

From: Ennis, Rick
Sent: Monday, July 31, 2017 3:14 PM
To: Duke, Paul R.
Cc: Marabella, Lee A.
Subject: Request for Additional Information - Salem Units 1 and 2 - Containment Fan Coil Unit Allowed Outage Time Extension Amendment Request (CACs MF9364 and MF9365)
Attachments: final rai01 mf9364-65.doc

By application dated March 6, 2017, as supplemented by letter dated May 4, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML17065A241 and ML17125A051, respectively), PSEG Nuclear LLC (PSEG, the licensee) submitted a license amendment request for Salem Nuclear Generating Station, Unit Nos. 1 and 2. The proposed amendment would revise Technical Specification 3.6.2.3, "Containment Cooling System," to extend the containment fan coil unit (CFCU) allowed outage time from 7 days to 14 days for one or two inoperable CFCUs.

The Nuclear Regulatory Commission's (NRC) staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific request for additional information (RAI) questions are attached. The RAI questions were provided in draft form to Mr. Paul Duke of the PSEG staff via e-mail on July 17, 2017. The draft questions were sent to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed.

A conference call between the NRC staff and the PSEG staff was held on July 31, 2017, to discuss the draft RAI questions. During the call, Mr. Duke stated that PSEG would provide a response to the RAI questions within 45 days (i.e., by September 14, 2017).

If you have any questions, please contact me at (301) 415-1420.

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Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

REQUEST FOR ADDITIONAL INFORMATION
REGARDING PROPOSED LICENSE AMENDMENT
CONTAINMENT FAN COIL 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 application dated March 6, 2017, as supplemented by letter dated May 4, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML17065A241 and ML17125A051, respectively), PSEG Nuclear LLC (PSEG, the licensee) submitted a license amendment request (LAR) 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 containment fan coil unit (CFCU) allowed outage time (AOT) from 7 days to 14 days for one or two inoperable CFCUs.

The Nuclear Regulatory Commission (NRC) staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific information requested is addressed below.

Balance-of-Plant Branch (SBPB)

Reviewer: Larry Wheeler

RAI-SBPB-1

PSEG's application stated that the proposed extended AOT is based on application of the Salem Probabilistic Risk Assessment (PRA) in support of a risk-informed extension, and on additional considerations and compensatory actions. The licensee further stated that the risk evaluation and deterministic engineering analysis supporting the proposed change have been developed in accordance with the guidelines established in NRC Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific Risk-Informed Decisionmaking: Technical Specifications," dated May 2011 (ADAMS Accession No. ML100910008), and RG 1.174, "An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant Specific Changes to the Licensing Basis" dated May 2011 (ADAMS Accession No. ML100910006).

PSEG provided, in Section 4.3 of Attachment 1 to the application, a deterministic assessment of the proposed CFCU AOT extension. However, in accordance with RG 1.177, Regulatory Position 2.2, "Traditional Engineering Considerations," there are several engineering considerations that were not adequately addressed in the LAR and are necessary for a risk-informed licensing submittal that the licensee should assess. Provide an engineering evaluation (in accordance with RG 1.177 Regulatory Position 2.2) that addresses the following considerations:

1. Defense-in-depth (including the following):
 - a. A reasonable balance among prevention of damage of core damage, prevention of containment failure, and consequence mitigation is preserved.
 - b. Over-reliance on programmatic activities as compensatory measures is avoided.
 - c. System redundancy, independence, and diversity are maintained.
 - d. Defenses against potential common cause failures (CCFs) are maintained and the potential for introduction of new CCF mechanisms is assessed.
 - e. Independence of physical barriers is not degraded.
 - f. Defenses against human errors are maintained.
 - g. The intent of the plant's design criteria is maintained.
2. Safety margin (including the following):
 - a. Codes and standards or alternatives approved for use by the NRC are met.
 - b. Safety analysis acceptance criteria in the final safety analysis report are met or proposed revisions provide sufficient margin to account for analysis and data uncertainties.

