RAIO-0618-60424

June 13, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 128 (eRAI No. 8966) on the NuScale Design Certification Application

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 128 (eRAI No. 8966)," dated August 04, 2017
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 128 (eRAI No.8966)," dated January 31, 2018

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) supplemental response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's supplemental response to the following RAI Question from NRC eRAI No. 8966:

- 03.08.04-3

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Marty Bryan at 541-452-7172 or at mbryan@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 8966

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 8966

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Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 8966
Date of RAI Issue: 08/04/2017

NRC Question No.: 03.08.04-3

10 CFR 50, Appendix A, GDC 1, 2, and 4, provide requirements to be met by SSC important to safety. In accordance with these requirements, DSRS Section 3.8.4 provides review guidance pertaining to the design of seismic Category I structures, other than the containment. Consistent with DSRS Section 3.8.4, the staff reviews description of the structures, loads and loading combinations, and design and analysis procedures.

FSAR Figures in chapter 1, Section 3.8, and Appendix 3B show stiffener walls under the sloping portion of the roof. Clarify whether there are any stiffening members under the flat portion of the roof which has dimensions of approximately 82'-6" by 346'. If not, describe the process for determining that the flat roof plate without stiffening members is sufficiently stiff and strong to resist and transfer seismic demands from and to the two inclined roof plates. Provide maximum allowable roof deformation values for each of the North-South and East-West directions and the calculated corresponding roof deformation values. Provide the frequency, modal mass ratio, and mode shape, for the most significant torsional mode in the RXB.

NuScale Response:

During an April 17, 2018 Public Meeting, the NRC requested additional details to be provided concerning this RAI question as follows:

Roof Construction

The details of the roof construction are not yet finalized. There is a possibility that during the roof construction, light weight Q-decking and steel supporting beams would be utilized as construction aid elements. If used, these construction aid elements will not be used to provide a direct or indirect load path for the final roof design. The temporary construction aid elements are removed after the concrete is cured. However, if any of the construction aid elements cannot be removed because of partial curing or because they are embedded into the concrete, their presence will be evaluated on a case-by-case basis.

Roof (and the entire RXB) Demand Forces and Moments Determination

The calculation of seismic demand forces and moments for all finite elements of the NuScale Reactor Building (RXB) were obtained by Soil Structure Interaction (SSI) analyses. The computer program SASSI2010 was used to perform the SSI analyses. In SASSI2010 the structural dynamics equations are solved in the frequency domain so there are no modal analysis to obtain modal participation factors, etc. In other words, total structural response calculated in SASSI2010, includes the coupled translational and torsional components but it does not decouple the results into translational and torsional. Therefore, to provide some idea about the significance of the torsional modes, a fixed base SAP2000 model was used and the modal participation factors were provided.

The following SSI analysis details were considered.

- Two SASSI2010 models for the cracked concrete condition: Standalone RXB model and combined triple building model that includes the RadWaste Building, Reactor Building, and Control Building.
- Two SASSI2010 models for the uncracked concrete conditions: Standalone RXB model and combined triple building model that includes the RadWaste Building,Reactor Building, and Control Building.
- Three soil types: Soil Types 11, 8, 7 for Certified Seismic Design Response Spectra (CSDRS) input.
- Two soil types: Soil Types 7 and 9 for Certified Seismic Design Response Spectra-High Frequency (CSDRS-HF) input.
- For each Soil Type 11, 8, and 7, average demand forces and moments from five (5) sets of CSDRS compatible seismic inputs are obtained.
- For each Soil Type 7 and 9, the demand forces and moments from one set of CSDRS-HF compatible input are obtained.
- All SASSI2010 SSI analyses are performed up to the maximum frequency that can be excited by the CSDRS and CSDRS-HF compatible seismic input motions. FSAR Table 3.7.2-18 and Table 3.7.2-19 provide the cut-off frequencies selected for the CSDRS and CSDRS-HF inputs respectively. It must be recognized that the selected cut-off frequencies will capture all necessary translational and rotational/torsional soil and structural coupled modes which could be excited by the input motions.
- As stated in FSAR Section 3.7.2.11, inertial torsional effects are inherently considered in the seismic analysis using a 3D finite element model with backfill soil. The potential for accidental torsion is considered insignificant due to the physical geometry of the structures which are deeply embedded with most of the mass at the foundation. The surrounding soil provides a significant amount of lateral resistance during a seismic event. However, to allow for the effects of unknown or potential accidental torsion loading, the seismic demand forces and moments obtained from the horizontal SSI analyses have been further increased by 5%.

Impact on DCA:

There are no impacts to the DCA as a result of this response.