RAIO-0818-61633

September 05, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
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
3. NuScale Power, LLC Supplemental Response to "NRC Request for Additional Information No. 128 (eRAI 8966)," dated June 13, 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:

NRC Staff Feedback:

In its response dated 1/31/2018 the applicant stated that beams used for construction purposes are planned to be left in place, but are not considered as part of the roof design. Subsequently, in its response dated 6/13/2018 the applicant stated that the details of the roof construction are not yet finalized. Further the applicant indicated the construction aids to be utilized including light weight Q-decking and steel supporting beams and stated that these are to be removed after concrete is cured. Also, the applicant clarified that the construction aids will not be used to provide direct or indirect load path for the final roof design. Additionally, the applicant stated that in the case that a construction aid element cannot be removed, its presence will be evaluated on a case-by-case- basis.

While the construction aid elements are not used to provide direct or indirect load path for the final roof design, the construction aids that may be left in place may affect the mass and

stiffness properties of the roof and associated seismic demands. Therefore, the staff request the applicant to clarify if the details of the roof construction and related evaluation of the effects of the construction aid elements left in place is to be completed for review as part of the DCA review or to be completed by the COL applicant. If the former, the staff requests the applicant to provide a date by which a supplemental response with such details will be provided for staff review. If the latter, the staff request the applicant to include a COL item in the DCA addressing such finalization of construction details and respective evaluation of the effects of the construction aid elements left in place.

Response:

The following COL Item, discussed in an NRC public meeting on August 7, 2018, has been added to FSAR Tier 2 Section 3.8.4.8, to address the finalization of construction details and respective evaluation of the effects of the left in place construction aid elements:

A COL applicant that references the NuScale Power Plant design certification will evaluate and document construction aid elements such as steel beams, Q-decking, formwork, lugs, and other items that are left in place after construction but that were not part of the certified design to verify the construction aid elements do not have an appreciable adverse effect on overall mass, stiffness, and seismic demands of the certified building structure. The COL applicant will confirm that these left in place construction aid elements will not have adverse effects on safety-related structures, systems, and components per FSAR Section 3.7.2.

Impact on DCA:

FSAR Tier 2, Section 3.8.4.8 and FSAR Tier 2, Table 1.8-2 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 01-61, RAI 02.04.13-1, RAI 03.04.01-4, RAI 03.04.02-1, RAI 03.04.02-2, RAI 03.04.02-3, RAI 03.05.01.04-1, RAI 03.05.02-2, RAI 03.06.02-6, RAI 03.06.02-15, RAI 03.06.03-11, RAI 03.07.01-2, RAI 03.07.01-3, RAI 03.07.02-6S1, RAI 03.07.02-8, RAI 03.07.02-12, RAI 03.08.04-3S2, RAI 03.08.04-23S1, RAI 03.08.04-23S2, RAI 03.08.05-14S1, RAI 03.09.02-15, RAI 03.09.02-48, RAI 03.09.02-67, RAI 03.09.02-69, RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-6, RAI 03.09.06-16, RAI 03.09.06-16S1, RAI 03.09.06-27, RAI 03.11-8, RAI 03.11-14, RAI 03.11-14S1, RAI 03.11-18, RAI 03.13-3, RAI 04.02-1S2, RAI 05.02.03-19, RAI 05.02.05-8, RAI 05.04.02.01-13, RAI 05.04.02.01-14, RAI 06.02.06-22, RAI 06.02.06-23, RAI 06.04-1, RAI 09.01.01-20, RAI 09.01.02-4, RAI 09.01.05-3, RAI 09.01.05-6, RAI 09.03.02-3, RAI 09.03.02-4, RAI 09.03.02-5, RAI 09.03.02-6, RAI 09.03.02-8, RAI 10.02-1, RAI 10.02-2, RAI 10.02-3, RAI 10.02.03-1, RAI 10.02.03-2, RAI 10.03.06-1, RAI 10.03.06-5, RAI 10.04.06-1, RAI 10.04.06-2, RAI 10.04.06-3, RAI 10.04.10-2, RAI 11.01-2, RAI 12.03-55S1, RAI 13.01.01-1, RAI 13.01.01-1S1, RAI 13.02.02-1, RAI 13.03-4, RAI 13.05.02.01-2, RAI 13.05.02.01-2S1, RAI 13.05.02.01-3, RAI 13.05.02.01-3S1, RAI 13.05.02.01-4, RAI 13.05.02.01-4S1, RAI 14.02-7, RAI 19-31, RAI 19-31S1, RAI 19-38, RAI 20.01-13

