UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 2, 2023

Mr. Eric Carr
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 − ISSUANCE OF AMENDMENT NOS. 346 AND 327 RE: REVISE TECHNICAL SPECIFICATIONS TO EXTEND ALLOWABLE OUTAGE TIME FOR INOPERABLE EMERGENCY DIESEL GENERATOR (EPID L-2022-LLA-0095)

Dear Mr. Carr:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment Nos. 346 and 327 to Renewed Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Nuclear Generating Station, Unit Nos. 1 and 2, respectively. These amendments consist of changes to the technical specifications (TSs) in response to your application dated June 29, 2022, as supplemented by letters dated November 17, 2022, and December 9, 2022.

The amendment revised the Salem Nuclear Generating Station, Units 1 and 2, Technical Specification Action 3.8.1.1.b.4 to extend the allowed outage time for an inoperable emergency diesel generator from 72 hours to 14 days.

A copy of the related safety evaluation is also enclosed. A Notice of Issuance will be included in the Commission's monthly *Federal Register* notice.

Sincerely,

/RA/

James S. Kim, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

Enclosures:
1. Amendment No. 346 to DPR-70
2. Amendment No. 327 to DPR-75
3. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PSEG NUCLEAR LLC

CONSTELLATION ENERGY GENERATION, LLC

DOCKET NO. 50-272

SALEM NUCLEAR GENERATING STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 346
Renewed License No. DPR-70

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment filed by PSEG Nuclear LLC, acting on behalf of itself and Exelon Generation Company, LLC (the licensees), dated June 29, 2022, as supplemented by letters dated November 17, 2022, and December 9, 2022, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-70 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 346, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications, and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Hipolito J. Gonzalez

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Date: 2023.05.02 14:20:37 -04'00'

Hipólito J. González, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Renewed Facility Operating License and Technical Specifications

Date of Issuance: May 2, 2023

ATTACHMENT TO LICENSE AMENDMENT NO. 346

SALEM NUCLEAR GENERATING STATION, UNIT NO. 1

RENEWED FACILITY OPERATING LICENSE NO. DPR-70

DOCKET NO. 50-272

Replace the following page of Renewed Facility Operating License No. DPR-70 with the attached revised page as indicated. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
3	3

Replace the following page of the Appendix A, Technical Specifications, with the attached revised page as indicated. The revised page is identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
3/4 8-2	3/4 8-2

(4) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70 to receive, possess and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(6) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

PSEG Nuclear LLC is authorized to operate the facility at a steady state reactor core power level not in excess of 3459 megawatts (one hundred percent of rated core power).

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 346, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications, and the Environmental Protection Plan.

(3) Deleted Per Amendment 22, 11-20-79

(4) Less than Four Loop Operation

PSEG Nuclear LLC shall not operate the reactor at power levels above P-7 (as defined in Table 3.3-1 of Specification 3.3.1.1 of Appendix A to this renewed license) with less than four (4) reactor coolant loops in operation until safety analyses for less than four loop operation have been submitted by the licensees and approval for less than four loop operation at power levels above P-7 has been granted by the Commission by Amendment of this renewed license.

(5) PSEG Nuclear LLC shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety

ACTION (Continued)

3. Determine the two remaining OPERABLE diesel generators are not inoperable due to common cause failure or perform Surveillance Requirement 4.8.1.1.2.a.2 within 24 hours. If the diesel generator is inoperable for preventive maintenance, the two remaining OPERABLE diesel generators need not be tested nor the OPERABILITY evaluated; and

4. In any case:

   a) Restore the inoperable diesel generator to OPERABLE status:

      1. Within 72 hours, or

      2. Within 14 days if the Supplemental Power Source (SPS) is available within 72 hours and verified once per 12 hours thereafter. If at any time the availability of the SPS cannot be met, either:

         a. Restore the SPS to available status or restore the diesel generator to OPERABLE status within 72 hours from entry into 3.8.1.1 Action b, or

         b. If 3.8.1.1 Action b has been entered for $\geq$ 48 hours, restore the SPS to available status or restore the diesel generator to OPERABLE status within 24 hours,

      Otherwise,

      3. Be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the next 30 hours.

c. With one independent A.C. circuit and one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining independent A.C. circuit by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; demonstrate the OPERABILITY of the remaining OPERABLE diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.2 within 8 hours; restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two independent A.C. circuits and three diesel generators to OPERABLE status within 72 hours from the time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

ACTION (Continued)

d. With two of the above required independent A.C. circuits inoperable:

1. Demonstrate the OPERABILITY of three diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.2 within 8 hours, unless the diesel generators are already operating; and

2. Within 12 hours, declare required systems or components supported by the inoperable offsite circuits inoperable when a required redundant system or component is inoperable, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours; and

3. Restore at least one of the inoperable independent A.C. circuits to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours; and

4. With only one of the independent A.C. circuits OPERABLE, restore the other independent A.C. circuit to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

e. With two or more of the above required diesel generators inoperable, demonstrate the OPERABILITY of two independent A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; restore at least two of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore three diesel generators to OPERABLE status within 72 hours from time of initial loss or be in least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

f. With one of the above required fuel transfer pumps inoperable, either restore it to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

g. With one of the above required fuel storage tanks inoperable, either restore it to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

h. LCO 3.0.4.b is not applicable to DGs.

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PSEG NUCLEAR LLC

CONSTELLATION ENERGY GENERATION, LLC

DOCKET NO. 50-311

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 327
Renewed License No. DPR-75

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment filed by PSEG Nuclear LLC, acting on behalf of itself and Exelon Generation Company, LLC (the licensees), dated June 29, 2022, as supplemented by letters dated November 17, 2022, and December 9, 2022, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-75 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 327, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Hipolito J. Gonzalez

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Date: 2023.05.02 14:21:01 -04'00'

Hipólito J. González, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Renewed Facility Operating License and Technical Specifications

Date of Issuance: May 2, 2023

ATTACHMENT TO LICENSE AMENDMENT NO. 327

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

RENEWED FACILITY OPERATING LICENSE NO. DPR-75

DOCKET NO. 50-311

Replace the following page of Renewed Facility Operating License No. DPR-75 with the attached revised page as indicated. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
3	3

Replace the following page of the Appendix A, Technical Specifications, with the attached revised page as indicated. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove	Insert
3/4 8-2	3/4 8-2

(3) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use at any time any byproduct, source or special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration and as fission detectors in amounts as required;

(5) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(6) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

PSEG Nuclear LLC is authorized to operate the facility at steady state reactor core power levels not in excess of 3459 megawatts (thermal).

