



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

April 24, 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 –  
SUPPLEMENTAL INFORMATION NEEDED FOR ACCEPTANCE OF  
REQUESTED LICENSING ACTION RE: CONTAINMENT FAN COOLER UNIT  
ALLOWED OUTAGE TIME EXTENSION (CAC NOS. MF9364 AND MF9365)

Dear Mr. Sena:

By letter dated March 6, 2017, PSEG Nuclear LLC (PSEG) submitted a license amendment request for Salem Nuclear Generating Station (Salem), Unit Nos 1 and 2. The proposed amendment would revise Technical Specification (TS) 3.6.2.3, "Containment Cooling System," to extend the allowed outage time for one or two containment fan cooler units at Salem, Unit Nos. 1 and 2, from 7 days to 14 days. Review of the proposed changes to the allowed outage time is performed in accordance with Regulatory Guide (RG) 1.177, Revision 1, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," and RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis." Review of the technical acceptability of the probabilistic risk assessment (PRA) is performed in accordance with RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." U.S. Nuclear Regulatory Commission (NRC) Regulatory Issue Summary 2007-06, "Regulatory Guide 1.200 Implementation," dated March 22, 2007, clarifies how the NRC staff will incorporate successive revisions to RG 1.200 that might change the process of, or the basis for, the NRC staff's review of the technical acceptability of a PRA.

The purpose of this letter is to provide the results of the NRC staff's acceptance review of this amendment request. The acceptance review was performed to determine if there is sufficient technical information in scope and depth to allow the NRC staff to complete its detailed technical review. The acceptance review is also intended to identify whether the application has any readily apparent information insufficiencies in its characterization of the regulatory requirements or the licensing basis of the plant.

Consistent with Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), an amendment to the license (including the TSs) must fully describe the changes requested, and following, as far as applicable, the form prescribed for original applications. Section 50.34 of 10 CFR addresses the content of technical information required. This section stipulates that the submittal address the design and operating characteristics, unusual or novel design features, and principal safety considerations.

The NRC staff has reviewed your application and concluded that the information delineated in the enclosure to this letter is necessary to enable the staff to make an independent assessment

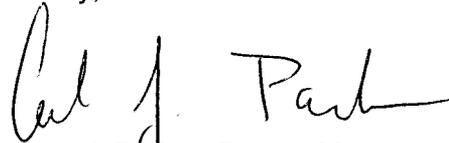
regarding the acceptability of the proposed amendment in terms of regulatory requirements and the protection of public health and safety and the environment.

In order to make the application complete, the NRC staff requests that PSEG supplement the application to address the information requested in the enclosure by May 5, 2017. This will enable the NRC staff to begin its detailed technical review. If the information responsive to the NRC staff's request is not received by the above date, the application will not be accepted for review pursuant to 10 CFR 2.101, and the NRC will cease its review activities associated with the application. If the application is subsequently accepted for review, you will be advised of any further information needed to support the staff's detailed technical review by separate correspondence.

The information requested and associated timeframe in this letter were discussed with Mr. Paul Duke of your staff on April 18, 2017.

If you have any questions, please contact me at (301) 415-1603 or [Carleen.Parker@nrc.gov](mailto:Carleen.Parker@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Carleen J. Parker". The signature is written in a cursive style with a large initial "C" and "P".

Carleen J. Parker, Project Manager  
Plant Licensing Branch I  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

Enclosure:  
Supplemental Information Needed

cc w/encl: Distribution via Listserv

SUPPLEMENTAL INFORMATION NEEDED  
AMENDMENT REQUEST REGARDING  
CONTAINMENT FAN COOLER UNIT ALLOWED OUTAGE TIME EXTENSION  
PSEG NUCLEAR LLC  
EXELON GENERATION COMPANY, LLC  
SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-272 AND 50-311

By letter dated March 6, 2017,<sup>1</sup> PSEG Nuclear LLC (the licensee) submitted a risk-informed license amendment request to revise Technical Specification (TS) 3.6.2.3, "Containment Cooling System," to extend the allowed outage time for one or two containment fan cooler units at Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2, from 7 days to 14 days. Review of proposed changes to the allowed outage time is performed in accordance with Regulatory Guide (RG) 1.177, Revision 1, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications,"<sup>2</sup> and RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."<sup>3</sup> Review of the technical acceptability of the probabilistic risk assessment (PRA) is performed in accordance with RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities."<sup>4</sup> U.S. Nuclear Regulatory Commission (NRC or the Commission) Regulatory Issue Summary (RIS) 2007-06, "Regulatory Guide 1.200 Implementation,"<sup>5</sup> dated March 22, 2007, clarifies how the NRC staff will incorporate successive revisions to RG 1.200 that might change the process of, or the basis for, the NRC staff's review of the technical acceptability of a PRA.

