RAIO-0714-54786

July 7, 2017

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 Response to NRC Request for Additional Information No. 21 (eRAI No. 8780) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 21 (eRAI No. 8780)," dated May 10, 2017

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

The Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 8780:

- 03.05.01.04-1

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,

Jennie Wike
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8780

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8780

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

eRAI No.: 8780
Date of RAI Issue: 05/10/2017

NRC Question No.: 03.05.01.04-1

10 CFR 50, Appendix A, General Design Criteria 2 (GDC 2) requires that structures, systems, and components (SSCs) important to safety be protected against natural phenomena, including the effects from tornados. In addition, GDC 4 requires SSCs important to safety to be appropriately protected against the effects of missiles that may result from events and conditions outside the nuclear power unit.

FSAR Tier 2, Section 3.5.1.4 states the design basis automobile missile is assumed to impact at all altitudes less than 30 feet above grade level. However, FSAR Tier 2, Section 3.5.2 states that the walls, roofs, and openings of the reactor building (RXB) and control room building (CRB) [which are both greater than 30 feet] are designed to withstand the design basis missiles discussed in Section 3.5.1.4. It is unclear to the staff if the entire height of the walls and the roof are designed to withstand the design basis automobile missile or only the pipe and sphere missiles. The staff notes that applying the automobile missile only to elevations below 30 feet within 0.5 miles of plant structures is consistent with the guidance of RG 1.76 and RG 1.221, but the above two statements appear to contradict each other.

The applicant is requested to revise and clarify the above statements to accurately describe the NuScale design.

In addition, if elevations above 30 feet of the RXB and CRB are not designed to withstand the design- basis automobile missile, the plant design should address potential sites with surrounding ground elevations higher than plant grade (e.g., elevated parking lot). Therefore, the applicant is also requested to include in its FSAR a COL information item that requires a COL applicant that references the NuScale design certification to confirm automobile missiles cannot be generated within a 0.5 mile radius of safety- related SSCs, and risk-significant SSCs requiring missile protection, that would lead to impact higher than 30 feet above plant grade.

NuScale Response:

As stated in FSAR Tier 2, Section 3.5.1.4, the automobile missile is assumed to impact at all altitudes less than 30 ft above grade level within 0.5 miles of plant structures, in accordance with Regulatory Guide 1.76.

The concrete walls and roof of the reactor building (RXB) and control building (CRB) below the 30 ft above plant grade threshold are designed to withstand all design basis missiles discussed in Section 3.5.1.4. The portions of the RXB and CRB that are above 30 ft plant elevation have not been analyzed to withstand the design basis automobile missile, but are resistant to the other design basis missiles.

FSAR Tier 2, Section 3.5.2 is revised to clarify how the RXB and CRB are designed to withstand applicable design basis missiles discussed in Section 3.5.1.4.

A COL information item is added to FSAR Tier 2, Section 3.5.2 to require a COL Applicant to confirm that automobile missiles cannot be generated within a 0.5 mile radius of safety-related SSC and risk-significant SSC requiring missile protection, that would lead to impact higher than 30 feet above plant grade. Additionally, if automobile missiles impact at higher than 30 feet above plant grade, the COL Applicant will evaluate and show that the missiles will not compromise safety-related and risk-significant SSC.

Impact on DCA:
FSAR Tier 2, Section 3.5.2 and Table 1.8-2 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 03.05.01.04-1, RAI 03.05.02-2, RAI 13.01.01-1, RAI 13.02.02-1, RAI 13.05.02.01-2, RAI 13.05.02.01-3, RAI 13.05.02.01-4

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 P&IDs 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 any 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.	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
COL Item 3.2-1:	A COL Applicant that references the NuScale Power Plant design certification will update Table 3.2-1 to identify the classification of site-specific SSC.	3.2
COL Item 3.3-1:	A COL Applicant that references the NuScale Power Plant design will confirm that nearby structures exposed to severe and extreme (tornado and hurricane) wind loads will not collapse and adversely affect the RXB or Seismic Category I portion of the CRB.	3.3
COL Item 3.4-1:	A COL Applicant that references the NuScale Power plant design certification will confirm the final location of structures, systems, and components subject to flood protection and final routing of piping.	3.4

