RAIO-1117-57228

November 16, 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. 238 (eRAI No. 9004) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 238 (eRAI No. 9004)," dated September 25, 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. 9004:

- 14.03.02-2

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 Steven Mirsky at 240-833-3001 or at smirsky@nuscalepower.com.

Sincerely,

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

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Demetrius Murray, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9004

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9004

NuScale Power, LLC
1100 NE Circle Blvd., Suite 200 Corvalis, Oregon 97330, Office: 541.360.0500, Fax: 541.207.3928
www.nuscalepower.com

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

eRAI No.: 9004
Date of RAI Issue: 09/25/2017

NRC Question No.: 14.03.02-2

10 CFR 52.47(b)(1), requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. SRP Section 14.3, and in particular, Sections 14.3.2 and Appendix C provide guidance in developing design descriptions, figures, and ITAAC for structural related items. SRP acceptance criterion 14.3.2.II.8 regarding external flooding states that for flooding, site parameters are specified that require the maximum flood level and ground water level to be below the finished plant grade level.

In DCD Tier 2 Table 14.3.2, ITAAC 3.11.03 and 3.13.03 for the Reactor Building (RXB) and the Control Building (CRB) state that DCD Tier 2, Section 3.4.2.1, “Probable Maximum Flood,” specifies the finished grade for all building structures, except at the truck ramp, to be 6 inches below the nominal ground floor elevation. The applicant proposed an ITAAC inspection to verify that as-built floor elevations of the RXB and CRB at ground entrance is located above the maximum external flood elevation to protect the RXB and the CRB from external flooding. However, the applicant did not provide the finished grade level at the truck ramp and did not discuss its effect on the protection of plant structures from external flooding. Therefore, the staff requests that the applicant provide the finished grade at the truck ramp and describe whether the ITAAC inspection will verify the as-built truck ramp elevation.

Additionally, the applicant stated, “The inspection will compare the maximum external flood elevation against the CRB as-built design drawings to verify that the required margin discussed in Section 3.4.1 is met”. The staff did not find the information regarding the required margin in Section 3.4.1. Therefore, the staff requests the applicant to quantify the required margin in the ITAAC.

SRP 14.3.2 acceptance criterion, 14.3.2.II.8 regarding external flooding states that for safety-related buildings ITAAC should require inspections to verify that external wall thicknesses below flood level are equal to or greater than 0.6 meter to protect against water seepage. The staff did not find the verification of this design feature in ITAAC provided in DCD Tier 1, Tables 3.11-2 and 3.13-1 for the RXB and CRB, respectively. Therefore, the staff requests the applicant to

include an ITAAC inspection requirement to verify the design features of external walls below flood level.

NuScale Response:

Part 1 response

Tier 2, Section 3.4.2.1, Probable Maximum Flood, states:

“The finished grade for all building structures, except at a truck ramp on the west side of the Radwaste Building and CRB tunnel, is approximately six inches below the baseline plant elevation.”

There is a truck ramp for the Radwaste Building (RWB) only; there is no truck ramp for the CRB. Therefore, neither the CRB ITAAC 03.13.03 nor the RXB ITAAC 03.11.03 will verify the as-built truck ramp elevation for the Radwaste Building.

Tier 2 Section 3.4.2.1 has been revised to clarify that there is a truck ramp only for the RWB and to correct a typographical error to identify the correct RWB truck ramp location on the south side instead of the west side of the building.

Part 2 response

Tier 1, Table 3.11-2 contains ITAAC No. 3. The design commitment for ITAAC No. 3 is “The Seismic Category I RXB is protected against external flooding in order to prevent flooding of safety-related SSC within the structure” ITAAC No. 3 acceptance criteria is “The RXB floor elevation at ground entrances is higher than the maximum external flood elevation.”

Tier 1, Table 3.13-1 contains ITAAC No. 3. The design commitment for ITAAC No. 3 is “The Seismic Category I CRB is protected against external flooding in order to prevent flooding of safety-related SSC within the structure” ITAAC No. 3 acceptance criteria is “The CRB floor elevation at ground entrances is higher than the maximum external flood elevation.”

Tier 2, Table 14.3-2 contains a discussion of both ITAAC 03.11.03 for the RXB and ITAAC 03.13.03 for the CRB. Both ITAAC Discussion columns state the following: “The inspection will compare the maximum external flood elevation against the [RXB or CRB] as-built design drawings to verify that the required margin discussed in Section 3.4.1 is met.” There is no mention of “margin” in Section 3.4.1.

Tier 2, Table 14.3-2 Discussion columns of ITAAC 03.11.03 and ITAAC 03.13.03 have been revised to contain wording consistent with the wording in Tier 1, Tables 3.11-2 and 3.13-1.

Part 3 response

NuScale does not propose to submit an ITAAC inspection requirement to verify the design features of external walls below flood level. The following discussion provides the basis for this decision.

