

## NuScaleDCRaisPEm Resource

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**From:** Cranston, Gregory  
**Sent:** Friday, August 11, 2017 9:53 AM  
**To:** RAI@nuscalepower.com  
**Cc:** NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Chakravorty, Manas; Park, Sunwoo; Vera Amadiz, Marieliz; Samaddar, Sujit  
**Subject:** Request for Additional Information No. 164, RAI 8935 (3.7)  
**Attachments:** Request for Additional Information No. 164 (eRAI No.8935).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 14 days.

If you have any questions, please contact me.

Thank you.

Gregory Cranston, Senior Project Manager  
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. 164 (eRAI No.8935)

Issue Date: 08/11/2017

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

03.07.02-23

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.

DSRS Section 3.7.2 provides guidance that, for soil-structure interaction (SSI) analysis for deeply embedded structures, proper consideration should be given to uncertainties associated with kinematic interaction, non-vertically propagating shear waves, sidewall impedance calculation, and other effects such as the development of gaps between the soil and structure specifically for strong-motion earthquakes. For non-vertically propagating shear waves, a sensitivity evaluation can be performed to determine whether this is an important effect to be included in the SSI analysis. Staff has not been able to identify how the applicant has considered these uncertainties associated with SSI of deeply embedded structures in the seismic analysis of NuScale Category I SSCs. Provide an explanation for what analyses the applicant has performed and how these uncertainties have been considered.

03.07.02-24

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 3.7-37 of the FSAR, Rev 0, the staff notes that there are 540 SSI analysis cases with five CSDRS compatible time history inputs and 72 SSI analysis cases with one CSDRS-HF compatible time history input. Staff is not able to discern which of these analysis cases correspond with which SSCs. Please update the FSAR to include a table to summarize the above-mentioned analysis cases with the following breakdown based on these SSCs:

- a. Analysis cases used to establish the seismic demands (loads and ISRS) for each of the seismic Category I buildings, RXB and CRB.
- b. Analysis cases used to establish the seismic demands (loads and ISRS) for the NuScale Power Module, Bioshield, Reactor Building Crane, Fuel Handling Crane, Fuel Storage Rack, Reactor Flange Tool, and Containment Flange Tool.

03.07.02-25

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.

Tables 3.7.2-23, 24 and 25 in the FSAR respectively provide SSI analysis results for one particular “example” shell, beam, and solid element, respectively. However, analysis results at other key locations are not provided. The applicant is requested to provide the design-basis seismic demands (e.g., forces, moments, soil pressures, accelerations, displacements, ISRS), at all applicable critical section locations of the RXB and CRB, that are used in structural design evaluations in FSAR Sections 3.8.4 and 3.8.5.

#### 03.07.02-26

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.

- a. In FSAR Subsection 3.7.2.5.2, the applicant indicates that the ISRS from the triple building model were considered for the design of SSCs in the RXB but not for the CRB.” It is expected that the structure-soil-structure interaction (SSSI) effect would be more pronounced on a lighter building (CRB) than a neighboring heavier building (RXB). The applicant is requested to provide justification for not considering the ISRS from the triple building model for the design of SSCs in the CRB.
- b. Figures 3.7.2-106 and 107 in the FSAR present the Reactor Building ISRS for floor at EL 24’ and EL 25’, respectively, which indicates noticeable difference in ISRS (both in shape and amplitude) for an elevation difference of only 1 foot. The applicant is requested to discuss the factors contributing to this observed difference.