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

August 14, 2017

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
DESIGN BASES ASSURANCE INSPECTION REPORT 05000272/2017007 AND 05000311/2017007

Dear Mr. Sena:

On July 14, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Salem Nuclear Generating Station, Unit Nos. 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on July 14, 2017, with Mr. Patrick Martino, Salem Plant Manager, and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. In conducting the inspection, the team examined the adequacy of selected components and modifications to mitigate postulated transients or accidents, maintain containment integrity, and/or minimize the potential for initiating events. The inspection involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

This report documents three NRC-identified findings that were of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of the very low safety significance of the violations and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section 2.3.2.a of the NRC Enforcement Policy. If you contest any NCV 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 U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Senior Resident Inspector at Salem Nuclear Generating Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I, and the NRC Senior Resident Inspector at Salem Nuclear Generating Station.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 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 the public inspection in the NRC Public Docket Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Mel Gray, Chief
Engineering Branch 1
Division of Reactor Safety

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

Enclosure:
Inspection Report 05000272/2017007 and
05000311/2017007
w/Attachment: Supplementary Information

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SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 - DESIGN BASES ASSURANCE INSPECTION REPORT 05000272/2017007 AND 05000311/2017007 DATED AUGUST 14, 2017

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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.	05000272/2017007 and 05000311/2017007
Licensee:	PSEG Nuclear LLC (PSEG)
Facility:	Salem Nuclear Generating Station, Units 1 and 2
Location:	Hancocks Bridge, NJ 08038
Inspection Period:	June 26, 2017 – July 14, 2017
Inspectors:	J. Schoppy, Senior Reactor Inspector, Team Leader Division of Reactor Safety (DRS) J. Brand, Reactor Inspector, DRS J. Kulp, Senior Reactor Inspector, DRS A. Patel, Senior Resident Inspector, Division of Reactor Projects (DRP) S. Kobylarz, NRC Electrical Contractor M. Yeminy, NRC Mechanical Contractor
Approved By:	Mel Gray, Chief Engineering Branch 1 Division of Reactor Safety

SUMMARY

Inspection Report (IR) 05000272/2017007, 05000311/2017007; 06/26/2017 – 07/14/2017; Salem Nuclear Generating Station, Units 1 and 2; Engineering Team Inspection.

The report covers the Design Basis Assurance Inspection conducted by a team of three U.S. Nuclear Regulatory Commission (NRC) inspectors and two NRC contractors. Three findings of very low safety significance (Green) were identified, all of which were considered to be non-cited violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Cross-cutting aspects associated with findings are determined using IMC 0310, "Components Within the Cross-Cutting Areas." The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6, dated July 2016.

NRC-Identified Findings

Cornerstone: Mitigating Systems

- Green. The team identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because between May 1995 to July 2017, PSEG did not verify that bolts, or other suitable connections, were installed to connect the safeguard equipment control (SEC) cabinets to the Bailey termination cabinets to satisfy the Seismic Qualification Utilities Group (SQUG) recommended method to resolve effects of potential cabinet interaction during a seismic event. PSEG's immediate corrective actions included initiating several corrective action notifications (NOTFs) to evaluate operability, extent-of-condition, and long-term resolution.

  This issue is more than minor because it is associated with the Design Control attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, PSEG performed a SQUG evaluation in response to unresolved safety issue (USI) A-46, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors," and submitted the results to the NRC detailing a potential for SEC cabinet seismic interaction with the adjacent Bailey termination cabinet. The evaluation results recommended bolting the SEC cabinet to the Bailey cabinet to eliminate the interaction. However, PSEG did not ensure and verify that the SQUG recommended bolts were installed, which resulted in a reasonable doubt on the operability of the SEC to reliably perform its intended function during and following a design basis seismic event. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," the team determined that this finding was Green because it was a design deficiency that potentially affected the design or qualification of a mitigating system, however, the mitigating system maintained its operability. The team determined there was no cross-cutting aspect associated with this finding since it was not representative of current PSEG performance. (Section 1R21.2.1.4)

- Green. The team identified a Green non-cited violation of Technical Specification (TS) 6.8.1, "Procedures and Programs," because since January 2007, PSEG did not establish an appropriate preventive maintenance (PM) schedule for the emergency diesel generator (EDG) ventilation dampers. Specifically, PSEG cancelled a pre-existing 36-month lubrication/clean/inspect PM in 2007 but failed to add the lubrication task to an existing 6-year

damper PM as intended. As a result, since January 2007, the intended lubrication PM was cancelled for the inlet, recirculation, and exhaust ventilation dampers on all six Unit 1 and Unit 2 EDG ventilation systems. PSEG's immediate corrective actions included initiating a corrective action NOTF to address the PM inadequacy and extent-of-condition.

The issue is more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern. Specifically, the removal of the EDG ventilation damper lubrication PM had the potential to adversely impact EDG reliability. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," the team determined that this finding was Green because it was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent the actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not represent an actual loss of function of one or more non-TS trains of equipment designated as high safety-significant in PSEG's Maintenance Rule program for greater than 24 hours. The team determined there was no cross-cutting aspect associated with this finding since it was not representative of current PSEG performance. (Section 1R21.2.1.5)

- Green. The team identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," because between April 2008 and July 2017, PSEG failed to promptly identify and correct a condition adverse to quality associated with an automatic voltage regulator (AVR) card installed in the 2C EDG. Specifically, PSEG corrective actions in response to a 2007 MPR Associates Part 21 report did not ensure that the 2C EDG was not susceptible to undesired voltage fluctuations associated with an aged-related defect in the installed AVR card. PSEG's immediate corrective actions included initiating a corrective action NOTF to evaluate operability and prioritize scheduling AVR card replacement.

  The issue is more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern. Specifically, without further inspection of the 2C EDG AVR card solder joints, cracks could form in the solder joint connections resulting in undesired voltage fluctuations and potentially preclude the 2C EDG from performing its safety function. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," the team determined that this finding was Green because it was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent the actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not represent an actual loss of function of one or more non-TS trains of equipment designated as high safety-significant in PSEG's Maintenance Rule program for greater than 24 hours. The team determined the finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Self-Assessment, because PSEG did not conduct self-critical and objective assessments of its programs and practices. Specifically, PSEG's pre-inspection self-assessment in May 2017 reviewed PSEG's corrective actions for the MPR Associates Part 21 Report, but did not identify the missed periodic refueling cycle inspections of the 2C EDG AVR card. [P.6] (Section 1R21.2.3.2)

Other Findings

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Design Basis Assurance Inspection (IP 71111.21M)

.1 Inspection Sample Selection Process

The team selected six risk significant components for review using information contained in the Salem Probabilistic Risk Assessment (PRA) and the U.S. NRC's Standardized Plant Analysis Risk (SPAR) model for Salem Nuclear Generating Station (Salem). Additionally, the team referenced the risk-informed inspection notebook for Salem in the selection of potential components for review. In general, the selection process focused on components that had a risk achievement worth (RAW) factor greater than 1.3 or a risk reduction worth (RRW) factor greater than 1.005. The components selected were associated with safety-related systems and included a variety of components such as pumps, batteries, ventilation fans, electrical breakers, and safeguards equipment control sequencers.

The team also selected five modifications that potentially affecting the design bases, licensing bases, and performance capability of the associated structures, systems, and components (SSCs). The team selected modifications completed in the last 3 years that had not been previously inspected by an NRC modification team using inspection procedure 71111.17T. The team selected modifications that were performed on risk significant components that were associated with the initiating event, mitigating system, or containment integrity cornerstones. The team selected a sample of component and structural modifications. Additionally, the complexity of the modification was also considered in selecting the modifications reviewed.

