

From: James Kim
Sent: Wednesday, February 28, 2024 4:39 PM
To: Jurek, Shane
Cc: Wiwel, Michael; Thomas, Brian J.
Subject: Final EXHB RAI for Hope Creek, Salem 1 and 2 Amendment to modify Exclusion Area Boundary (EPID L-2023-LLA-0125)
Attachments: NRC - RAIs Related to Offsite Disp Modeling and Met Data for PSEG LAR to Modify Hope Creek-Salem EABs.docx

SUBJECT: Salem 1 and 2 - Final EXHB RAI for Hope Creek, Salem 1 and 2 Amendment to modify Exclusion Area Boundary (EPID L-2023-LLA-0125)

Mr. Jurek,

By application dated September 6, 2023 (Agencywide Documents Access and Management System Accession No. ML23249A260), PSEG Nuclear LLC, the licensee, submitted a license amendment request change the licensing basis as described in the Salem Generating Station, (Salem), Units 1 and 2, and Hope Creek Generating Station (Hope Creek) Updated Final Safety Analysis Reports to account for modifications to the Exclusion Area Boundary for Salem and Hope Creek.

The NRC staff has determined that additional information is needed to complete its review of the request. On February 14, 2024, the NRC staff sent PSEG the draft Request for Additional Information (RAI) from the External Hazards Branch (DEX/EXHB). On February 28, 2024, the NRC staff and the licensee held a conference call to clarify the draft RAI questions. At the conclusion of teleconference, PSEG agreed to provide the RAI responses within 60 days. A publicly available version of this final RAI (attached) will be placed in the NRC's ADAMS.

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Requests for Additional Information (RAIs) Related to the Offsite Dispersion Modeling and Input Met Data for the PSEG LAR to Modify the Salem and Hope Creek EABs

BACKGROUND

Pursuant to 10 CFR 50.90 and by letter dated September 6, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23249A260), Public Service Enterprise Group Nuclear LLC (PSEG, the Licensees) submitted a license amendment request (LAR) to change the licensing bases as described in the Salem and Hope Creek Updated Final Safety Analysis Reports (UFSARs) to account for proposed modifications to the Exclusion Area Boundary (EAB) for the Salem and Hope Creek nuclear generating stations at the PSEG site.

The NRC staff reviewed the initial LAR submittal. Additional data and information needs pertaining to the accident-related, offsite atmospheric dispersion modeling for the respective EABs and the meteorological (Met) data input to that modeling were identified. These needs were provided to PSEG by email on September 28, 2023 (see ML23283A016) and discussed with the applicant on October 3, 2023. PSEG provided the supplemental data and information on October 30, 2023 (see ML21308A069). The NRC staff reviewed the supplemental submittal and determined that further clarification of the Met monitoring program and data processing was still necessary. PSEG responded by email on December 21, 2023 (see ML23355A273) to NRC's follow-up questions of December 11, 2023.

The requests for additional information (RAIs) here are based on the NRC staff's review of the various submittals and responses above because: (1) they may result in a need for PSEG to revise the atmospheric dispersion modeling the results of which are a direct input to the radiological dose evaluations in the original LAR, and (2) to reconcile noted discrepancies within the LAR and related submittals and/or the respective UFSARs.

REGULATORY BASIS

The radiological dose analyses that accompany this LAR, as submitted under 10 CFR 50.90, require, as direct inputs, dispersion parameters (i.e., relative concentrations or X/Qs). These X/Qs are based on using an appropriate dispersion model that relies, in part, on the input of representative Met data. The dispersion analyses for this LAR consider the offsite impacts at the proposed EAB for the Salem and Hope Creek facilities due to potential accident releases from those plants.

Relevant guidance on modeling offsite dispersion parameters is given by:

- Regulatory Guide (RG) 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," Revision 1, November 1982 (Reissued February 1983 for correction), ADAMS Accession No. ML003740205; and
- NUREG/CR-2858, "PAVAN: An Atmospheric Dispersion Program for Evaluating Design-Basis Accidental Releases of Radioactive Materials from Nuclear Power Plants," November 1982, ADAMS Accession No. ML12045A149.
- NUREG/CR-2260, "Technical Basis for Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," October 1981, ADAMS Accession No. ML12045A197.

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Relevant guidance on meteorological monitoring is given by:

- RG 1.23, "Meteorological Monitoring Programs for Nuclear Power Plants," Revision 1, March 2007, ADAMS Accession No. ML070350028.

REQUESTS FOR ADDITIONAL INFORMATION

RAI-1

According to Section 2.1 (Para. 2) and Section 2.2 of the original LAR submittal of Sept. 6, 2023 (ML23249A260), the EAB for Salem Units 1 and 2 and Hope Creek is said to be common on land and "coextensive with the Salem and Hope Creek site boundary", see also LAR Figure 2.2-1. Section 2.2 (Para. 2) and Figure 2.2-1 identifies the minimum distance to the respective EABs in the Delaware River (i.e., 1270 m for Salem Units 1 and 2 and 901 m for Hope Creek). Is/are the proposed EAB(s) for Salem Units 1 and 2 and Hope Creek on land and/or in the Delaware River still common or separate? Note that LAR Figures 2.6-1 and 2.6-2 look much the same for both facilities on land, but different in the Delaware River. Please clarify in the LAR and the respective Updated Final Safety Analysis Reports (UFSARs).

