



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

July 26, 2018

Mr. Peter P. Sena, III  
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 05000272/2018002 AND  
05000311/2018002**

Dear Mr. Sena:

On June 30, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Salem Nuclear Generating Stations (Salem) Units 1 and 2. On July 10, 2018, the NRC inspectors discussed the results of this inspection with Mr. Charles McFeaters, Salem Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at Salem. In addition, 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.

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 the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Part 2.390, "Public Inspections, Exemptions, Requests for Withholding."

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 05000272/2018002 and  
05000311/2018002

cc w/encl: Distribution via ListServ

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 –  
 INTEGRATED INSPECTION REPORT 05000272/2018002 AND  
 05000311/2018002 DATED JULY 26, 2018

DISTRIBUTION:

DLew, RA (R1ORAMAIL Res)  
 JGiessner, DRA (R1ORAMAIL Res)  
 RLorson, DRP (R1DRPMAIL Res)  
 DPelton, DRP (R1DRPMAIL Res)  
 JYerokun, DRS (R1DRSMAIL Res)  
 BWellington, DRS (R1DRSMAIL Res)  
 MFerdas, DRP  
 FBower, DRP  
 CLally, DRP  
 MDraxton, DRP  
 PFinney, DRP, SRI  
 AZiedonis, DRP, RI  
 JBowen, RI, OEDO  
 RidsNrrPMSalem Resource  
 RidsNrrDorlLpl1 Resource  
[ROPreports Resource](#)

DOC. NAME: G:\DRP\BRANCH3\Inspection Reports\Salem\2018\18Q2\SAL IR2018002 FINAL.docx  
 ADAMS ACCESSION NUMBER: ML18207A221

<input checked="" type="checkbox"/> SUNSI Review		<input checked="" type="checkbox"/> Non-Sensitive <input type="checkbox"/> Sensitive		<input checked="" type="checkbox"/> Publicly Available <input type="checkbox"/> Non-Publicly Available	
OFFICE	RI/DRP	RI/DRP	RI/DRP		
NAME	PFinney per email	RBarkley	FBower		
DATE	7/25/2018	7/26/2018	7/26/2018		

OFFICIAL RECORD COPY

**U.S. NUCLEAR REGULATORY COMMISSION  
Inspection Report**

Docket Nos. 50-272 and 50-311

License Nos. DPR-70 and DPR-75

Report Nos. 05000272/2018002 and 05000311/2018002

Enterprise Identifier: I-2018-002-0060

PSEG: PSEG Nuclear LLC PSEG

Facility: Salem Nuclear Generating Station (Salem) Units 1 and 2

Location: Hancocks Bridge, NJ 08038

Dates: April 1, 2018 through June 30, 2018

Inspectors: P. Finney, Senior Resident Inspector  
A. Ziedonis, Resident Inspector  
L. Dumont, Reactor Inspector  
M. Orr, Reactor Inspector  
J. Schoppy, Senior Reactor Inspector  
D. Tift, Regional State Liaison Officer  
J. Furia, Senior Health Physicist

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

## SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring PSEG's performance at Salem Units 1 and 2 by conducting the baseline inspections described in this report 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. NRC identified and self-revealing findings, violations, and additional items are summarized in the table below.

### List of Findings and Violations

<b>Inadequate Design Change for Service Water Pumps</b>			
Cornerstone	Significance	Cross-Cutting Aspect	Inspection Results Section
Mitigating Systems	Green NCV 05000272&311/2018-002-01 Closed	P.2 – Problem Identification and Resolution - Evaluation	71111.18
A self-revealing Green non-cited violation (NCV) of Title 10 of the <i>Code of Federal Regulations</i> (10 CFR) Appendix B, Criterion III, "Design Control," was identified because PSEG item equivalency evaluation (IEE) 80102443 did not evaluate the use of a chromium oxide spray coating for suitability of application in a brackish river water environment. Consequently, the coating material delaminated, which resulted in a failed in-service test (IST), inoperability and unavailability of the 26 service water (SW) pump as well as the subsequent unavailability of the 16, 21, and 24 SW pumps to perform replacements of those pumps with the same coating.			

## PLANT STATUS

Unit 1 began the inspection period at rated thermal power. There were no operational power changes of regulatory significance for the remainder of the inspection period.

Unit 2 began the inspection period at rated thermal power. On May 7, the unit was manually tripped for an elevated 21 reactor coolant pump (RCP) winding temperature indication. The unit was returned to rated thermal power on May 9. There were no other operational power changes of regulatory significance 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 performed plant status activities described in IMC 2515 Appendix D, "Plant Status" and conducted routine reviews using IP 71152, "Problem Identification and Resolution." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess PSEG's performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards."

## REACTOR SAFETY

### 71111.01 - Adverse Weather Protection

#### Summer Readiness (1 Sample)

The inspectors evaluated summer readiness of offsite and alternate AC power systems.