The team initially compiled a list of components based on the risk factors previously mentioned and risk significant modifications that had been completed. Additionally, the team reviewed the previous NRC *Component Design Bases Inspection* (CDBI) and *Evaluations of Changes, Tests, or Experiments and Permanent Plant Modifications* inspection reports and excluded those components and modifications previously inspected. The team then performed an assessment to narrow the focus of the inspection to six components, five modifications, and two operating experience (OE) items. The team selected one sample (Unit 1 containment) based on large early release frequency (LERF) implications. The team's assessment evaluated possible low design margin and included consideration of original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition/equipment reliability issues. The assessment also included items such as failed performance test results, corrective action history, repeated maintenance, Maintenance Rule (a)(1) status, operability reviews for degraded conditions, NRC resident inspector insights, and industry OE. Finally, consideration was given to the uniqueness and complexity of the design and the available defense-in-depth margins.

The team performed the inspection as outlined in NRC Inspection Procedure (IP) 71111.21M. This inspection effort included walkdowns of selected components and modifications; interviews with operators, system engineers, and design engineers; and reviews of associated design documents and calculations to assess the adequacy of the components to meet design basis, licensing basis, and risk-informed beyond design basis requirements.

Additionally, for the modification portion of the inspection, the team determined whether the modifications were adequately implemented; that procedures and design and license basis documentation affected by modification had been adequately updated to reflect any changes to the design or license basis of the facility after the change had been performed. The team also verified that any changes to the design and/or licensing bases had been performed in accordance with NRC guidance. Summaries of the reviews performed for each component, modification, and OE sample are discussed in the subsequent sections of this report. Documents reviewed for this inspection are listed in the Attachment.

.2 Results of Detailed Reviews

.2.1 Results of Detailed Component Reviews (6 samples)

.2.1.1 21, 22, and 23 Service Water Pumps

a. Inspection Scope

The team inspected 21, 22, and 23 service water (SW) pumps to verify that they were capable of performing their design functions. The team reviewed applicable portions of Salem's technical specifications (TSs), the Updated Final Safety Analysis Report (UFSAR), and the SW configuration control document to identify design basis requirements for the SW system. The team focused on potential common cause failure (CCF) mechanisms and events. The team reviewed plant drawings of the SW pumps and SW system to verify that they were consistent with the as-installed configuration and to look for potential CCF vulnerabilities. Additionally, the team reviewed the SW system operating procedures and recent system test results to verify that system flow rates and heat removal capability met design requirements.

The team performed several walkdowns of the SW intake structure where the pumps are located to assess the material condition, operating environment, and potential hazards. The team also reviewed the maintenance and operating history of the SW pumps and valves, associated corrective action NOTFs, SW system health reports, and applicable test results to determine if there were adverse operating trends and to ensure that PSEG adequately identified and addressed adverse conditions.

b. Findings

No findings were identified.

.2.1.2 Unit 1 Containment

a. Inspection Scope

The team inspected the Unit 1 containment building to verify that it was capable of performing its design function. The team reviewed the UFSAR, calculations, and procedures to identify the design basis requirements of the containment. The team also reviewed the most recent Unit 1 containment integrated leak rate test (ILRT) to verify that the containment overall leak rate and isolation capability was consistent with the design and licensing basis. The team reviewed containment structural inspection reports to assess the condition of the containment structure and to verify that PSEG appropriately entered adverse conditions into their corrective action program (CAP) for trending, tracking, and resolution. The team also reviewed containment accident heat load and containment fan cooler data to verify that post-accident temperatures would not challenge the design containment temperature. The team conducted a walkdown of accessible portions of the containment to assess the material condition, and to verify that the containment configuration was consistent with design basis assumptions and plant drawings. The team also reviewed corrective action documents to verify that PSEG appropriately identified and resolved deficiencies.

b. Findings

No findings were identified.

.2.1.3 2B 125 Vdc Battery

a. Inspection Scope

The team reviewed the design, testing, and operation of the 2B 125 volt direct current (Vdc) station battery to verify that it was capable of performing its design function of providing a reliable source of direct current (DC) power to connected loads under operating, transient, and accident conditions. The team reviewed design calculations to assess the adequacy of the battery's sizing to ensure that it could power the required equipment for a sufficient duration, and at a voltage above the minimum required for equipment operation. The team reviewed short circuit and breaker coordination calculations to ensure that breakers were adequately sized and were capable of interrupting short circuit faults. The team verified that proper coordination existed to provide adequate isolation of the affected portion of the circuit. The team reviewed battery test results to ensure that the testing was in accordance with design calculations, the Salem Generating Station Unit 2 TSs, and industry standards, and that the results confirmed acceptable performance of the battery. The team interviewed design engineers regarding design margin, operation, and testing of the DC system. The team performed a walkdown of the battery, DC buses, battery chargers, and associated distribution panels to assess the material condition, configuration control, and the operating environment. Finally, the team reviewed a sample of corrective action NOTFs to ensure that PSEG identified and properly corrected issues associated with the 2B 125 Vdc station battery.

b. Findings

No findings were identified.

.2.1.4 1A Safeguards Equipment Control

a. Inspection Scope

The team inspected the 1A SEC cabinet to verify installation and operation in accordance with the design bases and that PSEG performed maintenance to ensure equipment reliability. The team reviewed TSs, the UFSAR, and associated configuration baseline documents (CBDs) to identify design basis requirements for the SEC. The team reviewed drawings and vendor documents to verify that the installed configuration supported the design basis function under accident conditions. The team interviewed the system engineer, reviewed the system health report, and performed several walkdowns of the SEC cabinet to assess the observable material condition and operating environment. The team also verified that the location and installation of the cabinet mounting fasteners were in accordance with the design analyses, and that inter-cabinet fasteners were installed in accordance with PSEG regulatory submittals and NRC safety evaluations to ensure seismic adequacy. The team reviewed test procedures and recent surveillance test results against design bases and vendor documents to verify that the acceptance criteria was appropriate. The team reviewed vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents in order to verify that potential degradation was identified and addressed.

b. Findings

Introduction. The team identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” because between May 1995 and July 2017, PSEG did not verify that bolts or other suitable connections were installed to connect the SEC cabinet to the Bailey termination cabinets to satisfy the SQUG recommended method to resolve effects of potential cabinet interaction during a seismic event.

Description. During the team’s initial internal and external inspection of the 1A SEC cabinet, the team noted the close proximity of an adjacent Bailey termination cabinet and asked how PSEG had evaluated the potential for an adverse seismic interaction between the cabinets. Design engineering responded that concerns about interaction between the 1A SEC cabinet and the adjacent cabinet were addressed in PSEG’s response to NRC Generic Letter 87-02/USI A-46, “Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operation Reactors.” In 1995, PSEG’s seismic verification walkdowns had identified the potential seismic interaction between the cabinets as a seismic outlier and recommended bolting the SEC cabinet to the adjacent cabinet to resolve the concern.

The SQUG seismic verification concern was associated with the potential for seismic interaction between the SEC cabinet and Bailey cabinet during a seismic event, which could cause essential relays located in the SEC cabinet to malfunction and/or fail to operate as designed. The SQUG screening guidelines for the SEC cabinet identified the cabinet as a seismic verification outlier due to seismic interaction, because the SEC cabinet was mounted directly adjacent to the Bailey termination cabinets, and interaction between the cabinets during a seismic event could cause SEC essential relay contacts to chatter. This condition was applicable to essential relays in the three Unit 1 SEC cabinets (1A, 1B, and 1C) and the three Unit 2 SEC cabinets (2A, 2B, and 2C). During a 30 second seismic event that was discussed in the USI A-46 SQUG submittal to NRC

under PSEG letter LR-N95073, the essential SEC relays could experience multiple contact chatter operations from seismically-initiated cabinet interactions. The team reviewed selected PSEG schematic diagrams for safeguards equipment and observed that contact chatter of essential SEC relays could cause safety-related engineered safeguards equipment (such as safety injection pumps, auxiliary feedwater pumps, component cooling water pumps, and SW pumps, for example) to malfunction and/or operate out of sequence.

