found voltage at the input to the isolator that feeds the AFD recorder, the OTDT channel, and the Delta Flux indicator was below the expected value, indicating that the isolator output had caused inoperability of PR NI channel 1N44. Upon discovery of the inoperability, on April 23, operators entered TS 3.3.1.1, Action 6, which has operations place the inoperable OTDT channel in a trip condition within 6 hours. The channel detector was adjusted and operability of the channel was restored on April 23. For the past operability review, engineering analysis determined that the overall effect of the as-found voltage offset indicated that Channel 4 of OTDT had been inoperable since replacement of the upper detector current meter on April 21. The timeframe of inoperability exceeded that specified in TS 3.3.1.1, Action 6. The event was reported as an LER in accordance with 10 CFR 50.73(a)(2)(i)(B), for a condition prohibited by TS. The inspectors reviewed this LER to determine if PSEG's evaluations and associated corrective actions were appropriate. The inspectors also assessed the accuracy of the LER, the timeliness of corrective actions, whether violations of requirements occurred, and if potential generic issues existed. The enforcement aspects of this issue were documented in Section 4OA2.4 of this report. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

.5 (Closed) LER 05000311/2015-001-00: Condition Prohibited by Technical Specifications for One Channel of Over-Temperature Delta-T Inoperable

a. Inspection Scope

On January 20, 2015, I&C conducted a calibration on channel 2N44 PR NI and, subsequently, restored the channel. Approximately three days later, on January 23, 2015, operators identified low indication of the high differential band pen on the AFD recorder. The AFD monitor was declared inoperable based on the inaccurate reading and appropriate compensatory measures were taken. Subsequent troubleshooting completed on January 26 indicated that an isolator providing input to the 2N44 PR NI channel of the OTDT logic circuitry had failed. Upon discovery of the isolator failure, operators declared channel 4 of OTDT inoperable, and placed it in the trip condition in accordance with TS 3.3.1.1, Action 6, which requires that an inoperable OTDT channel be placed in a tripped condition within 6 hours. Upon analyzing the AFD recorder for a past operability review, PSEG determined that the channel became inoperable, and the AFD had made the step change, following channel calibration on January 20. OTDT channel 4 of the protection circuit was therefore inoperable for over five days without being placed in a tripped condition, contrary to TS 3.3.1.1, Action 6. The event was reported as an LER in accordance with 10 CFR 50.73(a)(2)(i)(B), for a condition prohibited by TS. The inspectors reviewed this LER to determine if PSEG's evaluations and associated corrective actions were appropriate. The inspectors also assessed the accuracy of the LER, the timeliness of corrective actions, whether violations of requirements occurred, and if potential generic issues existed. The enforcement aspects of this issue are documented in Section 4OA2.5 of this report. The inspectors did not identify any new issues during the review of the LER. This LER is closed.

4OA5 Other Activities

.1 Ground Water Monitoring Program

a. Inspection Scope

The inspectors reviewed ground water monitoring. The review was against criteria contained in 10 CFR Part 20, 10 CFR Part 50, 40 CFR 190, applicable Regulatory Guides and industry standards, TSs, ODCM, and PSEG station procedures for determining compliance. This included PSEGs on-going evaluations associated with the identification, on July 8, 2013, of tritium contamination in a new well (AA-V) placed in the Vincentown geologic formation. This matter had been previously discussed in NRC Integrated Inspection Report Nos. 05000272/2013004 and 05000311/2013004 (ML13323A526).

The inspectors reviewed: on-going evaluations; ground water flow measurements; public dose projections; remediation efforts and minimization of existing contamination; possible sources of contamination; and groundwater characterization. The inspectors reviewed PSEG Ground Water Monitoring Program sample results and sample results from the Salem Unit 1 and Unit 2 seismic gap drains.

b. Findings and Observations

No findings were identified.

#### 4OA6 Meetings, Including Exit

On December 18, 2015, the inspectors presented the inspection results to J. Perry and other members of PSEG staff. The inspectors verified that no proprietary information was retained by the inspectors or would be documented in this report.

#### 4OA7 Licensee-Identified Violations

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

- From 2010 to 2014, Salem Units 1 and 2, made a total of 8 shipments of radioactive waste for disposal which contained category 2 levels of radioactive material quantity of concern, but did not implement a transportation security plan for these shipments in violation of the requirements of 10 CFR 71.5, "Transportation of Licensed Material," and 49 CFR 172, Subpart I, "Safety and Security Plans." This performance deficiency adversely affected the Public Radiation Safety cornerstone attribute of Program and Process based on inadequate procedures associated with the transportation of radioactive material. The finding was determined to be of very low safety significance (Green) because Salem had an issue involving transportation of radioactive material, but it did not involve: (1) a radiation limit that was exceeded; (2) a breach of package during transport; (3) a certificate of compliance issue; (4) a low level burial ground nonconformance; or (5) not making notifications or not providing emergency information. This issue was documented in the PSEG's CAP as notification 20674767. Corrective actions included issuance of new procedure RP-AA-600-1009, revision of procedure LS-AA-1020, "Implementation of Significant Rules and Orders," Revision 1, and contracting with a vendor to receive regular, prompt notifications of potentially applicable rule changes in the Federal Register.