### 71111.04 - Equipment Alignment

#### Partial Walkdown (4 Samples)

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

- (1) Unit 2, 21 safety injection (SI) train during 22 train valve maintenance on May 2, 2018
- (2) Unit 2, emergency diesel generators (EDGs) during 2C EDG unavailability on June 11, 2018
- (3) Unit 2, 22 component cooling water (CCW) with the 21 CCW train inoperable on June 14, 2018
- (4) Common, chilled water during a cross-tie configuration on April 11, 2018

### 71111.05A/Q - Fire Protection Annual/Quarterly

#### Quarterly Inspection (5 Samples)

The inspectors evaluated fire protection program implementation in the following selected areas:

- (1) Unit 1, reactor plant auxiliary equipment area on May 11, 2018
- (2) Unit 2, EDG fuel oil storage pump and tank area on April 26, 2018
- (3) Unit 2, auxiliary feedwater (AFW) pumps area on May 10, 2018
- (4) Unit 2, 4160 Volt switchgear room on May 21, 2018
- (5) Common, auxiliary building ventilation areas on April 17, 2018

### 71111.06 - Flood Protection Measures

#### Internal Flooding (1 Sample)

The inspectors evaluated internal flooding mitigation protections in the Auxiliary Building from demineralized water piping on June 14, 2018.

#### Cables (1 Sample)

The inspectors evaluated cable submergence protection in:

- (1) 22 SW cable in the SW tunnel on June 26, 2018

### 71111.11 - Licensed Operator Requalification Program and Licensed Operator Performance

#### Operator Requalification (1 Sample)

The inspectors observed and evaluated a crew of licensed operators in the plant's simulator during licensed operator requalification training that involved a battery ground, loss of containment air particulate detector, small and large break loss of coolant, and a swap to cold leg recirculation on April 17, 2018.

#### Operator Performance (1 Sample)

The inspectors observed a Unit 2 reactor startup following a forced outage on May 8, 2018.

### 71111.12 - Maintenance Effectiveness

#### Routine Maintenance Effectiveness (3 Samples)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the following equipment and/or safety significant functions:

- (1) Unit 2, 26 SW pump delamination on April 18, 2018
- (2) Unit 2, chillers following multiple failures on June 18, 2018
- (3) Common, MSPI diesel generator testing on June 22, 2018

### 71111.13 - Maintenance Risk Assessments and Emergent Work Control (7 Samples)

The inspectors evaluated the risk assessments for the following planned and emergent work activities:

- (1) Unit 1, 1A EDG availability during an instrumented run on April 30, 2018
- (2) Unit 2, 2D vital instrument bus inverter unlatched transfers on April 3, 2018
- (3) Unit 2, 26 SW pump failed retest on April 4, 2018
- (4) Unit 2, 21 RCP resistance temperature detector (RTD) emergent work on May 7, 2018
- (5) Unit 2, emergent maintenance on the SW inlet valve to the 21 CC heat exchanger on June 15, 2018
- (6) Common, chilled water cross-tie configuration for maintenance on April 11, 2018
- (7) Common, 23 charging pump unavailability on April 23, 2018

### 71111.15 - Operability Determinations and Functionality Assessments (7 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Unit 1, 1SD1 shutdown bank control rod position indication on April 18, 2018
- (2) Unit 1, outer airlock door surveillance in alert range on April 25, 2018
- (3) Unit 2, 22 chiller trip on oil leak on April 6, 2018
- (4) Unit 2, intermediate range nuclear instrument (IRNI) failed channel check on May 8, 2018
- (5) Unit 2, SW tornado missile non-conformance on June 1, 2018
- (6) Unit 2, 21 SW pump degradation on June 8, 2018
- (7) Unit 2, 21 SW nuclear header pin-hole leak on June 4, 2018

### 71111.17T - Evaluations of Changes, Tests and Experiments (25 Samples)

The inspectors evaluated the following from April 30, 2018, to May 4, 2018:

#### 10 CFR 50.59 Evaluations

- (1) S2017-043, Reactor Coolant Pump Seals – Installation of SHIELD Seal (DCP 80109340) 50.59 Evaluation, Revision 0

#### 10 CFR 50.59 Screening/Applicability Determinations

- (1) S2016-116, Auxiliary Feed Pump Room Controls, Local Temperature Switches and Control Room CMC Switches, 50.59 Screening Revision 0
- (2) S2016-120, S1(S2).OP-SO.FO-0001, Emergency Diesel Fuel Oil System Operation, Revision 11(13), 50.59 Screening Revision 0
- (3) S2016-123, S1.OP-AR.DG-0001, Diesel Generator Alarm Response, Revision 15, 50.59 Screening Revision 0
- (4) S2016-148, S1.OP-AB.CC-0001, Component Cooling Abnormality, Revision 15, 50.59 Screening Revision 0
- (5) S2016-165, Replace GE TEC Containment Penetration Breakers, 50.59 Screening Revision 0