As stated in Office Instruction LIC-109, "Acceptance Review Procedures",<sup>6</sup> it is the policy of the Office of Nuclear Reactor Regulation to review an application to amend a license for completeness and acceptability for docketing. The quality of a requested licensing action (RLA) has a significant impact on the amount of NRC staff resources expended in the review process. When an application lacks critical information necessary for the NRC staff to complete its review, an excessive amount of NRC staff time is spent gathering this information. As a result, time spent on RLAs that are unacceptable for review results in longer review periods for the RLA and adversely impacts the resources and schedules of other acceptable RLAs. In accordance with LIC-109, and in conjunction with RG 1.177 and RG 1.174, the NRC staff has completed the acceptance review of the license amendment request (LAR), and has concluded that the fire risk analysis and seismic risk analysis that support the requested change do not include sufficient information to enable the NRC staff to make an independent assessment regarding PRA quality in a timely and efficient manner.

---

<sup>1</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML17065A241

<sup>2</sup> ADAMS Accession No. ML100910008

<sup>3</sup> ADAMS Accession No. ML100910006

<sup>4</sup> ADAMS Accession No. ML090410014

<sup>5</sup> ADAMS Accession No. ML070650428

<sup>6</sup> ADAMS Accession No. ML16144A521

When a licensee requests an amendment to its license that involves a risk-informed change to technical specifications, RG 1.177 states that when the risk associated with a particular hazard group or operating mode would affect the decision being made, it is the Commission's policy that if a staff-endorsed PRA standard exists for that hazard group or operating mode, then the risk will be assessed using a PRA that meets that standard. RG 1.174 adds that qualitative treatment of the missing modes and hazard groups may be sufficient when the licensee can demonstrate that those risk contributions will not affect the decision; that is, they do not alter the results of the comparison with the acceptance guidelines. In March of 2009, the NRC issued Revision 2 of RG 1.200, which endorsed industry standards for PRAs for internal events, internal floods, fires, and external events (i.e., seismic, external flooding, high winds, etc.). The NRC staff position provided in RIS 2007-06 allows 1 year before revisions to RG 1.200 are expected to be implemented in a licensee's PRA model that is used as a basis for risk-informed LARs.

According to the licensee's application, hazards applicable to Salem include internal events, internal flooding, internal fires, and seismic events. As a basis for the requested change to its TSs, the licensee performed a quantitative assessment of the change in risk using the site's PRA model of record, which accounts for internal events and internal flooding. The licensee's PRA model of record has been peer-reviewed against NRC-endorsed industry standard in accordance with RG 1.200. The licensee's calculated increase in risk associated with internal events and internal flooding does appear to have some margin below the NRC acceptability criteria outlined in RG 1.174 and RG 1.177. However, the licensee's PRA model of record does not account for the risk associated with internal fires or seismic events. The licensee gives an assessment of the risk associated with fires and seismic events using insights from an individual plant examination of external events (IPEEE) fire evaluation in conjunction with a non-peer-reviewed work-in-progress fire PRA, as well as an IPEEE seismic risk evaluation.

The IPEEE fire risk evaluation used the Electric Power Research Institute (EPRI) Fire-Induced Vulnerability Evaluation (FIVE) methodology to screen and evaluate vulnerable fire areas. Although the American Society of Mechanical Engineers (ASME) 2009 PRA standard discusses the FIVE methodology in non-mandatory Appendix 4-A FPRA Methodology, RG 1.200, Revision 2, specifically does not endorse the material in Appendix 4-A. The FIVE methodology was developed as a screening methodology used to identify vulnerabilities to fire risk during the IPEEE phase in the early 1990s. The FIVE methodology is more limited than the current methodology contained in NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, Final Report," because it is constrained by limitations and non-conservative assumptions in areas such as equipment selection and location (e.g., including multiple spurious actuations), plant response modeling, fire scenario selection and analysis, human reliability analysis, fire risk quantification, and uncertainty and sensitivity. Similarly, the seismic PRAs used in the IPEEE were generally limited in scope and focus and used seismic hazard curves, seismic fragility assessments, and seismic systems analyses that are no longer considered state-of-knowledge. As with the licensee's fire analysis, the seismic PRA has not been peer-reviewed against the industry standards in accordance with RG 1.200.

The licensee attempts to credit the fire and seismic risk assessments as a qualitative evaluation and concludes that, based on the dominant accident sequences evaluated in the IPEEE and the resultant quantitative results, the perceived risk increase would most likely be small. However, the licensee's assessment is based on quantitative or semi-quantitative analyses of limited

scope that do not meet NRC-endorsed industry standards and that use non-approved screening methods and outdated data. The licensee's LAR does not contain sufficient information for the staff to determine if the fire and seismic PRAs are technically acceptable to a degree that would support their use as the basis for the licensee's "qualitative" assessment of the overall contribution to risk from internal fires and seismic events. Although the insights presented in the assessment are useful in understanding the potential impact to risk from fires and seismic events, the insights do not constitute a qualitative evaluation and do not demonstrate an insignificant contribution to the risk increase. As a result, the licensee has not demonstrated, in accordance with RG 1.177 and RG 1.174, that risk contribution of the hazards would not affect the decision as to the acceptability of the increase in risk.

