

NuScaleTRRaisPEm Resource

From: Cranston, Gregory
Sent: Wednesday, April 17, 2019 1:31 PM
To: Request for Additional Information
Cc: NuScaleTRRaisPEm Resource; Lee, Samuel; Samaddar, Sujit; Roche-Rivera, Robert; Chowdhury, Prosanta; Ward, William
Subject: Request for Additional Information Letter No. 9676 (eRAI No. 9676) Topical Report, Seismic System Analysis (SEB)
Attachments: Request for Additional Information No.9676 (eRAI No. 9676).pdf

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

Please submit your technically correct and complete response by June 10, 2019, 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.9676 (eRAI No. 9676)

Issue Date: 04/17/2019

Application Title: NuScale Topical Report

Operating Company: NuScale

Docket No. PROJ0769

Review Section: 03.07.02 - Seismic System Analysis

Application Section: NA

QUESTIONS

03.07.02-1

Title 10 of the *Code of Federal Regulations* (CFR), Part 50, Appendix A, General Design Criteria (GDC) 2, "Design Bases for Protection Against Natural Phenomena," requires that safety-related structures be designed to withstand the effects of the most severe natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches and the appropriate combination of all applicable loads.

Title 10 CFR 50, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," 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) ground motion through design, testing, or qualification methods. The evaluation must take into account soil-structure interaction (SSI) effects and the expected duration of the vibratory motion.

NuScale, LLC (NuScale) submitted Topical Report (TR) TR-0119-58005, Revision 0, "Improvements in Frequency Domain Soil-Structure-Fluid Interaction Analysis," for NRC review and approval on July 26, 2018 (ML18208A361). In NRC's acceptance letter dated November 28, 2018 (ML18331A404), the staff provided an enclosure listing five acceptance review comments. These comments were discussed in a noticed, public, conference call on March 25, 2019. After discussing the comments, NuScale requested that the staff provide a request for additional information (RAI) to document any further questions staff may have as it reviews the topical report. What follows below are the staff's questions related to the acceptance review comments and the discussion of them during the call.

(a) The topical report describes three demonstration problems: (1) a surface founded containment building with internals, (2) a partially embedded box-shaped building with SSI, and (3) a partially embedded box-shaped building with soil-structure-fluid interaction. The staff noted that input motions (e.g. time history records and response spectra) used for topical report Demonstration Problem 2 and dynamic modal characteristics from fixed base analysis (e.g. frequencies, modal mass, and cumulative mass) of all structural models are not included in the report. The staff requests the above information be added to the topical report, to assist the staff in evaluating the provided results of the analysis.

(b) The staff notes that Demonstration Problems 2 and 3 in the report employ reduced or simplified building models and input parameters compared to those commonly encountered during nuclear power plant (NPP) licensing. For example, these problems use reduced building sizes and embedment depths, simplified configurations of internals, nearly uniform soil profiles, and input time histories with greater spectral content in the high frequency range than in the low frequency range where the dominant vibration frequencies for typical NPP structures lie. To extend the application of the proposed methodology to a case that reflects the characteristics of NPP SSI within the commonly encountered range, the staff requests the applicant to include a demonstration problem that employs a building structure that is more representative of actual safety-related structures for light water reactors including small modular reactors with respect to building size, depth of embedment, pool configuration, and internals configuration, and uses a more complex soil profile (simulating a realistic site soil profile) and time history inputs compatible with Regulatory Guide (RG) 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," -like spectra (i.e. input time histories with enhancement in the dominant frequency range for typical NPP structures). Comparisons between analysis results from the traditional SASSI and the proposed methodology should be provided. The results to be compared should include transfer functions, in-structure response spectra (ISRS), hydrodynamic pressures, and other key response parameters.

(c) The applicant is requested to provide the criteria and its basis for selecting frequencies for soil impedance calculations for the demonstration problems covered in the report.

