UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

August 11, 2020

Mr. Eric Carr
President and Chief Officer
PSEG Nuclear, LLC
PO Box 236
Hancock's Bridge, NJ 08038

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNITS 1 AND 2 – INTEGRATED INSPECTION REPORT 05000272/2020002 AND 05000311/2020002

Dear Mr. Carr:

On June 30, 2020, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Salem Nuclear Generating Station, Units 1 and 2. On July 2, 2020, the NRC inspectors discussed the results of this inspection with Mr. Dave Sharbaugh, Plant Manager and other members of your staff. The results of this inspection are documented in the enclosed report.

One finding of very low safety significance (Green) is documented in this report. This finding did not involve a violation of NRC requirements.

If you disagree with a cross-cutting aspect assignment 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 U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; and the NRC Resident Inspector at Salem Nuclear Generating Station, Units 1 and 2.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, “Public Inspections, Exemptions, Requests for Withholding.”

Sincerely,

X /RA/

Signed by: NRC-PIV
Brice A. Bickett, Chief
Reactor Projects Branch 3
Division of Reactor Projects

Docket Nos. 05000272 and 05000311
License Nos. DPR-70 and DPR-75

Enclosure:
Inspection report 05000272/2020002 and 05000311/2020002

cc w/ encl: Distribution via LISTSERV®

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNITS 1 AND 2 – INTEGRATED INSPECTION REPORT 05000272/2020002 AND 05000311/2020002 DATED AUGUST 11, 2020

DISTRIBUTION:

DLew, RA	**(R1ORAMAIL Res)**
RLorson, DRA	**(R1ORAMAIL Res)**
DCollins, DRP	**(R1DRPMAIL Res)**
BWelling, DRP	**(R1DRPMAIL Res)**
JYerokun, DRS	(**R1DRSMAIL Res)**
PKrohn, DRS	**(R1DRSMAIL Res**

JAmbrosini, DRP
BBickett, DRP
GWalbert, DRP
PFinney, DRP
JHawkins, DRP, SRI
MHardgrove, DRP, RI
RRolph, DRP, RI
SCalabrese, DRP
EBurket, RI, OEDO
RidsNrrPMSalem Resource
RidsNrrDorlLpl1 Resource
ROPreports Resource

DOCUMENT NAME: G:\DRP\BRANCH3\ROP_InspectionReports__Salem\2020\Salem Final Report 2020002.docx
ADAMS ACCESSION NUMBER: ML20219A654

☑ SUNSI Review		☑ Non-Sensitive ☐ Sensitive		☑ Publicly Available ☐ Non-Publicly Available	
OFFICE	RI/DRP	RI/DRP	RI/DRP		
NAME	JHawkins per email	PFinney/GW per email	BBickett		
DATE	08/10/20	8/10/20	8/11/20		

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Numbers:	05000272 and 05000311
License Numbers:	DPR-70 and DPR-75
Report Numbers:	05000272/2020002 and 05000311/2020002
Enterprise Identifier:	I-2020-002-0020
Licensee:	PSEG Nuclear, LLC
Facility:	Salem Nuclear Generating Station, Units 1 and 2
Location:	Hancocks Bridge, NJ 08038
Inspection Dates:	April 01, 2020 to June 30, 2020
Inspectors:	J. Hawkins, Senior Resident Inspector M. Hardgrove, Resident Inspector P. Finney, Senior Project Engineer J. Kulp, Senior Reactor Inspector R. Rolph, Resident Inspector S. Wilson, Senior Health Physicist
Approved By:	Brice A. Bickett, Chief Reactor Projects Branch 3 Division of Reactor Projects

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting an integrated inspection at Salem Nuclear Generating Station, Units 1 and 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information.

List of Findings and Violations

Inadequate Troubleshooting of a Failed Control Rod Drive Motor Generator Set			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green FIN 05000272,05000311/2020002-01 Open/Closed	[H.13] - Consistent Process	71152
A Green self-revealing finding was identified because PSEG did not follow their complex troubleshooting procedure MA-AA-716-004, Revision 15, "Conduct of Troubleshooting," regarding a failure of a 10 watt (W) resistor in the 22 control rod drive motor generator (MG) set voltage regulator on December 4, 2018. Specifically, PSEG's failure mode/cause table (FMCT) did not fully refute all failure modes and missed an opportunity to involve the original equipment manufacturer (OEM) and industry input into the FMCT as required by PSEG's complex troubleshooting procedure. As a result, PSEG experienced additional resistor failures in the 11 and 12 control rod MG sets resulting in a manual trip of the Unit 1 reactor during a reactor startup on March 25, 2020.			

