



10 CFR 50.90

LR-N22-0084  
LAR S22-02

November 17, 2022

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Salem Generating Station, Units 1 and 2  
Renewed Facility Operating License Nos. DPR-70 and DPR-75  
NRC Docket Nos. 50-272 and 50-311

Subject: **Response to Final Request for Additional Information for Salem LAR to Revise TS to Extend Allowed Outage Time for Inoperable EDG (EPID L-2022-LLA-0095)**

- References:
1. PSEG letter to NRC, "License Amendment Request to Amend Salem Unit 1 and Unit 2 Technical Specifications (TS) to Extend the Allowed Outage Time for an Inoperable Emergency Diesel Generator from 72 hours to 14 Days," dated June 29, 2022 (ADAMS Accession No. ML22180A268)
  2. NRC e-mail to PSEG, "Final RAI for Salem LAR to Revise TS to Extend Allowed Outage Time for Inoperable EDG (EPID L-2022-LLA-0095)," dated October 17, 2022, (ADAMS Accession No. ML22290A220)

In the Reference 1 letter, PSEG Nuclear LLC (PSEG) submitted a license amendment request (LAR) for Salem Generating Station Units 1 and 2 (Salem). The proposed amendment would revise Salem Technical Specification (TS) Action 3.8.1.1.b.4 to extend the allowed outage time (AOT) for an inoperable emergency diesel generator (EDG) from 72 hours to 14 days.

In Reference 2, the U.S. Nuclear Regulatory Commission staff provided PSEG a Request for Additional Information (RAI) to support the NRC staff's detailed technical review of Reference 1. The enclosure to this letter contains the responses to the RAI question contained in Reference 2.

PSEG has determined that the information provided in this submittal does not alter the conclusions reached in the 10 CFR 50.92 no significant hazards determination previously submitted. In addition, the information provided in this submittal does not affect the bases for

concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter.

If you have any questions or require additional information, please contact Mr. Michael Wiwel at 856-339-7907.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 11/17/2022  
(Date)

Respectfully,



David Sharbaugh  
Vice President – Salem Generating Station  
PSEG Nuclear LLC

Attachment: Response to Final Request for Additional Information for Salem LAR to Revise  
TS to Extend Allowed Outage Time for Inoperable EDG (EPID L-2022-LLA-0095)

cc: Administrator, Region I, NRC  
NRC Project Manager  
NRC Senior Resident Inspector, Salem  
Ms. A. Pfaff, Manager, NJBNE  
PSEG Corporate Commitment Tracking Coordinator  
Station Commitment Tracking Coordinator

**Attachment 1**

**Response to Final Request for Additional Information for Salem LAR to Revise TS to  
Extend Allowed Outage Time for Inoperable EDG (EPID L-2022-LLA-0095)**

## **BACKGROUND**

By application dated June 29, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22180A268), PSEG Nuclear (the licensee) requested a change to the Technical Specifications (TSs) for Salem Generating Station, Units 1 and 2 (Salem). The proposed change would modify TS Action 3.8.1.1.b.4 to extend the allowed out of service time for an inoperable emergency diesel generator (EDG) from 72 hours to 14 days.

## **NRC CONSIDERATION OF RISK INSIGHTS**

The proposed amendment is not a risk-informed amendment submitted in accordance with Regulatory Guide 1.174. Therefore, the NRC staff does not review the licensee's probabilistic risk assessment models to determine their technical acceptability. The NRC staff does not rely on the quantitative risk information provided by the licensee in the license amendment request (LAR). However, the NRC staff considers the licensee-provided qualitative risk insights and associated compensatory measures in its decision on the proposed change.

### **RAI APLC-1: Risk Insights Identified During the Risk Assessment**

The licensee states that the proposed amendment is 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." The licensee also states that additional risk insights reflecting the change in the allowed outage time (AOT) are provided.

Section 1.0, "Summary Description," of the enclosure to the LAR provides an overview of the proposed change. It states that the proposed extended AOT is based on a deterministic justification and a summary of probabilistic risk insights.