- (6) S2016-175, 2-EOP-SGTR-1, Steam Generator Tube Rupture, Revision 31, 50.59 Screening Revision 0
- (7) S2016-252, PORVs Accumulators Capacity Analysis, 50.59 Screening Revision 0
- (8) S2016-281, S1.OP-DL.ZZ-0003, Control Room Log - Modes 1-4, Revision 83, 50.59 Screening Revision 0
- (9) S2016-291, S1(S2).OP-SO.AF-0001, Auxiliary Feedwater System Operation, and S1(S2).OP-ST.AF-0011, Auxiliary Feed Water Alternate Suction Source Verification Modes 1-3, Revisions 34(42), 4(4), 50.59 Screening Revision 0
- (10) S2017-021, SC.OP-AR.AF-0001, MSPI Auxiliary Feedwater Pump Diesel Alarm Response, Revision 0, 50.59 Screening Revision 0
- (11) S2017-094, Salem 1 and 2 PAT Controller Replacement, 50.59 Screening Revision 0
- (12) S2017-122, Revision of Technical Specification 3/4.7.3 Basis, 50.59 Screening Revision 0
- (13) S2017-126, NUCR 70186659 – 0055, Reactor Trip Breaker Predefined Change Request, 50.59 Screening Revision 0
- (14) S2017-140, S2.OP-SO.DG-0002, 2B Diesel Generator Operation, Revision 38, 50.59 Screening Revision 0
- (15) S2017-146, Work Clearance Document Reviews, 50.59 Screening Revision 0
- (16) S2017-155, S1.OP-SO.DG-0001 OTSC 37A (70195272), 1A Diesel Generator Operation, 50.59 Screening Revision 0
- (17) S2017-173, Procedure Revisions to Support Installation of Fisher Thermo Scientific Nuclear Instrumentation for Salem 1 during 1R25 (Batch AD-AA-101-1003-F8), 50.59 Screening Revision 0
- (18) S2017-211, SC.CH-AD.DA-0405, Chemical Addition to Emergency Diesel Generator Jacket Water System, Revision 2, 50.59 Screening Revision 0
- (19) S2017-235, S1(S2)-EOP-FRHS-1, Restore Coincidence for FRHS-1 Feed and Bleed Initiation - Response to Loss of Secondary Heat Sink, Revisions 34(34), 50.59 Screening Revision 0
- (20) S2017-237, S1.OP-DL.ZZ-0006-FI, Primary Plant Log, Revision 14, 50.59 Screening Revision 0
- (21) S2017-245, VTD 320832, Rev 16, Emergency Operating Procedure Setpoint Document, Revision 16, 50.59 Screening Revision 0
- (22) S2018-010, Chilled Water Technical Specification LAR Calculations, 50.59 Screening Revision 0
- (23) S2018-020, S1(S2).OP-SO.CBV-0001, Containment Ventilation Operation, Revision 27(34), 50.59 Screening Revision 0
- (24) S2018-030, SAP Order 80121775, DS1.5-0560, Salem Common BEACON 6.8.4 Upgrade, 50.59 Screening Revision 0

#### 71111.18 - Plant Modifications (1 Sample)

The inspectors evaluated the following temporary or permanent modifications:

- (1) SW pump shaft coating Item Equivalency Evaluation 80102443

### 71111.19 - Post Maintenance Testing (6 Samples)

The inspectors evaluated post maintenance testing for the following maintenance/repair activities:

- (1) Unit 1, 1B EDG following scheduled maintenance on June 6, 2018
- (2) Unit 2, 21 RCP RTD following corrective maintenance on May 8, 2018
- (3) Unit 2, Intermediate Range Nuclear Instrument 2N36 following corrective maintenance on May 9, 2018
- (4) Unit 2, 21 chiller following compressor replacement on May 29, 2018
- (5) Unit 2, 21 SW nuclear header repairs following leak on June 8, 2018
- (6) Unit 2, 2C EDG following starting air solenoid valve replacement on June 12, 2018

### 71111.20 - Refueling and Other Outage Activities (1 Sample)

The inspectors evaluated Unit 2 forced outage activities following a manual reactor trip for an elevated RCP winding temperature indication from May 7 to 9, 2018.

### 71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

#### Routine (3 Samples)

- (1) Unit 1, 1A EDG monthly run, on April 30, 2018
- (2) Unit 2, 21 SI pump, on May 5, 2018
- (3) Common, main control room envelope tracer gas testing on May 18, 2018

#### Inservice (2 Samples)

- (1) Unit 1, 11 AFW pump, on May 2, 2018
- (2) Unit 2, 23 SW pump, on May 22, 2018

### 71114.06 - Drill Evaluation

#### Emergency Planning Drill (1 Sample)

The inspectors evaluated the conduct of a routine PSEG emergency planning drill on March 27, 2018.

#### Drill/Training Evolution (1 Sample)

The inspectors evaluated a simulator-based licensed operator requalification training evolution for licensed operators that involved a battery ground, loss of containment air particulate detector, a secondary steam leak, a large break loss of coolant, and a swap to cold leg recirculation on May 15, 2018.

## **RADIATION SAFETY**

### **Cornerstone: Occupational and Public Radiation Safety**

#### 71124.01 - Radiological Hazard Assessment and Exposure Controls

##### Contamination and Radioactive Material Control (1 sample)

The inspectors observed the monitoring of potentially contaminated material leaving the radiological controlled area and inspected the methods and radiation monitoring instrumentation used for control, survey, and release of that material.