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000272/2020-001-00	LER 2020-001-00 for Salem Station, Unit 1, Manual Reactor Trip and Auxiliary Feed Water System Actuation	71153	Closed

PLANT STATUS

Unit 1 began the inspection period at rated thermal power. The unit remained at or near rated thermal power for the remainder of the inspection period.

Unit 2 began the inspection period at rated thermal power. On April 11, 2020, the unit was manually tripped for a planned refueling outage (S2R24). A reactor startup was commenced on May 10, 2020, and when ascending in power the unit experienced equipment challenges with the 24 feed water regulating valve (24BF19). On May 14, 2020, the unit was shutdown to fix the issue and restarted on May 18, 2020, reaching 100 percent on May 24, 2020. The unit remained at or near rated thermal power for the remainder of the inspection period.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

Starting on March 20, 2020, in response to the National Emergency declared by the President of the United States on the public health risks of the coronavirus (COVID-19), resident inspectors were directed to begin telework and to remotely access licensee information using available technology. During this time the resident inspectors performed periodic site visits each week and conducted plant status activities as described in IMC 2515, Appendix D; observed risk significant activities; and completed on site portions of IPs. In addition, resident and regional baseline inspections were evaluated to determine if all or portion of the objectives and requirements stated in the IP could be performed remotely. If the inspections could be performed remotely, they were conducted per the applicable IP. In some cases, portions of an IP were completed remotely and on site. The inspections documented below met the objectives and requirements for completion of the IP.

REACTOR SAFETY

71111.01 - Adverse Weather Protection

Seasonal Extreme Weather Sample (IP Section 03.01) (1 Sample)

(1) Severe thunderstorm activity expected on April 13

71111.04 - Equipment Alignment

Partial Walkdown Sample (IP Section 03.01) (2 Samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

(1) Unit 2, 22 and 23 auxiliary feedwater (AFW) systems prior to scheduled 21 AFW pump inservice testing on April 1
(2) Unit 2, 21 residual heat removal (RHR) system and spring cans following S2RHR-2RHRH21-16 spring can degradation on April 20

71111.05 - Fire Protection

Fire Area Walkdown and Inspection Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the implementation of the fire protection program by conducting a walkdown and performing a review to verify program compliance, equipment functionality, material condition, and operational readiness of the following fire areas:

(1) Unit 1, auxiliary building charging and containment spray pump areas on May 29
(2) Unit 1, service water intake structure 15 service water pump bay during planned maintenance on June 18
(3) Unit 2, auxiliary building during 2R24 outage 21 component cooling train scheduled maintenance on April 15
(4) Unit 2, auxiliary building switchgear room during 2R24 outage during scheduled maintenance work on April 20
(5) Unit 2, containment walkdown during 2R24 refueling outage and scheduled maintenance work on April 24

71111.08P - Inservice Inspection Activities (PWR)

PWR Inservice Inspection Activities Sample (IP Section 03.01) (1 Sample)

S2RF024

(1) The inspectors verified that the reactor coolant system boundary, reactor vessel internals, risk-significant piping system boundaries, and containment boundary are appropriately monitored for degradation and that repairs and replacements were appropriately fabricated, examined and accepted by reviewing the following activities during the Salem Unit 2 S2RF024 refueling outage from April 20, 2020, to April 24, 2020:

03.01.a - Nondestructive Examination and Welding Activities.