On July 10, 2017, the team accompanied PSEG design engineers to verify the installation of the bolting between the cabinets. The team identified that the required bolts were not installed to connect the SEC cabinets to the adjacent Bailey termination cabinets. The team identified that the absence of bolts connecting the cabinets together was not in accordance with the 1A SEC cabinet SQUG outlier seismic verification sheet that PSEG had submitted to the NRC on May 22, 1995. Specifically, the PSEG submittal to the NRC proposed bolting the cabinets together to resolve the SQUG outlier for the seismic adequacy for the essential relays located in the SEC cabinet.

PSEG entered the issue into their CAP as NOTF 20771325 and determined that the SEC cabinets remained operable but non-conforming due to the missing bolts credited in the SQUG evaluation. PSEG provided a reasonable expectation of operability based on preliminary calculations that determined the SEC cabinet would not interact with the adjacent Bailey cabinets during a seismic event based on the structural rigidness of the cabinets. The team concluded that PSEG's prompt operability determination adequately addressed immediate operability concerns. PSEG's immediate corrective actions also included initiating several additional corrective action NOTFs to evaluate and track long-term resolution for each respective SEC cabinet (NOTFs 20771326, 20771327, 20771328, 20771329, 20771330, and 20771331).

Analysis. The team determined that PSEG's failure to verify that bolts were installed to connect the SEC cabinets to the adjacent Bailey termination cabinets was a performance deficiency. This issue was more than minor because it is associated with the Design Control attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, PSEG performed a SQUG evaluation in response to USI A-46, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors," and submitted the results to the NRC detailing a potential for SEC cabinet seismic interaction with the adjacent Bailey termination cabinet and recommended bolting the SEC cabinet to the Bailey cabinet to eliminate the interaction. However, PSEG did not ensure and verify that the SQUG recommended bolts were installed, which resulted in a reasonable doubt on the operability of the SEC to reliably perform its intended function during and following a design basis seismic event. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," the team determined that this finding was Green because it was a design deficiency that potentially affected the design or qualification of a mitigating system, however, the mitigating system maintained its operability. The team determined there was no cross-cutting aspect associated with this finding since it was not representative of current PSEG performance.

Enforcement. Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," states that measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2 and as specified in the license application, for

those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, between May 1995 and July 2017, PSEG had not correctly translated the required bolting into the SEC cabinets. Specifically PSEG had not verified that bolts, or other suitable connections, were installed to connect the SEC cabinets to the Bailey termination cabinets to satisfy the SQUG recommended method to resolve effects of potential cabinet interaction during a seismic event. PSEG's immediate corrective actions included initiating several corrective action NOTFs to evaluate operability, extent-of-condition, and long-term resolution. Because the failure to verify this condition is of very low significance and has been entered into the CAP (NOTF 20771325), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000272 and 05000311/2017007-01, Inadequate Design Verification that Inter-Cabinet Bolts were Installed between SEC and Bailey Cabinets**)

.2.1.5 2A Emergency Diesel Generator Room Supply Fan and Control Area Supply Fan

a. Inspection Scope

The team inspected the 2A EDG room supply fan (2VHE25) and 2A control area supply fan (2VHE28) to verify that they were capable of performing their design functions. The team reviewed applicable portions of Salem's TSs, the UFSAR, and the EDG CBD to identify design basis requirements for the EDG room and control area supply fans. The team reviewed plant drawings of the supply fans to verify that they were consistent with the as-installed configuration. The team also reviewed design margin calculations to ensure that the supply fans could successfully operate under the most limiting conditions. The team also reviewed design specifications and vendor documents to verify that the ventilation system would function as designed when required and support proper operation of the components located in the area. The team reviewed flow paths, design of fans and air-operated dampers, and the design of the exhaust gravity dampers to verify that there were no choke points where the air flow could be restricted. The team also reviewed the maintenance history, PM schedule, PM evaluations, and EDG surveillance data to assess the adequacy of maintenance activities as well as the overall capability of the ventilation system to support the proper EDG operation.

The team discussed the design, operation, corrective maintenance, and preventive maintenance of the supply fans with the engineering staff to gain an understanding of the performance history and overall component health. The team performed several walkdowns of the supply fans and EDG ventilation system to assess the material condition, operating environment, and configuration control and to verify that the as-built condition was consistent with the design. The team also reviewed the maintenance and operating history of the supply fans, associated corrective action NOTFs, EDG system health reports, and applicable test results to determine if there were any adverse operating trends and to ensure that PSEG adequately identified and addressed adverse conditions.

b. Findings

Introduction. The team identified a Green non-cited violation of TS 6.8.1, "Procedures and Programs," because PSEG, since 2007, did not establish an appropriate PM schedule for the EDG ventilation dampers. Specifically, PSEG cancelled a pre-existing 36-month lubrication/clean/inspect PM in January 2007, but failed to add the lubrication

task to an existing 6-year damper PM as intended. As a result, since January 2007, the intended lubrication PM was cancelled for the inlet, recirculation, and exhaust ventilation dampers on all six Unit 1 and Unit 2 EDG ventilation systems.

Description. The Salem Unit 1 and Unit 2 EDG area room ventilation systems consist of inlet, recirculation, and exhaust dampers to remove heat generated by the EDG when required to operate. During a walkdown of the 2A EDG area room ventilation system on June 27, 2017, the team identified that the exhaust damper was not fully closed, as designed, when the supply fan was not operating. During a subsequent walkdown on June 28, the team identified that the exhaust damper was not fully open, as designed, when the supply fan was operating. On June 28, PSEG initiated corrective action NOTF 20769477 to evaluate the exhaust damper linkages which were bent in some locations. Subsequently, engineering performed a calculation to bound the potential ventilation flow restriction due to the degraded exhaust damper and determined that the EDG ventilation flow would remain above the minimum assumed in design calculations and that the 2A EDG ventilation system remained operable.

The team reviewed the corrective and preventive maintenance history for the 2A EDG exhaust damper to assess potential causal factors for the degraded linkages. The team noted that PSEG's most recent lubrication of the 2A EDG exhaust damper was in April 2005 during a scheduled 36-month lubrication/clean/inspect PM. Based on the team's questions regarding the history of this particular 36-month PM, PSEG provided documentation that engineering had revised that PM in January 2007. Engineering had evaluated the EDG area room ventilation system PMs and concluded that the clean and inspect portion could be deleted based on past performance, and the lubrication PM should be combined with an existing damper operator (DMOP) PM performed at a 6 year frequency. While responding to the team's PM questions, PSEG identified that the damper lubrication activity was not added to the existing 6-year DMOP PM as intended. As a result, the team noted that the 2A EDG ventilation exhaust damper was not lubricated since April 2005 and the lack of lubrication may have contributed to the degraded condition of exhaust damper identified by the team in June 2017. In assessing the extent-of-condition, the team noted that the recurring lubrication PM was cancelled in January 2007 for the inlet, recirculation, and exhaust ventilation dampers on all six Unit 1 and Unit 2 EDG ventilation systems. The team performed an extent-of-condition walkdown of accessible portions of the inlet, recirculation, and exhaust ventilation dampers on all six Unit 1 and Unit 2 EDG ventilation systems and reviewed the CAP for EDG damper-related issues dating back to January 2007. The team did not identify any additional degraded dampers and/or evidence that unlubricated dampers adversely impacted EDG operability through June 2017. PSEG entered the issue into their CAP as NOTF 20771251 to address the EDG ventilation system PM inadequacy and the extent-of-condition.

Analysis. The failure to maintain adequate lubrication of the supply, exhaust, and recirculation dampers on all six Unit 1 and Unit 2 EDG ventilation systems was a performance deficiency. The issue was more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern. Specifically, the removal of the EDG ventilation damper lubrication PM had the potential to adversely impact EDG reliability. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," the team determined that this finding was Green because it was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent the actual

loss of a safety function of a single train for greater than its TS allowed outage time, and did not represent an actual loss of function of one or more non-TS trains of equipment designated as high safety-significant in PSEG's Maintenance Rule program for greater than 24 hours. The team determined there was no cross-cutting aspect associated with this finding since it was not representative of current PSEG performance as the associated PSEG deficiency occurred in January 2007.