### **ATTACHMENT: SUPPLEMENTARY INFORMATION**

**SUPPLEMENTARY INFORMATION****KEY POINTS OF CONTACT**Licensee Personnel

J. Perry, Site Vice President  
 K. Grover, Plant Manager  
 T. Cachaza, Regulatory Assurance  
 J. Donovan, System Engineer  
 P. Fabian, PSEG SG Engineer  
 J. Frick, Radioactive Materials Shipper  
 T. Giles, Salem Unit 1 and 2 ASME Section XI Program Manager  
 D. LaFleur, Regulatory Assurance  
 D. Mora, Robinson, Salem Unit 1 & 2 NDE Supervisor  
 T. Oliveri, Salem Unit 1 and Unit 2 NDE Supervisor  
 M. Phillips, Salem Regulatory Assurance  
 T. Sexsmith, Regulatory Assurance  
 J. Stead, Senior Plant Engineer  
 S. Taylor, Radiation Protection Manager  
 A. Zang, System Engineer  
 J. Russell, Chemistry staff  
 D. Wahl, Chemistry staff  
 M. Millinor Chemistry staff

Others

J. Vouglitois, Nuclear Engineer, NJ Department of Environmental Protection, Bureau of Nuclear Engineering

**LIST OF ITEMS OPENED, CLOSED AND DISCUSSED**Open and Closed

05000311/2015004-01	NCV	Inadequate Auxiliary Building Barrier Controls (Section 1R01)
05000272/2015004-02	NCV	Inadequate Maintenance Effectiveness of Control Room Ventilation Radiation Monitors (Section 1R12)
05000272/2015004-03	NCV	Improper PM Deletion Resulted in Plant Shutdown Required by Technical Specifications (Section 4OA2.3)
05000272;311/2015004-04	NCV	Inadequate Post Maintenance Testing on OTDT Channels (Section 4OA2.4)

<u>Closed</u>			
05000272/2014-006-001	LER		Manual Reactor Trip Due to Main Power Transformer Low Oil Level (Section 4OA3.2)
05000272/2015-003-00	LER		Plant Shutdown Required by Technical Specifications (Section 4OA3.3)
05000272/2015-004-00	LER		Condition Prohibited by Technical Specification for One Channel of Overtemperature Delta-T Inoperable (Section 4OA3.4)
05000311/2015-001-00	LER		Condition Prohibited by Technical Specification for One Channel of Overtemperature Delta-T Inoperable (Section 4OA3.5)

### LIST OF DOCUMENTS REVIEWED

\* Indicates NRC-identified

#### **Section 1R01: Adverse Weather Protection**

##### Procedures

SC.OP-AB.ZZ-0001, Adverse Environmental Conditions, Revision 18

##### Notifications

20503202\*    20704341\*    20704491\*    20704505\*    20704563\*    20704646\*  
 20704648\*    20704651\*

##### Evaluations

70180548

##### Other Documents

UFSAR 2.4, 3.4, and 3.5

VTD 320758, Salem IPEEE, Revision 0



**Section 1R04: Equipment Alignment**

Procedures

ER-AA-380, Primary Containment Leakrate Testing Program, Revision 9  
S2.RA-IS.ZZ-0013, Reactor Containment Building Integrated Leak Rate Test, Revision 4  
S2.OP-SO.CVC-0008, Rapid Boration, Revision 7  
S2.OP-AR.ZZ-0012, Control Console 2CC2, Revision 38

Notifications

20679251    20687798    20700779\*    20702809    20712170    20712179

Drawings

205231, Component Cooling, Sheet 1, Revision 66  
205328, Chemical and Volume Control Operation, Sheets 1 and 2, Revisions 57 and 69

Maintenance Orders/Work Orders

50179584

Other Documents

UFSAR 9.4.2

**Section 1R05: Fire Protection**

Procedures

FP-SA-1541, Salem Pre-Fire Plan Unit 1 460V Switchgear Rooms & Corridor, Revision 0  
FP-SA-1542, Salem Pre-Fire Plan Unit 1 Spent Fuel/Component Cooling Heat Exchanger and Pump Area, Revision 0  
FP-SA-1543, Salem Pre-Fire Plan Unit 1 Auxiliary Feedwater Pumps Area, Revision 0  
FP-SA-1544, Salem Pre-Fire Plan Unit 1 Charging Pump, Spray Additive Tank Area, Revision 0  
FP-SA-2547, Pre-Fire Plan Unit 2 Mechanical Penetration Area, Revision 0

Notifications

20710094\*  
20710097\*

**Section 1R06: Flood Protection Measures**

Procedures

SC.OP-AB.ZZ-0001, Adverse Environmental Conditions, Revision 18  
SC.OP-AB.ZZ-0002, Flooding, Revision 4

Notifications

20705502\*

Other Documents

SA-PRA-012, Internal Flood Evaluation Summary Notebook, Revision 1

**Section 1R07: Heat Sink Performance**Notifications

20707480

Maintenance Orders/Work Orders

30166659 80046390 70181337 80113728

Other Documents

S-C-CBV-MDC-1637, Containment Fan Cooler Unit Design Basis Capacity, Revision 4

**Section 1R08: In-service Inspection – Salem Unit 1**Procedures

ER-AP-331-1002, Boric Acid Corrosion Control Program Identification, Screening and Evaluation, Revision 7

ER-AP-331-1003, RC Leakage Monitoring and Action Plan, Revision 5

ER-AP-331-1004, Boric Acid Corrosion Control (BACC) Training and Qualification, Revision 4

S2.OP-PT.CAN-0001(Q), Containment Walkdown, Revision 28

ER-AP-331, Boric Acid Corrosion Control Program, Revision 6

OU-AA-335, VT-2, Revision 5

Visual Examination PSEG Nuclear L.L.C., Procedure ER-AP-331-1001, Revision 7

Boric Acid Corrosion Control (BACC) Inspection Locations Implementation and Inspection Guidelines

OU-AA-335-003, Revision 3

OU-AA-335-043, Magnetic Particle Examination, Revision 3

Bare Metal Visual Examination (VE) of Class 1 PWR Components

Notifications

01956887	01958294	01960060	01960192	01962130	01967763
01968281	01979332	01995292	02044899	02045365	02073706
02073711	02079633	20648291	20648707	20649063	20649673
20649678	20650156	20650362	20650372	20650727	20651304
20651479	20654970	20655227	20655244	20656205	20657919
20658785	20660346	20692992	20707864		