Table 1.8-2: Combined License Information Items

Item No.	Description of COL Information Item	Section
COL Item 1.1-1:	A COL applicant that references the NuScale Power Plant design certification will identify the site-specific plant location.	1.1
COL Item 1.1-2:	A COL applicant that references the NuScale Power Plant design certification will provide the schedules for completion of construction and commercial operation of each power module.	1.1
COL Item 1.4-1:	A COL applicant that references the NuScale Power Plant design certification will identify the prime agents or contractors for the construction and operation of the nuclear power plant.	1.4
COL Item 1.7-1:	A COL applicant that references the NuScale Power Plant design certification will provide site-specific diagrams and legends, as applicable.	1.7
COL Item 1.7-2:	A COL applicant that references the NuScale Power Plant design certification will list additional site-specific piping and instrumentation diagrams and legends as applicable.	1.7
COL Item 1.8-1:	A COL applicant that references the NuScale Power Plant design certification will provide a list of departures from the certified design.	1.8
COL Item 1.9-1:	A COL applicant that references the NuScale Power Plant design certification will review and address the conformance with regulatory criteria in effect six months before the docket date of the COL application for the site-specific portions and operational aspects of the facility design.	1.9
COL Item 1.10-1:	A COL applicant that references the NuScale Power Plant design certification will evaluate the potential hazards resulting from construction activities of the new NuScale facility to the safety-related and risk significant structures, systems, and components of existing operating unit(s) and newly constructed operating unit(s) at the co-located site per 10 CFR 52.79(a)(31). The evaluation will include identification of management and administrative controls necessary to eliminate or mitigate the consequences of potential hazards and demonstration that the limiting conditions for operation of an operating unit would not be exceeded. This COL item is not applicable for construction activities (build-out of the facility) at an individual NuScale Power Plant with operating NuScale Power Modules.	1.10
COL Item 2.0-1:	A COL applicant that references the NuScale Power Plant design certification will demonstrate that site-specific characteristics are bounded by the design parameters specified in Table 2.0-1. If site-specific values are not bounded by the values in Table 2.0-1, the COL applicant will demonstrate the acceptability of the site-specific values in the appropriate sections of its combined license application.	2.0
COL Item 2.1-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site geographic and demographic characteristics.	2.1
COL Item 2.2-1:	A COL applicant that references the NuScale Power Plant design certification will describe nearby industrial, transportation, and military facilities. The COL applicant will demonstrate that the design is acceptable for each potential accident, or provide site-specific design alternatives.	2.2
COL Item 2.3-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific meteorological characteristics for Section 2.3.1 through Section 2.3.5, as applicable.	2.3
COL Item 2.4-1:	A COL applicant that references the NuScale Power Plant design certification will investigate and describe the site-specific hydrologic characteristics for Section 2.4.1 through Section 2.4.14, ~~as applicable~~except Section 2.4.8 and Section 2.4.10.	2.4
COL Item 2.5-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific geology, seismology, and geotechnical characteristics for Section 2.5.1 through Section 2.5.5, below.	2.5

Table 1.8-2: Combined License Information Items (Continued)