Enforcement. The team identified a Green, non-cited violation of TS 6.8.1, "Procedures and Programs," which requires, in part, that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide (RG) 1.33, Revision 2, February 1978. The RG 1.33, Appendix A, Section 9.b requires, in part, that PM schedules be developed to specify lubrication schedules and inspection of equipment. Contrary to the above, in January 2007, PSEG removed the lubrication schedule and equipment inspection requirements of the EDG ventilation system dampers (supply, exhaust, and recirculation). PSEG's immediate corrective actions included initiating a corrective action NOTF to address the PM inadequacy and extent-of-condition. Because this finding is of very low safety significance and has been entered into PSEG's CAP (NOTFs 20771251 and 20769477), this violation is being treated as a non-cited violation consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000272 and 05000311/2017007-02, Inadequate PM for the EDG Room Ventilation System**)

.2.1.6 22 Service Water Pump, 2A Emergency Diesel Generator, and 21 Safety Injection Pump 4KV Breakers

a. Inspection Scope

The team inspected the 22 SW pump, 2A EDG, and 21 safety injection (SI) pump 4KV circuit breakers. The team reviewed TSs, the UFSAR, system CBDs, and selected drawings and calculations to identify design basis requirements for the circuit breakers. The team reviewed the current system health report, vendor technical documents (VTDs) and maintenance procedures, and corrective action NOTFs associated with the circuit breakers to identify whether there were current conditions affecting circuit breaker reliability. The team verified overcurrent relay settings and recent relay calibration test results for adequacy to ensure reliable motor operation during the most limiting design basis operating conditions. The team interviewed the system engineer and performed a walkdown of the 4 KV switchgear to assess the observable material condition, overcurrent protective relay settings, configuration control, and operating environment.

b. Findings

No findings were identified.

.2.2 Results of Detailed Modification Review (5 samples)

.2.2.1 1R21 Motor-Operated Valve Margin Upgrades

a. Inspection Scope

The team reviewed design change package (DCP) 80101454 that implemented several modifications to multiple motor-operated valves (MOVs) in various safety-related

systems. Specifically, PSEG implemented the modifications to address low or negative valve design margin obtained when applying standard industry inputs into the MOV program calculations. The team reviewed the modification to determine if the design basis, licensing basis, or performance capability of the valves and/or electrical system had been degraded by the modification. The team interviewed engineers and MOV program owners to gain understanding of maintenance issues and overall reliability of the valves, and reviewed the associated work order instructions and documentation to verify that maintenance personnel had implemented the modification as designed. Additionally, the team reviewed the post modification test (PMT) results to determine whether sufficient margin for valve operation and mechanical stresses was available. The team reviewed periodic verification diagnostic test results and stroke test documentation to verify that acceptance criteria were met and consistent with the design basis. The team reviewed associated system health reports and corrective action documents to verify that PSEG properly identified and resolved deficiencies and adequately maintained the valves. Finally, the team performed a walk down of the accessible valves to assess the overall material conditions of the MOVs and associated components and power cables. The team also reviewed the 10 CFR 50.59 applicability review and screening associated with the modification.

b. Findings

No findings were identified.

.2.2.2 Service Water Intake Structure Bay 1 Support Upgrades

a. Inspection Scope

The team reviewed DCP 80107780 that replaced or upgraded the degraded supports in SW intake structure (SWIS) bay 1. PSEG upgraded the impacted supports from carbon steel to stainless steel to resist corrosion due to exposure to brackish water in the SWIS bays. The team assessed whether the modification was consistent with the design and licensing bases and operational requirements. The team conducted interviews with responsible engineers and walked down hardware installations in the SWIS. The team also evaluated whether affected evaluations, calculations, and drawings were properly updated to reflect the post-modification configuration. Finally, the team reviewed the 10 CFR 50.59 screening determination associated with this modification to evaluate whether PSEG had been required to obtain NRC approval prior to implementing the changes.

b. Findings

No findings were identified.

.2.2.3 Unit 1 FLEX Mechanical Connections

a. Inspection Scope

The team reviewed DCP 80110341 that installed mechanical connections to the safety-related and non-safety related systems required for FLEX strategies at Unit 1. PSEG installed selected piping and valves which will provide an alternate means for providing water to the reactor coolant system, steam generators, and spent fuel cooling

system during a beyond design basis event. The team assessed whether the modification affected the design basis functions of the systems. The team conducted interviews with responsible engineers and walked down various installed piping and valves in the SI, SW, auxiliary feedwater, charging, and spent fuel pool systems. Finally, the team reviewed the 10 CFR 50.59 screening determination associated with this modification to evaluate whether PSEG had been required to obtain NRC approval prior to implementing the changes.

b. Findings

No findings were identified.

.2.2.4 Service Water Intake Structure Ice Barrier and Wavewall Modifications

a. Inspection Scope

The team reviewed DCP 80108869 that eliminated the pre-existing top-pinned support and used a tube steel support attached to the new structure of ice barrier panels to provide more rigorous support. The modification also repaired the damaged sections of the north and south wavewalls and installed an expansion joint between the wavewalls and the SWIS. The team assessed whether the modification was consistent with the design and licensing bases and operational requirements. The team conducted interviews with responsible engineers, reviewed photographs of the ice barrier installation, and walked down accessible hardware installations on the SWIS. The team also evaluated whether PSEG properly updated affected calculations and drawings. Finally, the team reviewed the 10 CFR 50.59 screening determination associated with this modification to evaluate whether PSEG had been required to obtain NRC approval prior to implementing the changes.

b. Findings

No findings were identified.

.2.2.5 Motor-Operated Valves 1SJ1, 1SJ2, 2SJ1, and 2SJ2 Margin Recovery

a. Inspection Scope

The team reviewed DCP 80109986 that implemented modifications to several SI system MOVs in order to improve valve design margin. Specifically, PSEG implemented the modifications to address less than desired design margin identified when incorporating degraded grid voltage study results into the MOV capability calculations (NOTF 20599498). The team reviewed the modification to determine if the design basis, licensing basis, or performance capability of the valves and/or electrical system had been degraded by the modification. The team interviewed engineers and MOV program owners to gain understanding of maintenance issues and overall reliability of the valves, and reviewed the associated work order instructions and documentation to verify that maintenance personnel had implemented the modification as designed. Additionally, the team reviewed the PMT results to determine whether sufficient margin for valve operation and mechanical stresses was available. The team reviewed periodic verification diagnostic test results and stroke test documentation to verify acceptance criteria were met and consistent with the design basis. The team reviewed associated system health

reports and corrective action documents to verify that PSEG properly identified and resolved deficiencies and adequately maintained the valves. Finally, the team performed a walk down of the accessible valves to assess the overall material conditions of the MOVs and associated components and power cables. The team also reviewed the 10 CFR 50.59 applicability review and screening associated with this modification.

b. Findings

No findings were identified.

.2.3 Review of Industry Operating Experience and Generic Issues (2 samples)

The team reviewed selected OE issues for applicability at Salem. The team performed a detailed review of the OE issues listed below to verify that PSEG had appropriately assessed potential applicability to site equipment and initiated corrective actions when necessary.

.2.3.1 Flowserve Part 21 – Double Disc Gate Valve Wedge Pin Failures

a. Inspection Scope

The team assessed PSEG's applicability review and disposition of a Flowserve 10 CFR Part 21 report associated with double disc gate valve wedge pin failures. The Part 21 report discussed issues concerning a wedge pin failure of an Anchor Darling double disc gate valve at Browns Ferry Nuclear Plant Unit 1. An investigation revealed that the wedge pin had broken in several locations and the disc retainer had fallen from the wedge assembly and was found located between the valve discs. A topical report developed by the Boiling Water Reactor Owners Group (BWROG) Valve Technical Resolution Group provided a recommended industry response to the Flowserve 10 CFR Part 21 report. PSEG documented recommended actions from the BWROG report in corrective action NOTF 20603850 and evaluation 70152996. PSEG's associated evaluation noted that the Part 21 report was applicable to 32 Salem safety-related valves, all of which were maintained in PSEG's MOV program. PSEG completed the short-term recommendation prescribed in the BWROG report for each valve. Specifically, PSEG conducted a wedge pin shear capability evaluation and reviewed diagnostic test data on all 32 of the susceptible Salem valves with no anomalies identified. Additionally, PSEG planned to systematically perform other recommendations prescribed in the BWROG report, including: performing visual inspection of the stem during valve stroke testing to check for excessive stem rotation (19 valves completed with no anomalies), and performing internal inspections of the stem/wedge connection to ensure the connection is solid with proper contact with the stem shoulder and wedge (3 valves inspected with no anomalies).