##### Risk-Significant HRA and VHRA Controls (1 sample)

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

#### 71124.02 - Occupational As Low As Reasonably Achievable (ALARA) Planning and Controls

##### Verification of Dose Estimates and Exposure Tracking Systems (1 sample)

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities. The inspectors reviewed post-job ALARA evaluations of excessive exposure.

#### 71124.03 - In-Plant Airborne Radioactivity Control and Mitigation

##### Engineering Controls (1 sample)

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.

## **OTHER ACTIVITIES – BASELINE**

#### 71151 - Performance Indicator Verification

The inspectors verified PSEG's performance indicators submittals listed below for the period from March 2017 through March 2018. (6 Samples)

- (1) Unit 1 Unplanned Scrams per 7000 Critical Hours (IE01)
- (2) Unit 2 Unplanned Scrams per 7000 Critical Hours (IE01)
- (3) Unit 1 Unplanned Power Changes per 7000 Critical Hours (IE03)
- (4) Unit 2 Unplanned Power Changes per 7000 Critical Hours (IE03)
- (5) Unit 1 Unplanned Scrams with Complications (IE04)
- (6) Unit 2 Unplanned Scrams with Complications (IE04)

The inspectors verified PSEG's performance indicators submittals listed below for the period from December 2017 through December 2018. (2 Samples)

- (1) Unit 1 Safety System Functional Failures (MS05)
- (2) Unit 2 Safety System Functional Failures (MS05)

#### 71152 - Problem Identification and Resolution

##### Semiannual Trend Review (1 Sample)

The inspectors reviewed the PSEG's corrective action program for trends that might be indicative of a more significant safety issue.

#### 71153 - Follow-up of Events and Notices of Enforcement Discretion

##### Events (1 Sample)

The inspectors evaluated response to the following events.

- (1) Unit 2, manual reactor trip in response to elevated 21 RCP winding temperature indication on May 7, 2018, EN#53386

### **INSPECTION RESULTS**

<b>Inadequate Design Change for Service Water Pumps</b>			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000311/2018-002-01 Closed	P.2 – Problem Identification and Resolution - Evaluation	71111.18
<p>A self-revealing Green non-cited violation (NCV) of Title 10 of the Code of Federal Regulations (10 CFR) Appendix B, Criterion III, "Design Control," was identified because PSEG item equivalency evaluation (IEE) 80102443 did not evaluate the use of a chromium oxide spray coating for suitability of application in a brackish river water environment. Consequently, the coating material delaminated, which resulted in a failed in-service test (IST), inoperability and unavailability of the 26 service water (SW) pump as well as the subsequent unavailability of the 16, 21, and 24 SW pumps to perform replacements of those pumps with the same coating.</p>			
<p><u>Description:</u></p> <p>On March 14, 2018, the 26 SW pump failed its quarterly IST, and was declared inoperable. The SW system is designed with six SW pumps per Unit. Although Unit 2 entered a planned 72-hour shutdown limiting condition for operation (LCO) during the IST, operators manually realigned the SW system from the test lineup to a normal configuration such that no LCO was required with 26 SW pump inoperable. Maintenance technicians discovered a significant amount of river debris and foreign material internal to the pump, and determined pump replacement was required. On April 6, 2018, 26 SW pump was restored to OPERABLE after successfully replacing the pump and performing a successful post maintenance test (PMT).</p>			

PSEG performed Equipment Reliability Evaluation (ERE) 70199518, and concluded the cause of 26 SW pump IST failure was attributed to delamination of the chromium oxide spray coating material applied to the pump shaft and various pump internals. PSEG further determined that the delamination caused internal bearing rubbing and increased internal clearances, which allowed the buildup of river grass and foreign material to wedge between the increased clearances, thus changing the flow characteristics of the pump. Recent IST performance history did not require a transition to the IST alert range, which would have required increased frequency testing.

Although the ERE did not determine the cause of the delamination, PSEG wrote a separate notification (NOTF), 20793444, to investigate the adequacy of IEE 80102443, which approved use of the chromium oxide spray coating in 2011. PSEG determined that the IEE did not review the SW pump internals coating material for application in a brackish water environment. The IEE focused on SW pump bearing and bushing material change, and further stated that the coating would be applied to the shaft and various pump internals by a different vendor to harden the pump internals due to the new bearing material. However, the actual coating was not evaluated for acceptability as a non-identical replacement item by evaluating form, fit, and function, as required by SM-AA-300, "Procurement Engineering Support Activities," Revision 5, step 4.1.1, item 3. PSEG captured this issue in NOTF 20798798.