1. Ultrasonic Examination of 10-SJ-1231-18, Cold Leg Pipe to Safety Injection Branch Connection (UT-20-19)
2. Ultrasonic Examination of 14-RH-2214-13BC 3 inch Branch Connection Weld (MRP-192) (UT-20-43)
3. Dye Penetrant Examination of 8-SJ-1262-10, Safety Injection Pipe to Pipe Weld (PT-20-003)
4. Dye Penetrant Examination of 8-SJ-1262.9PS Safety Injection Pipe to Containment to Penetration Integral Attachment– License Renewal, (PT-20-005)
5. Magnetic Particle Examination of 14-BF-2221-11, Feedwater Piping Welded Attachment (MT-20-001)
6. Visual Examination (VT3) of 2C-CVCH-515, Chemical Volume Control Class 1 Hangar (VT-20-080)
7. Visual Examination (VT1) of body to bonnet bolt on 2CV77, 23 Loop Charging Line Stop Valve (60140623)
8. Re-acceptance by examination and analysis of 23 Loop Charging Line Stop Valve (2CV77) due to boric acid residue discovered during S2RF023 (70203562)
9. Weld Repair of SJ22 Safety Injection Accumulator 2-inch Instrumentation Nozzle # 8 (60146109)

03.01.b - Pressurized-Water Reactor Vessel Upper Head Penetration Inspection Activities.

PSEG did not perform any reactor vessel upper head penetration examinations during this outage.

03.01.c - Pressurized-Water Reactor Boric Acid Corrosion Control Inspection Activities

1. Boron on Packing of 2PS3 (20472774/70113523)
2. Boron on Reactor Coolant Pump 24 Seal Package (20848107)

03.01.d - Steam Generator Tube Inspection Activities
PSEG did not perform any steam generator tube examinations during this outage.

71111.11Q - Licensed Operator Requalification Program and Licensed Operator Performance

Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (1 Sample)

(1) Unit 2 main control room (MCR) observation of shutdown on April 10 and 11

71111.13 - Maintenance Risk Assessments and Emergent Work Control

Risk Assessment and Management Sample (IP Section 03.01) (3 Samples)

The inspectors evaluated the accuracy and completeness of risk assessments for the following planned and emergent work activities to ensure configuration changes and appropriate work controls were addressed;

(1) Unit 1 and Unit 2, reactor bypass breaker maintenance schedule-online versus outage risk on April 14
(2) Unit 1, analog rod position indication (ARPI) perturbation resulting in a change of rod position for multiple groups and banks on June 29
(3) Unit 2, switchgear and penetration area ventilation outage risk with 23 switchgear area supply fan damper failed closed and opposite header depressurized for local leak rate testing on April 22

71111.15 - Operability Determinations and Functionality Assessments

Operability Determination or Functionality Assessment (IP Section 03.01) (4 Samples)

The inspectors evaluated the licensee's justifications and actions associated with the following operability determinations and functionality assessments:

(1) Unit 1, part 21 1R44A high radiation monitor nickel seal non-conformance on April 14
(2) Unit 2, 22 service water header following external corrosion on service water piping on April 14
(3) Unit 2, 21, 22, and 24 reactor coolant pump (RCP) component cooling spring can misalignment on May 4
(4) Unit 2, 21AF23 and 24AF24 stop check valves not meeting acceptance criteria reverse flow inservice testing on June 2

71111.18 - Plant Modifications

Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (2 Samples)

The inspectors evaluated the following temporary or permanent modifications:

(1) Unit 1, develop metal impact monitoring system TCP (NOTF 20846950 and Order 70212290) due April 23
(2) Unit 1 and Unit 2, resistor replacements on control rod drive motor generator sets on April 1

71111.19 - Post-Maintenance Testing

Post-Maintenance Test Sample (IP Section 03.01) (7 Samples)

The inspectors evaluated the following post maintenance test activities to verify system operability and functionality:

(1) Unit 1,12 steam generator feedwater pump elevated vibrations week of April 1
(2) Unit 1, 14MS28 (main turbine stop valve) week of April 1
(3) Unit 1, 11 steam generator feedwater pump advanced digital feedwater control system remote 1/O cabinet failure on April 14
(4) Unit 2, 24 reactor coolant pump seal and motor replacement on April 14
(5) Unit 2, 21SW122 complete valve rebuild during 2R24 refueling outage on April 20
(6) Unit 2, 2B emergency diesel generator R9 cylinder jacket water leakage during scheduled outage maintenance window on April 29

(7) Unit 2, 23 auxiliary feedwater pump governor valve hunting and relief valve lifting during in-service testing on May 10

71111.20 - Refueling and Other Outage Activities

Refueling/Other Outage Sample (IP Section 03.01) (1 Sample)

(1) Unit 2, scheduled refueling outage 2R24 from April 11 to May 24

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

Surveillance Tests (other) (IP Section 03.01) (2 Samples)

