RAIO-1117-56998

November 02, 2017

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 216 (eRAI No. 9087) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 216 (eRAI No. 9087)," dated September 08, 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. 9087:

- 14.03.03-1

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

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9087

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9087

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

eRAI No.: 9087
Date of RAI Issue: 09/08/2017

NRC Question No.: 14.03.03-1

10 CFR 52.47(b)(1) requires “The proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the [Atomic Energy] Act, and the Commission's rules and regulations.” In supporting this requirement, and that of General Design Criteria 4, *Environmental and dynamic effects design bases,* which requires, in part, that systems, structures, and components (SSCs) important to safety to be designed to accommodate the effects of and to be compatible with the environmental conditions associated with postulated accidents, including loss-of-coolant accidents, the following issue is noted. The ITAAC for protection of safety-related SSCs from dynamic and environmental effects (DCD Tier 1, Rev. 0, Table 2.1-4, ITAAC #4) is located in the section for the NuScale Power Module. However, this ITAAC should be expanded to cover the full scope of the plant area for the certified design where pipe breaks may be postulated. The staff requests that this ITAAC either be relocated to a more broad section of Tier 1, or duplicated so as to provide full coverage of the areas contained in the certified design requiring analysis for the protection of safety-related SSCs from dynamic and environmental effects.

NuScale Response:

FSAR Tier 1, Table 2.1-4, ITAAC No. 4 is developed for the NuScale Power Module (NPM) to ensure protection of safety-related SSCs against the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems up to and including the Reactor Pool Bay Wall.

Areas beyond the Reactor Pool Bay Wall are the responsibility of the COL applicant as specified in revised COL Item 3.6-3, submitted in response to RAI 8942, Question 03.06.02-15 by NuScale letter RAIO-0917-55791, dated September 1, 2017 (ML17244A893). The revised COL Item 3.6-3 states the following:

“COL Item 3.6-3
A COL applicant that references the NuScale Power Plant design certification will perform the pipe rupture hazards analysis (including dynamic and environmental effects) of the high- and moderate-energy lines outside the Reactor Pool Bay and design appropriate protection features. This includes an evaluation and disposition of multi-module impacts in common pipe galleries, the identification of any new detection and auto-isolation functions for mitigating an auxiliary boiler high-energy line break, and evaluations regarding subcompartment pressurization. The COL applicant will update Table 3.6-2, Figure 3.6-16 and Figure 3.6-17 as appropriate.”

A new design commitment has been added to Tier 1, Section 3.11.1, Reactor Building Design Description, and a new ITAAC No. 8 has been added to Tier 1, Table 3.11-2 to satisfy COL Item 3.6-3. A corresponding discussion of new ITAAC No. 8 has been added to Tier 2, Table 14.3-2. The revisions to Tier 1, Section 3.11.1 and Table 3.11-2, and Tier 2 Table 14.3-2 are included in the attached FSAR mark-up.

Impact on DCA:

Tier 1, Section 3.11.1, Tier 1, Table 3.11-2, 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.

- The RXB is Seismic Category I and maintains its structural integrity under the design basis loads.
- Non-Seismic Category I SSC located where a potential for adverse interaction with a Seismic Category I SSC exists in the RXB will not impair the ability of Seismic Category I SSC to perform their safety functions during or following a safe shutdown earthquake (SSE).

RAI 14.03.03-1

- Safety-related SSC are protected against the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.

3.11.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 3.11-2 contains the inspections, tests, and analyses for the RXB.