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 327, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

ACTION (Continued)

3. Determine the two remaining OPERABLE diesel generators are not inoperable due to common cause failure or perform Surveillance Requirement 4.8.1.1.2.a.2 within 24 hours. If the diesel generator is inoperable for preventive maintenance, the two remaining OPERABLE diesel generators need not be tested nor the OPERABILITY evaluated; and

4. In any case:

   a) Restore the inoperable diesel generator to OPERABLE status:

      1. Within 72 hours, or

      2. Within 14 days if the Supplemental Power Source (SPS) is available within 72 hours and verified once per 12 hours thereafter. If at any time the availability of the SPS cannot be met, either:

         a. Restore the SPS to available status or restore the diesel generator to OPERABLE status within 72 hours from entry into 3.8.1.1 Action b, or

         b. If 3.8.1.1 Action b has been entered for $\geq$ 48 hours, restore the SPS to available status or restore the diesel generator to OPERABLE status within 24 hours,

      Otherwise,

      3. Be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the next 30 hours.

c. With one independent A.C. circuit and one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining independent A.C. circuit by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; demonstrate the OPERABILITY of the remaining OPERABLE diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.2 within 8 hours; restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two independent A.C. circuits and three diesel generators to OPERABLE status within 72 hours from the time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

ACTION (Continued)

d. With two of the above required independent A.C. circuits inoperable:

1. Demonstrate the OPERABILITY of three diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.2 within 8 hours, unless the diesel generators are already operating; and

2. Within 12 hours, declare required systems or components supported by the inoperable offsite circuits inoperable when a required redundant system or component is inoperable, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours; and

3. Restore at least one of the inoperable independent A.C. circuits to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours; and

4. With only one of the independent A.C. circuits OPERABLE, restore the other independent A.C. circuit to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

e. With two or more of the above required diesel generators inoperable, demonstrate the OPERABILITY of two independent A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; restore at least two of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore three diesel generators to OPERABLE status within 72 hours from time of initial loss or be in least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

f. With one of the above required fuel transfer pumps inoperable, either restore it to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

g. With one of the above required fuel storage tanks inoperable, either restore it to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

h. LCO 3.0.4.b is not applicable to DGs.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 346 AND 327 TO

RENEWED FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75

PSEG NUCLEAR LLC

CONSTELLATION ENERGY GENERATION, LLC

SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-272 AND 50-311

1.0 INTRODUCTION

By application dated June 29, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22180A268), as supplemented by letters dated November 17, 2022 (ML22321A124), and December 9, 2022 (ML22346A094), PSEG Nuclear LLC (PSEG or the licensee) submitted a license amendment request for the Salem Nuclear Generating Station, Unit Nos. 1 and 2 (Salem).

The amendment proposed to revise the Technical Specification (TS) Action 3.8.1.1.b.4 to extend the allowed out of service time (AOT) for an inoperable emergency diesel generator (EDG) from 72 hours to 14 days.

The supplemental letters dated November 17, 2022, and December 9, 2022, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on September 6, 2022 (87 FR 54553).

2.0 REGULATORY EVALUATION

2.1 Offsite Power System

The Salem offsite power is supplied to Salem from three physically independent, 500-kV circuits designed and located to minimize the likelihood of simultaneous failure. Two 500-kV transmission lines extend north from the plant via separate rights-of-way to two major switching stations: Public Service Electric and Gas (PSE&G) New Freedom Switching Station and Atlantic City Electric's Orchard Switching Station.

The third transmission line serves as a tie line to the adjacent Hope Creek Generating Station (Hope Creek) 500-kV switchyard, which is interconnected to the PJM 500-kV system via two

independent transmission lines. The Salem switchyard is a breaker-and-a-half scheme. The Salem offsite AC power sources are provided by a split 13-kV ring bus (north and south) that are connected to the 500-kV switchyard. Each 500-13-kV station power transformer (1SPT and 2SPT) feeds two (one for each unit) 13-4-kV station power transformers: 11SPT, 21SPT, and 12SPT, and 22SPT, which are associated with non-safety related (NSR) group buses. The 13-4-kV station power transformers, 13SPT and 14SPT, (Salem, Unit 1) share the loads of three vital buses and two circulating water bus sections, while 23SPT and 24SPT (Salem, Unit 2) share the loads of three vital buses and two circulating water bus sections. The 13-kV bus arrangements assure a continuous preferred power supply to each unit in the event one 500-13kV transformer should become inoperable.

2.2 Onsite Power System

The onsite power system for each unit consists of the main generator, the auxiliary power and station power transformers (SPTs), the EDGs, and the group vital and circulating water bus sections and their related distribution systems. The 4160-V (4-kV) buses, which feed safeguard equipment, are energized by SPTs served by the 13-kV south bus sections. Preferred power is supplied to the 13-kV bus south sections by two sources from the 500-kV switchyard. In case of a unit trip, each 4-kV group bus automatically transfers from the auxiliary power transformer source to the SPT source.

For each Salem unit, the 4160-V system is divided into four group bus sections, three vital bus sections, and two circulating water bus sections. Safeguards loads are divided among vital buses in three independent load groups. Each of these load groups is provided with a dedicated EDG which serves as a power supply in the event the preferred source is unavailable. The three 4-kV vital ac buses are normally energized from either No. 13 (23) or No. 14 (24) SPT through in-feed breakers 13 (23) ASD, 13 (23) BSD, 13 (23) CSD or 14 (24) ASD, 14 (24) BSD, and 14 (24) CSD. In the event the normal source to a 4-kV bus becomes unavailable, that bus can be automatically transferred to its alternate source under normal breaker alignments and protective relaying conditions.

In the event all offsite power is lost, the EDGs are automatically started and the normal in-feed breakers to each 4-kV vital bus are opened. Loading of each 4-kV vital bus is automatically controlled by a load sequencer to ensure post-accident loads are energized within the times analyzed in chapter 15 of the Updated Final Safety Analysis Report (UFSAR). The EDGs are designed to be ready to accept load within 13 seconds after receipt of a signal to start. The EDGs are started automatically by the safety injection signal or detection of a loss of offsite power, which is determined via 2-out-of-3 undervoltage (UV) protective relaying logic which initiates the loading sequence for each vital bus.

2.3 EDGs

The three ALCO Model 251G, 18-cylinder EDGs, will automatically start by accident initiation logic or on detection of a loss of offsite power. The continuous rating of each EDG is 2600 kW, 3250 kVA, 900 rpm, 4160-V, three phase, 60 cycles. Each EDG set supplies power to one 4160-V vital bus in the event of a loss of offsite power (LOOP). Each EDG is sized to handle the loads necessary for a design basis loss-of-coolant accident (LOCA) coincident with a LOOP.