(1) Unit 2, 23 auxiliary feedwater pump full flow test on April 10
(2) Unit 2, 2B emergency diesel generator surveillance testing and 24-hour endurance run on June 3

Containment Isolation Valve Testing (IP Section 03.01) (1 Sample)

(1) Unit 2, local leak rate testing (LLRT) 2VC5 and 2VC6 due to failed S2.OP-LR.VC-0003 on April 12

71114.06 - Drill Evaluation

Select Emergency Preparedness Drills and/or Training for Observation (IP Section 03.01) (1 Sample)

(1) LORT-Emergency preparedness drill on June 23

RADIATION SAFETY

71124.01 - Radiological Hazard Assessment and Exposure Controls

Radiological Hazard Assessment (IP Section 03.01) (1 Partial)

(1) (Partial)
The inspectors evaluated how the licensee identifies the magnitude and extent of radiation levels and the concentrations and quantities of radioactive materials and how the licensee assesses radiological hazards.

Instructions to Workers (IP Section 03.02) (1 Partial)

(1) (Partial)
The inspectors evaluated radiological protection-related instructions to plant workers. Specifically, inspectors reviewed radiation work permit 24 and ALARA Plan 58 for Unit 2 regenerative heat exchanger maintenance.

.

Contamination and Radioactive Material Control (IP Section 03.03) (1 Partial)

The inspectors evaluated licensee processes for monitoring and controlling contamination and radioactive material.

(1) (Partial)
The inspectors evaluated the licensee's process for release of personal items and use of the small article monitor as well as control of highly radioactive items stored in pools.

Radiological Hazards Control and Work Coverage (IP Section 03.04) (1 Partial)

The inspectors evaluated in-plant radiological conditions during facility walkdowns and observation of radiological work activities.

(1) (Partial)
- The inspectors reviewed breathing zone air sample results for the Unit 1 reactor coolant filter replacement conducted on April 8, 2020
- The inspectors reviewed RWP 24 and attended the pre-job brief for removal of the Unit 2 reactor coolant letdown heat exchanger
- The inspectors reviewed survey records and electronic personnel dosimeter alarm setpoints

High Radiation Area and Very High Radiation Area Controls (IP Section 03.05) (1 Partial)

The inspectors evaluated licensee controls of the following High Radiation Areas and Very High Radiation Areas:

(1) (Partial)
- The inspectors reviewed the circumstances of technical specification high radiation area occurrences, as defined by Nuclear Energy Institute document 99-02
- The inspectors reviewed procedural changes since the last inspection to determine the adequacy of access controls for high radiation and very high radiation area

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

IE01: Unplanned Scrams per 7000 Critical Hours Sample (IP Section 02.01) (2 Samples)

(1) Unit 1, April 1, 2019 - March 31, 2020
(2) Unit 2, April 1, 2019 - March 31, 2020

IE03: Unplanned Power Changes per 7000 Critical Hours Sample (IP Section 02.02) (2 Samples)

(1) Unit 1, April 1, 2019 - March 31, 2020
(2) Unit 2, April 1, 2019 - March 31, 2020

IE04: Unplanned Scrams with Complications (USwC) Sample (IP Section 02.03) (2 Samples)

(1) Unit 1, April 1, 2019 - March 31, 2020
(2) Unit 2, April 1, 2019 - March 31, 2020

71152 - Problem Identification and Resolution

Semiannual Trend Review (IP Section 02.02) (1 Sample)

(1) Unit 1 and Unit 2, Corrective action program trend review

Annual Follow-up of Selected Issues (IP Section 02.03) (3 Samples)

The inspectors reviewed the licensee's implementation of its corrective action program related to the following issues:

(1) Unit 1, Review of recent steam generator tube leaks, the root cause analyses, and corrective actions
(2) Unit 1 and Unit 2, Review of recent pressurizer spray valve packing leakage troubleshooting, causal evaluation, and corrective actions
(3) Unit 1 and Unit 2, Review of troubleshooting and corrective actions for failed control rod drive motor generator set resistors

71153 - Followup of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (1 Sample)

The inspectors evaluated the following licensee event reports (LERs):

(1) LER 272/2020-001-00 for Salem Unit 1 manual reactor trip and auxiliary feed water system actuation on May 26. The inspection conclusions associated with this LER are documented in this Inspection Report under Inspection Results Section.