RAI-2

For any given accident scenario at either Salem Units 1 and 2 or Hope Creek and evaluated in this LAR, will any of the releases to the ambient atmosphere occur simultaneously from multiple release points or locations such that the composite impacts may be additive? If not, why or why not and, if so, should more than one release location have been accounted for with such an accident?

RAI-3

The NRC staff notes that the PAVAN dispersion model does not include a provision to account for plume rise and, if applicable to a given accident source, the plume rise would have to be determined separately. If any of the accident releases in this LAR are determined to be elevated due to plume rise for the duration of the accident (i.e., greater than 2.5 times the height of adjacent solid structures), then the applicability of determining stability class based on the delta-T between 150 ft and 33 ft would also need to be evaluated.

- a) For the Salem Units 1 and 2 accident scenarios, what is/are the temperature(s) relative to atmospheric conditions at the point(s) of release to the open environment due to a Loss of Coolant Accident (LOCA) and to the Steam Generator Tube Rupture (SGTR) accidents for Salem Unit 1 and, if applicable, any of the other accident scenarios listed in LAR Table 2.3-1 and Subsection 2.6.2.1 (Para. 3) (i.e., a Main Steam Line Break (MSLB), especially if still a high energy release at the point(s) the outside atmosphere is reached, and, if applicable, any of the other accident scenarios (i.e., Locked Rotor Accident (LRA), Fuel Handling Accident (FHA), and Rod Ejection Accident (REA))? Also, for any applicable accident scenario, please indicate the orientation (e.g., vertical, horizontal) and characteristics (e.g., capped, uncapped) of any respective release location(s) as well as the corresponding exit velocities or alternatively the inside stack diameter(s) and flow rate(s).

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This information is needed in order to confirm the reasonability of having assumed that ground-level releases in the PAVAN dispersion modeling apply to all accidents as opposed to an effective elevated release given that the proposed sector-specific distances to the EAB are being reduced (by about 500 m on land and about 400 m in the Delaware River) such that the maximum impact point could extend beyond one or more of these proposed sector-specific EAB distances.

- b) For the Hope Creek accident scenarios, what is/are the temperature(s) relative to atmospheric conditions at the point(s) of release to the open environment due to a LOCA (e.g., for the Main Steam Isolation Valves (MSIVs)), and a MSLB especially if either or both are still a high energy release at the point(s) the outside atmosphere is reached) and, if applicable, any of the other accident scenarios listed in LAR Table 2.4-1 and Subsection 2.6.2.2 (Para. 2) (i.e., FHA, Control Rod Drop Accident (CRDA), Instrument Line Pipe Break (ILPB), and Feedwater Line Break outside containment (FWLB))? Also, for any applicable accident scenario, please indicate the orientation (e.g., vertical, horizontal) and characteristics (e.g., capped, uncapped) of any respective release location(s) as well as the corresponding exit velocities or alternatively the inside stack diameter(s) and flow rate(s).

This information is needed in order to confirm the reasonability of having assumed that ground-level releases in the PAVAN dispersion modeling apply to all accidents as opposed to an effective elevated release given that the proposed sector-specific distances to the EAB are being reduced (by about 450 m on land and in the Delaware River) such that the maximum impact point could extend beyond one or more of these proposed sector-specific EAB distances.

RAI-4

Section 3 (Sent. 2) of the original LAR submittal of Sept. 6, 2023 (ML23249A260) states “[f]or the Salem SGTR event, the dose results for the Control Room and Low Population Zone were also recalculated.” On the other hand, Section 3.1 (Para. 5) states “[N]ote that the Control Room and Low Population Zone (LPZ) X/Qs are not revised for this activity, as the distances to the Control Rooms and LPZ are not impacted.” Tables 3.3-2 and 3.3-3 for the pre-accident and concurrent iodine spike cases for the Salem Unit 1 SGTR accident and Tables 3.3-4 and 3.3-5 for the respective iodine spike cases for a Unit 2 SGTR accident provide, in addition to the EAB TEDE doses, TEDE dose values at the Control Room and LPZ.

- a) The Control Room and LPZ X/Qs used for these dose calculations do not appear to be otherwise identified in the LAR. Please identify or cross-reference the X/Q values, meteorological data on which those X/Qs are based, and any other dispersion modeling-related assumptions (including the model used to estimate the Control Room X/Qs) that support these dose calculations. The LAR and respective UFSARs should be updated accordingly to explain this information.
- b) Please address the difference, if any, between a SGTR accident at Salem Unit 1 and Salem Unit 2 since the latter does not otherwise appear to be addressed and update the LAR and respective UFSARs accordingly. This includes explaining why only the SGTR accident for Salem Unit 1 was specified for modeling (i.e., in Table 2.6-1) while: (1) the total TEDE dose at the proposed EAB for Salem Unit 2 is slightly higher in Tables 3.3-4 and 3.3-5 compared

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to the total TEDE dose at the proposed EAB for Salem Unit 1 in Tables 3.3-2 and 3.3-3, (2) the distance to the proposed EAB is less from Salem Unit 2 versus Salem Unit 1 as shown in Table 2.6-1 considering that a ground-level release has been assumed and for such releases the X/Qs decrease with increasing distance, and (3) the X/Q attributed to Unit 2 as specified in Table 3.3-1 (second page) (i.e., 2.44 E-04) corresponds to the maximum X/Q in Table 3.1-7 (i.e., "All Accidents except Salem SGTR Unit 1).