The safety-related 125-Vdc power system provides power to safeguard loads via three separate and independent vital DC buses. Each bus provides an independent source of control power for each of the three 4-kV and 460-Vac vital buses and the 125-Vdc distribution cabinets. The

125-Vdc system also supplies power through inverters to the 115-Vac instrument buses that power critical Class 1E instrument loads. Two chargers, each capable of 100 percent normal load, are provided for each 28-V and 125-V battery. The 28-V and 125-V chargers are fed from the vital AC buses. The 28-Vdc system provides power to the safety-related interposing relay system. Each 28-V and 125-V battery is fed from two separate vital buses. The capacity of the station 125-Vdc Class 1E batteries is sufficient to provide power to all analyzed loads in response to a station blackout (SBO) condition for the required 4 hour coping period.

2.4 Current Technical Specification Requirements

Salem TS, Section 3.8.1.1, Action b.4, requires an inoperable diesel generator to be restored to OPERABLE status within 72 hours, or the plant be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

2.5 Proposed Technical Specification Requirements

The Salem, Unit 1 and Unit 2, TS 3.8.1.1, Action b.4, will be revised as follows to extend the AOT for the EDGs to 14 days:

4. In any case:
a) Restore the inoperable diesel generator to OPERABLE status:

1. Within 72 hours, or

2. Within 14 days if the Supplemental Power Source (SPS) is available within 72 hours and verified once per 12 hours thereafter. If at any time availability of the SPS cannot be met either:

a. Restore the SPS to available status or restore the diesel generator to OPERABLE status within 72 hours from entry into 3.8.1.1 Action b, or

b. If 3.8.1.1 Action b has been entered for $\geq$ 48 hours, restore the SPS to available status or restore the diesel generator to OPERABLE status within 24 hours,

Otherwise,

3. Be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the next 30 hours.

2.6 Reason for the Proposed Change

This proposed TS change is being requested to extend the TS AOT from 72 hours to 14 days to allow sufficient time and flexibility to perform planned EDG preventative maintenance and subsequent surveillances online to ensure long term diesel generator reliability and availability. The extended AOT also gives additional time for repairing and reestablishing operability in the

event of an emergent inoperability of an EDG while online, thus reducing the risk associated with a unit shutdown. To justify the 11 day extension to the existing TS AOT, a supplemental power source (SPS) is provided in the form of dual, trailer-mounted diesels that can be synchronized and connected to the 4-kV vital bus affected by the inoperable EDG.

2.7 Regulatory Requirements and Guidance

The NRC staff used the following regulatory requirements and guidance to evaluate the license amendment request (LAR):

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.36, "Technical specifications, "Section (c)(2)(i), requires that applicants for a license authorizing operation of a production or utilization facility include in their application proposed TSs that specify limiting conditions for operation (LCOs). LCOs are

> the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met.

10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," requires that preventive maintenance activities must be sufficient "to provide reasonable assurance that structures, systems, and components (SSCs) . . . are capable of fulfilling their intended functions." Section 50.65(a)(4) requires licensees to assess and manage the increase in risk that may result from proposed maintenance activities.

10 CR 50.63, "Loss of all alternating current power," requires licensees to assess the impact of station blackout, as defined in 10 CFR 50.2. In Section 50.2, station blackout is defined as "the complete loss of alternating current (ac) electric power to the essential and nonessential switchgear buses in a nuclear power plant (i.e., loss of offsite electric power system concurrent with turbine trip and unavailability of the onsite emergency ac power system)."

Branch Technical Position 8-8 Onsite (Emergency Diesel Generators) And Offsite Power Sources Allowed Outage Time Extensions (BTP 8-8) provides guidance from a deterministic perspective in reviewing requests for extensions for the EDGs and offsite power sources from the current allowed outage time up to 14 days to perform online maintenance of EDGs and offsite power sources.

NUREG 1764, "Guidance for the Review of Changes to Human Actions," Rev 1 (ML072640413) describes how to assess changes to manual operator actions and assess the safety significance of the actions. It provides direction to determine the level of human factors review necessary and provides the correlated acceptance criteria with risk insights.

RG 1.155, "Station Blackout," dated August 1988 (ML003740034), provides guidance for meeting the regulations that require nuclear power plants to be capable of coping with a station blackout for a specified duration.

RG 1.174, Revision 3, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated January 2018 (ML

17317A256), describes an acceptable risk-informed approach for assessing changes to licensing bases.

RG 1.177, Revision 1, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," dated May 2011 (ML100910008), describes an acceptable risk-informed approach for assessing proposed permanent TS changes in AOTs.

3.0 TECHNICAL EVALUATION

3.1 Electrical Engineering

3.1.1 Proposed Technical Specification Requirements - TS 3.8.1.1, Action b.4

The licensee stated in the LAR that the proposed extended AOT is based on a PSEG deterministic justification and a summary of probabilistic risk insights. The licensee proposed to extend the CT for an inoperable EDG to be removed from service from 72 hours to 14 days to perform preventative or corrective maintenance resulting from an emergent condition. The licensee evaluated the proposed change based on defense-in-depth features that are in place at Salem station to accommodate an extended AOT for the EDGs. The additional considerations and compensatory measures are consistent with the 14 day Action CT time permitted in BTP 8-8. In addition, the licensee performed a risk analysis to demonstrate that the proposal is within the risk acceptance guidelines in RG 1.174 and RG 1.177.

Station Blackout Capability

Salem SBO diesels 460/230 Vac are not formally credited in the licensing basis, provided for additional defense-in-depth protection as well as to reduce the risk significance of EDG performance issues during a 4 hour SBO coping period. One SBO diesel provides an available source of power to backup battery chargers for the 125-Vdc and 28-Vdc system. A second portable 'SBO' diesel is available to provide power to the 500-kV switchyard breaker controls. In section 3.3 of LAR, the licensee states:

> The Salem Generating Station SBO analysis was performed in accordance with the guidelines provided in Regulatory Guide 1.155, "Station Blackout," and NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors" for assessment of Salem's compliance with the requirements of 10CFR 50.63 [sic]. Salem does not utilize an alternate AC source operation approach; instead, the assessment uses the "AC-Independent" approach outlined in NUMARC 87-00 for its coping capability.
>
> EDG reliability is calculated based on NSAC-108 criteria and is considered to be 0.975 for Salem. . . . Increasing the EDG AOT to 14 days will not have any impact on the Salem target reliability used in the SBO coping time calculation at Salem.