RAI-SBPB-2

The licensee stated, in Section 4.4.1 of Attachment 1 to the application, that maintenance practices involve protecting other equipment coincident with maintenance being performed on the CFCUs. If two CFCUs are unavailable, PSEG procedures require the other CFCUs and one containment spray pump to be protected to prevent concurrent unavailability. In addition, procedures direct the plant personnel to routinely monitor various maintenance configurations and protect equipment that could lead to an elevated risk condition (e.g., "red" risk condition) if it were to become unavailable due to unplanned or emergent conditions. The licensee stated that this is normally accomplished using a predictive PRA software tool based on the PRA model of record (i.e., equipment out of service configuration risk monitor program from the Electric Power Research Institute). The licensee stated that, based on the very small risk increase involving the configuration analyzed in this LAR, there is no further need for additional compensatory measures or quantification other than the existing programs stated above.

As noted above, given the condition that two CFCUs are unavailable, PSEG plans to protect the other three CFCUs and one containment spray pump. However, support systems for the CFCUs and containment spray pump are not specifically stated as being protected. Provide a complete list of protected equipment which may include the CFCU and containment spray system support systems, such as cooling water, cooling water accumulators, essential room cooling and or chillers, alternating current and/or direct current electrical buses, on-site emergency diesel generators, and switchyard components/breakers, etc..

PRA Licensing Branch (APLA)

Reviewer: Michael Levine

The proposed extended AOT is based, in part, on application of the Salem PRA in support of a risk-informed extension. The risk evaluation and deterministic engineering analysis supporting the proposed change have been developed in accordance with the guidelines established in RG 1.177. When a licensee requests an amendment to its license that involves a risk-informed change to the TSs, 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. Through RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," the NRC endorsed, with clarifications and qualifications, the industry standard ASME/ANS RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications." In general, the staff anticipates that current good practice, i.e., Capability Category II of the ASME/ANS standard, is the level of detail that is adequate for the majority of applications.

The licensee peer reviewed its base PRA model against an earlier version of the industry standard (RA-Sb-2005). In accordance with RG 1.200, Revision 2, the licensee identified and addressed differences in the supporting requirements (SRs) that were revised between the 2005 and the 2009 versions of the ASME PRA standard. In addition, the licensee performed a gap assessment, against the NRC clarifications in Appendix A of RG 1.200, Revision 2, in order to ensure the PRA meets the current standard. The peer review assesses the PRA model and all applicable supporting documentation against the applicable SRs in the standard. As part of its application, the licensee included tables indicating the Capability Category to which each applicable SR was met, a summary of the findings and observations (F&Os) for each SR that was not met to Capability Category II or higher, and the licensee's resolutions of the F&Os.

APLA-RAI-1

As part of the NRC staff's review of the technical acceptability of the licensee's PRA, the staff reviewed all applicable open F&O's for satisfactory resolution. In F&O Tables 4-1 through 4-8 in Enclosure 1 of the LAR, many of the resolution statements for SRs that do not meet Capability Category II or higher indicate that the basis for resolution is contained in a separate document not submitted with the LAR. In addition, these resolution statements contain little or no further justification describing why the applicable SR is now met at a satisfactory level. The information supplied by the licensee in the F&O tables for these SRs is not sufficient for the staff to determine if the indicated resolution appropriately addresses the open F&Os. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in risk-informed applications.

Please provide one of the following:

1. A discussion justifying, including any applicable supporting documentation, why each of the following SRs (corresponding to the SR nomenclature from RA-Sa-2009) are met at Capability Category II or higher given the stated resolution:

IE-A1
IE-A8
IE-C6

IE-C12
SC-B4
SC-B5
SY-A6
SY-B3
SY-B4
SY-B6
SY-B10
HR-F2
DA-C4
DA-C12
DA-C13
DA-C14
DA-D3
QU-B10
QU-D3
QU-D4
QU-D6
QU-D7
IFSN-A1
IFSN-A8

Or

2. A detailed justification discussing why not meeting the above SRs, or meeting the SRs at Capability Category I is sufficient for this application.