INSPECTION RESULTS

Inadequate Troubleshooting of a Failed Control Rod Drive Motor Generator Set			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green FIN 05000272,05000311/2020002-01 Open/Closed	[H.13] - Consistent Process	71152
A Green self-revealing finding was identified because PSEG did not follow their complex troubleshooting procedure MA-AA-716-004, Revision 15, "Conduct of Troubleshooting," regarding a failure of a 10 watt (W) resistor in the 22 control rod drive motor generator (MG) set voltage regulator on December 4, 2018. Specifically, PSEG's failure mode/cause table			

(FMCT) did not fully refute all failure modes and missed an opportunity to involve the original equipment manufacturer (OEM) and industry input into the FMCT as required by PSEG's complex troubleshooting procedure. As a result, PSEG experienced additional resistor failures in the 11 and 12 control rod MG sets resulting in a manual trip of the Unit 1 reactor during a reactor startup on March 25, 2020.

Description: Salem Unit 1 and Unit 2 each contain 2 control rod MG sets that utilize the same voltage regulator feedback configuration. The voltage regulator feedback configuration consists of capacitors, resistors, transformers, and a voltage regulator card. Each control rod MG set has 2 resistors in the voltage regulator circuitry; for a total of 8 resistors between both units in this application. These resistors are one (1) ohm, 10 watt (W) resistors.

On December 4, 2018, the 22 control rod MG set tripped while Unit 2 was operating at 100 percent power. PSEG's complex troubleshooting required the completion of an FMCT to support the cause of the failure. The 3R resistor within 22 control rod MG set voltage regulator circuit was identified failed. The station's FMCT and associated analysis at that time identified the failed system, structure, or component (SSC) and subsequent analysis determined the cause of that SSC failure of accelerated aging caused by high thermal temperatures and cycling.

On March 25, 2020, a manual reactor trip was initiated when the 11 control rod MG set tripped with the 12 control rod MG set out of service for maintenance due to a failed 3R resistor on March 24, 2020 (NOTF 20847054 and LER 05000272/2020-001-00, Salem Unit 1 Manual Reactor Trip and Auxiliary Feed Water System Actuation). The 11 control rod MG set experienced a failure of an equivalent resistor, 1R, resulting in the failure and a manual reactor trip. PSEG's causal evaluation determined that a loss of voltage regulation in each of the control rod MG sets was due to a failed resistor resulting from excessive power consumption with reduced manufacturing margin. The 1R (11 MG) and 3R (12 MG) resistors serve the same function in the control rod MG set voltage regulator circuitry for each MG set. A failure in this portion of the voltage regulator circuitry can result in a loss of function to the voltage regulator card ultimately leading to a loss of signal to the generator exciter field.

The inspectors reviewed PSEG's troubleshooting during the most recent issues in March 2020. During PSEG's complex troubleshooting for the March 2020 manual reactor trip, the OEM vendor was consulted on the design of the control rod MG set voltage regulator circuitry per MA-AA-716-004, Revision 15, and with respect to the repeat issues. The vendor noted that a 25 W resistor should be installed in the control rod MG set voltage regulating circuitry instead of the existing 10 W resistor. Based on this information, PSEG decided to replace the existing 10 W resistors with 25 W resistors for improved reliability and operating margin based on industry input for similar issues at other nuclear plants. PSEG's causal evaluation (Order 70212431) documented that their previous complex troubleshooting for the 22 control rod MG set resistor failure in 2018, "did not fully refute the resistor power consumption as part of the troubleshooting process," and that there was a "missed opportunity to include OEM and industry input in the development of the failure modes and testing plan."