It is noted by the staff that the summary of the coping evaluation was provided in the PSEG letter to NRC "Response to Safety Evaluation on Station Blackout (SBO) Salem Generating Station, Units 1 and 2," dated March 19, 1992 (ML18096A579). Based on the established 4 hour SBO coping period for Salem station and the additional risk mitigating defense-in-depth features available to restore AC power (either offsite or onsite), the staff finds that sufficient time margin exists to accommodate establishing the

supplemental power source in the event of a LOOP with one EDG inoperable and a failure of a remaining EDG.

The licensee's procedure ER-AA-201, "Emergency Diesel Generator Reliability Program," establishes the EDG Reliability Program for Hope Creek and Salem stations and provides guidance for monitoring start and load demands in relation to preset trigger values. The program provides direction on remedial actions if those trigger values are exceeded. The Salem Maintenance Rule program (10 CFR 50.65) has established three performance criteria to monitor the EDGs - unavailability, reliability, and condition monitoring. The licensee stated that it meets the zero functional failures over the span of 36 months. Staff noted that this will ensure the EDG reliability and or availability when the other EDG is in a 14 day AOT.

3.1.2 Assessment of NUREG-0800, BTP 8-8 Requirements

The NRC staff notes that during the maintenance on one EDG, the redundant EDG will be available to supply essential loads required to shut down the reactor and maintain it in a safe shutdown condition (assuming no failure in the redundant train), in the event of a design basis event. The BTP 8-8 specifically discusses the defense-in-depth aspects for onsite power sources from a deterministic perspective for proposed AOT extensions. The following is a list of BTP 8-8 guidance and how Salem meets the intent of these provisions:

> *a). The supplemental source must have the capacity to bring a unit to safe shutdown (cold shutdown) in case of a loss of offsite power (LOOP) concurrent with a single failure during plant operation (Mode 1).*

The licensee stated the supplement AC power will consist of two portable, trailer mounted diesel generators (AOT diesels) that will be synchronized and connected to one of two receptacle panels, one for each Salem unit, located on the exterior of the common circulating water (CW) switchgear building. A synchronizing cable is connected between the two AOT diesels allowing them to auto-synchronize when started. The AOT diesel generators, when synchronized, have a 2 hour rating of 4912 kW. The AOT diesels have been tested by the manufacturer to successfully start and accept a load representative of the largest Hope Creek load (1250 HP residual heat removal (RHR) pump) while feeding an established base load of 2750 KW. Each AOT diesel is equipped with a fuel tank with the capacity to run for a minimum of ten hours at rated load. The diesels are configured to be refueled while running via FLEX fuel transfer pumps and transportable, 1000 gallon fuel cubes.

The NRC staff noted that the AOT diesel generators have the capacity of 2 hour rating of 4912 kW, which is enough to start and accept large loads while feeding an established load of 2750 kW to meet the electrical load requirements for each of the three Salem EDGs during a LOOP concurrent with a single failure to safely shutdown the plant.

> *b). The permanent or temporary power source can be either a diesel generator, gas or combustion turbine, or power from nearby hydro units. This source can be credited as a supplemental source, that can be substituted for an inoperable EDG during the period of extended AOT in the event of a LOOP, provided the risk-informed and deterministic evaluation supports the proposed AOT and the power source has enough capacity to carry all LOOP loads to bring the unit to a cold shutdown.*

The adequacy of the capacity of the synchronized AOT diesels to supply all LOOP loads to achieve cold shutdown will be provided as a backup to a single inoperable EDG in case of a LOOP event concurrent with a failure of the remaining EDG during the extended CT. The portable AOT diesels will be shared with Hope Creek as dedicated supplemental power sources for EDG outages beyond 72 hours, although the AOT diesels will not be credited by both stations for extended AOTs at the same time. The AOT diesel generators, when synchronized, have a continuous less losses rating of 4350 kW. Each AOT diesel is equipped with a fuel tank with the capacity to run for a minimum of ten hours at rated load. In the event a Salem station is in an extended EDG outage crediting availability of the AOT diesels and both stations were to experience a complete loss of LOOP, Hope Creek station would respond per its design and licensing basis with the availability of its EDGs. Similarly, the Salem station not in an extended EDG outage would respond to the LOOP per its design and licensing basis with availability of its three EDGs. The Salem station in an extended EDG AOT would respond to the LOOP using the remaining two available EDGs which are sufficient to achieve cold shutdown of the unit. In the event one of the two EDGs were to experience a failure, the AOT diesel would be deployed within three hours to provide power to the 4kV emergency bus affected by the extended EDG outage. The synchronized AOT diesels in conjunction with one operating EDG are sufficient to obtain cold shutdown of the unit.

> *c). For plants using Alternate Alternating Current (AAC) or supplemental power sources discussed above, the time to make the AAC or supplemental power source available, including accomplishing the cross-connection, should be approximately one hour to enable restoration of battery chargers and control reactor coolant system inventory.*

Attachment 5 of this LAR provides a sequence of conservatively estimated time steps for completing all the required staging, connection, backfeed actions and to the impacted 4kV bus is estimated to be less than 3 hours. The only differences between the steps required for the ‘A’ vital bus and the ‘B’ and ‘C’ buses are the breaker designations that need to be manually aligned. The 3 hour time frame is bounded by the 4 hour required coping time for loss of all AC power for Salem. Hope Creek and Salem have the same AOT diesel package and connections. Hope Creek has a 3 hour time frame and validated the time frame as part of implementation of the TS amendment approved. The distance for the AOT diesels to the Salem connection points is shorter compared with the Hope Creek. Based on the above evaluation, the staff concluded that use of the Hope Creek timeline is considered to be conservative for application to Salem. The procedures and materials necessary for refueling the AOT diesels have already been established for their use at Hope Creek.

These same procedures and fuel transfer equipment will be adapted for use of the AOT diesels at Salem. The operations and maintenance training for staging, connecting and operating the AOT diesels developed for use at Hope Creek will also be applied for training Salem personnel. This is a regulatory commitment and stated in section 3.1.2 of this SE.