The NRC staff concludes that the licensee's LAR does not meet the acceptability standards as outlined in LIC-109. The application lacks critical information necessary for the NRC staff to complete its review without an excessive amount of NRC staff time and resources. In accordance with RG 1.174 and RG 1.177, because internal fires and seismic events are significant risk contributors at Salem, the licensee needs to assess the contribution of those hazards to the overall increase in risk using a PRA that meets the NRC-endorsed industry standards in RG 1.200, or provide a sufficient qualitative assessment that demonstrates the contribution to the risk increase is insignificant enough that it would not affect the NRC staff's decision. However, the assessments for internal fires and seismic events provided by the licensee in support of this risk-informed LAR do not meet the NRC-endorsed standards, nor do they provided qualitative information sufficient to determine that the risk contributions from fires and seismic events would constitute an insignificant change to core damage frequency and large early release frequency or incremental conditional core damage probability and incremental conditional large early release probability. As a result, the NRC staff cannot make an independent assessment regarding the acceptability of the proposed amendment request in terms of regulatory requirements and the protection of public health and safety and the environment.

Consistent with the NRC forward fit policy dated July 14, 2010,<sup>7</sup> the NRC staff position provided in RIS 2007-06 that allows 1 year before revisions to RG 1.200 are expected to be implemented in LARs, and the issuance of a staff-endorsed fire and seismic hazards PRA standard in 2009, the NRC staff finds that:

1. For the risk contribution associated with **internal fires**, the LAR should include
  - a. A quantitative evaluation (i.e., PRA) that:
    - i. Meets an NRC-endorsed industry standard;
    - ii. Is peer reviewed in accordance with RG 1.200; and
    - iii. Includes the result of the reviews, including all open findings and observations (F&Os), and the change in risk.

**OR**

---

<sup>7</sup> ADAMS Accession No. ML101960180, footnote 2

- b. A sufficient qualitative evaluation of the risk contributors that:
  - i. Is of sufficient scope and depth. If the IPEEE fire evaluation is used as a basis, deficiencies in the evaluation that result from using the EPRI FIVE methodology should be addressed, including using NRC-approved methods for plant partitioning, to account for multiple spurious actuations, for plant response modeling, for fire scenario selection and analysis, to account for human reliability, for fire risk quantification, and to account for uncertainty;
  - ii. Includes a discussion that clearly demonstrates why the risk contributions will not affect the decision as to the acceptability of the increase in risk;
  - iii. If the basis for the qualitative evaluation **relies on a PRA**, the PRA should meet the criteria outlined above for quantitative evaluations.

**AND**

- 2. For the risk contribution associated with **seismic events**, the LAR should include:

- a. A quantitative evaluation (i.e., PRA) that:
  - i. Meets an NRC-endorsed industry standard;
  - ii. Is peer-reviewed in accordance with RG 1.200; and
  - iii. Includes the result of the reviews, including all open findings and observations (F&Os), and the change in risk.

**OR**

- b. A sufficient qualitative evaluation of the risk contributions that:
  - i. Is of sufficient scope and depth. The evaluation should be performed using current state-of-knowledge where applicable, including updated site-specific seismic hazard analyses, seismic fragility assessments, and seismic systems analysis; and
  - ii. Includes a discussion that clearly demonstrates why the risk contributions will not affect the decision as to the acceptability of the increase in risk.
  - iii. If the basis for the qualitative evaluation **relies on a PRA**, the PRA should meet the criteria outlined above for quantitative evaluations.

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2 –  
 SUPPLEMENTAL INFORMATION NEEDED FOR ACCEPTANCE OF  
 REQUESTED LICENSING ACTION RE: CONTAINMENT FAN COOLER UNIT  
 ALLOWED OUTAGE TIME EXTENSION (CAC NOS. MF9364 AND MF9365)  
 DATED APRIL 24, 2017

**DISTRIBUTION:**

Public  
 LPL1 R/F  
 RidsACRS\_MailCTR Resource  
 RidsNrrDssSbpb Resource  
 RidsNrrDssStsb Resource  
 RidsNrrDraApla Resource  
 RidsNrrDorl Resource  
 RidsNrrDorlLpl1 Resource  
 RidsNrrLALRonewicz Resource  
 RidsNrrPMSalem Resource  
 RidsRgn1MailCenter Resource  
 LWheeler, NRR  
 MChernoff, NRR  
 MLevine, NRR

**ADAMS Accession No.: ML17102A865**

OFFICE	NRR/DORL/LPL1/PM	NRR/DORL/LPL1/LA	NRR/DRA/APLA/BC
NAME	CParker	LRonewicz	SRosenberg
DATE	04/19/2017	04/13/2017	04/20/2017
OFFICE	NRR/DORL/LPL1/BC	NRR/DORL/LPL1/PM	
NAME	JDanna	CParker	
DATE	04/21/2017	04/24/2017	

**OFFICIAL RECORD COPY**