PSEG also determined this was not the first SW pump to undergo internal coating delamination. In September of 2016, the 16 SW pump exhibited degraded IST, which resulted in planned corrective maintenance in March of 2017. Maintenance discovered the presence of foreign material internal to the pump and replaced the pump. In June of 2017, failure analysis of the removed pump identified the coating delamination (70192782-0030 and 70194122-0090). In May of 2017, 24 SW pump had a problem with the packing leakoff line during PMT from planned maintenance. In response, PSEG completed work group evaluation (WGE) 70194122 in June of 2017, which identified the same coating delamination as the previous 16 SW pump. PSEG determined the 24 SW pump issue was not a condition adverse to quality, because it was considered rework identified during PMT from planned maintenance. The inspectors verified this determination was in accordance with performance improvement job aid PIA-016, "Examples of a Condition Adverse to Quality," Revision 0. The WGE did assign an equipment reliability (ER) strategy (70194122-0040) that resulted in changing the pump internals coating material to Inconel, but did not identify or evaluate the remaining SW pumps coated with chromium oxide. Following the 26 SW pump failed IST, PSEG performed a full extent of condition evaluation, and determined that the 21 SW pump was the one remaining pump installed in the plant with the chromium oxide coating. PSEG expedited the 21 SW pump replacement, and although the pump did exhibit degraded IST performance into the alert range prior to replacement, PSEG successfully replaced the pump prior to IST failure.

Corrective Actions: PSEG performed corrective maintenance to restore the 16 SW pump on March 21, 2017; 24 SW pump on May 27, 2017; 26 SW pump on April 6, 2018; and 21 SW pump on June 16, 2018. Additionally, PSEG performed ERE 70199758 and a failure analysis to evaluate the cause of the coating failure, wrote NOTF 20798798 to capture the deficient IEE in the CAP, and changed the coating material from chromium oxide to Inconel.

Corrective Action References: NOTFs 20798798 and 20793444, and ERE 70199518

Performance Assessment:

Performance Deficiency: The inspectors determined that not evaluating the SW pump internal coating material for form, fit and function as required by SM-AA-300, step 4.1.1, was a performance deficiency that was within PSEG's ability to foresee and correct, and should have been prevented.

Screening: This finding is more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone, and adversely affected the cornerstone objective of ensuring the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the coating material delaminated from the pump internals, which resulted in failed IST, inoperability and unavailability of the 26 SW pump as well as unavailability of the 16, 21 and 24 SW pumps to perform pump replacements.

Significance: The inspectors assessed the significance of the finding using IMC 0609.04, "Initial Characterization of Findings," and IMC 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions." The inspectors determined that this finding was of very low safety significance (Green), because the finding did not represent a loss of the SW system safety function, did not result in any loss of function beyond the Technical Specification allowed outage time, and did not result in the loss of any non-Technical Specification trains that were designated as high safety-significance in accordance with PSEG's maintenance rule program.

Cross-Cutting Aspect: This finding has a cross-cutting aspect of Problem Identification and Resolution, Evaluation, because PSEG did not thoroughly evaluate the chromium oxide coating delamination after it was identified in June of 2017 to have occurred on two pumps, to ensure that the resolutions addressed the cause and extent of condition prior to additional SW pump coating delaminations. Specifically, a WGE and an ER strategy were performed in response to two SW pump coating delamination issues, but neither product identified nor evaluated the SW pumps with the coating, and consequently did not ensure that the resolution addressed the cause and extent of condition. Although the inadequate IEE that approved the coating material was performed in 2011, which is outside of the nominal three-year current performance window as discussed in IMC 0310, the inspectors determined that the more recent missed opportunities in 2017 on the 16 and 24 SW pumps by PSEG were representative of current performance. (P.2)

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires that measures be established for the selection and review of materials for suitability of application. PSEG procedure SM-AA-300, "Procurement Engineering Support Activities," Revision 5, step 4.1.1, item 3, requires the station to perform an IEE to document the acceptability of non-identical replacement items by evaluating form, fit, and function.

Contrary to this, from November 3, 2011, until June 21, 2018, IEE 80102443 was approved to make a non-identical replacement to the SW pump internals, but did not evaluate the use of a new coating material for suitability of application in a brackish river water environment. Specifically, the IEE evaluated the pump bearing and bushing material change, and further stated that a chrome oxide coating would be applied to the pump shaft and various pump internals by a different vendor, to harden the pump internals due to new bearing material.

However, the chrome oxide spray coating material was not evaluated for form, fit, and function in its service environment.

Disposition: This violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy.

Observations	71152 Semi-Annual Trends
--------------	--------------------------

The inspectors evaluated a sample of condition reports generated over the past two quarters to identify trends (either NRC- or licensee-identified) that might indicate the existence of a more significant safety issue, and to identify potential adverse trends in systems, structures and components (SSCs). The inspectors determined that, in most cases, the issues were appropriately evaluated by PSEG staff and appropriately resolved. The inspectors noted three examples of trends that were important to safety:

Notification Significance Screening

PSEG nuclear oversight department (NOS) identified an adverse trend associated with the significance level screening of NOTFs. NOTFs are documents used by PSEG to identify an issue or a problem at the station, as described in LS-AA-120, "Issue Identification and Screening," Revision 17. Five significance levels are use in the significance screening process. Levels 1 through 3 fall under the scope of the corrective action program (CAP), and levels 4 and 5 are considered Non-CAP (N-CAP).