> *d). The availability of AAC or supplemental power source should be verified within the last 30 days before entering extended AOT by operating or bringing the power source to its rated voltage and frequency for 5 minutes and ensuring all its auxiliary support systems are available or operational.*

The BTP 8-8 requirement is to verify the availability of the AOT diesels prior to entry into the extended AOT, and every 12 hours thereafter. This is included in the proposed TS change. The

AOT diesel generators have been placed into a periodic testing program to ensure they are always available to support both planned and unplanned EDG outages. Hope Creek procedure HC.OP-PT.NB-4160, “AOT Diesel Generators Periodic Test,” was developed to perform this testing as part of implementation of the Hope Creek TS amendment (dated April 30, 2019, ML19073A073). This test procedure will continue to be used as a “common” procedure to support the extended AOT for Salem as well. Based on this, the staff concluded that the periodic test program ensure both AOT diesels are always available.

> *e). To support the one-hour time for making this power source available, plants must assess their ability to cope with loss of all AC power for one hour independent of an AAC power source*.

Existing Salem calculation ES-4.009 for Salem, Unit 1, and ES-4.010 for Salem, Unit 2, provide the 125-Vdc safety related battery sizing, load profile and voltage drop calculations for the Class 1E 125- Vdc system. Salem calculation ES-3.002 provides the 28-Vdc battery and battery charger sizing calculation for both Salem units. These calculations demonstrate that Salem can cope for up to 4 hours during a loss of all AC power (SBO). Licensee is therefore requesting a 3 hour allowance for establishing the supplement power based on this 4 hour coping period. Based on this, the staff concluded that the three hour timeframe conservatively established for staging and connecting the AOT diesels to backfeed the applicable Salem vital 4-kV bus.

> *f). The plant should have formal engineering calculations for equipment sizing and protection and have approved procedures for connecting the AAC or supplemental power sources to the safety buses.*

Salem calculation ES-15.004, “Load Flow and Motor Starting Calculation,” shows that safety related 4.16 kV motors require a minimum starting voltage of 70 percent and, ES-9.003, “System Dynamic Performance of the Salem NGS Emergency Diesel Generators,” shows that the 1A EDG has the worst case accident load profile. With the base load of 1677 kW, the 1A EDG exhibits a 19 percent measured voltage dip when starting the 856 kW Service Water Pump. The test reports provided by the supplier for the AOT diesels show that they can start (with less than 20 percent voltage dip) and supply all required Salem EDG loads. Salem’s EDG Protective Relaying Setpoint calculation ES-7.009, “Protective Relaying Setpoint Calculation – Salem 1 and 2 Emergency Diesel Generators,” will be revised to document the AOT diesel generator protective relaying setpoints.

There are two sets of undervoltage relays on 4-kV vital buses. One relay is set at 70 percent and the other is set at 95.1 percent with a time delay of 13 seconds and a reset time voltage of 96 percent. The AOT diesel generator voltage never dips to 70 percent when the maximum load was applied during factory testing. The120V settings for the 95.1 percent UV relays are 113-Vac with a 114.1-Vac (reset) based on a 4200/120 PT. Based on detailed test data provided in the vendor test report for the AOT diesels, the AOT diesel voltage recovered above 96 percent in less than 13.0 seconds for all simulated Hope Creek motor starts. Since the Salem motor loads are smaller than the Hope Creek motor loads, the staff concluded that the AOT diesel generator voltages will recover before the drop out time delay of the 95.1 percent UV relays on the vital 4-kV buses.

The Salem procedure OP-SA-102-106, “*Salem* Operations Master List of Timed Actions” provides the actions and timelines necessary to establish the AOT diesels within 3 hours. All station communications and interactions with ESOC are governed by Station procedure OP-AA-108-107-1001, “Response to Grid Emergencies and ESOC / ER&T Interface.” The

diesel driven air compressor is sized to maintain station air header pressure throughout the 4 hour coping period. Directions for use of the diesel driven air compressor are also controlled by Salem procedure S1(2).OP-AB.LOOP-0001. At the time of implementation, procedures will be developed for Salem station to stage and connect the supplemental power source. These procedures will be based on the procedures established for use of the AOT diesels at Hope Creek adapted to reflect the breaker alignments required to backfeed the Salem vital buses.

> *g). The EDG or offsite power AOT should be limited to 14 days to perform maintenance activities. The licensee must provide justification for the duration of the requested AOT (actual hours plus margin based on plant-specific past operating experience).*

The proposed AOT for the Salem EDGs is to 14 days based on the established scope and duration of the extensive 280 hour EDG maintenance window (9R) that currently takes place every ninth refueling outage. Unanticipated findings during post maintenance activities may present the potential to exceed the 280 hours, a contingency of 56 hours is proposed to be added to 280 hours to arrive at the proposed 14 day (336 hours) AOT.

> *h). The Tech Specs (TS) must contain Required Actions and Completion Times to verify that the supplemental AC source is available before entering extended AOT.*

For an inoperable EDG, the proposed change to TS 3.8.1.1 Action b.4 will require verification that the AOT diesel generators is available within 72 hours.

> *i). The availability of the AAC or supplemental power source shall be checked every 8-12 hours (once per shift).*

The proposed change to TS 3.8.1.1 Action b.4 will include a requirement to verify the supplemental power source is available within 72 hours and once per 12 hours thereafter.

> *j). The extended AOT will be used no more than once in a 24-month period (or refueling interval) on a per diesel basis to perform EDG maintenance activities, or any major maintenance on offsite power transformer or bus.*

The extended AOT will be applied for planned maintenance outages no more than once in an 18-month period per EDG which corresponds to Salem's refueling interval. The Salem EDG out-of-service hours are tracked in accordance with Maintenance Rule unavailability requirements. No limit is placed on the use of the extended AOT for unplanned (emergent) maintenance.

> *k). The preplanned maintenance will not be scheduled if severe weather conditions are anticipated.*

Salem procedure OP-SA-108-116, "Operability Assessment and Equipment Control Program" which will control entry into the extended TS AOT will be revised to ensure that voluntary entry into the extended AOT should not be scheduled if adverse weather conditions are expected. This is a licensee regulatory commitment and stated in section 3.1.2 of this SE.

> *l). The system load dispatcher will be contacted once per day to ensure no significant grid perturbations (high grid loading unable to withstand a single contingency of line or generation outage) are expected during the extended AOT.*

In section 3.2 Grid Reliability, the licensee states:

> The Salem 500-kV switchyard is sourced by three independent offsite transmission lines; . . . Any one transmission line provides sufficient power for post-accident and safe-shutdown loads for both Salem stations. The electrical and geographical independence of these three offsite transmission lines provide increased reliability relative to the connection of the Salem offsite sources to the PJM 500-kV system.

Salem procedure OP-SA-108-116, "Salem Operability Assessment and Equipment Control Program," will be revised to include the requirement to contact the grid operator once per day during the extended AOT to ensure no significant grid disturbances are expected. This is a regulatory commitment, stated in section 3.1.2 of this SE.