The team interviewed the MOV program engineer, reviewed a risk-informed sample of valve diagnostic test results and trending, reviewed a risk-informed sample of surveillance test results for the susceptible valves, performed walkdowns of a risk-informed sample of susceptible valves, and reviewed associated system health reports and corrective action documents to independently assess PSEG's susceptibility to this failure mechanism and the adequacy of their corrective actions to date.

b. Findings

No findings were identified.

.2.3.2 MPR Associates 10 CFR Part 21 – Basler Electric SBSR Automatic Voltage Regulator (AVR) Card Solder Joints

a. Inspection Scope

The team assessed PSEG's applicability review and disposition of MPR Associates 10 CFR Part 21 regarding a defect identified in Basler Electric SBSR AVR card solder joints. The 10 CFR Part 21 report discussed issues with the soldered electrical connections between the L1 magnetic amplifier (magamp) module and the card. Specifically, over a period of years in service (~15 years), cracks can form in the solder joint connections due to thermal expansion. PSEG's evaluation noted that the Part 21 was applicable to all of the Unit 1 and Unit 2 Salem EDGs. PSEG documented recommended actions from the Part 21 that included an inspection and repair plan. These actions included an inspection program that should occur on a fuel cycle periodicity after 15 years of service and if cracks are found, the card should be replaced, or the solder joints repaired. The team interviewed the EDG system engineer, reviewed associated CAP documents and AVR card inspection work orders, reviewed planned AVR card inspection PMs, and reviewed related industry OE to independently assess PSEG's susceptibility to this potential defect and their corrective actions to date.

b. Findings

Introduction. The team identified a Green non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," because between April 2007 and July 2017, PSEG failed to promptly identify and correct a condition adverse to quality associated with an AVR card installed in the 2C EDG. Specifically, PSEG corrective actions in response to a 2007 MPR Part 21 report did not ensure that the 2C EDG was not susceptible to undesired voltage fluctuations associated with an aged-related defect in the installed AVR card.

Description. Salem Unit 1 and Unit 2 have six EDGs, three per unit (Unit 1 – 1A, 1B, and 1C; Unit 2 – 2A, 2B, and 2C). Salem EDGs control EDG stator voltage via an AVR and an exciter. The AVR is the controller, while the exciter converts the control signal from the AVR to a field voltage that is applied to the EDG field winding. The main component of the AVR is an electronic circuit card that is referred to as the Basler Electric SBSR AVR card.

On September 21, 2007, MPR Associates issued a 10 CFR Part 21 report that identified defects in their Basler Electric SBSR AVR card solder joints. Solder joints are used to join two or more items together by using a filler metal. Specifically, the nature of the defect is that over a period of years (~ 15 years), cracks can form in the solder joint connections between the L1 magamp and the circuit board. On September 25, 2007, PSEG entered NOTF 20337500 into their CAP to evaluate the applicability of the Part 21 to the Salem Unit 1 and Unit 2 EDGs. The evaluation concluded that all six of Salem's EDG AVR cards were susceptible to solder joint cracking of the L1 magamp connection and that the EDG AVR card solder joints should be inspected during the next refueling outage (Unit 1 EDGs in December 2007, and Unit 2 EDGs in March 2008). The evaluation also stated a

periodic inspection and repair program should be established and that the recommended inspections should occur on a fuel cycle periodicity after 15 years of service. PSEG concluded that if cracks of the solder joints are found, the card should be replaced, or the joints repaired by remaking of the solder connections.

The team reviewed all six of the EDG AVR card inspection corrective action NOTFs (1A - 20344022, 1B – 20344023, 1C – 20344024, 2A – 20344025, 2B – 20344026, and 2C - 20344027) and associated work orders that documented the inspection results. The team noted that the work orders documented that four of the six cards (1A, 2A, 3A, and 2B EDG AVR cards) had indications of cracking and were repaired by remaking of the solder connections. PSEG inspected the EDG AVR cards for the 2A and 2C EDGs and found no cracks. Accordingly, PSEG placed those AVR cards back in service without completing any repairs. Subsequently, PSEG replaced the 2A EDG AVR card in 2009. During the period 2010 to 2013, PSEG replaced the 1A, 1B, and 1C EDG AVR cards and scheduled the next periodic inspection in 2020. PSEG's engineering evaluation concluded that if an AVR card was repaired and/or replaced then the card should be inspected after 15 years in service and that the periodic fuel cycle inspections are not necessary. If the AVR card was inspected with no cracks found and placed back in service, PSEG concluded that periodic inspections of those AVR cards should be completed every fuel cycle (18 month periodicity).

Based on available documentation, the team identified that the 2C EDG AVR card had been in service for greater than 15 years and may be susceptible to cracking as described in corrective action NOTF 20337500. Specifically, the initial inspection conducted in 2008 did not identify cracks and the card was placed back in service without implementing PSEG's recommended corrective action to conduct periodic inspections of the AVR card solder joints on an every fuel cycle periodicity. In response to the team's questions, on July 13, 2017, PSEG initiated corrective action NOTF 20771229 to document the deficiency and determined that the 2C EDG was operable but non-conforming. PSEG determined that based on recent EDG surveillance data that indicated proper EDG voltage control that the 2C EDG was operable and would perform its specified function. PSEG planned to inspect the 2C EDG AVR card at the next EDG maintenance opportunity. The team concluded that PSEG's operability basis and short-term corrective actions plans were adequate.

The team also noted that PSEG missed several opportunities to identify the 2C EDG AVR card missed periodic fuel cycle inspections. In May 2008, PSEG initiated corrective action NOTF 20345733 to evaluate NRC Information Notice 2007-36 which documented various EDG voltage regulator problems across the nuclear industry and included the MPR Associates Part 21 report regarding the AVR card solder joints. PSEG's evaluation of the information notice determined that the inspections and subsequent repairs had been completed but did not identify the need to perform periodic inspections. On May 26, 2017, PSEG completed a self-assessment in preparation for this inspection. PSEG specifically reviewed the corrective actions for the MPR Associates Part 21 and determined that all corrective actions were satisfactory. The team concluded that the self-assessment should have reasonably identified the inadequate corrective action of not completing the periodic inspections of the 2C EDG AVR card.