Documented Boric Acid Leak Evaluations

Order 70168167/ Confirmation 11833606

Order 70168210/ Confirmation 11833268

Order 70168212/ Confirmation 11838288

Order 70168483/ Confirmation 11849959

Order 70169244/ Confirmation 11920547

Order 70171799/ Confirmation 12106463

Order 70171846/ Confirmation 12108596

Order 70171860/ Confirmation 12108665

Order 70173516/ Confirmation 12290323

Order 70175161/ Confirmation 12426293

Order 70175524/ Confirmation 12460089

Order 70175543/ Confirmation 12460092

Order 70175543/ Confirmation 12460092

Order 70175544/ Confirmation 12460097  
Order 70175546/ Confirmation 12460115  
Order 70175619/ Confirmation 12468853  
Order 70146346/ Confirmation 10355778  
Order 70179114/ Confirmation 12764521  
Order 70179364/ Confirmation 12763996  
Order 70179169/ Confirmation 12763996  
Order 70179213/ Confirmation 12768523  
Order 70179323/ Confirmation 12795692  
Order 70179324/ Confirmation 12795708  
Order 70179328/ Confirmation 12796339  
Order 70179329/ Confirmation 12766344  
Order 70179358/ Confirmation 12780109  
Order 70179369/ Confirmation 12784676  
Order 70179381/ Confirmation 12780755  
Order 70179421/ Confirmation 12784733  
Order 70179551/ Confirmation 12830904  
Order 70179582/ Confirmation 12820418  
Order 70179892/ Confirmation 12836939  
Order 70179370/ Confirmation 12784678  
Order 70179421/ Confirmation 12784733  
Order 70179328/ Confirmation 12796339  
Order 70179323/ Confirmation 12795692  
Order 70179324/ Confirmation 12795708  
Order 70179551/ Confirmation 12830904  
Order 70179892/ Confirmation 12836939

Self-Assessments

FASA/FBM Report, Title: Boric Acid Corrosion Control (BAAC) Program Focused Area  
Self-Assessment, Salem Generating Station

LS-AA-126-F4, Revision 0

Check In Self-Assessment Report - NRC ISI/SG Inspection, IP 71111.08, 9/14/15

LS-AA-126- FS, Revision 0

Check In Self-Assessment Report – Implementation of Welding and Repair Program Check In  
Self-Assessment, IP 71111.08, 9/14/15, Revision 0

NDE Procedures

AREVA Inc. Nondestructive Examination Procedure, 54-ISI-615-001, Procedure for Manual and  
Semi-Automated Phased Array Ultrasonic Examination of Socket Fillet Welds, 10/02/14

PSEG Nuclear LLC VTD Number 902850(001), AREVA Inc. Document No.: 51-9210235-000,  
Salem 2R20 SG Degradation Assessment – April 2014

PSEG Nuclear LLC VTD Number 902988(001), AREVA Inc. Document No.: 51-9225803-000,  
Salem Unit 2 Condition Monitoring For 2R20 Operational Assessment for  
Cycles 21 and 22 – 8/07/14

AREVA Inc. Nondestructive Examination Procedure, 54-ISI-868-000, Procedure for Manual  
Phased Array Ultrasonic Examination of Dissimilar Metal Piping Welds, 8/25/15

AREVA Inc. Nondestructive Examination Procedure, 54-ISI-880-001, Procedure for Manual  
Phased Array Ultrasonic Examination of Dissimilar Metal Piping Welds, 8/17/15

PSEG Nuclear LLC Procedure OU-AA-335-002, Revision 3, Liquid Penetrant Examination

AREVA Inc. Nondestructive Examination Procedure 54-ISI-132-011, Manual Ultrasonic  
Examination of Vessel Nozzle Inner Radius Regions, 1/27/11

NDE Data Reports

Data Sheet PT-14-008, PT 21 RCP Lugs

Data Sheet VEN-15-022; 2R21 IWE, Containment Liner Panel 98-011, Liner thickness UT measurement.

Data Sheet VEN-15-021; 2R21 IWE, Containment Liner Panel 98-009, Liner Thickness UT measurement.

Data Sheet VEN-15-020; 2R21 IWE, Containment Liner Panel 98-007, Liner Thickness UT measurement.

Data Sheet VEN-15-018; 2R21 IWE, Containment Liner Panel 88-007, Liner Thickness UT measurement.

Data Sheet VEN-15-019; 2R21 IWE, Containment Liner Panel 88-013, Liner Thickness UT measurement.

MT-15-001; Nozzle to Shell weld (SG22)

Repair Replacement Activity

22-RCP support indications, Notification 20647348, Engineering Evaluation 60116663

Miscellaneous References

NUREG-0313, Revision 2, Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, W.S. Hazelton; W.H. Koo, Title: Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping

NRC Bulletin 2003-02: Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity, August 21, 2003

Westinghouse NSAL-14-6, 9/24/2014, Subject: Reactor Coolant Pump Turning Vane Bolt Cracking and Failures

Code Case N-722-1, Additional Examinations for PWR Pressure Retaining Welds In Class 1 Components Fabricated with Alloy 600/82/182 Materials Section XI, Division 1

Code Case N-729-1, Alternative Examination Requirements for PWR Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds Section XI, Division 1

Code Case N-770-1, Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1

NRC Letter dated October 6, 2014 to PSEG Nuclear; Subject: Salem Nuclear Generating Station, Units 1 and 2 – Request for Relief SC-14R-140 from American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI Requirements Regarding the Reactor Vessel Head Flange Seal Leak Detection Piping (TAC NOS. MF3898 AND MF3899)

PSEG Letter to NRC, dated 4/11/2013; LR-N13-0058; Subject: Request for Relief from ASME Code Pressure Test for Service Water Supply Buried Piping

PSEG Letter to NRC, dated 4/20/2014, Subject; Salem Nuclear Generating Station, Unit No. 2-Safety Evaluation of Relief Request no. S2-14R-124 for the Remainder of the 10-Year Interval Inservice Inspection Interval (TAC NO. MF1433)

PSEG Letter to NRC, dated 4/08/2014; LR-N14-0099; Subject: Request for Relief from System Pressure Test Pressurization Requirements on Class 1 and Class 2 Reactor Vessel Flange O-ring Leak Detection System