The inspectors reviewed PSEG's 22 control rod MG set resistor failure FMCT from 2018. The inspectors noted the conduct of troubleshooting procedure, MA-AA-716-004. Step 4.14.5 of this procedure states that, "Engineering and Maintenance to Prove/Refute all FMCT failure modes via troubleshooting or tabletop discussion," and Attachment 2 of the FMCT Complex Troubleshooting Quality Final Checklist was checked "yes" for Item 4 by PSEG stating that all failure modes had been ruled out. The inspectors' review determined that PSEG's FMCT had not fully refuted the power consumption (or operating margin) of the

resistor as part of the troubleshooting process. Further, the inspectors noted that this attachment describes in detail PSEG's equipment repairs, component replacement and other actions that are required to restore the failed control rod MG set back to a fully functional status. Part of PSEG's documented actions states that the expected power consumption of the resistor should not exceed 3.1 Amps and that this should be observed on the installed recorder monitoring the control rod MG set. Based on this, the inspectors determined that PSEG did not fully refute all failure modes, specifically the resistor power consumption. The inspectors also noted Step 4.2.12, of MA-AA-716-004, states to, "Involve resources from OEM, other stations, Corporate Engineering and Maintenance, Equipment Vendors or Technical Specialists as required," but the inspectors noted that PSEG did not involve the OEM or industry input into the 2018 MG set failure FMCT.

Based on the above, the inspectors determined that PSEG did not follow their complex troubleshooting procedure to both refute all potential failure modes identified in their FMCT and involve OEM and industry input in the FMCT process.

The disposition of this finding closes LER 05000272/2020-001-00, Salem Unit 1 Manual Reactor Trip and Auxiliary Feed Water System Actuation.

Corrective Actions: PSEG's corrective actions involved completing complex troubleshooting on the resistor failure, documenting a causal evaluation, replacing all the resistors in the 4 MG sets with 25 W resistors, and to validate the design of the control rod MG set voltage regulator circuitry in upcoming refueling outages.

Corrective Action References: NOTFs 20846906, 20814239, 20850448, 20847003, 20847054, 70212431, 70204693, 60145878, 60145818, and 60142553

Performance Assessment:

Performance Deficiency: The inspectors determined that PSEG did not follow their complex troubleshooting procedure, in accordance with MA-AA-716-004, Revision 15. This was a performance deficiency that was reasonably within PSEG's ability to foresee and should have been prevented. Specifically, PSEG's FMCT did not fully refute all failure modes, specifically the resistor power consumption, or incorporate OEM as required by PSEG's complex troubleshooting procedure for failure of a resistor in the 22 control rod drive MG set voltage regulator in December 4, 2018.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The performance deficiency is more than minor because it was associated with the equipment performance attribute of the Initiating Events cornerstone and because the resistor failure resulted in a manual trip, it adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, not adequately refuting all failure modes to assess previous control rod MG set failures resulted in the resistors on the 11 and 12 control rod MG sets failing, resulting in operators implementing a manual reactor trip at power.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process (SDP) for Findings At-Power."

Cross-Cutting Aspect: H.13 - Consistent Process: Individuals use a consistent, systematic approach to make decisions. Risk insights are incorporated as appropriate. The inspectors determined that this finding had a cross-cutting aspect in the area of Human Performance, Consistent Process because PSEG did not use a consistent, systematic approach to make decisions, and did not incorporate risk insights as appropriate. Specifically, PSEG was not consistent within their process and procedures to obtain OEM and industry input. [H.13]
Enforcement: Inspectors did not identify a violation of regulatory requirements associated with this finding.

Observation: Unit 1, Review of recent steam generator tube leaks, the root cause analyses, and corrective actions	71152

The inspectors reviewed PSEG's causal evaluations and corrective actions regarding the 14 steam generator (SG) tube leak which developed on February 25, 2020 (Order 70211926). As a result of this tube leak, PSEG performed a controlled shutdown of Unit 1 to investigate the cause of the leak. PSEG determined that foreign material had caused tube 57-54 to leak and found four adjacent tubes that were impacted, to a lesser extent, by the same piece of foreign material. PSEG's investigation into the origin of the foreign material concluded that the part, a cylindrical 2 inch long by 0.5 inch wide Type 416 free machining stainless steel, was not from installed plant equipment and was most likely introduced into the secondary system during previous maintenance activities. PSEG's corrective actions included plugging the affected SG tubes, performing in-depth testing of all the 14 SG tubes and extent of condition testing on the other three Unit 1 SGs, and revising the site's program and procedures for foreign material exclusion (FME) and work practices.