RAI 14.03.03-1

Table 3.11-2: Reactor Building Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	Fire and smoke barriers provide confinement so that the impact from internal fires, smoke, hot gases,or fire suppressants is contained within the RXB fire area of origin.	An inspection will be performed of the RXB as-built fire and smoke barriers.	The following RXB fire and smoke barriers exist in accordance with the fire hazards analysis, and have been qualified for the fire rating specified in the fire hazards analysis: • fire-rated doors • fire-rated penetration seals • fire-rated dampers • fire-rated walls, floors, and ceilings • smoke barriers
2	Internal flooding barriers provide confinement so that the impact from internal flooding is contained within the RXB flooding area of origin.	An inspection will be performed of the RXB as-built internal flooding barriers.	The following RXB internal flooding barriers exist in accordance with the internal flooding analysis report and have been qualified as specified in the internal flooding analysis report: • flood resistant doors • curbs and sills • walls • water tight penetration seals • National Electrical Manufacturer's Association enclosures
3	The Seismic Category I RXB is protected against external flooding in order to prevent flooding of safety-related SSC within the structure.	An inspection will be performed of the RXB as-built floor elevation at ground entrances.	The RXB floor elevation at ground entrances is higher than the maximum external flood elevation.
4	The RXB includes radiation shielding barriers for normal operation and post-accident radiation shielding.	An inspection will be performed of the as-built RXB radiation shielding barriers.	The thickness of RXB radiation shielding barriers is greater than or equal to the required thickness specified in Table 3.11-1.
5	The RXB includes radiation attenuating doors for normal operation and for post-accident radiation shielding. These doors have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed.	An inspection will be performed of the as-built RXB radiation attenuating doors.	The RXB radiation attenuating doors are installed in their design location and have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed in accordance with the approved door schedule design.
6	The RXB is Seismic Category I and maintains its structural integrity under the design basis loads.	i. An inspection and analysis will be performed of the as-built RXB. ii. An inspection will be performed of the as- built RXB.	i. A design report exists and concludes that the deviations between the drawings used for construction and the as-built RXB have been reconciled, and the RXB maintains its structural integrity under the design basis loads. ii. The dimensions of the RXB critical sections conform to the approved design.

Table 3.11-2: Reactor Building Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7	Non-Seismic Category I SSC located where a potential for adverse interaction with a Seismic Category I SSC exists in the RXB will not impair the ability of Seismic Category I SSC to perform their safety functions during or following a SSE.	An inspection and analysis will be performed of the as-built non-Seismic Category I SSC in the RXB.	A report exists and concludes that the Non-Seismic Category I SSC located where a potential for adverse interaction with a Seismic Category I SSC exists in the RXB will not impair the ability of Seismic Category I SSC to perform their safety functions during or following an SSE as demonstrated by one or more of the following criteria: • Seismic Category I SSC are isolated from non-Seismic Category I SSC, so that interaction does not occur. • Seismic Category I SSC are analyzed to confirm that the ability to perform their safety functions is not impaired as a result of impact from non-Seismic Category I SSC. • A non-Seismic Category I restraint system designed to Seismic Category I requirements is used to assure that no interaction occurs between Seismic Category I SSC and non-Seismic Category I SSC.
8	Safety-related SSC are protected against the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.	An inspection will be performed of the as-built high- and moderate-energy piping systems and protective features for the safety-related SSC located in the RXB outside the Reactor Pool Bay.	Protective features are installed in accordance with the as-built Pipe Break Hazard Analysis Report and safety-related SSC are protected against or qualified to withstand the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.

RAI 09.01.04-1, RAI 09.05.01-6, 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
03.11.08	RXB	Section 3.6, Protection against Dynamic Effects Associated with Postulated Rupture of Piping, provides the design bases and criteria for the analysis required to demonstrate that safety-related SSC are not impacted by the adverse effects of a high-and moderate-energy pipe failure within the plant. An ITAAC inspection is performed to verify that the as-built protective features located in the RXB outside the Reactor Pool Bay credited in the reconciled Pipe Break Hazards Analysis Report such as pipe whip restraints, pipe whip or jet impingement barriers, jet impingement shields, or guard pipe have been installed in accordance with design drawings of sufficient detail to show the existence and location of the protective hardware. The as-built inspection is intended to verify that changes to postulated pipe failure locations and protective features or protected equipment made during construction do not adversely affect the safety-related functions of the protected equipment.	X	X			
03.12.01	RWB	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 requirement for normal operation and post-accident conditions and to demonstrate conformance with RG 4.21 and RG 8.8. Compartment walls, ceilings, and floors, or other barriers provide shielding. An ITAAC inspection is performed to verify that the thickness of RWB radiation barriers is greater than or equal to the required thicknesses. The required thicknesses are specified in Tier 1 Table 3.12-1.			X		