In May of 2017, NOS identified several examples of NOTFs that documented issues associated with safety-related equipment, but were subsequently screened with an N-CAP significant level (NOTF 20764651). Additional follow-up reviews by NOS in August of 2017 (20773330), February of 2018 (20787256), and May of 2018 (20793644), have identified continued challenges in the screening of NOTFs as CAP issues versus N-CAP issues. In response, PSEG completed WGE 70194087 in June of 2017, which determined the station was applying too narrowly a focus on the impact of the safety function when screening NOTFs that document issues with safety-related equipment. PSEG also re-reviewed over 2000 NOTFs, re-screened over 350 NOTFs, rolled out additional guidance to station NOTF screening committees. In addition, PSEG has performed subsequent revisions to LS-AA-120, "Issue Identification and Screening," to improve definitions and guidance with examples of issues at each significance level in CAP, as well as examples of N-CAP items.

The inspectors have also questioned PSEG on a sampling of NOTF significance screenings, including August 2017 (20774380), November 2017 (20782853 and associated NCV 05000272/2017004-01 [ML18039A899]), and February 2018 (20786093). The inspectors determined that PSEG was taking adequate actions to correct this adverse trend.

Status Control and Human Performance Events

PSEG identified an adverse trend in the areas of status control and human performance events. In June of 2018, PSEG documented an adverse trend in operations department human performance events (20796617), including a 2B EDG trip on reverse power during post maintenance testing, a station air compressor automatic start on low air header pressure during maintenance, and a service water valve mispositioned during tagging for planned maintenance. In February of 2018, PSEG initiated common cause evaluation 70198988, in

response to a negative trend of status control events in 2017, including steam generator nitrogen sparging containment isolation valves (CIVs) that were left open during plant startup (NCV 05000272/2018001-03 [ML18134A260]), and a mispositioned main generator hydrogen vent valve that caused a loss of hydrogen pressure in the main generator and subsequent unplanned downpower to 47 percent (IR 05000272/311/2017004 [ML18039A899], Summary of Plant Status and Section 4OA3.1). PSEG has taken several actions in response to this adverse trend, including issuing several station communications, establishing a cross-discipline status control committee, establishing a status control excellence plan, assigning an action to perform an annual status control CCE that incorporates industry benchmarking, issuing status control cards to all personnel that work in the plant for use during pre-job briefs, and performance of a self-assessment to evaluate station procedures and administrative processes governing configuration control. The inspectors noted that several of the status control events inherently involved a failure to follow procedure, but did not specifically select items from this trend review for additional inspection based on the low safety significance (other than the NCV referenced above). The inspectors determined that PSEG was taking adequate actions to correct this adverse trend.

#### Main Control Room Ventilation Outside Air Intake Radiation Monitors (R1Bs)

On October 17, 2017, PSEG identified an adverse trend of R1B issues (20778575), whereby some issues resulted in control area ventilation (CAV) system actuation from the normal ventilation damper alignment (i.e., normal mode) to the safety mode of operation, and other issues consisted of an abnormal rising trend in detector radiation levels (i.e., counts) discovered by operators prior to system actuation. PSEG determined that several of the issues were caused by degraded detector mylar shielding, which is designed to shield ambient light from the detector. In response to the trend, PSEG took credit for actions performed under ERE 70196422, completed on November 8, 2017. The ERE identified the direct cause to be attributed to degraded mylar, and took actions to correct the direct cause. PSEG further attributed the cause of the degraded mylar to be discrete particulates entering the ventilation intake and impacting the mylar. The inspectors noted the ERE treated this as a prevention item, which does not require an assigned corrective action, and created an enhancement action (70196422, operation 80) for engineering to evaluate alternate duct designs to shield the detector from discrete particles.

From November 28, 2017, to June 10, 2018, the inspectors noted an apparent trend of five additional R1B failures that either resulted in an unplanned shift in CAV mode, or the R1B being declared inoperable due to rising counts. Each of the five failures were corrected and the R1Bs were returned to service. PSEG identified the apparent trend through the Plant Health Committee (PHC) review process, and discussed the trend at a PHC meeting on June 11, 2018. PHC determined that no further action was required, based on the low risk screening of the R1Bs in accordance with ER-AA-2001-1003, "Equipment Reliability Risk Management Process." The inspectors independently reviewed each of the five failures, including PSEG's corrective maintenance, and did not identify any causes that were common to the five failures. The inspectors noted the enhancement action assigned under ERE 70196422 has been open since November 7, 2017.

In the case of each of the three observations above, the inspectors determined there was no new performance deficiency identified.



**EXIT MEETINGS AND DEBRIEFS**

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

- On May 4, 2018, the inspectors presented the Evaluations of Changes, Tests and Experiments inspection results to Mr. Charles V. McFeaters, Site Vice President, and other members of PSEG staff.
- On May 25, 2018, the inspector presented the radiation safety inspection results to Mr. S. Howe, Radiation Protection Manager, and other members of the licensee staff.
- On July 10, the inspectors presented the quarterly resident inspector inspection results to Mr. Charles McFeaters, Salem Vice President, and other members of the PSEG staff.

