

NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Saturday, August 05, 2017 8:58 AM
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Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Samaddar, Sujit; Park, Sunwoo; Vera Amadiz, Marieliz; Chakravorty, Manas
Subject: RE: Request for Additional Information No. 133, RAI 8936 (3.7.2)
Attachments: Request for Additional Information N0. 133 (eRAI No. 8936).pdf

Attached please find NRC staff's request for additional information 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. The NRC Staff recognizes that NuScale has preliminarily identified that the response to one or more questions in this RAI is likely to require greater than 60 days. NuScale is expected to provide a schedule for the RAI response by email within 20 days.

If you have any questions, please contact me.

Thank you.

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Licensing Branch 1 (NuScale)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-0546

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Request for Additional Information No. 133 (eRAI No. 8936)

Issue Date: 08/05/2017

Application Title: NuScale Standard Design Certification - 52-048 Operating

Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 03.07.02 - Seismic System Analysis

Application Section: 3.7.2

QUESTIONS

03.07.02-7

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

In FSAR Section 3.7.5, the applicant provided a brief description of the computer programs used in the analysis and design of the site-independent seismic Category I and Category II structures. However, it did not provide sufficient information regarding the verification & validation (V&V) of these programs. The applicant is requested to provide in the DCA information summarizing the V&V of the computer programs used to determine design-basis seismic demands for NuScale seismic Category I and II structures. The demonstration should test those characteristics of the software that mimic the physical conditions, material properties, and physical processes that represent the NuScale design in numerical analysis. The V&V should cover the full range of parameters used in NuScale design-basis seismic demand calculations including the discretization and aspect ratio of finite elements, Poisson's ratio, frequencies of analysis, and other parameters pertinent to seismic system analyses.

03.07.02-8

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

To investigate the effect on the design of operations with less than the full complement of 12 NPMs, the applicant performed a sensitivity study that involved seven NPMs and reported the results obtained from the study in FSAR Subsection 3.7.2.9.1. The staff could not establish from the study that the sensitivity analyses performed would bound all the potential operating configurations with fewer than the full complement. Therefore, the applicant is requested to specify the potential operating configurations with less than 12 NPMs and demonstrate that, for the specified operating configurations, the seismic demands at critical building locations are bounded by the design basis demands presented in the FSAR. A COL information item should also be considered for a COL applicant to ensure that their specified operating configurations would be acceptable based on their site specific analysis.

03.07.02-9

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

In FSAR Subsection 3.7.2.11, the applicant states, "However, to allow for the effects of accidental torsion, a 5 percent eccentricity is incorporated into the SASSI2010 element forces using SRSS". Eq. 3.7-17 in the FSAR, however, indicates that the effect of accidental torsion is accounted for simply by increasing the maximum element forces by 5 percent, which is not consistent with the statement on Subsection 3.7.2.11 and the guidance in DSRS Section 3.7.2. The applicant is requested to provide justification for the use of Eq. 3.7-17.

03.07.02-10

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

On Page 3A-1 of the FSAR, the staff noted that a detailed dynamic analysis of the NPM subsystem is performed using a more detailed NPM model and the input time histories obtained from the SSI analysis of the reactor building which included a simplified NPM to account for the coupling of NPMs and the reactor building. The applicant is requested to provide in the FSAR a comparison of the seismic demands (forces and moments) at the NPM upper and bottom support locations interfacing with the RXB obtained from the SASSI analysis of the RXB system model and from the ANSYS analysis of the detailed 3D NPM system model. The applicant should explain any significant differences and confirm that the loads used for the NPM support designs are conservative.

03.07.02-11

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

FSAR Section 3.7.2.15, entitled as "Analysis Procedure for Damping", refers to Section 3.7.1.3 for the damping ratios used for seismic analysis of the RXB and CRB. DSRS Section 3.7.2.II.13 provides guidance that either the composite modal damping approach or the modal synthesis technique can be used to account for element-associated damping. However, the FSAR Section 3.7.1.3 (or Section 3.7.1.2) does not provide relevant information. Therefore, the applicant is requested to provide detailed information with respect to the analysis procedure for damping used in various seismic analysis methods for NuScale seismic Category I SSCs.

03.07.02-12

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake (SSE) through design, testing, or qualification methods.

On Page 3.7-49 of the FSAR, the applicant provided COL Item 3.7-5 stating that “A COL applicant that references the NuScale Power Plant design certification will perform a SSI analysis of the RXB and the CRB using the NuScale SASSI2010 models for those structures.” However, the staff views that the COL Item should be expanded to ensure that the site-specific seismic demands of the standard design SSCs are bounded by the corresponding DCD demands and, if not, the standard design SSCs should be appropriately modified to accommodate the site-specific demands. A similar expansion should be considered for COL Item 3.7-6 (on Page 3.7-49) which states that “A COL applicant that references the NuScale Power Plant design certification will perform a SSSI analysis that includes the RXB, CRB, RWB and both Turbine Generator Buildings.”