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

Item No.	Description of COL Information Item	Section
COL Item 3.4-2:	A COL Applicant that references the NuScale Power plant design certification will identify the selected mitigation strategy for each room containing structures, systems, and components subject to flood protection.	3.4
COL Item 3.4-3:	A COL Applicant that references the NuScale Power plant design certification will develop an inspection and maintenance program to ensure that each water-tight door, penetration seal, or other "degradable" measure remains capable of performing its intended function.	3.4
COL Item 3.4-4:	A COL Applicant that references the NuScale Power plant design certification will confirm that site-specific tanks or water sources are placed in locations where they cannot cause flooding in the Reactor Building or Control Building.	3.4
COL Item 3.4-5:	A COL Applicant that references the NuScale Power Plant design certification will determine the extent of waterproofing and dampproofing needed for the underground portion of the Reactor Building and Control Building based on site-specific conditions.	3.4
COL Item 3.4-6:	A COL Applicant that references the NuScale Power Plant design certification will confirm that nearby structures exposed to external flooding will not collapse and adversely affect the RXB or Seismic Category I portion of the CRB.	3.4
COL Item 3.5-1:	A COL Applicant that references the NuScale Power Plant certified design will provide a missile analysis for the turbine generator which demonstrates that the probability of a turbine generator producing a low trajectory turbine missile is less than 10-5.	3.5
COL Item 3.5-2:	A COL Applicant that references the NuScale Power Plant certified design will address the effect of turbine missiles from nearby or co-located facilities.	3.5
COL Item 3.5-3:	A COL Applicant that references the NuScale Power Plant certified design will confirm that automobile missiles cannot be generated within a 0.5 mile radius of safety-related SSC and risk-significant SSC requiring missile protection, that would lead to impact higher than 30 feet above plant grade. Additionally, if automobile missiles impact at higher than 30 feet above plant grade, the COL Applicant will evaluate and show that the missiles will not compromise safety-related and risk-significant SSC.	3.5
COL Item 3.5-4:	A COL Applicant that references the NuScale Power Plant design certification will evaluate site-specific hazards for external events that may produce more energetic missiles than the design basis missiles defined in FSAR Tier 2, Section 3.5.1.4.	3.5
COL Item 3.6-1:	A COL Applicant that references the NuScale Power Plant design certification will determine if a high-energy line break or moderate energy line break outside of the Reactor Building, Control Building, or Radioactive Waste Building could affect site-specific essential equipment (or result in a transient or other off-normal event in a second module), and install protection as necessary.	3.6
COL Item 3.6-2:	A COL Applicant that references the NuScale Power Plant design certification will finalize the stress analysis of the high-energy lines in the Reactor Pool Bay and update Table 3.6-2, Figure 3.6-12, Figure 3.6-13, Figure 3.6-14 and Figure 3.6-15 as appropriate.	3.6
COL Item 3.6-3:	A COL Applicant that references the NuScale Power Plant design certification will finalize the stress analysis and the environmental analysis of the high-energy lines outside the reactor pool bay. This includes the identification of any new detection and auto-isolation functions for mitigating an auxiliary boiler high-energy line break. The COL Applicant will update Table 3.6-2, Figure 3.6-16 and Figure 3.6-17 as appropriate.	3.6
COL Item 3.6-4:	A COL Applicant that references the NuScale Power Plant design certification will perform stress analysis for high energy lines outside the NPM if needed to identify and mitigate the consequences of potential breaks.	3.6
COL Item 3.7-1:	A COL Applicant that references the NuScale Power Plant design certification will describe the site-specific SSE.	3.7
COL Item 3.7-2:	A COL Applicant that references the NuScale Power Plant design certification will provide site-specific time histories. In addition to the above criteria for cross correlation coefficients, time step and earthquake duration, strong motion durations, comparison to response spectra and power spectra density, the applicant will also confirm that site-specific ratios V/A and AD/V2 (A, V, D, are PGA, ground velocity, and ground displacement, respectively) are consistent with characteristic values for the magnitude and distance of the appropriate controlling events defining the site-specific uniform hazard response spectra.	3.7

Therefore, there are no design basis Aircraft Hazards. Discussion of the beyond design basis Aircraft Impact Assessment is provided in Section 19.5.

3.5.2 Structures, Systems, and Components to be Protected from External Missiles

RAI 03.05.01.04-1

All safety-related and risk-significant SSC that must be protected from external missiles are located inside the seismic Category I RXB and Seismic Category I portions of the CRB. ~~The walls, roofs, and openings are designed to withstand the design basis missiles discussed in Section 3.5.1.4.~~The concrete walls and roof of the reactor building (RXB) and control building (CRB) below the 30 ft above plant grade threshold are designed to withstand all design basis missiles discussed in Section 3.5.1.4. The portions of the RXB and CRB that are above 30 ft plant elevation have not been analyzed to withstand the design basis automobile missile, but are resistant to the other design basis missiles discussed in Section 3.5.1.4. Section 3.8 provides additional information for the design of RXB and CRB.

RAI 03.05.01.04-1

COL Item 3.5-3: A COL Applicant that references the NuScale Power Plant certified design will confirm that automobile missiles cannot be generated within a 0.5 mile radius of safety-related SSC and risk-significant SSC requiring missile protection, that would lead to impact higher than 30 feet above plant grade. Additionally, if automobile missiles impact at higher than 30 feet above plant grade, the COL Applicant will evaluate and show that the missiles will not compromise safety-related and risk-significant SSC.

The RXB and CRB meet the requirements of the RG 1.13, Rev. 2, "Spent Fuel Storage Facility Design Basis", RG 1.117, Rev. 2, "Protection Against Extreme Wind Events and Missiles for Nuclear Power Plants," and RG 1.221, Revision 0, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants" for protection of SSC from wind, tornado and hurricane missiles.

The RXB and CRB have not been credited to withstand turbine missiles.

RAI 03.05.02-02

COL Item 3.5-4: A COL Applicant that references the NuScale Power Plant design certification will evaluate site-specific hazards for external events that may produce more energetic missiles than the design basis missiles defined in FSAR Tier 2, Section 3.5.1.4.

3.5.3 Barrier Design Procedures

In the design, there are a limited number of potential internal missiles and a limited number of targets. If a missile/target combination is determined to be statistically significant (i.e., the product of (P_1), (P_2) and (P_3) is greater than 10^{-7} per year), barriers are installed.

Safety-related and risk-significant SSC are protected from missiles by ensuring the barriers have sufficient thickness to prevent penetration and spalling, perforation, and scabbing that could challenge the SSC. Missile barriers are designed to withstand local and overall