**DOCUMENTS REVIEWED****71111.01 - Adverse Weather Protection**Procedures

OP-AA-108-107-1001, Response to Grid Emergencies and ESOC / ER&T Interface, Revision 5

**71111.04 - Equipment Alignment**Procedures

S1.OP-DL.ZZ-0003, Control Room Log – Modes 1-4, Revision 84

S1.OP-SO.CC-0002, 11 and 12 Component Cooling Heat Exchanger Operation, Revision 32

S1.OP-SO.CC-0003, Inservice Testing – 13 Component Cooling Pumps, Revision 25

Condition Reports

20793557      20786124      20797325

Drawings

205334-SIMP, Unit 2 Safety Injection Simplified P&ID, Revision 2

Miscellaneous

Additional Reading Sheet associated with 20786124, Dated 06/13/2018

NC.DE-AP.ZZ-0002, Equal Signal Pressure / Control of Valves SW122 and SW127, Revision 0

S-1-CC-MDC-1817, Component Cooling System Thermal-Hydraulic Analysis – Unit 1,  
Revision 9

S-2-CC-MDC-1692, Component Cooling System Thermal-Hydraulic Model – Unit 2, Revision 7

**71111.05 – Fire Protection**Procedures

FP-AA-011, Control of Transient Combustible Material, Rev. 6

Miscellaneous

FP-SA-2543-F1, U2 Auxiliary Feed pump & Letdown Heat Exchange Area, Rev. 0

SC.ER-PS-0001-A2, Salem Fire Barrier Deviations, Rev. 0

**71111.06 – Flood Protection Measures**Condition Reports

20715168      20775834      20747706      20780808

Drawings

205246, Demineralized Water – Restricted Areas, Sheet 1, Revision 45

Maintenance Orders/Work Orders

60137110      60133992

**7111.11 - Licensed Operator Requalification Program**Procedures

EP-SA-111-130, Salem EAL Wall Chart – All Modes, Revision 2  
 EP-SA-111-131, Salem EAL Wall Chart – Hot Conditions (RCS > 200°F), Revision 1  
 OP-SA-102-106-F1, Master List of Times Actions, Revision 1  
 S2.OP-AB.LOAD-0001, Rapid Load Reduction, Revision 19  
 S2.OP-AB.RC-0001, Reactor Coolant System Leak, Revision 14  
 S2.OP-AB.PZR-0001, Pressurizer Heater Malfuction, Revision 18

Miscellaneous

ACM 2017-009, 2PR2 PORV Leakage, Revision 1  
 S-ESG-1802, Simulator Training Scenario

**7111.12 - Maintenance Effectiveness**Condition Reports (\*initiated in response to inspection)

20799133*	20793581	20791632	20796561	20795909	20793974
20793476	20793465	20793116	20793429	20793065	

Maintenance Orders/Work Orders

70200387	70085974	70088447	70200400	70196614
----------	----------	----------	----------	----------

Miscellaneous

NUMARC 87-00, Revision 0

**7111.13 - Maintenance Risk Assessments and Emergent Work Control**Condition Reports (\*initiated in response to inspection)

20790904*	20790976*	20789818*	20791273*	20792515*	20792839*
20792707*	20792716*	20792717*	20793378*		

**7111.15 - Operability Determinations and Functionality Assessments**Condition Reports (\*initiated in response to inspection)

20792430*	20792989	20792822*	20792575	20793249*	20793752
20792250	29792581	20794055	20794044	20797741	20758900
20768856	20768866	20762932	20760469	20796523	20799781
20798222	20798223	20798968	20796701*	20799780	20765041
20799448	20796648	20796970	20797131	20797136	20797561
20797569	20797570	20797571	20797573	20797572	20797574
20797772	20797773	20797774	20797775	20797776	20797777
20799051*	20798741	20796231	20793326	20792935	20793992
20793991					

Drawings

205447, Units 1 and 2 Service Water Intake Yard Duct Runs Pipe Tunnel Conduit and Trays, Revision 37, Sheet 1  
 211750, Units 1 and 2 Class 1 Tanks and Pipe Tunnel, Sheet 1, Revision 7  
 219562, Units 1 and 2 Class 1 Tanks and Pipe Tunnel, Sheet 1, Revision 10  
 219563, Service Water Piping to Auxiliary Building, Revision 23

Maintenance Orders/Work Orders

60138533	60138438	50203517	50203277	60139321	60132502
70192913	70199153	30289992	30289993	30288527	60139163
70200981					

Miscellaneous

ACM 2018-005, Salem Unit 2 RAP Tunnel North Manhole Opening Missile Shield Removed, Revision 0  
 Event Notification 53438, Tornado Missile Vulnerabilities  
 ND.DE-TS.ZZ-1014, Technical Standard: Instrument Piping and Tubing Design Requirements, Revision 4  
 Operability Evaluation 2018-003, 21 Service Water Pump, Revision 0  
 Operability Evaluation 2018-004, Non Conformances due to Tornado Missile Vulnerability, Revisions 0 and 1  
 SC.IC.CC.NIS-023, NIS Source Range/Intermediate Range N36 Channel Calibration, Revision 1