APLA-RAI-2

Supporting requirement DA-C2 of ASME/ANS RA-Sa-2009 specifies that licensees collect plant-specific data for the basic event/parameter grouping corresponding to that defined by supporting requirements DA-A1, DA-A3, DA-A4, DA-B1, and DA-B2. The issue identified in the F&O corresponding to DA-C2 in Table 4-6 of Enclosure 1 of the LAR states that the licensee only collected plant-specific data for Mitigating Systems Performance Index (MSPI) components but that a draft licensee procedure provided during the peer review requires that plant-specific data be supplied for all Systems, Structures, Components (SSCs) with Risk Achievement Worths (RAWs) > 2 and Fussell-Vesely (F-V's) > 0.005. It is not clear how the resolution provided by the licensee addresses the specific concern that plant-specific data (as defined in the SRs) be supplied for all SSCs with RAWs > 2 and F-V's > 0.005 as directed by plant procedure. The information supplied by the licensee in the F&O table for this SR is not sufficient for the staff to determine if the indicated resolution appropriately addresses the open F&O. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in risk-informed applications.

Please provide one of the following:

1. Clarification on whether the resolution indicated includes collecting plant-specific data (for all basic event/parameter grouping corresponding to that defined by supporting requirements DA-A1, DA-A3, DA-A4, DA-B1, and DA-B2) as indicated in the F&O and not just MSPI components, or

2. A detailed justification discussing why not meeting SR DA-C2 is sufficient for this application.

APLA-RAI-3

Supporting requirement DA-C8 of ASME/ANS RA-Sa-2009 specifies that for Capability Category II/III to be met, licensees should use plant-specific operational records to determine the time that components were configured in their standby status. The corresponding F&O for SR DA-C8 in Table 4-6 of Enclosure 1 of the LAR indicates that the licensee did not provide a basis for the estimated times that applicable components were in their standby configuration. The licensee's resolution does not indicate whether the times used for equipment configured in their standby status are derived from plant-specific operational records. The information supplied by the licensee in the F&O table for this SR is not sufficient for the staff to determine if the indicated resolution appropriately addresses the open F&O. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in risk-informed applications.

Please provide one of the following:

1. Clarification on whether the equipment standby times are taken from plant-specific operational records, or
2. A justification discussing why not meeting SR DA-C8, or meeting SR DA-C8 at Capability Category I, is sufficient for this application.

APLA-RAI-4

Supporting requirement DA-C10 of ASME/ANS RA-Sa-2009 specifies that for Capability Category II to be met, licensees should review the test procedure to determine whether a test should be credited for each possible failure mode. In addition, the licensee should count only completed tests or unplanned operational demands as success for component operation. If the component failure mode is decomposed into sub-elements (or causes) that are fully tested, then the licensee should use tests that exercise specific sub-elements in their evaluation. The peer review found that the SR was not met, stating in the F&O for SR DA-C10 that:

Documentation describing the process of reviewing test procedures to determine surveillance test data could not be identified. No specific surveillance tests were discussed in the Data Analysis Notebook. The Systems Analysis Notebooks for specific systems described various surveillance testing, but did not reference surveillance tests by name.

As a resolution to the F&O, the licensee stated that:

Initiating event category tables were provided in the revised Initiating Events Notebook (SA-PRA-001) to provide a benchmark comparison to ensure that Salem initiating event categories were adequate in capturing the necessary PRA initiating events. The plants compared were South Texas, Surry, and Watts Bar. No further action required.

It appears that the licensee's response is not related to the issue identified in the F&O. The information supplied by the licensee in the F&O table for this SR is not sufficient for the staff to

determine if the indicated resolution appropriately addresses the open F&O. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in risk-informed applications.

Please provide one of the following:

1. A discussion describing how, in relation to the issues indicated in the F&O, the licensee meets SR DA-C10 to Capability Category II or higher, or
2. A justification discussing why not meeting SR DA-C10, or meeting SR DA-C10 at Capability Category I, is sufficient for this application.

APLA-RAI-5

Section 2.3.2 of RG 1.177 states that, as a minimum, the licensee should perform evaluations of core damage frequency (CDF) and large early release frequency (LERF) to support any risk-informed changes to the TSs. The licensee used its base PRA to evaluate the change in CDF (i.e., Level 1 PRA) and LERF associated with the AOT extension. As part of its application, the licensee included F&O tables indicating the Capability Category and any associated F&Os for each applicable SR. However, these tables only included applicable SRs associated with the Level I portion of the PRA. These tables did not include a disposition of SRs associated with LERF. Specifically, SRs LE-A1 through LE-G6. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in risk-informed applications.

