

NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Tuesday, August 21, 2018 12:46 PM
To: Request for Additional Information
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Subject: Request for Additional Information No. 499 eRAI No. 9564 (5.4.2.1)
Attachments: Request for Additional Information No. 499 (eRAI No. 9564).pdf

Attached please find NRC staff's request for additional information (RAI) concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

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Request for Additional Information No. 499 (eRAI No. 9564)

Issue Date: 08/21/2018

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 05.04.02.01 - Steam Generator Materials

Application Section: 5.4.1, "Steam Generators," and 5.4.1.6, "Steam Generator Program" (also DSRS Section 5.4.2.2)

QUESTIONS

05.04.02.01-15

In Question 05.04.02.01-6 in Request for Additional Information (RAI) 9231, the NRC staff requested clarification of the design requirements for the steam generator (SG) tube support structures and how they are addressed in the Tiers 1 and 2 materials of the final safety analysis report (FSAR). In the response to Question 05.04.02.01-6 dated February 12, 2018 (ADAMS Accession No. ML18043B174), NuScale stated that the SG tube supports are classified as internal structures and are constructed in accordance with ASME Code, Section III, Subsection NG as a guide. The response further states that NuScale is applying the requirements in ASME Code, Section III, Subarticles NG-2400, NG-3200, NG-4300, and NG-4400 to the SG tube support design and fabrication. Additionally, the response stated that NuScale is applying the requirements in ASME Code, Section III, Article NG-5000 as follows: surface examinations (liquid penetrant examinations) will be performed for major joint welds in the SG tube supports, and visual inspections during fabrication will be performed for other welds.

The NRC staff observed in the response to 05.04.02.01-6 in RAI 9231 that NuScale now refers to the lower and upper SG supports as "SG supports" and the SG tube support assemblies that span the full height of the SG tube bundle that include the tabs as "SG tube supports." The NRC staff uses this new terminology in this RAI.

The response to 05.04.02.01-6 in RAI 9231 did not provide sufficient information regarding the meaning of the phrase "as a guide" when describing how ASME Code, Section III, Subsection NG is applied to the SG supports and SG tube supports in the NuScale design. The NRC staff notes that secondary components of current SGs in the United States, including SG tube support structures, are designed in accordance with ASME Code, Section III, Subsections NB, NC, or NG. No current SGs in the United States use ASME Code, Section III, Subsection NG "as a guide." Therefore, it is unclear why the SG supports and SG tube supports would not be designed in accordance with ASME Code, Section III, Subsections NB, NC, or NG without exception given that SG tube integrity is no less important for the NuScale SG design than it is for current SGs in the United States. If the SG supports and SG tube supports were to fail they could impact the integrity of the SG tubes which are a part of the reactor coolant pressure boundary (RCPB). The use of ASME Code, Section III, Subsections NB, NC, or NG provides the staff a reasonable basis to conclude, in accordance with General Design Criterion (GDC) 14, that the probability of abnormal RCPB leakage from the failure of secondary components is an extremely low probability event.

To ensure that the SG supports and SG tube supports are designed to meet the requirements of GDC 1, 4, 14, 15, and 31 in Appendix A of Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), as they relate to maintaining the integrity of the RCPB, the NRC staff requests the following:

- a. Revise Sections 3.2.2, 3.9.3.1.2, and 5.4.1.5 in Tier 2 of the FSAR to state that the SG supports and SG tube supports are designed, fabricated, constructed, tested, and inspected in accordance with either ASME Code, Section III, Subsection NB, NC, or NG.
- b. If necessary, revise Table 3.2-1 in Tier 2 of the FSAR to reflect the classification information of the SG supports and SG tube supports.

05.04.02.01-16

In Question 05.04.02.01-6.d in RAI 9231, the NRC staff requested confirmation that there are no tube support plate-to-tube support plate welds in the NuScale design and requested Table 5.2-7 in Tier 2 of the FSAR be revised to that effect. In response to Question 05.04.02.01-6.d, NuScale confirmed that there are no tube support plate-to-tube support plate welds in the design, and stated that there are welds between sections of the SG tube supports and that Table 5.2-7 was revised accordingly.

In the response to Question 05.04.02.01-6.d, NuScale noted the inservice inspection examination method for the welds between sections of the SG tube supports in Table 5.2-7 as general visual. For these welds, Table 5.2-7 was also revised to include a note that the general visual exams are an augmented exam and that the welds are examined where accessible. The NRC staff understands the phrase "augmented exam" to mean an exam is being performed beyond what is required. The NRC staff notes that the inservice inspection examination information for the SG supports and the assemblies that span the full height of the SG tube bundle (i.e., the tabs) is not included in Table 5.2-7.

The NRC staff does not understand the general visual examination methodology and what is meant by the phrase "examine where accessible." The NRC staff notes that current SGs in the United States follow industry guidelines for secondary side inspections (i.e., Nuclear Energy Institute (NEI) 97-06, Electric Power Research Institute (EPRI) PWR Steam Generator Examination Guidelines, and EPRI Steam Generator Integrity Assessment Guidelines).