On May 27, 2015 the Nuclear Energy Institute (NEI) submitted for NRC review and discussion NEI 15-02, Draft A of Revision 0, Industry Guideline for the Development of Tier 1 and ITAAC Under 10 CFR Part 52, dated May 2015 (ML15147A672). The letter contained a proposed standardized set of ITAAC that resulted in numerous NRC public meetings with the industry to discuss the standardization of inspections, tests, analyses and acceptance criteria (ITAAC) with the objective to clarify the scope of ITAAC required for design certification applications.

The NRC sent NuScale two letters, the first dated April 8, 2016 (ML16096A121), and the second dated June 21, 2016, that contained a set of standardized ITAAC that could be used in NuScale's design certification application.

None of the letters described above contained a standardized ITAAC to verify the minimum thickness of external wall thicknesses below flood level to protect against water seepage. In addition, the technical or operating experience basis for the minimum wall thickness acceptance criteria of 0.6 m is not provided in SRP 14.3.2. Finally, the proposed ITAAC does not satisfy the first principles discussed in NEI 15-02 and re-submitted by NEI in a letter to the NRC on June 14, 2017.

NRC's proposed ITAAC requires that safety-related walls below flood level have a minimum thickness of 0.6 m, or approximately 2 ft. NuScale has two safety-related buildings, the Control Building and the Reactor Building. The thickness of the exterior walls of the Control Building and the Reactor Building are 3 ft. and 5 ft. respectively. It is reasonable to believe that if a Control Building or Reactor Building exterior wall was less than 2 ft. the gross error would immediately be discovered in the field and reported to the NRC.

NuScale ITAAC 03.13.01 for the Control Building and ITAAC 03.11.06 for the Reactor Building require an inspection and analysis to be performed of the as-built buildings, and a design report be developed with the conclusion that deviations between the drawings used for construction and the as-built building have been reconciled, and the building maintains its structural integrity under the design basis loads.

Impact on DCA:

Tier 2, Section 3.4.2.1 and Tier 2, Table 14.3-2 have been revised as described in the response above and as shown in the markup provided in this response.

3.4.1.3.4 Flooding at Elevation 63'-3"

Elevation 63'-3" contains electrical equipment and utility rooms. There are no SSC subject to flood protection located at this elevation.

3.4.1.3.5 Flooding at Elevation 50'-0"

Elevation 50'-0" contains electrical equipment, air bottles, and utility rooms. There are no SSC that are subject to flood protection at this elevation.

3.4.1.4 Flooding Outside the Reactor and Control Buildings

RAI 14.03.02-2

Flooding of the RXB or CRB caused by external sources does not occur. The design external flood level is established as less than 99' elevation (one foot below the baseline plant elevation (top of concrete) at 100'-0"). The finished grade at the building perimeter of the RXB and CRB is approximately 6 inches below the top of concrete elevation, except at a truck ramp on the ~~west~~south side of the Radwaste Building and the CRB tunnel.

Water from tanks and piping that are non-seismic and non-tornado/hurricane protected is a potential flooding source outside the buildings. [[However, there are no large tanks or water sources near the entrances to the CRB and RXB.]] The site is graded to transport water away from these buildings. Therefore, failure of equipment outside the CRB and RXB cannot cause internal flooding.

3.4.1.5 Site Specific Analysis

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.

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.

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.

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.

3.4.2 Protection of Structures Against Flood from External Sources

The design includes the two Seismic Category I structures: the RXB and the CRB. The Radioactive Waste Building (RWB) is Seismic Category II and does not contain any

equipment subject to flood protection. There are no other safety-related structures in the design.

3.4.2.1 Probable Maximum Flood

The design is the equivalent of a "Dry Site" as defined in Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants," Rev. 1. The Seismic Category I structures are protected from external floods and groundwater by establishing the following design parameters:

- The probable maximum flood elevation (including wave action) of the design is one foot below the baseline plant elevation (100'-0).
- The maximum groundwater elevation for the design is two feet below the baseline plant elevation.

RAI 14.03.02-2

- ~~The finished grade for all building structures, except at a truck ramp on the west side of the Radwaste Building and CRB tunnel,~~With the exceptions of a truck ramp on the south side of the Radwaste Building and the CRB tunnel which is below grade, the finished grade for all building structures is approximately six inches below the baseline plant elevation. The yard is graded with a minimum slope of 1.5% away from these structures.

The below grade portions of the Seismic Category I structures provide protection for the safety-related and risk-significant SSC from groundwater intrusion by utilizing the following design features:

- the portions of the buildings that are below grade consider the use of waterstops and waterproofing
- exterior below grade wall or floor penetrations have watertight seals
- waterproofing and dampproofing systems, if used, are applied per the International Building Code Section 1805 (Reference 3.4-3)
- waterproofing and dampproofing materials, if used in horizontal applications, will have a coefficient of static friction equal to or greater than the design parameter established in Table 2.0-1 for all interfaces between the basemat and soil.