Please provide one of the following:

1. Provide all F&Os characterized as findings from the peer review of the internal events, Level 2 PRA. For each F&O, include details of its disposition or why not meeting the corresponding Capability Category II requirements has no impact on the application. Specifically, SRs LE-A1 through LE-G6, or
2. A detailed justification discussing why no peer review of the SRs associated with LERF is acceptable for this application.

APLA-RAI-6

Supporting requirement IFSN-A7 of ASME/ANS RA-Sa-2009 specifies that for the SR to be met, the licensee, in applying SR IFSN-A6 to determine susceptibility of SSCs to flood-induced failure mechanisms, should credit the operability of SSCs identified in SR IFSN-A5 with respect to internal flood impacts only if supported by an appropriate combination of: (a) test or operational data; (b) engineering analysis; and (c) expert judgment. The associated F&O in Table 4-8 of Enclosure 1 of the LAR indicated that the licensee's basis that walkdown observations revealed air-operated valves (AOVs) and motor-operated valves (MOVs) were of a robust design that would exclude them from being susceptible to water damage for spray scenarios was insufficient for determining susceptibility of these components to flood-induced failure mechanisms per this SR. The licensee's resolution stated that the robustness of AOVs and MOVs with regard to spray scenarios was an informed judgment based on empirical observation and reinforced by a paper presented at the PSA 2008 ANS conference by J. Lin, and that water spray does not generally prevent AOVs and MOVs from operating, and although it may remotely be possible, the most likely result is that it will not. The licensee's resolution still

does not present an adequate justification supported by an appropriate combination of test or operational data, engineering analysis, and expert judgment. The information supplied by the licensee in the F&O table for this SR is not sufficient for the staff to determine if the indicated resolution appropriately addresses the open F&O. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in risk-informed applications.

Please provide one of the following:

1. An adequate justification, including any supporting documentation, that describes clearly the link between the observed robustness of the valves and the empirical information from test or operational data and/or engineering analysis that would lead expert judgment to conclude that the observed robustness is sufficient to preclude failure from spray flooding, or
2. A justification discussing why not meeting SR IFSN-A7 is acceptable for this application.

APLA-RAI-7

Regulatory Position 2.1 of RG 1.200, Revision 2 states that if a licensee demonstrates that the parts of a PRA that are used to support an application comply with the ASME/ANS PRA standard, when supplemented to account for the staff's regulatory positions contained in Appendix A, the NRC would consider the PRA to be adequate to support the applicable risk-informed regulatory application. In Section 4.1.3 of Enclosure 1 of the LAR, the licensee stated that it performed a gap assessment against the NRC clarifications in Appendix A of RG 1.200, Revision 2 with regard to the ASME standard, RA-Sa-2009. The licensee provides the results of the gap assessment in Table 4-11 of Enclosure 1. However, Table 4-11 only includes the assessment of NRC regulatory positions for three SRs. The information supplied by the licensee in Table 4-11 is not sufficient for the staff to determine if the licensee supplemented appropriately ASME/ANS RA-Sa-2009 to account for the staff's regulatory positions contained in Appendix A of RG 1.200. As a result, the staff cannot make a determination on the technical acceptability of the licensee's PRA for use in this risk-informed application.

Please provide one of the following:

1. A gap assessment of all regulatory positions contained in Appendix A of RG 1.200 for the applicable hazards. The assessment should include a disposition of **all** clarifications and qualifications (i.e., not limited just to SRs) for the applicable hazards, or
2. A justification discussing why the requested gap assessment is not necessary.

APLA-RAI-8

In accordance with RGs 1.174 and 1.177, the licensee provided a qualitative evaluation of the change in risk associated with the AOT extension for internal fires and seismic hazards using insights gained for the internal events and flooding PRA models. In its letter dated May 4, 2017 (ADAMS Accession No. ML17125A051), the licensee provided supplemental information about the qualitative evaluation to the NRC.