> *m). Component testing or maintenance of safety systems and important non safety equipment in the offsite power systems that can increase the likelihood of a plant transient (unit trip) or LOOP will be avoided. In addition, no discretionary switchyard maintenance will be performed.*

Salem procedures OP-SA-108-116 which will be used to control entry into the extended TS AOT and OP-AA-108-116, "Protected Equipment Program," will ensure component testing or maintenance of safety systems and important non safety equipment in the offsite power systems that can increase the likelihood of a plant transient (unit trip) or LOOP will be avoided during the extended 14 day AOT. This is a regulatory commitment, stated in section 3.1.2 of this SE.

> *n). TS required systems, subsystems, trains, components, and devices that depend on the remaining power sources will be verified to be operable and positive measures will be provided to preclude subsequent testing or maintenance activities on these systems, subsystems, trains, components, and devices.*

TS required equipment will be verified to be operable in accordance with TS and appropriate LCO Action Statements will be entered as applicable. Maintenance and testing activities will also be controlled in accordance with the operability requirements for the affected equipment contained within the TS. Use of the AOT diesels as a supplemental power source does not alter Salem's approach to ensuring operability of TS required systems, subsystems, trains, components, and devices.

> *o). Steam-driven emergency feed water pump(s) in case of PWR units, and Reactor Core Isolating Cooling and High Pressure Coolant Injection systems in case of BWR units, will be controlled as "protected equipment".*

Salem procedures OP-SA-108-116 which will be used to control entry into the extended TS AOT and OP-AA-108-116 will be revised to ensure that the Turbine-Driven Auxiliary Feedwater Pump and all supporting systems and components shall be operable and controlled as protected equipment. This is a regulatory commitment, stated in section 3.1.2 of this SE.

3.1.3 Electrical Engineering Conclusion

The NRC staff reviewed the proposed TS changes to Salem, Unit 1 and Unit 2, TS 3.8.1.1, Action b.4, to extend the CT of one inoperable EDG to 14 days. The licensee used the BTP 8-8

guidelines for deterministic assessment. The staff reviewed the licensee responses to BTP 8-8 guidelines, and found they are acceptable and are therefore in compliance with the 10 CFR 50.36(c)(2)(i). Salem uses Hope Creek procedures and connecting time of 3 hours for AOT diesels that will be synchronized and connected. The distance for the AOT diesels to the Salem connection points is shorter compared with Hope Creek. The Salem Maintenance Rule program (10 CFR 50.65(a)(4)) has established zero functional failures over the span of 36 months. Staff noted that this will ensure the EDG reliability and/or availability when the other EDG is in 14 day AOT. The SBO analysis was performed for assessment of Salem compliance with the requirements of 10 CFR 50.63. Per the SBO analysis, there is reasonable assurance that the AOT Diesels can be used to bring the plant to cold shutdown. The SBO diesels are not formally credited in the licensing basis; however, they provide additional defense-in-depth protection as well as reduce the risk significance during the coping period. Based on the above evaluation, the NRC staff concludes, the proposed TS changes TS 3.8.1.1, Action b.4, to Salem, Units 1 and 2, are acceptable.

3.2 Human Factors Engineering

3.2.1 Description of Personnel Actions

Currently, Salem performs online maintenance every 18 months per EDG during a 72-hour AOT as directed by TS 3.8.1. The submittal states the durations are typically scheduled for 50 percent of the AOT to ensure the time allotted is sufficient. These activities address preventative maintenance and previously identified equipment issues that do not affect operability. The submittal described the current online maintenance activities at Salem which takes approximately 36 hours (50 percent of the current 72-hour AOT). PSEG provided a typical scope of the current online work as including the following:

- Rack Booster Replacement
- Fuel Rack and Linkage Lubrication
- Governor Oil Sampling
- Jacket Water Pressure Switch Calibration
- Banjo Bolt Torque Check
- Jacket Water Gasket Repairs
- Pre-lube Pump Replacement
- Cylinder Indicator Valve Replacement

The proposed change would add activities typically performed during the refueling outages to the extended AOT. This change would combine the current online maintenance activities with maintenance activities that are currently performed in larger windows of time during refueling outages.

Refueling outage maintenance activities are scheduled such that designated activities are performed in accordance with plant procedure SC.MD-PM.DG-0032, “Standby Diesel Generator Inspection,” on a once-per-cycle basis and one EDG per refueling outage is scheduled for a large window of work on three, six and nine refueling cycle frequencies. The licensee states that the duration of these maintenance windows are as follows:

- 1R Maintenance Window (once per cycle) – 90 hours
- 3R Maintenance Window (once per 3 cycles) – 120 hours
- 6R Maintenance Window (once per 6 cycles) – 120 hours

- 9R Maintenance Window (once per 9 cycles) – 280 hours

As the time it takes to complete these additional maintenance activities would take much longer, this is the basis for the extension of the AOT. The submittal states that the proposed change moves these maintenance activities from the refueling outage plan to the proposed 14 day extended AOT. PSEG identifies the change in maintenance activities as being associated with the EDGs specifically, with no other safety systems receiving maintenance.

PSEG proposes a contingency of 56 hours (2.3 days) to be added to the longest established maintenance window of 280 hours. This additional time is provided to accommodate unanticipated discovery and/or complications and associated troubleshooting that can arise during a major EDG overhaul or during emergent troubleshooting and associated repairs that can potentially arise during plant operation.

PSEG provided the proposed changed TS. This expands the AOT for T.S. 3.8.1.1, Action b.4, to include an additional human action (HA) of verifying the availability and readiness of the SPS within the 72-hour period for which the current TS requires restoration of the inoperable diesel generator to supply either train of safety related loads.

In the LAR stated, PSEG stated that Salem will implement the requirements outlined in BTP 8-8 which includes crediting the availability of a supplemental power source SPS. The SPS consists of two portable, AOT diesels. These AOT diesels which are synchronized, and trailer mounted, can provide AC power to the vital bus impacted by the EDG outage in the event of a loss of offsite power concurrent with a single failure of a remaining EDG during plant operation in the extended AOT. The proposed change will utilize the AOT diesels by connecting them to one of two receptacle panels, one for each Salem unit. Each of the two AOT diesels is stored onsite within the protected area on a trailer within weatherproof enclosures.