The design does not use a permanent dewatering system.

RAI 03.04.02-1, RAI 03.04.02-2, RAI 03.04.02-3

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. Additionally, a COL applicant will provide the specified design life for waterstops, waterproofing, damp proofing, and watertight seals. If the design life is less than the operating life of the plant, the COL applicant should describe how continued protection will be ensured.

RAI 03.04.02-1, RAI 03.04.02-2, RAI 03.04.02-3

RAI 09.01.04-1, RAI 09.05.01-6, RAI 14.03.02-2, RAI 14.03.03-1, RAI 14.03.09-1, RAI, 14.03.09-2, RAI 14.03.09-3, RAI 14.03.12-2, RAI 14.03.12-3

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.01.01	CRH	Testing is performed on the CRE in accordance with RG 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Revision 0, to demonstrate that air exfiltration from the CRE is controlled. RG 1.197 allows two options for CRE testing; either integrated testing (tracer gas testing) or component testing. Section 6.4 Control Room Habitability, describes the testing requirements for the CRE habitability program. Section 6.4 provides the maximum air exfiltration allowed from the CRE. In accordance with Table 14.2-18, a preoperational test using the tracer gas test method demonstrates that the air exfiltration from the CRE does not exceed the assumed unfiltered leakage rate provided in Table 6.4-1: Control Room Habitability System Design Parameters. Tracer gas testing in accordance with ASTM E741 will be performed to measure the unfiltered in-leakage into the CRE with the control room habitability system (CRHS) operating.			X		
03.01.02	CRH	The CRHS valves are tested by remote operation to demonstrate the capability to perform their function to transfer open and transfer closed under preoperational temperature, differential pressure, and flow conditions. In accordance with Table 14.2-18, a preoperational test demonstrates that each CRHS valve listed in Tier 1 Table 3.1-1 strokes fully open and fully closed by remote operation under preoperational test conditions. Preoperational test conditions are established that approximate design-basis temperature, differential pressure, and flow conditions to the extent practicable, consistent with preoperational test limitations.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.11.03	RXB	Section 2.4.2, Floods, discusses that the ~~site is properly graded to prevent localized flooding from the maximum precipitation event~~maximum flood elevation (including wind-induced wave run-up) is one foot below baseline plant elevation. Section 3.4.2.1, Probable Maximum Flood, states that the ~~finished grade for all building structures except at the truck ramp is 6 inches below the nominal ground floor elevation~~probable maximum flood elevation (including wave action) of the design is one foot below the baseline plant elevation (100'-0). An ITAAC inspection is performed to verify that the RXB as-built floor elevation at ground entrances is located above the maximum external flood elevation to protect the RXB from external flooding. The inspection will compare the maximum external flood elevation against the RXB as-built design drawings to verify that the ~~required margin discussed in Section 3.4.1 is met~~floor elevation at ground entrances is a minimum of one foot above the maximum external flood elevation.		X			
03.11.04	RXB	Section 12.3, Radiation Protection Design Features, provides the design bases for radiation shielding, including type, form and material properties utilized in specific locations. Radiation shielding is provided to meet the radiation zone and access requirements for normal operation and post-accident conditions, and to demonstrate compliance with 10 CFR 50.49, GDC 4, and GDC 19. Compartment walls, ceilings, and floors, or other barriers provide shielding. An ITAAC inspection is performed to verify that the thickness of RXB radiation barriers is greater than or equal to the required thicknesses. The required thicknesses are specified in Tier 1 Table 3.11-1.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.13.03	CRB	Section 2.4.2, Floods, discusses that the ~~site is properly graded to prevent localized flooding from the maximum precipitation event~~maximum flood elevation (including wind-induced wave run-up) is one foot below baseline plant elevation. ~~Section 3.4.1, Internal Flood Protection for Onsite Equipment Failures, and Section 3.4.2, Protection of Structures against Flood from External Sources, discuss that Seismic Category I structures that may be subjected to the design basis flood are designed to withstand the maximum external flood level to protect safe shutdown equipment within the structure.~~ Section 3.4.2.1, Probable Maximum Flood, states that the ~~finished grade for all building structures except at the truck ramp is 6 inches below the nominal ground floor elevation~~probable maximum flood elevation (including wave action) of the design is one foot below the baseline plant elevation (100'-0). An ITAAC inspection is performed to verify that the CRB as-built floor elevation at ground entrances is located above the maximum external flood elevation to protect the CRB from external flooding. The inspection will compare the maximum external flood elevation against the CRB as-built design drawings to verify that the ~~required margin discussed in Section 3.4.1 is met~~floor elevation at ground entrances is a minimum of one foot above the maximum external flood elevation.		X			