The licensee's letter stated that the bases for the qualitative evaluations, described in the enclosure to the letter, rely in part on the Salem Full Power Internal Events (FPIE) PRA model of record (MOR). The licensee stated that the model of record used was developed and peer

reviewed consistent with the ASME PRA Standard as endorsed by RG 1.200 and that the result of the FPIE PRA reviews, including the applicability of peer review F&Os, was provided in Section 4.1.3 and Tables 4-1 to 4-11 in Enclosure 1 to PSEG's March 6, 2017 submittal. However, the enclosure to the supplemental letter seems to indicate that the licensee used FPIE PRA MOR SA115A as the basis for the qualitative evaluations. According to the licensee's March 6, 2017 submittal, the licensee used MOR SA112A in support of the quantitative evaluation, and the F&O information contained in Tables 4-1 to 4-11 is from the peer review of SA112A. In addition, in the March 6, 2017 submittal, the licensee stated that CFCU extended AOT evaluation was completed before MOR SA115A was finalized in December 2016.

In accordance with RG 1.200, in order for a PRA to be considered sufficient for use in support of a risk-informed licensing application, a licensee needs to demonstrate the technical acceptability of the PRA through peer review against an NRC-endorsed industry standard. Because the licensee is using MOR SA115A in support of a risk-informed licensing action as the basis for a qualitative evaluation, the licensee needs to demonstrate the technical acceptability of the PRA in accordance with RG 1.200. The licensee has not provided the staff any information regarding the technical acceptability of SA115A in accordance with RG 1.200. As a result, the staff cannot determine if the technical acceptability of SA115A is sufficient in support of this risk-informed licensing application.

Please provide one of the following:

1. Clarification on which model of record the licensee used as a basis for the qualitative evaluation of the internal fires and seismic hazard risk. If the licensee used MOR SA115A as the basis for the qualitative evaluation, then
 - a. Describe the changes made to the internal events PRA since the SA112A PRA model. This description should be of sufficient detail to assess whether these changes are PRA maintenance or PRA upgrades as defined in Section 1-5.4 of the PRA Standard. Since the following may indicate a PRA upgrade, include in your discussion: any new methodologies, changes in scope that impacts the significant accident sequences or the significant accident progression sequences, changes in capability that impacts the significant accident sequences or the significant accident progression sequences.
 - b. Indicate, and provide justification, whether the changes described in Part 1.a are PRA maintenance or PRA upgrades as defined in Section 1-5.4 of the PRA Standard.
 - c. Indicate whether a focused-scope peer review(s) has been performed for those PRA upgrades identified in Part 1.b. As applicable, provide a list of the F&Os from the peer review(s) that do not meet the appropriate Capability Category in accordance with RG 1.200, and explain how the F&Os were dispositioned for this application. If a focused-scope peer review(s) was not performed for these PRA upgrades, then provide a qualitative or quantitative evaluation (e.g., sensitivity or bounding analysis) of its effect until a focused-scope peer review can be completed, or
 - 1) A justification describing why demonstrating the technical acceptability of MOR SA115A is not necessary for use in support of this risk-informed licensing application, or
 - 2) The results of the qualitative evaluations using the SA112A PRA as the bases.

APLA-RAI-9

RG 1.177 outlines a three-tiered approach for evaluating the risk associated with a proposed TS AOT change. Tier 2 identifies and evaluates any potential risk-significant plant configurations that could result if equipment, in addition to that associated with the proposed license amendment, is taken out-of-service simultaneously, or if other risk significant operational factors, such as concurrent system or equipment testing, are involved. The purpose of this evaluation is to ensure that there are appropriate restrictions on dominant risk-significant configurations associated with the change in place.

According to Section 6.3 in Enclosure 1 of the LAR, the Tier 2 assessment was addressed as part of the sensitivity cases investigated in Section 5.5 of Enclosure 1, in which other equipment other than the CFCUs is investigated for relative importance. However, based on the information presented in Section 5.5 of Enclosure 1, it is not clear what, if any, risk significant configurations the licensee identified or what, if any, measures the licensee is taking to avoid those risk significant configurations. As a result the staff cannot determine if the licensee's Tier 2 evaluation is sufficient to ensure that the licensee will have appropriate restrictions on dominant risk-significant configurations, associated with the change in CFCU AOT, in place.

Please provide a discussion describing clearly any potential risk-significant plant configurations that could result if equipment, in addition to that associated with the proposed license amendment, is taken out-of-service simultaneously, or if other risk significant operational factors, such as concurrent system or equipment testing, are involved. Include a description of any restrictions that the licensee plans to implement in order to avoid any identified risk-significant configurations once the change in CFCU AOT is in place.