The procedures and materials necessary for refueling the AOT diesels have already been established for their use at Hope Creek. These same procedures and fuel transfer equipment will be adapted for use of the AOT diesels at Salem. Additionally, the operations and maintenance training for staging, connecting, and operating the AOT diesels developed for use at Hope Creek will also be applied for training Salem personnel.

3.2.2 Determination of Human Factors Level of Review

The staff reviewed the proposed changes and considered the related actions involved limited to the EDGs and the recovery of emergency AC or offsite power. PSEG presented a deterministic based (non-risk informed) amendment request supplemented by risk insights, which is in alignment with NRC BTP 8-8. As such, the staff proceeded with a non-risk informed screening process as outlined in NUREG-1764.

The staff assessed the safety significance of the identified HA by reviewing Table A.2, “Generic PWR Human Actions That Are Risk Important,” in Appendix A of NUREG-1764. The staff verified that no actions from “Group 1: PWR Human Actions That Are Risk-important,” are included in the submittal. However, in “Group 2: PWR Potentially Risk-Important Human Actions,” the following action is included: Recover Emergency AC or Offsite Power. This includes recovering AC power by either manual transfer of the source of offsite power, or recovery of onsite normal/emergency AC power. The proposed Required Action B.2. falls into this category. Due to the potential risk, the staff further screened the identified HA and the associated TS changes to determine the level of review required. The staff performed an

independent evaluation of one inoperable EDG for the proposed AOT and conferred with the NRC risk analyst as the initial input for the screening process.

The proposed TS changes pertaining to the transfer of the source of AC power includes an addition of a supplemental power source in the form of AOT diesels. The submittal stated the proposed extension to the AOT does not introduce any new operator actions. The proposed changes require operators to align and ensure availability of the AOT diesels associated with one inoperable EDG.

In Section 3.8, “Risk Assessment of Increasing the EDG AOT to 14-Days,” PSEG included supplemental risk insights in the submittal, specifically a quantitative and qualitative analysis of the change in risk associated with the proposed TS changes extending the AOT for the three Salem EDGs individually. Additionally, by letter dated November 29, 2002 (ML22333A902) the staff requested additional information in accordance with NUREG 1764 2.3.5.1, which outlines methods for qualitative assessments. By letter dated December 9, 2022, (ML22346A094) PSEG provided the requested information regarding the HAs associated with ensuring the availability and operability of the designated SPS.

NUREG 1764 states that plant modifications and their associated HAs, such as the change proposed by PSEG in this submittal can be categorized into regions of high (I), medium (II), and low risk (III), which contributes to the determination of the necessary level of HFE review.

The staff reviewed the LAR and the RAI response provided by PSEG to assess the following relevant aspects of the proposed TS changes in accordance with NUREG 1764:

- Operating Experience
- New Human Actions
- Change in Automation
- Change in Tasks
- Change in Performance Context
- Level of Communication
- Team Aspects

Based on the review of table A.2, in NUREG-1764, a qualitative assessment of the safety-significance of Required Action B.2., and an evaluation of the afore mentioned relevant aspects of the proposed TS change associated with the required action provided by PSEG (clarity of referenced procedures, task descriptions, and the time allotted for the actions included in the proposed TS change), a Level III human factors review was determined to be appropriate. Therefore, the staff applied the criteria for a Level III review.

3.2.3 Human Factors Technical Evaluation

Although the NRC staff ultimately determined that a Level III review was appropriate for the reasons stated above, the staff considered information in the application and RAI response when conduction the screening process which resulted in changing the level of review from level II to level III. Thus, the staff has documented the considerations supporting this decision in this portion of the IOLB Safety Evaluation Input. Of note, the level of detail presented is similar that of Level II review.

The NRC staff reviewed T.S. 3.8.1.1 Action b.4, of ensuring the readiness and availability of the AOT diesels. The associated tasks are clearly defined, and proceduralized and included in the TS bases. PSEG committed to training licensed operators and auxiliary operators training on the purpose and use of the AOT diesels DG System. Operator rounds will ensure the availability of the AOT diesels and provide an additional level of overall monitoring. A dedicated, 1.0 MW load bank is stationed near the AOT diesel storage location to accommodate routine load testing of each AOT diesel to ensure availability for use during an extended EDG outage. Routine testing of the AOT diesels is accomplished by Hope Creek procedure HC.OP-PT.NB-4160, “AOT Diesel Generators Periodic Test.”

PSEG provided descriptions of the plant staff actions and stated that the actions associated with placing the AOT diesels into service are similar in nature to those plant actions that already exist relative to operator response strategies associated with a Station Blackout (SBO) event as well as placing FLEX equipment into service to address beyond design basis events. The response to RAI IOLB-1 clarified that there have been no problematic issues identified based on operating experience associated with implementing the procedures that govern the actions associated with FLEX and SBO response strategies. The additional HA introduced in TS 3.8.1.1 was described by PSEG as is analogous to several HA’s previously modeled in the Salem PRA.

PSEG also stated in the response to RAI IOLB-1 that planned procedures and validation effort are expected to be highly similar to those related to the Salem FLEX equipment and for the use of the AOT diesel generators which are also used at Hope Creek. Additionally, PSEG stated that though the functional responsibilities for staging, connecting, starting, and loading the AOT diesel generators represent an additional set of tasks to the Salem plant organization, PSEG also stated in the response to RAI IOLB-1 that the activities are not new or especially unique in nature. PSEG further stated that the activities involved (e.g., hauling the diesel trailers and cable reels, plugging in cables, starting the diesels and performing breaker manipulations) are not unique unto themselves and are routinely performed during both normal operations and abnormal conditions as directed by the established procedures.

PSEG described the required established chain of communications for the proposed TS change as no different than those established in the procedures regarding staging and using FLEX and SBO equipment. Therefore, the proposed AOT diesel generator staging, connection and backfeed activities do not increase the complexity of communications. The team aspects associated with staging and using the AOT diesel generators were also described as no different than the team aspects associated with any number of actions required for normal and off-normal plant operations

PSEG also provided information confirming Salem’s ability to cope with loss of all AC power for 4 hours independent of an alternate alternating current (AAC) power source (i.e., additional diesels, gas or combustion turbines, hydro units, or other power sources) in accordance with BTP 8-8. PSEG provided a detailed description of associated procedures and provided the times associated to complete the tasks. The total time required to stage the AOT diesels, electrically connect them to the respective backfeed panel and align associated bus breakers to the impacted 4kV bus is estimated to be less than 3 hours. This is bounded by the four-hour required coping time for loss of all AC power for Salem. The procedures for establishing the AOT diesels for Salem will be based on those procedures developed for Hope Creek and the actions for establishing the AOT diesels will be included in Salem procedure OP-SA-102-106, “Salem Operations Master List of Timed Actions” and will be time validated as part of implementation of the amendment.