Analysis. PSEG's failure to promptly identify and correct a condition adverse to quality associated with the missed periodic inspections of the AVR card installed in the 2C EDG was a performance deficiency. The performance deficiency was more than minor

because, if left uncorrected, it had the potential to lead to a more significant safety concern. Specifically, without further inspection of the 2C EDG AVR card solder joints, cracks could form in the solder joint connections resulting in undesired voltage fluctuations and potentially preclude the 2C EDG from performing its safety function. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," the team determined that this finding was of very low safety significance (Green) because it was not a design or qualification deficiency, did not involve an actual loss of safety function, did not represent the actual loss of a safety function of a single train for greater than its TS allowed outage time, and did not represent an actual loss of function of one or more non-TS trains of equipment designated as high safety-significant in PSEG's Maintenance Rule program for greater than 24 hours. The finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Self-Assessment, because PSEG did not conduct self-critical and objective assessments of its programs and practices. Specifically, PSEG's pre-inspection self-assessment in May 2017 reviewed PSEG's corrective actions for the MPR Associates Part 21, but did not identify the missed periodic refueling cycle inspections of the 2C EDG AVR card. [P.6]

Enforcement. Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. Contrary to this, between April 2008 and July 2017, PSEG's CAP did not assure that a condition adverse to quality associated with the safety-related EDG system was promptly identified and corrected. Specifically, PSEG did not perform the recommended (NOTF 20337500) once per refueling cycle inspection of the 2C EDG AVR card after initial inspection, and as a result, the 2C EDG AVR could be susceptible to voltage fluctuations causing failure of the 2C EDG. PSEG's immediate corrective actions included initiating a corrective action NOTF to evaluate operability and prioritize scheduling of the 2C EDG AVR replacement and inspection. Because the violation was of very low safety significance (Green) and has been entered into the CAP (NOTF 20771229), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. (**NCV 05000311/2017002-03, Inadequate Corrective Action Regarding Missed Periodic Inspections of 2C EDG AVR Card**)

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (IP 71152)

a. Inspection Scope

The team reviewed a sample of problems that PSEG had previously identified and entered into the CAP. The team reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions. In addition, the team reviewed NOTFs written on issues identified during the inspection to verify adequate problem identification and incorporation of the problem into the CAP. The specific corrective action documents that the team sampled and reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, including Exit

On July 14, 2017, the team presented the inspection results to Mr. Patrick Martino, Salem Plant Manager, and other members of the PSEG staff. The team verified that no proprietary information was retained by the inspectors or documented in the report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

PSEG Personnel
M. Ambrosino, Engineering Programs Manager
S. Boesch, Service Water System Engineer
T. Cachaza, Senior Regulatory Compliance Engineer
E. Ciemiewicz, Contractor, MOV Program Subject Matter Expert
R. DeNardy, Valve Component Engineer
K. Down, Air-Operated Valve Engineer
C. Fee, Design Engineer
A. Ford, Environmental Qualification Engineer
A. Ghose, Design Engineer
F. Hummel, Nuclear Staff Engineer
D. Johnson, Corporate Valve Engineer
K. King, Design Engineer
S. Markos, Senior Manager, Corporate Design Engineering
C. McFeaters, Site Vice President
G. Morrison, Service Water Design Engineer
T. Mulholland, Acting Operations Director
G. Pahwa, Senior Engineer
D. Pfaefflin, Senior Reactor Operator
O. Pineda-Porras, Design Engineer
M. Richers, Design Engineering Manager
P. Robbins, Design Engineer

NRC Personnel:
P. Finney, Senior Resident Inspector
A. Ziedonis, Resident Inspector

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Open and Closed

NCV 05000272&311/2017007-01	NCV	Inadequate Design Verification that Inter-Cabinet Bolts were Installed between SEC and Bailey Cabinets (Section 1R21.2.1.4)
NCV 05000272&311/2017007-02	NCV	Inadequate PM for the EDG Room Ventilation System (Section 1R21.2.1.5)
NCV 05000311/2017007-03	NCV	Inadequate Corrective Action Regarding Missed Periodic Inspections of 2C EDG AVR Card (Section 1R21.2.3.2)

LIST OF DOCUMENTS REVIEWED

Audits and Self-Assessments

80120306, Salem 2017 CDBI Inspection Check-In Self-Assessment, dated 5/26/17
NOSA-SLM-14-06 (80112366), Engineering Programs and Station Blackout Audit Report, dated 8/13/14
NOSA-SLM-15-07 (80114160), Engineering Design Control Audit Report, dated 6/17/15
NOSA-SLM-16-06 (80117467), Engineering Programs and Station Blackout Audit Report, dated 9/8/16

Calculations

3SC-028, Seismic II/I Evaluation of Pipe Supports for SWIS Bay Upgrades, Revision 3
3SC-027, Seismic II/I Seismic Evaluation of Commodity Supports for SWIS Bay Upgrades, Revision 3
6S0-0334, Seismic Mounting of Unit 2 Strainer Control Panels, Revision 5
6S0-0552, Design of Ice Barrier, Revision 1
6S0-1846, Evaluation of Service Water Intake Structure, Revision 2
30790-CALC, Braided Flexible Connector Calculation, Revision 2
267750A, Service Water Pump House Piping, Revision 8
ES-4.003, 125 Volt DC Short Circuit and System Voltage Drop Calculation, Revision 10
ES-4.004, 125 Volt DC Battery and Battery Charger Sizing Calculations, Revision 13
ES-4.006, 125 Volt DC Component Study and Voltage Drop Calculation, Revision 9
ES-13.006, Breaker and Relay Coordination Calculation Safety Related AC System, Revision 0
ES-18.006, Selection of TOL Heater Elements-Unit 1 and 2 Safety Related MOVs, dated 5/10/05
MSWG-0181, Design Calculation for MSWG-0181, Revision 2
MSWG-0185, Design Calculation for MSWG-0185, Revision 2
MSWG-0189A, Design Calculation for MSWG-0189A, Revision 2
MSWG-388, Design Calculation for MSWG-388, Revision 3
S-1-DGV-MDC-0661, Diesel Generator Area Ventilation System Equipment Assessment Capability, Revision 3
S-1-DGV-MDC-1227, D/G Area Heat Gain and Heat Loss, Revision 1
S-2-CAV-MDC-0683, U-2 Battery Room Cooling & Heating Load Calculation, Revision 0
S-2-CAV-MDC-0685, U-2 Battery Room Ventilation System Evaluation, Revision 2
S-2-CAV-MDC-0689, U-2 Battery Room Hydrogen Generation/Ventilation Calculation, Revision 1
S-2-DGV-MDC-0662, Diesel Generator Area Ventilation System Equipment Assessment Capability, Revision 3
S-2-DGV-MDC-1228, D/G Area Heat Gain and Heat Loss, Revision 1
S-2-SEC-SDC-0794, Seismic Analysis of SEC Panel, Revision 1

Completed Surveillance, Performance, and Functional Tests

2DGV10-11-2, PMT-DMOP Functional Test, performed 10/14/12
50166337, SEC Mode Ops Testing 2A Vital Bus, performed 10/25/15
50171369, SEC Mode Ops Testing 1A Vital Bus, performed 4/23/16
50171717-10, NUST 1R 1A SEC/Relay Time Resp & Sequencer, performed 4/26/16
50177163-10, NUST 18M ST 1A SEC/Logic & Timing Test, performed 12/2/16
MIDAS 2015.226, Salem MOV Performance Valve Test Report, dated 3/10/17
S1.OP-ST.CAN-0001, Primary Containment Valves Monthly, performed 6/9/17
S1.OP-ST.CAN-0002, Inside Containment Valve Verification Modes 1 - 4, performed 7/18/16
S1.OP-ST.CC-0005, Inservice Testing Component Cooling Valves, performed 10/26/11
S1.OP-ST.CS-0004, Inservice Testing Containment Spray Valves, performed 11/05/14 & 4/14/16
S1.OP-ST.MS-0002, Inservice Testing Main Steam and Feedwater Valves, performed 5/4/16
S2.FP-ST.FS-0021, Diesel Area CO2 Systems Operability and Partial Discharge Test, performed 12/29/15
S2.OP-ST.DG-0001, 2A Diesel Generator Surveillance Test, 6/15/17
S2.OP-ST.DG-0012, 2A Diesel Generator Endurance Run, performed 4/4/17
S2.OP-ST.SJ-0003, Inservice Testing Safety Injection Valves, Stroke Time Test, performed 12/12/16
S2.OP-ST.SW-0001, Inservice Testing - 21 Service Water Pump, performed 12/23/16
SAL1ILRT.16-R160728A, Salem Unit 1 Integrated Leak Test Report, July 2016
SC.IC-PM.ABV-0001, Diesel Generator Area Ventilation Dampers Test, performed 10/23/12
SC.MD-PM.ZZ-0005, Molded Case Circuit Breaker Maintenance, performed 11/4/14
SC.MD-PT.230-0001, Thermal Overload Relay Overcurrent Trip Testing, performed 11/2/11