NRC Letter dated June 23, 2014, to PSEG Nuclear; Subject: Salem Generating Station, Unit No. 2 – Safety Evaluation of Relief Request No. S2-14R -131 Regarding the Fourth 10-Year Inservice Inspection Interval (TAC NO. ME2442)

PSEG Letter to NRC, dated 7/09/2013, SUBJECT: Request for authorization to Continue Using a Risk-Informed Inservice Inspection Alternative to the ASME Boiler and Pressure Vessel Code Section XI Requirements for Class 1 and 2 Piping

NRC Letter to PSEG dated 4/18/2013, Subject: Salem Nuclear Generating Station, Unit No. 2 – Safety Evaluation of Relief Request No. S2-14r-123 Regarding the Fourth 10-Year Inservice Inspection Interval (TAC NO. ME8847)

PSEG Letter to NRC, dated 7/07/2012; LR-N12-0157; Subject: Submittal of Relief Request Associated with the Fourth Ten-Year Inservice (ISI) Interval Code Edition PSEG Letter to NRC, dated 1/15/2015; LR-N15-0001; Subject: Supplemental to License Renewal Amendment Request to Revise Technical Specifications to Adopt TSTF-510, Revision 2 “Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection”

Miscellaneous

ASME Boiler and Pressure Vessel Code Case N-729-1, Alternative Examination Requirements for PWR Reactor Vessel Upper Heads

Apparent Cause Evaluation for AR# 00207921-06

**Section 1R11: Licensed Operator Requalification Program**

Procedures

2-EOP-TRIP-1, Reactor Trip or Safety Injection, Revision 28

2-EOP-TRIP-2, Reactor Trip Response, Revision 28

S2.OP-AB.SW-0003(Q), Service Water Bay Leak, Revision 7

S2.OP-AB.TL-0001(Q), Loss of Main Turbine Lube Oil, Revision 4

S2.OP-AB.TRB-0001(Q), Turbine Trip Below P-9, Revision 14

**Section 1R12: Maintenance Effectiveness**

Procedures

ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 14

Notifications

20702720\*    20702964\*    20703037\*    20703177\*    20704483\*    20704558\*

20704603\*    20704643\*    20704707\*    20704925\*    20704929\*    20711013\*

20711037\*    20711460\*    20711461\*    20713372\*

**Section 1R13: Maintenance Risk Assessments and Emergent Work Control**

Notifications

20707922    20712068

Maintenance Orders/Work Orders

70181728

**Section 1R15: Operability Determinations and Functionality Assessments**Notifications

20710575    20710731    20710985    20711150    20711504\*    20715574\*  
20713553

Drawings

205332, Residual Heat Removal, Sheet 1, Revision 37

Maintenance Orders/Work Orders

70182099    70182262

Other Document

UFSAR 6.2

**Section 1R18: Plant Modifications**Procedures

CC-AA-201, Plant Barrier Control Program, Revision 5

LS-AA-104-1000, 50.59 Resource Manual, Revision 8

OP-AA-108-115, "Operability Determinations and Functionality Assessments," Revision 4

Notifications

20712428\*    20715581\*    20714946    20706526    20706527    20706785  
20696345    20705558    20672533    20663402    20672535    20710999  
20663402

Drawings

208070, Salem Unit 1 Containment Area Shielding and Heavy Equipment Handling Platform, Sheet 1, Revision 10

201193, Salem Units 1 and 2 Reactor Containment Equipment Hatch and Personnel Locks, Sheet 1, Revision 11

Maintenance Orders/Work Orders

70168637

Other Documents

ACM 14-012, U1 Containment Outer Equipment Hatch Removal in Modes 1-4, dated 10/17/2014

Additional Reading 14-181, Verify via the National Weather Service that no Severe Weather Alert has been issued for the area

DCR 80112838, Containment Equipment Hatch Tornado Missile Evaluation S-C-CAN-SDC-2330, Revision 0

DCR 80114274, Dose Analysis – Removal of Equipment Hatch Blocks, Revision 0

EGM 15-001, Enforcement Guidance for Tornado-Generated Missile Protection Noncompliance

NCV 05000412/337/2014003-01; Removal of Missile Barrier Renders Containment Inoperable

NRC Inspection Manual Part 9900: 10 CFR 50.59 Changes, Tests and Experiments

NRC Inspection Manual Chapter 0326, Appendix C, Section C.01, Relationship Between the GDC and the Technical Specifications

NRC Memo: ROP Application of EGM 15-002, dated 06/12/2015

NRC RIS 2001-09: Control of Hazard Barriers

- NRC RIS 2008-14: Use of TORMIS Computer Code for Assessment of Tornado Missile Protection
- NRC RIS 2013-05: NRC Position on the Relationship between GDC and Technical Specification Operability
- NRC RIS 2015-06: Tornado Missile Protection
- PBI 14-076, Removal of Containment Outer Equipment Hatch in Modes 1-4, dated 10/19/2014
- PBI 15-090, Removal of Containment Outer Equipment Hatch in Modes 1-4, dated 10/17/2015
- S1-CRM-006, S1R23: Removal of Unit 1 Containment Concrete Missile Shields and Outer Hatch while Operating in Modes 1, 2, 3 and 4, dated 10/09/2014
- S2014-172, 50.59 Screening for DCR 80112838, Revision 0
- S2015-369, 50.59 Evaluation for 80114274, Containment Equipment Hatch Shadow Shield Removal, Revision 0
- S2.OP-ST.CAN-0001, Containment Valves Monthly, Revision 14
- S-C-CAN-SDC-2330, Containment Hatch Tornado Missile Evaluation, Revision 0
- Standard Review Plant Section 3.5.3, Revision 1
- White Paper – 10 CFR 50.59; the Process, Application to Substantial Modifications to Licensee Facilities, and NRC Staff Assessment of Licensee Implementation