**71111.17 - Evaluations of Changes, Tests and Experiments**Procedures

1-EOP-LOCA-3, Transfer To Cold Leg Recirculation, Revision 31  
 LS-AA-104, 50.59 Review Process, Revision 6  
 LS-AA-104-1000, 50.59 Resource Manual, Revision 8  
 LS-AA-104-1006, PSEG Nuclear 50.59 Training and Qualification, Revision 3  
 S1.OP-SO.CC-0001, Component Cooling System Operation, Revision 20  
 S1.OP-SO.SW-0005, Service Water System Operation, Revision 41

Condition Reports (\*initiated in response to inspection)

20768892	20769000	20769002	20770247	20774261	20784396
20793321	20793479*	20793480*	20793579*	20793585*	20793589*
20793590*	20793592*	20793593*			

Maintenance Orders/Work Orders

70062808	70183596	70195291	70195979	70183596	80120385
80121786					

Miscellaneous

LR-N17-0080, Salem CTE Summary Report of Changes Tests, and Experiments, 4/14/17  
 LTR-SEE-16-236, Downstream Effects Evaluation of an Inadvertent Actuation of the Reactor Coolant Pump Shutdown Seal at Salem Units 1 and 2, 2/7/17  
 NOSA-SLM-17-07, Salem Engineering Design Control Audit Report, 6/28/17  
 Salem 50.59 Performance Self-Assessment, 4/12/18  
 SNGS Unit 1 Amendment No. 316 to Facility Operating License, Renewed License No. DPR-70  
 SNGS Unit 2 Amendment No. 297 to Facility Operating License, Renewed License No. DPR-75  
 S-C-CAV-MDC-2320, Evaluation of the Control Area Ventilation System During Chilled Water System Chiller Replacement, Revision 2  
 S-C-CH-MDC-2319, Hydraulic Evaluation of Salem Units 1 and 2 Chilled Water Systems to Support Reduced Chiller Availability, Revision 2  
 SGS-TRM, SNGS Units 1 and 2 Technical Requirements Manual, Revision 0  
 SGS-UFSAR, Revision 29

TR-FSE-14-1-P, Use of Westinghouse SHIELD Passive Shutdown Seal for FLEX Strategies,  
 Revision 1  
 VTD 320832, Emergency Operating Procedure Setpoint Document, Revision 16

**71111.19 – Post Maintenance Testing**

Procedures

S2.OP-ST.CH-0004, Chilled Water System – Chillers, Revision 23

Condition Reports (\*initiated in response to inspection)

20793466    20797457\*    2797367\*    20799000\*

Maintenance Orders/Work Orders

50203942    50202240    70200903    70156720    60138959

Miscellaneous

PMT of Failed IR NI 2N36, Completed on May 9, 2018

**71111.20 - Refueling and Other Outage Activities**

Procedures

OP-AA-108-114, Post Transient Review, Revision 5  
 OP-SA-108-114-1001, Post-Trip Data Collection Guidelines – Salem, Revision 4  
 S2.OP-AB.RCP-0001, Reactor Coolant Pump Abnormality, Revision 22  
 S2.OP-IO.ZZ-0008, Maintaining Hot Standby, Revision 16

Condition Reports

20796928	20793014	20794354	20792574	20793987	20793944
20793813	20793989	20793988	20796661	20796639	20796566
20796564	20795287	20795892	20795893	20795894	20795895
20793977	20793979	20796650	20796651	20796652	20796654
20793714	20794037	20793844	20794056	20794360	20794421
20798152	20798151				

Drawings

218920, 11 and 12 RCPs and Loops, Revision 26  
 203525, Units 1 and 2 Control Rooms Recorder Panels 1RP4 and 2RP4, Revision 41

Maintenance Orders/Work Orders

60138585

**71111.22 – Surveillance Testing**

Condition Reports

20781952    20793466    20793084

Maintenance Orders/Work Orders

50202723    50201642    50201611

**71114.06 - Drill Evaluation**Procedures

S2.OP-AB.GRID-0001, Abnormal Grid, Revision 21

S2.OP-AB.LOAD-0001, Rapid Load Reduction, Revision 19

Condition Reports (\*initiated in response to inspection)

20789869*	20793157*	20791381	20791372	20791371	20791369
20791370	20791428	20791368	20791012	20790997	20789820
20790913	20790906	20790967	20790968	20790969	20790970
20790858	20790323	20791147	20789844	20790038	20790703
20790009	20790594	20790595	20790627		

Drawings

205203, Unit 1 Main, Reheat and Turbine Bypass Steam, Sheet 1, Revision 78

Miscellaneous

S18-01, Emergency Drill Scenario

S18-01, Emergency Drill Critique Report

**71152 - Problem Identification and Resolution**Condition Reports (\*initiated in response to inspection)

20791323*	20790980*	20791015*	20791418*	20793152*	20793247*
20793250*	20793811*	20796886*	20798999*	20799212*	

**71153 - Follow-Up of Events and Notices of Enforcement Discretion**Condition Reports (\*initiated in response to inspection)

20794421\*

Miscellaneous

Post-Trip Data Collection, Completed on May 7, 2018

Post Transient Review, Completed on May 7, 2018

TSO 2018-015, Units 1 and 2 RCP Stator Winding Alternate Indications, dated 05/10/2018