Completed Preventive Maintenance, Calibrations, and Inspections

30114820, 54M 2ADD/2A DG Mtr/Replace Bkr, performed 5/25/10
30116561, 54M 2AD1AX8D/22SWP Mtr/Replace Bkr, performed 6/29/10
30144289, 54/MO CAL 2A Diesel Bkr Failure Relays, performed 4/26/11
30150911, NUPM 15Y 4KV BRKR 0224A6260-005 Overhaul Breaker, performed 1/28/15
30194671, NUPM 54M 2ADD/2A DG MTR/Replace Bkr, performed 3/2/15
30195838, NUPM 54M 2AD1AX8D/22 SWP Mtr/Replace Bkr, performed 12/22/15
30195874, NUPM 54M CAL 22 S.W. Pmp Relays & CTs, performed 2/2/15
30207032, NUPM 54M 2A EDG Relays & CTs, performed 11/20/15
30207066, NUPM 54M CAL 2A Diesel Bkr Failure Relays, performed 11/20/15
30221697, NUPM 54M CAL 21 S.I. Pump Relays & CTs, performed 2/13/17
30222299, NUPM 54M 2AD1AX5D/21 SI PP MTR/Replace Bkr, performed 1/29/15
ILD-DLV-00268, ILD Expansion Joint Inspections Report, Revision 0

Corrective Action Notifications (NOTFs)

20256833	20690602	20744007	20770171*	20771243*
20257418	20692993	20745503	20770191*	20771245*
20337500	20698022	20747136	20770208*	20771246*
20344022	20701570	20747486	20770247*	20771247*
20344023	20702792	20747551	20770258*	20771248*
20344024	20704651	20747554	20770281*	20771251*
20344025	20704666	20747706	20770453	20771325*
20344026	20707468	20750485	20770577*	20771326*
20344027	20709561	20751203	20770585*	20771327*
20358399	20717253	20751455	20770614*	20771328*
20503202	20718800	20751669	20770615*	20771329*
20503265	20721126	20751881	20770616*	20771330*
20580539	20721686	20752593	20770617*	20771331*
20580950	20723652	20756931	20770618*	20771332*
20581244	20724755	20762821	20770619*	20771345*
20603850	20726066	20768809	20770620*	20771421*
20619220	20726861	20768829	20770653*	20771422*
20619277	20727419	20768877	20770675*	20771423*
20637523	20727466	20769085*	20770829*	20771424*
20658865	20727594	20769086*	20770950*	20771425*
20661177	20728185	20769451	20770951*	20771426*
20664982	20728828	20769464*	20770993*	20771427*
20666951	20730035	20769466*	20770996*	20771428*
20679201	20730222	20769477*	20771001*	20771429*
20683101	20730224	20769505	20771215*	20771430*
20684625	20732441	20770026	20771221*	
20685040	20739472	20770075	20771229*	

*NOTF written as a result of this inspection

Design & Licensing Bases

2443-009-10, Shoreline Investigation and Oceanographic Study, Proposed Nuclear Generating Station Salem NJ, dated 11/20/70

DE-CB.4KV-0011, Configuration Baseline Documentation for 4kV Auxiliary Power System, Revision 5

DE-CB.DGV-0020, Configuration Baseline Documentation for Diesel Generator Area Ventilation System, Revision 0

DE-CB.SW-0047, Configuration Baseline Documentation for Service Water System, Revision 7

DE-CB.SWV-0027, Configuration Baseline Documentation for Service Water Intake Structure Ventilation, Revision 0

SC.DE-BD.DG-0001, UFSAR Chapter 15 DB/LB System Validation for the Emergency Diesel Generator System, Revision 0

SL-012270, Salem Generating Station Flood Hazard Reevaluation, Revision 0

Drawings

203035-A Sh. 1, No. 1 & 2 Units - 1A & 2A Vital Buses 1A & 2A Emergency Diesel Generators Schematic Controls, Revision 29

203061-A-8789, No.2 Unit 4160V Vital Buses One Line Diagram, Revision 35

203666-B-9532 Sh. 1, No. 1 & 2 Units Safeguards Emergency Loading Sequence Logic Diagram Controls, Revision 9

203667-B-9532 Sh. 2, No. 1 & 2 Units Safeguards Emergency Loading Sequence Logic Diagram Controls, Revision 7
203668-B-9532 Sh. 3, No. 1 & 2 Units Safeguards Emergency Loading Sequence Logic Diagram Controls, Revision 6
203669-B-9532 Sh. 4, No. 1 & 2 Units Safeguards Emergency Loading Sequence Logic Diagram Controls, Revision 7
203670-B-9532 Sh. 5, No. 1 & 2 Units Safeguards Emergency Loading Sequence Logic Diagram Controls, Revision 11
203673-B-9532 Sh. 6, No. 1 & 2 Units Safeguards Emergency Loading Sequence Logic Diagram Controls, Revision 6
203834-B-9774 Sh. 2, No. 2 Unit – 2A – 4160V Vital Bus No. 22 Service Water Pump DC Schematic (125 V) Controls, Revision 22
205322 A 8762 Sh. 3, Diesel Generator and Fuel Handling Area Ventilation, Revision 4
205342 A 8763 Sh. 1, No. 2 Unit Service Water Nuclear Area, Revision 81
205342 A 8763 Sh. 2, No. 2 Unit Service Water Nuclear Area, Revision 76
205342 A 8763 Sh. 3, No. 2 Unit Service Water Nuclear Area, Revision 81
205342 A 8763 Sh. 4, No. 2 Unit Service Water Nuclear Area, Revision 63
205342 A 8763 Sh. 5, No. 2 Unit Service Water Nuclear Area, Revision 74
205342 A 8763 Sh. 6, No. 2 Unit Service Water Nuclear Area, Revision 71
205342 A 8763 Sh. 7, No. 2 Unit Service Water Nuclear Area, Revision 7
211630-B-9532 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 8
211631-B-9532 Sh. 1 of 2, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 10
211632-B-9532 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 8
211637-B-9770, No. 2 Unit 2A 4160 Vital Buses No. 21 Safety Injection Pumps Schematic Controls, Revision 12
211763, Sheets 1-5, Service Wtr. Intake Structure Ice Barrier Details, Revision 0
217170-A-1320 Sh. 1, No. 1 Unit – No. 1 Relay Room Safeguards Emer. Cab. – Vital Bus 1A Wiring Diagram Controls, Revision 20
223677 B 9789 Sh. 3, No. 1A and 2A Diesel Generators Console, Revision 21
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223720 A 1404, 125 VDC One Line, Revision 34
223827 B 9789, Number 1A and 2A Diesel Generators 230V Vital Control Center, Revision 27
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236254-B-9621 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 7
236255-B-9621 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 8
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236260-B-9621 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 7
236261-B-9621 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 7
236262-B-9621 Sh. 1, No. 1 Unit No. 1A, 1B & 1C Vital Buses Safeguard Equipment Control System Schematic Controls, Revision 10
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30354-D-4073 Sh. 4, Stainless & Carbon Steel Guide Straps for ½" Thru 2" Pipe, Revision 0
N0330205, Sh. 1, 285K Pump Assembly for Public Service Electric and Gas Company, INC, Revision Q
SW-1-7H, Sh. 1, No 1 and 2 Unit – Service Water Intake Pump Piping, Revision 21
SW-1-7M, Sh. 1, No 1 and 2 Unit – Service Water Intake Pump Piping, Revision 13