**Section 1R19: Post-Maintenance Testing**

Procedures

- S2.OP-ST.DG-0005(Q), 22 Fuel Oil Transfer System Operability Test, Revision 26
- S2.RA-ST.DG-0005(Q), Diesel Generator Auxiliaries 22 Fuel Oil Transfer System Operability Test Acceptance Criteria, Revision 11
- S2.OP-ST.CC-0002, Inservice Testing – 22 Component Cooling Pump, Revision 28
- SC.MD-CM.SJ-0001, Safety Injection Pump Disassembly, General Repair and Reassembly, Revision 18

Notifications

20692042	20692043	20698972	20702660	20704472	20705142
20706557*	20706784*	20707882*			

Work Orders

50179535	60117374	60122060	60126143	60126193	80085769
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Other Documents

- S-1-ABV-MDC-2050, Salem Unit 1 Auxiliary Building Temperature Calculation – Normal and Emergency Modes, Revision 1

**Section 1R20: Refueling and Other Outage Activities**

Notifications

20706230*	20706231*	20706232*	20706233*	20706234*	20706235*
20706547*	20706785*	20707130*	20707300*	20707306*	20707707*
20708041*	20709663*	20710057*	20710058*	20710220*	20710243*
20710825*	20710841*	20710860*	20710862*	20710863*	20710952*
20710956*	20710959*	20711453*	20711763*	20711774*	20712552*
20715865*					

Other

- Fatigue Assessment for 20707426

**Section 1R22: Surveillance Testing**Procedures

ER-AA-380, Primary Containment Leakrate Testing Program, Revision 9  
 S2.OP-ST.SJ-0016, High Head Cold Leg Throttling Valve Flow Balance Verification,  
 Revision 33  
 S2.RA-IS.ZZ-0013, Reactor Containment Building Integrated Leak Rate Test, Revision 4

Notifications

20703416    20705037    20709970    20710142    20710333    20712713\*

Maintenance Orders/Work Orders

50167037

**Section 2RS1: Access Control to Radiologically Significant Areas**Procedures

OU-AA-101-1006, Outage Management Risk and Impact Assessment, Revision 2  
 RP-AA-15, Radioactive Contamination Control Program Description, Revision 3  
 RP-AA-103, Radiological Control of Reactor cavity and Spent Fuel Pool Operation, Revision 0  
 RP-AA-300, Radiological Survey Program, Revision 5  
 RP-AA-300-1003, Discrete Radioactive Particle Control, Revision 0  
 RP-AA-301, Radiological Air Sampling Program, Revision 5  
 RP-AA-302, Alpha Source Term Characterization, Revision 4  
 RP-AA-400, ALARA Program, Revision 6  
 RP-AA-401, Operational ALARA Planning and Control, Revision 13  
 RP-AA-401-1001, Special Instruction for Highly Radioactive In-core Components, Revision 0  
 RP-AA-403, Administration of the Radiation Work Permit Program, Revision 3  
 RP-AA-460, Control for High and Very High radiation Areas, Revision 17  
 RP-AA-461, Radiological Control for Contaminated Water Diving Operation, Revision 3  
 RP-AA-500, Radioactive Material Control, Revision 12  
 RP-AA-503, Unconditional Release Survey Method, Revision 8  
 RP-AA-825, Maintenance, Care and Inspection of Respiratory Protective Equipment, Revision 5  
 WC-AA-105, Work Activity Risk Management, Revision 3  
 S2.CH-IO.ZZ-1112(Z), Salem Unit 2 Shutdown Chemistry Plan, Revision 5

Documents

Audits (NOSA13-08, 15-08)  
 Locked High Radiation Key Inventory Logs  
 Radiation Protection Job Guides (various)  
 Radiological Survey data (various)  
 Containment Power Entry Checklist, Unit 2, February 11, 2014  
 Radiation Protection Briefing Containment Entries Modes 1 through 4  
 Radiation Protection Plant Radionuclide Evaluation  
 Corrective Action Documents (various notifications)



**Section 2RS2: Occupational ALARA Planning and Controls**

Procedures

OU-AA-101-1006, Outage Management Risk and Impact Assessment, Revision 2  
RP-AA-103, Radiological Control of Reactor Cavity and Spent Fuel Pool Operation, Revision 0  
RP-AA-300, Radiological Survey Program, Revision 5  
RP-AA-303, Personnel Air sampling, Revision 1  
RP-AA-400, ALARA Program, Revision 6  
RP-AA-401, Operational ALARA Planning and Control, Revision 13  
RP-AA-401-1001, Special Instruction for Highly Radioactive In-core Components, Revision 0  
RP-AA-461, Radiological Control for Contaminated Water Diving Operation, Revision 3  
WC-AA-105, Work Activity Risk Management, Revision 3  
S2.CH-IO.ZZ-1112(Z), Salem Unit 2 Shutdown Chemistry Plan, Revision 5

Documents

Salem Unit 1, 22 Refueling Outage Radiological Performance Report  
ALARA Plans (various)  
Radiation Protection Job Guides (Reactor Disassembly, Reactor Cavity Decontamination)  
Unit 2 Outage Chemistry Control Plan  
2R20 Hard Gamma Projection  
Corrective Action Documents (various notifications)

**Section 2RS3: In-plant Airborne Radioactivity Control and Mitigation**

Procedures

RP-AA-103, Radiological Control of Reactor Cavity and Spent Fuel Pool Operation, Revision 0  
RP-AA-300, Radiological Survey Program, Revision 5  
RP-AA-301, Radiological Air Sampling Program, Revision 5  
RP-AA-303, Personnel Air sampling, Revision 1  
RP-AA-507, Operation of Eagle Air Airquest SMT  
RP-AA-825, Maintenance, Care and Inspection of Respiratory Protection Equipment, Revision 5  
RP-AA-1013, Operation and Inspection of 3M Hood and PAPR Blower Unit, Revision 1  
NC.RP-TI.ZZ-0404(Q), Testing and Evaluation of Compressed Breathing Air, Revision 1

Documents

Respiratory Protection Training Modules  
Breathing air test data (vendor, August 24, 2015)  
Eagle Air Grade D (site - August 27, 2015)  
Air pack records review (Packs 123, 129, 130, 131, 133)  
Air Pack inspections (Packs 123, 133)  
Radiological Source Term Data – 10 CFR61 waste stream report  
Airborne Radioactivity Sampling Results (various)  
Corrective Action Documents (various notifications)  
Section