The inspector's review determined that PSEG's corrective actions were generally appropriate, timely, and commensurate with the safety significance of the event and its consequences. In particular, the station's FME program is being updated to align with industry to include documented FME observations by qualified individuals, re-enforcement of standards and additional FME excellence training, and improved work procedures for high risk secondary system breaches. However, the inspectors noted a few observations regarding previous corrective actions to address a similar tube leak on the 13 SG in 2017 (Order 70197357). In particular, the inspectors reviewed PSEG's actions regarding the metal impact monitoring system (MIMS), or loose parts monitoring (LPM) system, specifically:

- MIMS is described in Salem's UFSAR Section 5.6.8 as a system supplied by the vendor and installed on both Units to enable early detection and presence of metallic debris and loose parts inside the nuclear steam system. The inspectors reviewed PSEG's use of the system, historical alarms, the system classification, and performance monitoring associated with the MIMS/LPM. The inspectors found that the LPM system is TIER 3, a system that is not regularly monitored. The inspectors questioned the TIER 3 classification given that the reactor coolant system, which contains the steam generators, is TIER 1. The reactor coolant system as a TIER 1 system has significantly more performance monitoring requirements because of its importance to nuclear safety and plant reliability. As a result of the inspectors questioning the MIMS system classification and performance monitoring, PSEG initiated corrective actions under NOTF 20851059 to change the system to TIER 2, a system with a graded approach to performance monitoring. Additionally, the station added MIMS to the reactor coolant system performance monitoring plan per ER-AA-2003, System Performance Monitoring and Analysis.

- The inspectors noted differences between the Salem Unit 1 and 2 MIMS systems. Specifically, the Unit 2 MIMS system has been modified twice to improve its reliability and capabilities, first in 2006 (Order 80089134) to install a digital processor to filter out nuisance alarms, record noises for analysis and digitally display the information for ease of use, and a second time in 2008 (Order 80093153) to reconfigure and separate the two system accelerometers. Similar Unit 1 modifications have not been made to improve the reliability and capability of the MIMS system. The inspectors noted that after the Unit 1 13 SG tube leak in 2017, the vendor recommended (Salem Unit 1 MIMS Impact Analysis Report, WNA-AR-00750-PSE, from January 2018) that the station take actions similar to those on Unit 2 to improve reliability and capabilities of MIMS. The inspectors found that PSEG did not take actions to complete these recommendations. As a result of this, PSEG initiated a performance needs analysis (Order 70212914) of the MIMS system due August 30, 2020, and an assessment of system improvements (Order 70212677) due May 30, 2021.

- The inspectors noted that metallic noises were observed on the 12 SG during the reactor startup from the 14 SG tube leak on April 1, 2020 (NOTF 20848945). The vendor performed a similar review to the impact review mentioned above (Order 70212560) in which "*it may be a concern that similar impact activity was observed on 14 SG in late 2017, prior to the recent forced outage on Unit 1*." Recommendations from the vendor included the action of monitoring all MIMS channels once per day in the short term. In the long term, the recommendations included repairing the inoperable 11 SG MIMS channels, relocating the Unit 1 sensor locations to allow for location discrimination, and upgrading the Unit 1 MIMS system to allow for recording capability. PSEG has created actions in the CAP to address these vendor recommendations.

The inspectors determined that although these observations and actions to resolve them were in some cases not timely, the issues were evaluated and determined to not be performance deficiencies in accordance with the guidance in IMC 0612, Appendix B, "Issue Screening," and Appendix E, "Examples of Minor Issues." Consequently, these issues were not subject to enforcement action in accordance with the NRC's enforcement policy.

Observation: Unit 1 and Unit 2, Review of corrective action program trends	71152

The inspectors evaluated several issues and associated notifications (NOTFs) generated over the course of the past two quarters by departments that provide input to the quarterly trend reports. The inspectors determined that, in most cases, issues and potential trends were appropriately identified, evaluated and resolved by PSEG, as noted below:

- The station's common cause review of recent reactor trips. The evaluation detailed several areas for improvement including behaviors such as consistently challenging assumptions, not driving for timely resolution of equipment issues, not engaging a broader team of expertise, gaps in predictive and PM and system performance monitoring.

- The station's common cause review of recent pipe spring can and line support issues. The evaluation determined a need for better work instructions regarding pinning spring cans prior to maintenance.

- The station's common cause review of NRC and PSEG identified preventive maintenance (PM) gaps associated with FLEX equipment. The evaluation determined a lack of technical rigor applied when the FLEX PMs were generated in 2014. PSEG's corrective actions are in-progress to review all FLEX equipment.