Therefore, the NRC staff requests the following to ensure that the SG tube supports meet the requirements of GDC 1, 4, 14, 15, 31, and 32 in Appendix A of 10 CFR Part 50, 10 CFR 50.55a, 10 CFR 50.36, 10 CFR 50.65, and Appendix B in 10 CFR Part 50 as they relate to implementing a SG program and maintaining the integrity of the RCPB:

- a. Revise Section 5.4.1.6 in Tier 2 of the FSAR to describe the general visual examination that will be performed on the welds between sections of the SG tube supports with an emphasis on how the general visual examination meets industry guidelines on secondary side inspections. This description should include a discussion of the meaning of the phrase "examine where accessible."
- b. Revise Table 5.2-7 to include the inservice inspection examination category and method for the lower and upper supports and the assemblies that span the full height of the SG tube bundle (i.e., the tabs). If necessary, revise Section 5.4.1.6 to include a description of the examination methodology with an emphasis on how it meets industry guidelines on secondary side inspections.

05.04.02.01-17

In Question 05.04.02.01-8.a to RAI 9231, the NRC staff requested information about the design requirements for the SG inlet flow restrictors. In the response to Question 05.04.02.01-8.a, NuScale stated that the SG inlet flow restrictors are designed, fabricated, constructed, tested, and inspected as non-structural attachments and revised the FSAR accordingly. The NRC staff observed that Table 3.2-1 in Tier 2 of the FSAR notes the Quality Group as N/A for the SG inlet flow restrictors.

In response to Question 03.09.05-2 to RAI 8901, NuScale stated that the SG inlet flow restrictors and associated hardware are non-pressure boundary items and are not inside or integral to the RCPB and therefore are not "reactor internals" (ADAMS Accession No. ML17284A092). The response further indicated that there is no ASME design code associated with the SG inlet flow restrictors.

It is unclear to the NRC staff why there is no ASME code associated with the design, fabrication, construction, testing, and inspection of the SG inlet flow restrictors given they are a first-of-a-kind design, are mounted to the ASME Code Class 1 feed plenum tubesheets (forms part of the RCPB), and extend inside the ASME Code Class 1 SG tubes (forms part of the RCPB). If the SG inlet flow restrictors were to fail they could impact the integrity of the SG tubes and feed plenum tubesheets (integrity of the RCPB), and flow through the SG tubes. The NRC staff notes that secondary components of current SGs in the United States are designed in accordance with ASME Code, Section III, Subsections NB, NC, or NG. The use of ASME Code, Section III, Subsections NB, NC, or NG provides the staff a reasonable basis to conclude, in accordance with GDC 14, that the probability of abnormal RCPB leakage from the failure of secondary components is an extremely low probability event.

To ensure the SG inlet flow restrictors satisfy the requirements of 10 CFR Part 50, Appendix A, GDC 1, 4, 14, 15, 30, and 31, as they relate to ensuring the integrity of the RCPB, please provide the design, fabrication, construction, testing, and inspection criteria for the SG inlet flow restrictors and a discussion of how the criteria will ensure integrity of the RCPB.

05.04.02.01-18

In the response to Question 05.02.01.01-7 of RAI 9335, NuScale stated that the material of the thermal relief valves is in Section 5.4.1.5 in Tier 2 of the FSAR. The NRC staff did not find the material of the thermal relief valves identified in Section 5.4.1.5 or in Table 5.4-3. Therefore, to ensure the materials comply with 10 CFR 50.55a, please revise Section 5.4.1.5 and Table 5.4-3 to add the materials of the thermal relief valves, or alternatively describe in Section 5.4.1.5 and Table 5.4-3 where the materials are identified in the FSAR.

05.04.02.01-19

In Question 05.04.02.01-14.b to RAI 9231, the NRC staff requested that an appropriate program element that meets the intent of the maintenance of the SG secondary-side integrity program element in NEI 97-06 be added to Combined License (COL) Information Item 5.4-1. The purpose of the maintenance of SG secondary-side integrity program element in NEI 97-06 is to monitor secondary-side SG components that are susceptible to degradation.

In response to Question 05.04.02.01-14.b, NuScale added "shell side integrity and accessibility assessment" and "steam plant corrosion product deposition assessment" to COL Information Item 5.4-1 to meet the intent of the SG secondary-side integrity program element in NEI 97-06. However, it is unclear to the NRC staff how the proposed SG program elements meet the purpose of the SG secondary-side integrity program element from NEI 97-06.

The NRC staff requests Section 5.4.1.6 in Tier 2 of the FSAR be revised to describe how the proposed elements meet the intent of the NEI 97-06 program element, or alternatively use different terminology to describe the SG program element (e.g., "maintenance of SG shell side integrity" or "monitoring of SG shell side components that are susceptible to degradation"). This is requested to ensure GDC 32, 10 CFR 50.55a, 10 CFR 50.36, 10 CFR 50.65, and Appendix B in 10 CFR Part 50 are met by ensuring implementation of a SG program to maintain the structural and leakage integrity of the SG tubes.