## **Section 2RS4: Occupational Dose Assessment**

### Procedures

RP-AA-300, Radiological Survey Program, Revision 5  
RP-AA-300-1003, Discrete Radioactive Particle Control, Revision 0  
RP-AA-301, Radiological Air Sampling Program, Revision 5  
RP-AA-401, Operational ALARA Planning and Control, Revision 13  
RP-AA-401-1001, Special Instruction for Highly Radioactive In-core Components, Revision 0  
RP-AA-460, Control for High and Very High Radiation Areas, Revision 17  
RP-AA-461, Radiological Control for Contaminated Water Diving Operation, Revision 3  
S2.CH-IO.ZZ-1112(Z), Salem Unit 2 Shutdown Chemistry Plan, Revision 5

### Documents

NVLAP Dosimetry Accreditation  
Whole Body Counter Calibration Data  
General Source Term Data  
Corrective Action Documents (various)

## **Section 2RS5: Radiation Monitoring Instrumentation**

### Procedures

NC.EP-EP.ZZ-0307, Plant Vent Sampling, Revision 6  
ER-SA-310-1009, Salem Generating Station Maintenance Rule Scoping, Revision 5  
NC.RS-TI.ZZ-0505(Q), Calibration of the MGP Instruments Telepole, Revision 1  
NC.RS-TI.ZZ-0586(Q), Certification and Operating Instruction for the Neutron  
Calibration Source, Revision 0  
S1.IC-FT-RM 1R12A Containment Noble Gas Monitor Channel Functional  
S1.IC-CC.RM-0028, Liquid Radwaste Monitor (1R18) Calibration  
S1.IC-FT.RM-0028 1R18 Liquid Radwaste Monitor Channel Functional  
S1.IC-CC.RM-0029, 1R9 Channel Detector Calibration  
S2.IC-CC.RM-0060, Chem Waste Basin Process Monitor Calibration (2R37)  
S1.1C.IC-CC.RM-0072(Q), Containment High range Channel A Calibration  
S1.1C.IC-CC.RM-0073(Q), Containment High range Channel B Calibration  
S1.IC-FT.RM-0072(Q), Containment High Range Monitor Channel A Functional  
S1.IC-FT.RM-0073(Q), Containment High Range Monitor Channel B Functional  
S2.IC-CC.RM-0066, 2R41C Detector Calibration  
S1.IC-CC.RM-0066, 1R41C Channel Detector Calibration  
S1.IC-CC.RM-0064, 1R41A, D Channel Detector Calibration  
S2.IC-CC.RM-0064, 2R41A Low Range /2R41D Composite Plant vent Noble gas Process  
Radiation Monitors  
S1.IC-CC-RM-0088, 1R41 Plant Vent Noble Gas Sample and Process Flow SC-RM-0004-02,  
Salem Unit 2 Plant Vent Noble Gas Radiation Monitor Channel 2R41 (Alarm Set Points)  
S1.IC-FT.RM-0129, 1R19A-D, Steam Generator Blowdown Process Radiation Monitor

### Documents

Source Certificate Sr-90 1760-23  
Updated Detector Response baseline with New Sources for 1 and 2 R41 Monitors  
(December 2014)  
Passive Monitoring Study  
Isokinetic Sampling Analysis  
National Source Tracking Confirmation Letters

Source Leak checks (S-1179, S-1180, and S-783)  
Instrument Calibration Records (Gem 5 Portal Monitor, Argos 5A/B Portal monitor,  
Chrono 4 tool monitor)  
Corrective Action Documents (various notifications)

**Section RS06: Radioactive Gaseous and Liquid Effluent Treatment**

Procedures

SC.CH-PM.WD-00870, R41 Mid/High Range Cartridge  
CY-AP-120-1100, sample preparation of particulate and Iodine Filters During Radiological  
Emergencies  
S1.CH-AB.CBV-1076, Unit 1 Containment Atmosphere Sampling Under Accident Conditions  
S2.CH-AB.CBV-2076, Unit 2 Containment Atmosphere Sampling Under Accident Conditions  
SC.CH-AB.RC-1075, Sampling Reactor Coolant and RHR Heat Exchanger Outlet Under  
Accident Conditions  
SC.CH-AB.RC-1080, Reactor Coolant Sample Transfer and Dilution Under Accident Conditions  
NC.EP-EP.ZZ-0306, Emergency Air Sampling  
S1. RA-PT-ABU-002, Auxiliary Building Ventilation  
ER-AA-450, Rev. 2, Implementation of the Technical Specification Surveillance Frequency  
Program  
S1.RA-PT.FHV-0001, Fuel Handling Building Ventilation System  
Salem Offsite Dose Calculation Manual

Documents

SGT-TRM, Salem Generating Station Technical Requirements  
Buried Piping Service Water Line Inspection Results  
HEPA and Charcoal ventilation system test results (various)  
Ground water Monitoring Data  
Effluent Release Permits  
TS Ventilation System Test data  
Corrective Action Documents (various notifications)

**Section 2RS8: Radioactive Solid Waste Processing and Radioactive Material Handling,  
Storage, and Transportation**

Scaling Factors

2015 Dry Active Waste; 2014 Unit 1 Spent Resin Storage Tank; 2014 Unit 2 Spent Resin  
Storage Tank; 2014 Liquid Waste Processing Resin; 2014 Turning Vane Bolt Smear

Procedures

RP-AA-600, Radioactive Material Waste Shipments, Revision 14  
RP-AA-600-1003, Radioactive Waste Shipments to Barnwell and the Defense Consolidation  
Facility (DCF), Revision 6  
RP-AA-600-1005, Radioactive Material and Non Disposal Site Waste Shipments, Revision 10  
RP-AA-600-1006, Shipment of Category 1 Quantities of Radioactive Material or Waste  
(Category 1 RAMQC), Revision 7  
RP-AA-600-1009, Shipment of Category 2 Quantities of Radioactive Material or Waste  
(Category 2 RAMQC), Revision 0  
RP-AA-601, Surveying Radioactive Material Shipments, Revision 9  
RP-AA-602, Packaging of Radioactive Material Shipments, Revision 16