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70077135, NRC Info Notice 2007-36 EDG Volt Regulator, dated 5/16/08
70108834, Change Current 6Y Replacement Scope of all Thirty Three SW Expansion Joint to 2Y Evisive Scan Testing and Visual/Physical Inspections, dated 6/24/10
70119165, Gap between Last Battery Cell & Battery Rack End, dated 4/12/11
70152091, NRC Info Notice 2013-05, Battery Expected Life and Its Potential Impact on Surveillance Requirements, Revision 0
80045300, MOV 1SJ2, Motor Replacement, Revision 0
80101454, 1R21 MOV Margin Upgrades, Revision 2
80107780, SWIS Bay 1 Support Upgrades, Revision 0
80108869, Salem SWIS Ice Barrier and Wavewall Modifications, Revision 1
80109986, Salem Units 1 and 2, MOVs 1SJ1, 1SJ2, 2SJ1, and 2SJ2, Margin Recovery, Revision 1
80110341, Salem Unit 1 Flex Mechanical Modifications, Revision 3
80117135, Procedure Revision MA-AA-796-024, Revision 16, 10CFR 50.59 Screen, Revision 0
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S2013-142, 50.59 Screening: Salem SWIS Ice Barrier and Wavewall Modifications (DCP 80108869), Revision 1

S2014-236, 50.59 Screening: Salem Unit 1 Service Water Intake Structure Bay 1 Support Upgrades (DCP 80107780), Revision 0
SC.DE-TS.ZZ-4703, Salem Cable Tray, Conduit and Support Design and Evaluation, Revision 0
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S-SWI-00128, SWI Crack (a)(1) Evaluation, dated 11/3/16

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30254880	60073552	60075434	60132885	60103610
30255203	60073553	60080946	60090801	60103611
30266435	60073554	60087957	60090862	60112260
60011052	60073761	60111117	60090863	60112261
60021029	60073762	60113347	60090864	60112342
60023680	60074013	60122743	60090868	60112343
60060385	60074369	60125680	60090869	

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PSWR 6464, Penetration Seal Work Release for Salem Unit 1, Penetration Seal E-15403-110, Revision 0
PSWR 6467, Penetration Seal Work Release for Salem Unit 1, Penetration Seal S-15403-021, Revision 0
TSO 2016-14, Indication Light Bulb Replacement, dated 4/24/16

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VEN-14-001, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-A ROWS 26 - 46), performed 9/19/14
VEN-14-002, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-B ROWS 26 - 46), performed 9/19/14
VEN-14-003, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-C ROWS 26 - 46), performed 9/19/14
VEN-14-004, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-D ROWS 26 - 46), performed 9/19/14
VEN-14-033, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-A ROWS 01-25), performed 11/7/14
VEN-14-034, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-B ROWS 01-25), performed 11/7/14
VEN-14-035, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-C ROWS 01-25), performed 11/7/14
VEN-14-036, ASME IWL (Class CC) Containment Concrete Visual Examination (CON-S1-QUAD-D ROWS 01-25), performed 11/7/14

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S1.OP-SO.CBV-0001, Containment Ventilation Operation, Revision 26
S1.OP-SO.WG-0006, Containment Purge to Plant Vent, Revision 27
S2.OP-AB.4KV-0001, Loss of 2A 4KV Vital Bus, Revision 11
S2.OP-AB.SW-0001, Loss of Service Water Header Pressure, Revision 16
S2.OP-AB.SW-0003, Service Water Bay Leak, Revision 7
S2.OP-AB.SW-0005, Loss of All Service Water, Revision 4
S2.OP-AR.ZZ-0018, Auxiliary Annunciator, Revision 21
S2.OP-SO.4KV-0001, Loss of 2A 4KV Vital Bus, Revision 32
S2.OP-SO.125-0002, 2B 125VDC Battery Charger Operation, Revision 8
S2.OP-SO.125-0005, 2A 125VDC Bus Operation, Revision 25
S2.OP-SO.SW-0001, Service Water Pump Operation, Revision 28
S2.OP-ST.125-0001, Electrical Power Systems 125Vdc Distribution, Revision 11
S2.OP-ST.DG-0001, 2A Diesel Generator Surveillance Test, Revision 52
S2.OP-ST.DG-0012, 2A Diesel Generator Endurance Run, Revision 26
S2.OP-ST.SW-0001, Inservice Testing – 21 Service Water Pump, Revision 37
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NRC Information Notice 2007-36, Emergency Diesel Generator Voltage Regulator Problems, dated 11/15/07
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S1.IC-TR.ZZ-0002, Unit 1 Master Time Response, Revision 23
S2.FP-ST.FS-0021, Diesel Area CO2 Systems Operability and Partial Discharge Test, Revision 15

S2.MD-ST.125-0003, Quarterly Inspection and Preventative Maintenance of Units 1, 2, & 3 125 Volt Station Batteries, Revision 31
S2.MD-ST.125-0005, Annual Inspection and Surveillance of Unit 1 & 2 125 Volt Vital Batteries, Revision 6
S2.RA-ST.SW-0001, Inservice Testing 21 Service Water Pump Acceptance Criteria, Revision 13
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Salem U-2, MOV Program Health Report P4-2016
Salem U-2, Safety Injection System Health Report, Q4-2016
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S-IR-6S0-0030 Volume 1, Structure and Component Monitoring Report, Revision 0
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PI-419949, Joy Manufacturing Axivane Fan Operators Handbook, dated 3/19/93
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VTD 143776, Instruction Manual for Safeguard Equipment Control, Revision 14
VTD 314197, Technical Manual Control Electronics Unit (CEU) & Test Panel, Revision 7
VTD 317099 (02), Maximum Thrust and Seismic Analysis for 4” Class 150 Stainless Steel Flex Gate Valve with SMB-00 Limitorque Actuator, dated 7/7/94
VTD 317099 (03), Maximum Thrust and Seismic Analysis for 8” Class 150 Stainless Steel Flex Wedge Gate Valve with SMB-1-25 Limitorque Actuator, dated 3/7/94
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VTD 32220 (01), Letter LR-N95073, Generic Letter 87-02 and Supplement 1 USI A-46 Walkdown Summary Report Salem Generating Station Unit Nos. 1 and 2 Docket Nos. 50-272 and 50-311, Revision 1
VTD 32220 (02), Relay Evaluation Report for Salem Generating Station Units 1 and 2 Attachment No. 2 Volume 1, Revision 1
VTD 32220 (03), Relay Evaluation Report for Salem Generating Station Units 1 and 2 Attachment No. 2 Volume 2, Revision 1
VTD 32220 (04), Seismic Evaluation Report for Salem Generating Station Attachment 3, Revision 1
VTD 32220 (05), Letter LR-N96083, Generic Letter 87-02 and Supplement 1 USI A-46 Walkdown Summary Report Salem Generating Station Unit Nos. 1 and 2 Docket Nos. 50-272 and 50-311 Supplemental Submittal, Revision 1
VTD 32220 (06), Salem Generating Station Supplemental Submittal Attachment G, Revision 1

LIST OF ACRONYMS

ADAMS	Agency-Wide Documents Access and Management System
AVR	Automatic Voltage Regulator
BWROG	Boiling Water Reactor Owners Group
CAP	Corrective Action Program
CCF	Common Cause Failure
CBD	Configuration Baseline Document
CDBI	Component Design Bases Inspection
CFR	Code of Federal Regulations
DBAI	Design Basis Assurance Inspection
DC	Direct Current
DCP	Design Change Package
DMOP	Damper Operator
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EDG	Emergency Diesel Generator
ILRT	Integrated Leak Rate Test
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
LERF	Large Early Release Frequency
MAGAMP	Magnetic Amplifier
MIDAS	MOV Integrated Data Acquisition System
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NOTF	Notification
NRC	Nuclear Regulatory Commission

OE	Operating Experience
PM	Preventive Maintenance
PMT	Post Maintenance Test
PRA	Probabilistic Risk Assessment
PSEG	Public Service Enterprise Group Nuclear LLC
RAW	Risk Achievement Worth
RG	Regulatory Guide
RRW	Risk Reduction Worth
SDP	Significance Determination Process
SEC	Safeguard Equipment Control
SI	Safety Injection
SPAR	Standardized Plant Analysis Risk
SQUG	Seismic Qualification Utilities Group
SSC	Structure, System, and Component
SW	Service Water
SWIS	Service Water Intake Structure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
USI	Unresolved Safety Issue
VDC	Volts, Direct Current
VTD	Vendor Technical Document