PSEG described the activities associated with proposed extended AOT. The staff reviewed the proposed maintenance to be completed during the extended AOT and TS 3.8.1.1 Action B.4. added to the proposed TS. The staff also reviewed the actions associated with the change of alternative AC source in accordance with BTP 8-8 and found no new actions or change in actions as the SBO system is already in place. The staff verified that the actions are in the low-risk category after assessing the risk insights provided in the submittal and by completing a qualitative assessment of the action identified by the licensee which could potentially pose a risk in accordance with NUREG 1764. Thus, there is no need for further analysis as there is no risk significance regarding HFE aspects of the proposed change to the TS. The staff finds the requested change to TS 3.8.1.1 acceptable.

3.2.3 Human Factors Conclusion

The NRC staff concludes that the licensee's request does not have an adverse effect on safety. Staff reviewed the licensee's analysis methods and detailed descriptions to verify that only a Level III review is necessary. As such, the staff finds that there is no degradation in the ability to provide an emergency alternative power source. The staff finds that the existing operator actions contained in the current licensing basis continue to provide a reasonable means of ensuring safety during the extended completion time proposed. Ultimately the staff finds the that the elements in 10 CFR 50.36 and NUREG 1764 were met, and the proposed changes are acceptable with regard to HFE.

3.3 Risk Insights

The licensee stated that the proposed amendment was deterministic and was developed using the guidelines in Branch Technical Position 8-8, "Onsite (Emergency Diesel Generators) and Offsite Power Sources Allowed Outage Time Extensions." In Section 3.8, "Risk Assessment of Increasing the EDG AOT to 14-Days," of the LAR, the licensee stated that a quantitative and qualitative risk assessment was performed to support the LAR. The licensee provided the quantitative risk assessment results in the LAR and additional risk insights in the LAR supplement dated November 17, 2022.

Because this LAR is not a risk-informed application, the NRC staff did not review the licensee's probabilistic risk assessment (PRA) models to determine their technical acceptability as a basis to support this application. As a result, the NRC staff did not rely on the quantitative risk information provided by the licensee in the LAR. However, the NRC staff considered the licensee's risk insights to aid in the deterministic review of the proposed change.

The NRC staff determined that "special circumstances," as discussed in NUREG-0800, Section 19.2, "Review of Risk Information Used to Support Permanent Plant-Specific Changes to the Licensing Basis: General Guidance," dated June 19, 2007 (ML071700658), which would have necessitated additional risk information to be provided, did not exist for the proposed change.

In Section 3.6, "Supplemental AC Power Source for Extended AOT," of the LAR, the licensee described a supplemental alternating current (AC) power source that is required to be available throughout the extended AOT that can provide AC power to the vital bus impacted by the EDG outage in the event of a loss of offsite power (LOOP) concurrent with a single failure of a remaining EDG during plant operation in the extended AOT. The licensee stated that the supplemental AC power source will consist of two portable, trailer-mounted diesel generators (AOT DGs). The licensee stated that the AOT DGs will be shared with Hope Creek as dedicated

supplemental power sources for EDG outages beyond 72 hours, but the AOT DGs will not be credited by both stations for extended AOTs at the same time.

In the LAR supplement, the licensee provided risk insights associated with internal events, fire events, seismic events, and other external hazards. For other external hazards, the licensee stated that the IPEEE identified that fire and seismic events were the only important external event contributors to risk and there are no significant vulnerabilities to other external events. For internal events, the licensee stated that the two sequences with the greatest contribution to risk when an EDG is in the extended AOT are (1) a station blackout (SBO) scenario with auxiliary feedwater (AFW) and cooldown success and (2) an SBO scenario with the loss of AFW. The licensee stated that these two sequences account for the majority of the increase in risk for each EDG. The licensee also stated that the most likely cause of failure of the AOT DGs is operators failing to align the AOT DGs.

For fire events, the licensee discussed a vulnerability that was identified and addressed as part of Salem's Individual Plant Examination of External Events (IPEEE). This vulnerability involved redundant sets of cables supplying offsite power to the vital buses that are separated by less than 10 feet in a portion of the turbine and service buildings. As a result of the IPEEE, the licensee implemented transient combustible controls for this area. The licensee stated that this vulnerability is relevant to the application because power from the AOT DGs travels in the same cables as offsite power in route to the vital buses. For fires in this portion of the turbine and service buildings, an EDG would be effective in powering the vital buses, but the AOT DGs would not be effective in powering the vital buses. The licensee concluded that there is an increased fire risk in this portion of the turbine and service buildings if an EDG is out of service for the extended AOT. The licensee stated that this risk increase is mitigated by the licensee's process for implementing the requirements of 10 CFR 50.65(a)(4).

For seismic events, the licensee stated that the LOOP frequency calculated in the Salem Seismic Hazard and Screening Report (ML14090A043) was several orders of magnitude lower than the LOOP frequency calculated in the internal events PRA. The licensee concluded that the overall increase in risk associated with the AOT extension is dominated by the increase in risk from internal events.

In addition to reviewing the licensee's risk insights, the NRC staff performed an independent assessment using the NRC's Standardized Plant Analysis Risk (SPAR) model for Salem Generating Station. The NRC staff used the SPAR model for Salem to assess the proposed change and identified risk insights and the dominant risk contributors for the proposed change. The NRC staff concluded the licensee's risk insights support the proposed change and the licensee appropriately identified the dominant risk scenarios for the proposed change. The NRC staff noted that the licensee's diverse and flexible coping (FLEX) strategies provide an additional level of defense-in-depth during the proposed change.

The NRC staff's review of the licensee's risk insights finds that (1) the licensee appropriately identified the dominant risk scenarios for the proposed change and (2) the licensee's available procedures appropriately manage the risk from the dominant risk scenarios. Therefore, the NRC staff concludes that the licensee's risk insights support the proposed change.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State official was notified of the proposed issuance of the amendment on March 23, 2023. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and change SRs. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve NSHC, published in the *Federal Register* on September 6, 2022 (87 FR 54553), and there were no public comments on such finding. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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Date: May 2, 2023

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 − ISSUANCE OF AMENDMENT NOS. 346 AND 327 RE: REVISE TECHNICAL SPECIFICATIONS TO EXTEND ALLOWABLE OUTAGE TIME FOR INOPERABLE EMERGENCY DIESEL GENERATOR (EPID L-2022-LLA-0095) DATED MAY 2, 2023

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