Item No.	Description of COL Information Item	Section
COL Item 3.7-11:	A COL applicant that references the NuScale Power Plant design certification will perform a site-specific analysis that, if applicable, assesses the effects of soil separation. The COL applicant will confirm that the in-structure response spectra in the soil separation cases are bounded by the in-structure response spectra shown in FSAR Figure 3.7.2-107 through Figure 3.7.2-122.	3.7
COL Item 3.8-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific program for monitoring and maintenance of the Seismic Category I structures in accordance with the requirements of 10 CFR 50.65 as discussed in Regulatory Guide 1.160. Monitoring is to include below grade walls, groundwater chemistry if needed, base settlements and differential displacements.	3.8
COL Item 3.8-2:	A COL applicant that references the NuScale Power Plant design certification will confirm that the site independent Reactor Building and Control Building are acceptable for use at the designated site.	3.8
COL Item 3.8-3:	A COL applicant that references the NuScale Power Plant design certification will identify local stiff and soft spots in the foundation soil and address these in the design, as necessary.	3.8
COL Item 3.8-4:	A COL applicant that references the NuScale Power Plant design certification will evaluate and document construction aid elements such as steel beams, Q-decking, formwork, lugs, and other items that are left in place after construction but that were not part of the certified design to verify the construction aid elements do not have an appreciable adverse effect on overall mass, stiffness, and seismic demands of the certified building structure. The COL applicant will confirm that these left in place construction aid elements will not have adverse effects on safety-related structures, systems, and components per Section 3.7.2.	3.8
COL Item 3.9-1:	A COL applicant that references the NuScale Power Plant design certification will provide the applicable test procedures before the start of testing and will submit the test and inspection results from the comprehensive vibration assessment program for the NuScale Power Module, in accordance with Regulatory Guide 1.20.	3.9
COL Item 3.9-2:	A COL applicant that references the NuScale Power Plant design certification will develop design specifications and design reports in accordance with the requirements outlined under American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III (Reference 3.9-1). A COL applicant will address any known issues through the reactor vessel internals reliability programs (i.e. Comprehensive Vibration Assessment Program, steam generator programs, etc.) in regards to known aging degradation mechanisms such as those addressed in Section 4.5.2.1.	3.9
COL Item 3.9-3:	A COL applicant that references the NuScale Power Plant design certification will provide a summary of reactor core support structure ASME service level stresses, deformation, and cumulative usage factor values for each component and each operating condition in conformance with ASME Boiler and Pressure Vessel Code Section III Subsection NG.	3.9
COL Item 3.9-4:	A COL applicant that references the NuScale Power Plant design certification will submit a Preservice Testing program for valves as required by 10 CFR 50.55a.	3.9
COL Item 3.9-5:	A COL applicant that references the NuScale Power Plant design certification will establish an Inservice Testing program in accordance with ASME OM Code and 10 CFR 50.55a.	3.9
COL Item 3.9-6:	A COL applicant that references the NuScale Power Plant design certification will identify any site-specific valves, implementation milestones, and the applicable ASME OM Code (and ASME OM Code Cases) for the preservice and inservice testing programs. These programs are to be consistent with the requirements in the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a in accordance with the time period specified in 10 CFR 50.55a before the scheduled initial fuel load (or the optional ASME Code Cases listed in Regulatory Guide 1.192 incorporated by reference in 10 CFR 50.55a).	3.9
COL Item 3.9-7:	Not Used.	
COL Item 3.9-8:	A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of power-operated valve assembly performance sufficient to satisfy periodic verification design basis capability requirements.	3.9

RAI 03.08.04-3S2

COL Item 3.8-4: A COL applicant that references the NuScale Power Plant design certification will evaluate and document construction aid elements such as steel beams, Q-decking, formwork, lugs, and other items that are left in place after construction but that were not part of the certified design to verify the construction aid elements do not have an appreciable adverse effect on overall mass, stiffness, and seismic demands of the certified building structure. The COL applicant will confirm that these left in place construction aid elements will not have adverse effects on safety-related structures, systems, and components per Section 3.7.2.

The comparison of the non-seismic parameters is performed as described in COL Item 2.0-1 in Section 2.0. A direct comparison of seismic inputs cannot be made. Therefore the results of the site specific seismic analysis prepared in response to COL Item 3.7-5 and COL Item 3.7-6 in Section 3.7.2.16 are compared as described below.

The site specific foundation input response spectra (FIRS) are compared to the CSDRS and CSDRS-HF (which were used as the FIRS for the site-independent analysis). This demonstrates that the site specific seismic input is bounded by the input used for design.

In-structure response spectra at 5 percent damping are used for comparison within the buildings. The design ISRS may be used as a surrogate for the forces and moments. If the site independent ISRS are larger than the site specific ISRS the forces and moments will also be bounded for the design. The ISRS comparisons are done specifically at the reactor pool floor and the NPM lug restraints to confirm that the forces and accelerations that will be experienced by NPMs are acceptable. In addition, the ISRS at the RBC wheels is checked. The RBC is the only other large risk-significant SSC. As a general check of the buildings, the ISRS are compared at grade and at the roof of the RXB; and at the main control room, grade level and the top of the Seismic Category I portion of the CRB.This will be accomplished by confirming the following site specific characteristics/results are bounded by the DCD design parameters/results:

RAI 03.08.04-23

RXB

• FIRS	Compare to Figure 3.7.1-1 through Figure 3.7.1-4
• ISRS at the reactor pool floor	Compare to Figure 3.7.2-108
• ISRS at the NPM lug restraints	Compare to Figure 3.7.2-116
• ISRS at the RBC wheels	Compare to Figure 3.7.2-114
• ISRS at grade	Compare to Figure 3.7.2-111
• ISRS at the roof	Compare to Figure 3.7.2-113

RAI 03.08.04-23