Section 3.8, "Risk Assessment of Increasing the EDG AOT to 14 Days," of the enclosure to the LAR describes the results of the risk assessment performed in support of this LAR. It states that a quantitative and qualitative analysis of risk was performed to support the conclusion that the change in risk associated with the proposed 14-day AOT extension for the emergency diesel generators is acceptable. In addition, the notes for tables 3.8-1 and 3.8-2 state that risk contributions from fire, seismic, and other external hazards were evaluated qualitatively in the risk assessment.

Since the proposed amendment is not a risk-informed amendment submitted in accordance with Regulatory Guide 1.174, the NRC staff considers the licensee-provided qualitative risk insights and associated compensatory measures, but the NRC staff does not rely on the quantitative risk information provided in the LAR. The NRC staff did not find a discussion of the risk insights mentioned in the LAR and section 1.0 of the enclosure to the LAR and how these insights support the request.

Please address the following:

Discuss the risk insights mentioned in the LAR and section 1.0 of the enclosure to the LAR for the proposed request to increase the EDG AOT to 14 days and justify how those insights support this application. The discussion should include the qualitative risk insights associated with fire, seismic, and other external hazards and their impact on this application.

### **Response to RAI APLC-1**

A quantitative and qualitative analysis of risk was performed to support the conclusion that the change in risk associated with the proposed Technical Specification (TS) Allowed Outage Time (AOT) extension for the Emergency Diesel Generators is acceptable. This risk analysis addressed Key Principles 4 and 5 of the Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.174 and RG 1.177, and the risk was calculated consistent with NRC guidance provided in these RGs.

### **Internal Events Insights**

The data for the AOT Diesel Generator (DG) failure to run and failure to start events were taken from the PWR Owner's Group report PWROG-18042-NP Revision 1. Like the other Human Reliability Analysis (HRA) events in the model, the HRA was performed using the EPRI HRA calculator and the Cause Based Decision Tree Method (CBDTM). The most likely failure cause for the AOT diesels is the operators failing to align the AOT diesels, but the possibility of hardware failure is also a significant contributor to risk. The deterministic portions of the License Amendment Request (LAR) focus on the PSEG activities to ensure that capable and reliable diesels are available, and procedures and training ensure that operators are likely to be successful.

The delta Core Damage Frequency (CDF) cutsets for the Emergency Diesel Generator (EDG) 'A' case show that the dominant sequences are initiated by Loss of Offsite Power (LOOP) events, followed by a failure of a 'B' train component that leads to loss of the 'B' EDG. The sequence with the highest contribution is a station blackout (SBO) scenario with Auxiliary Feedwater Flow (AFW) and cooldown success. This sequence credits the AOT DGs, however, SBO conditions result either from operator failure to shed DC loads to enable sufficient time for AOT DG alignment, or random failures of the AOT DGs themselves, including operator failure to align and start the DGs. The Salem-specific design feature of note is that the power to the two fuel oil transfer pumps is provided by the 'A' and 'B' trains, thus the 'C' EDG could not be refueled in certain scenarios.

The sequence with the second greatest contribution is another SBO scenario which includes loss of steam generator cooling due to loss of feedwater. The two motor-driven AFW pumps and the turbine-driven AFW pump are unavailable due to loss of power, and the 4th (non-safety related) AFW pump experiences a random failure. No credit is given to the AOT DGs to restore power to AFW.

These two sequences account for the majority of the delta CDF cutsets for the 'A' EDG maintenance case. The majority of the remaining delta CDF is made up of similar SBO sequences. The 'B' EDG maintenance case leads to sequences that are mirror images of the 'A' EDG scenarios described above. The 'C' EDG sequences are similar, but show much lower risk because of the fuel transfer system design described above.

### Fire Insights

Section 1.4.2 of Salem's individual Plant Examination of External Events (IPEEE) discusses the station fire risk. As part of this internal fire analysis, one potential plant vulnerability was identified, and a plant enhancement has been implemented as a result. There are two sets of cables supplying offsite power to the 4kV vital buses and these are routed through one elevation of the turbine and service buildings before entering the auxiliary building. The two sets provide a redundant source of power to the vital 4kV buses. Thus, if one set is damaged by fire, the second set could provide power to all three buses. In the turbine and service buildings, the two redundant sets of cables are separated by less than 10 feet for a portion of the area. No significant fixed combustible sources are located within 30 feet of the cables and are therefore not considered to be risk significant. However, as a result of the fire IPEEE, transient combustible controls similar to those in place for the auxiliary building, penetration areas, and service water intake structure have been put into effect for this area of the turbine and service buildings. The internal fire Probabilistic Risk Assessment (PRA) model was credited with this enhancement and was reflected in the IPEEE results.