RP-AA-602-1001, Packaging of Radioactive Material/Waste Shipments, Revision 9  
RP-AA-603, Inspection and Loading of Radioactive Material/Waste Shipments, Revision 5  
RP-AA-605, 10CFR61 Program, Revision 1  
RP-AA-605-1001, Evaluation of 10CFR61 Sample Results, Revision 1  
RP-AA-607, Radioactive Material Shipped in Accordance with IATA (International Air Transport Association) Requirements, Revision 7  
RP-AA-614, Use of Various Casks for Shipping Radioactive Materials, Revision 0  
RP-AA-100, Process Control Program for Radioactive Wastes, Revision 10  
LS-AA-1020, Implementation of Significant Rules and Orders, Revision 1

Quality Assurance

Check-In Self-Assessment, Radioactive Waste Shipping, October 2015  
Radiation Protection Audit Report NOSA-SLM-13-08, October 2013

Training

Lesson Plans NRP9902RMATIC-02; NRP2003BO14C-02, Radioactive Material Shipping  
Energy Solutions NRC/DOT Radioactive Waste Packaging, Transportation and Disposal  
Training  
Energy Solutions IATA: Transportation of Dangerous Goods by Air Shipper Certification  
Training

Shipments

14-09; 14-35; 14-66; 14-108; 14-163

**Section 40A1: Performance Indicator Verification**

Notifications

20701570	20701615	20702113	20704554*	20710680	20712080*
20712169*	20713716*				

Documents

MSPI Derivation Reports for Emergency AC, High Pressure Injection, and Cooling Water  
Systems for September 2014 and September 2015  
Salem Offsite Dose Calculation Manual  
Personnel Radiation Dose Records and Calculations  
Station Effluent Release Reports  
Corrective Action Documents (various Notifications)

**Section 40A2: Problem Identification and Resolution**

Procedures

LS-AA-120, Issue Identification and Screening Process, Revision 13  
MA-AA-716-004, Conduct of Troubleshooting, Attachment 2, Revision 12  
NC.ER-AP.ZZ-0010(Q), Equipment Reliability Process, Revision 1  
SC.MD-CM.CBV-0001(Q), Removal and Installation of CFCU Motor Bearing Replacement  
and Motor Power Lead Insulation, Revision 6

Notifications

20681031	20681675	20681855	20681876	20681942	20682394
20682396	20682404	20682625	20683022	20695667	20695668
20695669	20695670	20703760*	20704346*	20704462*	20704575*
20704583*	20704707*	20705576*	20706539*	20706709*	20706930*
20713433					

Maintenance Orders/Work Orders

70171710	70174554	70174727	70174731	70174924	80039649
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Other Documents

Adverse Condition Monitoring and Contingency Plan ACM 14-015, Revisions 9 and 13  
 LER 2015-003-00, Plant Shutdown Required by Technical Specifications, dated 5/6/15  
 Salem Unit 1 Narrative Log  
 PSEG Purchase Order 4500517606  
 Letter from Schulz Electric to PSEG, "1S-69 300/100 HP CFCU Motor Preliminary Inspection Results," dated 3/18/15  
 Schulz Electric Weld Inspection and Stator Repair Plan N-7510-SR, Rev. 0, dated 8/4/15  
 Letter from C.W. Churchman, PSEG to General Manager – Salem Operations, "Engineering Evaluation No. S-C-M945-EEE-0109-0 Reactor Containment Fan Cooling (RCFC) Motor Reliability Study," dated 5/7/86  
 Westinghouse Reactor Containment Fan Cooler Technical Manual, referred to as PSEG Vendor Technical Document 139970, Revision 24  
 OE8699, Containment Fan Cooler Motor Stator Bar to Motor Frame Weld Cracks  
 OE24899, Containment Fan Coolers Exhibit Evidence of Stator/Rotor Rubbing

**Section 40A3: Follow-up of Events and Notices of Enforcement Discretion**Procedures

SC.MD-CM.CBV-0001(Q), Removal and Installation of CFCU Motor Bearing Replacement and Motor Power Lead Insulation, Revision 6  
 MA-AA-716-004, Conduct of Troubleshooting, Attachment 2, Revision 12  
 NC.ER-AP.ZZ-0010(Q), Equipment Reliability Process, Revision 1  
 SC.IC-FT.NIS-0013(Q), N35 Intermediate Range, Revision 5  
 SC.IC-FT.NIS-0014(Q), N36 Intermediate Range, Revision 5  
 SC.IC-DC.NIS-0024(Q), Power Range N44 Channel Detector Current Adjustment, Revision 12  
 LS-AA-120, Issue Identification and Screening Process, Revision 13  
 LS-AA-125, Corrective Action Program, Revision 20  
 S1.OP-ST.NIS-0002(Q), Power Distribution – Quadrant Power Tilt Ratio, Revision 15  
 SC.IC-CC.NIS-0018(Q), N44 Power Range, Revision 8  
 SC.OP-DL.ZZ-0027(Q), Form 1, Salem Additional Reading/Operator Action Log, Revision 5  
 MA-AA-716-012, Post Maintenance Testing, Revision 20  
 ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 14  
 SC.IC-CC.NIS-0017(Q), N43 Power Range, Revision 7  
 S2.IC-GP.NIS-0001(Q), Nuclear Instrumentation System Data Procedure, Revision 321

Cause Evaluations

CCE, Multiple Hagan/NUM Module Failures Lead to Unplanned LCO Entries (70177445)  
 ACE, 24NM306 Isolator Found Low (70173371)  
 ACE, OPS Fundamental "Monitoring" Opportunity (70173374)  
 WGE, Incorrect PMT/RT Assigned to Corrective Maintenance Work (70175956)