- c) Please update the LAR and UFSARs to explain the basis for applying the maximum X/Q for Salem Unit 1 (i.e., 2.44 E-04) from Table 3.1-7 to Salem Unit 2 for all of the accidents listed in Table 3.4-1 which include at least two accident scenarios (i.e., the LRA and REA) that are not shown in Table 2.4-1 for Unit 2.

RAI-5

Section 3.1 (Para. 4, Sent. 2) states "[t]he 95th percentile EAB X/Q values were calculated to support accident analyses for Salem and Hope Creek using the PAVAN computer code for the updated distances." Please correct and clarify the phrase "The 95th percentile EAB X/Q values..." to read "The 0.5 percent sector-specific and 5 percent overall site EAB X/Q values...", which is consistent with the methodology in Reg Guide 1.145 and NUREG/CR-2260. The NRC staff notes that correction of the phrase "95th percentile" is also needed in Section 3.1.2 (Para. 1, Sent.1) and in Subsection 3.1.2.3 (Para. 2, Sent. 1) of the original LAR submittal of Sept. 6, 2023 (ML23249A260) by changing it to read "0.5 percent sector-specific". Similar corrections may also be needed in the supplemental LAR submittal dated October 30, 2023 (ML23303A144) and in the respective UFSARs. Finally, the NRC staff notes that the summary tables in the Hope Creek and Salem Units 1 and 2 PAVAN output files provided by PSEG correctly label the controlling X/Q, in those cases, as the "0.5 percent X/Q" limiting value.

RAI-6

Section 3.1.1 (Para. 2, Sent. 5 and Para. 3, Sent. 1) read "Additionally, hourly ΔT from 10 m – 46 m (33 ft. – 150 ft.), 10 m – 60 m (33 ft. – 197 ft.), and 10 m – 91 m (33 ft. – 300 ft.) was included..." and "...stability class based on 10 m – 46 m (33 ft. – 150 ft.) ΔT ", respectively. Please correct the LAR submittal in Section 3.1.1 and elsewhere as needed to read "Additionally, hourly ΔT based on 46 m – 10 m (150 ft. – 33 ft.), 60 m – 10 m (197 ft. – 33 ft.) , and 91 m – 10 m (300 ft. – 33 ft.) temperature differences was included..." and "...stability class based on the 46 m – 10 m (150 ft. – 33 ft.) ΔT ", respectively. If the upper measurement level used to determine stability class changes based on one or both of the earlier RAI questions, please revise Para. 3 (Sent. 1) as appropriate. The NRC staff notes that Subsection 3.1.1.1 (Para. 1, Sent. 2) correctly states, although inconsistent with the previously indicated text, that ΔT is determined "between 46 meters and 10 meters (150 ft. – 33 ft.)". The NRC staff further notes that similar discrepancies exist in the PAVAN input and output files provided by PSEG for this LAR.

RAI-7

Subsection 3.1.1.1 (Para. 1, Sent. 2) states, in part, "...the updated JFDs were constructed using hourly wind speed and direction recorded at the 10 meter (33 ft.) level...". If the upper measurement level used to determine stability class changes based on one or both of the earlier RAI questions, the use of wind data from a higher measurement level for the Salem Units 1 and

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2 and/or the Hope Creek dispersion modeling analyses with PAVAN also needs to be evaluated. If so, considering the comparison between the joint frequency distributions (JFDs) in the LAR and those used to support a previous Early Site Permit application, please revise Para. 1 and any other affected text accordingly. More importantly, the JFDs in Tables 3.1-1 and 3.1-2 of the original LAR submittal of Sept. 6, 2023 (ML23249A260) and in Attachments 2 and 3 of the supplemental LAR submittal dated October 30, 2023 (ML23303A144) may also need to be revised as well as the affected PAVAN dispersion modeling, radiological doses, and related text.

RAI-8

Subsection 3.1.1.1 (Para. 3, Sent. 2) states “Wind speeds were grouped into nominal 0.5 meters per second (m/s) steps from 0.0 m/s to 10.0 m/s and above 10.0 m/s.” This statement only partially matches the maximum wind speeds listed in the Salem and Hope Creek PAVAN model input / output files and the individual yearly and composite 3-year (i.e., 2019-2021) wind speed groupings in the JFDs presented in the original and supplemental LAR submittals (ML23249A260 and ML23303A144, respectively). Please correct the statement in Subsection 3.1.1.1 of the LAR, and elsewhere, for consistency with the JFDs and model input / output files.