This vulnerability is relevant to the AOT diesel configuration because the power from the AOT diesels travels in the same cables as the offsite power in route to the vital buses. For these fires, where an EDG would be effective in powering the vital buses, the AOT diesels would not be effective. Therefore, there is an increased fire risk in these areas if it is assumed that the onsite EDGs will be in maintenance configurations for the extended AOT. This risk increase is mitigated by Salem's "fire-in-a4 process," which is implemented in accordance with 10CFR50.65(a)(4). Under this process, for any Technical Specification AOT longer than 72 hours that is within the scope of the program, risk management actions will be proceduralized and implemented.

During preparation of the LAR, conservative calculations were performed and the quantitative results and insights were comparable to those discussed in the internal events PRA. The calculations resulted in a  $\Delta$ CDF and an Incremental Conditional Core Damage Probability (ICCDP) comparable to that of the Full Power Internal Events (FPIE) results for a 14-day AOT. Since the change in CDF is acceptable, it is judged that the change in Large Early Release Frequency (LERF) will also be acceptable, and the risk metrics of interest meet the acceptance criteria in RG 1.174 and RG 1.177.

Since the submittal of the LAR, Salem has completed a Fire PRA and that PRA is currently undergoing an industry peer review. A review of the PRA results show fire risk associated with non-turbine and non-service building fire scenarios for the extended EDG AOT is judged to be negligible given that those scenarios will not result in a LOOP or if they do result in a LOOP, the AOT DG would be effective in powering a safety bus. Additionally, the important fire scenarios were reviewed, and fires in the turbine building and service building are not important contributors to fire risk.

### Other external hazard insights

The Salem Seismic Hazard and Screening Report performed in response to the NRC's Request for Information regarding Recommendation 2.1 of the Near-Term Task force Review of Insights from the Fukushima Dai-ichi Accident (LR-N14-0051 [Reference 1]) includes an assessment of seismic induced LOOP. The LOOP frequency for the seismic damage states described in this report was determined to be several orders of magnitude lower than the LOOP frequency calculated for internal events PRA. During preparation of the LAR, conservative estimations of seismic risk were performed. Assuming certain failure of the AOT DG, seismic  $\Delta$ CDF and an ICCDP is estimated to be much lower than the estimates from FPIE. This indicates that the overall risk increase for the AOT extension is dominated by that calculated in the internal events PRA.

The Salem IPEEE identified that fire and seismic events were the only important external event contributors to CDF at Salem. Other external event hazards have been screened out, either by compliance with the 1975 Standard Review Plan (SRP) criteria or by bounding probabilistic analyses that demonstrate a CDF that is less than the IPEEE screening criterion. The IPEEE has demonstrated that Salem Generating Station has no significant vulnerabilities to external events.

The risk associated with other external events is determined to be negligible for this AOT extension because the likelihood of a LOOP is significantly less than the likelihood of a random LOOP modeled in the FPIE.

### Summary

The risk impacts of extending the EDG AOT have been analyzed to assess internal events and external events risk increases. The common element through all of these analyses is the overall risk importance associated with operator actions to perform DC load shedding during an SBO event and to correctly place the AOT diesels into service. The unique Salem design vulnerability that affects the analysis is the difficulty to refuel the 'C' EDG following the unlikely failure of power sources to the A and B safety buses. This analysis demonstrates the acceptability, from a qualitative risk perspective, of increasing the Salem Technical Specification 3.8.1.1.b.4 AOT for one inoperable EDG from the currently specified 72 hours to 14 days based on the availability of an alternate AC power source (i.e., AOT diesel generators).

### Reference

- [1] LR-N14-0051, Letter from John F. Perry to NRC, "PSEG Nuclear LLC's Seismic Hazard and Screening Report (CUES Sites) Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident – Salem Generating Station," dated March 28, 2014 (Adams Accession No. ML14090A043).