Licensee Event Reports (LER)

LER 272/2015-004-00, Condition Prohibited by Technical Specification for One Channel of  
 Overtemperature Delta-T Inoperable  
 LER 311/2015-001-00, Condition Prohibited by Technical Specification for One Channel of  
 Overtemperature Delta-T Inoperable  
 LER 2015-003-00, Plant Shutdown Required by Technical Specifications, dated 5/6/15

Notifications

20681031	20681675	20681855	20681876	20681942	20682394
20682396	20682404	20682625	20683022	20695667	20695668
20695669	20695670	20686645	20677028	20677280	20674510
20687099	20692341	20690330	20693764	20692408	20681551
20676871	20677581	20676595	20676753	20676752	20676754
20680729	20681243	20680687	20680729	20674518	20689386
20545327	20546311	20577394	20594192	20649574	

Maintenance Orders/Work Orders

70174554	70174727	70174731	80039649	70176686	70173439
70175956	70177445	30003829	70173371	60122238	30186622
60121200	30160436	50158472	60122420	60122184	60122980
70174803	70174804	70175092	70110919	70130146	70142912

Other Documents

Salem Unit 1 Narrative Log  
 PSEG Purchase Order 4500517606  
 Letter from Schulz Electric to PSEG, "1S-69 300/100 HP CFCU Motor Preliminary Inspection  
 Results," dated 3/18/15  
 Schulz Electric Weld Inspection and Stator Repair Plan N-7510-SR, dated 8/4/15, Revision 0  
 Letter from C.W. Churchman, PSEG to General Manager – Salem Operations, "Engineering  
 Evaluation No. S-C-M945-EEE-0109-0 Reactor Containment Fan Cooling (RCFC) Motor  
 Reliability Study," dated 5/7/86  
 Westinghouse Reactor Containment Fan Cooler Technical Manual, referred to as PSEG Vendor  
 Technical Document 139970, Revision 24  
 OE8699, Containment Fan Cooler Motor Stator Bar to Motor Frame Weld Cracks  
 OE24899, Containment Fan Coolers Exhibit Evidence of Stator/Rotor Rubbing

Miscellaneous

List of Orders and Update Status - nuclear instrumentation surveillances, as of December 2015  
 Operator/Narrative Logs, January, April and October 2015, Salem 1&2  
 Crew Learning, Operations Shift E Event Date April 22, 2015  
 EVAL-S-NIS-00085, 2N44 Power Range Unavailability  
 July 2015 Utilities Services Alliance MRM Package  
 Functional Diagram 220417 B 9542-8, No. 13 & 23 Reactor Coolant Loops Delta T Protection  
 System

Functional Diagram 220416 B 9542-7, No. 12 & 22 Reactor Coolant Loops Delta T Protection System

S2 AFD Recorder Sequence of Events (for M-Rule)

Functional Diagram 220417 B 9542-8, No. 13 & 23 Reactor Coolant Loops Delta T Protection System

Unplanned LCO PI Data, January – September 2015

S1.OP-DL.ZZ-0003(Q), Control Room Log (Modes 1-4), Revision 74, dated January 19, 2015

Functional Diagram 220415 B 9542-8, No. 11 & 21 Reactor Coolant Loops Delta T Protection System

Functional Diagram 220458 B 9524-14, Nuclear Instrumentation System Power Range No. 4 1N44

Functional Diagram 220087 B 9538-16, Reactor Protection and Process Control Systems T/AVG Control and Protection Interconnections

Functional Diagram 220094 B 9538-16 and 9538-14, Reactor Protection and Process Control System Axial Flux Difference Monitoring Interconnection

Functional Diagram 220092 B 9538-23, Reactor Protection and Process Control Systems T/AVG Control and Protection Interconnections

Reactor Protection System and Nuclear Instrumentation System Performance Monitoring Plans

EAG Failure Analysis Report, Job #: E0FNW560, April 2015

S1.OP-ST.NIS-0002(Q), Revision 15, and S1. IC-ST.NIS-0004(Q), Revision 19, April 21, 2015 and S1.IC-DC.NIS-0024, Revision 12, April 23, 2015

**LIST OF ACRONYMS**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ACE	apparent cause evaluation
ACM	adverse condition monitoring
AFD	axial flux distribution
AFW	auxiliary feedwater
ALARA	as low as is reasonably achievable
ASME	American Society of Mechanical Engineers
BACC	Boric Acid Corrosion Control
CAM	continuous air monitor
CAP	corrective action program
CAV	control area ventilation
CFCU	containment fan cooling unit
CFR	<i>Code of Federal Regulations</i>
EDG	emergency diesel generator
EPD	electronic personal dosimeter
HELB	high energy line break
HRA	high radiation area
I&C	instrumentation and control
IMC	Inspection Manual Chapter
IR	Inspection Report
ISI	in-service inspection
LCO	limiting condition for operation
LER	licensee event report
LHRA	locked high radiation area
MPFF	maintenance preventable functional failure
MR	maintenance rule
MSHA	Mine Safety and Health Administration
MSPI	Mitigating Systems Performance Index
NCV	non-cited violation
NDE	non-destructive examination
NEI	Nuclear Energy Institute
NI	nuclear instrumentation
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission, U.S.
ODCM	Offsite Dose Calculation Manual
OE	operating experience
OTDT	over-temperature delta-temperature
PBI	plant barrier impairment
PCM	personnel contamination monitor
PI	performance indicator
PM	preventive maintenance
PMT	post-maintenance testing
PR	power range
PSEG	Public Service Enterprise Group Nuclear LLC
RG	Regulatory Guide
RM	radiation monitor
RMPFF	repeat maintenance preventable functional failure
RP	Radiation Protection
RPS	reactor protection system



RWP	radiation work permit
SAM	small article monitor
SCBA	self-contained breathing apparatus
SG	steam generator
SGFP	steam generator feedwater pump
SSC	structure, system, and component
SW	service water
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
UT	ultrasonic testing
VHRA	very high radiation area
WGE	work group evaluation