- The station's self-assessment of the PM program. The evaluation identified several program gaps including critical components lacking time-based PM plans and PM plans not created for new equipment modifications. Additionally, the station identified examples of PM plans with no active work orders and PM plan changes that were not adequately justified. The assessment appropriately documented that a number of these gaps were, in part, the result of inadequate technical rigor applied to procedural guidance and adherence to industry standards.

However, the inspectors did note a few instances where PSEG was not timely or did not appropriately identify, evaluate and resolve adverse trends. Examples of these are documented below:

- While the site identified a negative trend in HELB damper switch issues after multiple switches failed during 2R24, the inspectors identified the operability determination and extent of condition due to the suspected cause lacked the technical rigor required per station procedures (NOTF 20855032).

- The inspectors determined that the failure analysis performed for the 14MS167 main steam isolation valve was not timely. This valve failed to operate in April 2019, and the failure analysis was completed in June 2020, indicating foreign material (a rag in the bidirectional solenoid) was the cause of the valve failing to operate.

- The inspectors identified PSEG's oil analysis and trending program as a potential adverse trend based on recent events including the NRC identified AFW pump oil issue (NRC Inspection Report 2020001) and the recent failure of 23 turbine driven AFW pump governor due to potential oil contamination. PSEG documented the inspector's concerns in NOTF 20854127. Corrective actions are in-progress to address the oil sampling and analysis program gaps due to process rigor.

The inspectors evaluated these issues IAW IMC 0612, Appendix B, "Issue Screening," and Appendix E, "Examples of Minor Issues," and determined the issues did not constitute performance deficiencies or were of minor significance. Consequently, these issues were not subject to enforcement action in accordance with the NRC's enforcement policy.

Observation: Unit 1 and Unit 2, review of recent pressurizer spray valve packing leakage troubleshooting, causal evaluation, and corrective actions	71152
The inspectors reviewed PSEG's troubleshooting, causal evaluation and corrective actions regarding the Unit 2 pressurizer spray valve (2PS3) packing leak on March 1, 2020. On that date, main control room operators noted a rising unidentified RCS leak rate. The initial leak rate was calculated at 4 gpm coincident with indications of containment radiation monitors alarming, lowering pressurizer level, and containment temperature and dew point rising. Operators entered TS 3.4.7.2.b Action V for greater than 1 gpm unidentified RCS leakage and conducted containment walk downs which identified the source of the leak to be the 2PS3 valve packing. PSEG isolated the 2PS3 packing leak to satisfy the TS required actions. The inspectors reviewed PSEG's causal evaluation, ERE 70212197, which	

determined that the cause of the 2PS3 packing failure was a broken guide bushing which created a loss of packing consolidation and eventual packing leak. PSEG's evaluation also determined that the contributing cause was an actuator misalignment which led to the broken guide bushing and the subsequent packing leak.

The inspector's review of the packing leak determined that PSEG's corrective actions were generally appropriate, timely, and commensurate with the safety significance of the event and its consequences. However, the inspectors noted a few weaknesses regarding previous station actions which changed the maintenance strategy of the pressurizer spray valves. These weaknesses included not having a clearly documented trigger which would initiate performance of the internal valve PM and not having the parts available that were necessary to perform the internal valve and actuator replacement PM, if required. PSEG documented both concerns in their CAP under NOTF 20851917 and Order 70212197. PSEG's other corrective actions included repairing the 2PS3 valve internals and scheduling repair of the 2PS3 actuator misalignment during the next refueling outage.

The inspectors evaluated these issues to not be performance deficiencies in accordance with the guidance in IMC 0612, Appendix B, "Issue Screening," and Appendix E, "Examples of Minor Issues." Consequently, these issues were not subject to enforcement action in accordance with the NRC's enforcement policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On April 23, 2020, the inspectors presented the RP Radiological Hazard Assessment Inspection 71124.01 (REMOTE) inspection results to Chaz McFeaters, Site Vice President and other members of the licensee staff.

- On July 2, 2020, the inspectors presented the integrated inspection results to Mr. Dave Sharbaugh, Plant Manager and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71124.01	Procedures	RP-AA-300	Radiological Survey Program	Revision 6
		RP-AA-301	Radiological Air Sampling Program	Revision 8
		RP-AA-503	Unconditional Release Survey Method	Revision 8