RAIO-0818-61607

August 28, 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 Response to NRC Request for Additional Information No. 287 (eRAI No. 9221) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 287 (eRAI No. 9221)," dated November 24, 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. 9221:

- 03.06.01-1

Revisions for the FSAR Section 3.6 are not included with this RAI response. Revision of the FSAR Section 3.6 is in preparation and will be provided by separate letter.

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

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Marieliz Vera, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9221

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NuScale Response to NRC Request for Additional Information eRAI No. 9221

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.: 9221
Date of RAI Issue: 11/24/2017

NRC Question No.: 03.06.01-1

GDC 4 “Environmental and Dynamic Effects Design Bases,” in part, requires that nuclear power plant SSCs important to safety be designed to accommodate the effects of, and be compatible with, environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss of coolant accidents. These SSCs are to be protected against the effects of pipe whip and discharging fluids resulting from high or moderate energy pipe breaks. 10 CFR 52.47(a)(25) states the interface requirements for those portions of the plant for which the application does not seek certification must be sufficiently detailed to allow completion of the FSAR. In coordination with this requirement, the NRC staff’s guidance as delineated in RG 1.206 Section C.III.1.4, “Combined License Action or Information Items,” states that COL applicants should identify or uniquely designate the information provided in the application, including the FSAR to addresses the COL action or information items.

In RAI 8942 question 03.06.02-15, the staff requested the applicant to explain why the dynamic analysis for the high-energy lines outside the Reactor Pool Bay is not needed.

The applicant response to the RAI states that the NuScale design has used a ‘graded level of detail’ approach for piping design. The applicant states that essential systems and components are located primarily inside containment; however, there are some essential systems and components located just outside containment. A preliminary PRHA was completed for these areas of the NPM, up to the disconnect flanges as described in FSAR Sections 3.6.1.1.2, 3.6.2.1.2 and 3.6.4.6. The routing and analysis of the remainder of the piping beyond the Reactor Pool Wall is to be completed by the COL applicant as described in COL Item 3.6-3.

The staff evaluated the applicant’s response and determined that additional information is needed. The staff finds that, as stated in GDC 4, structures important to safety shall be protected against the effects of pipe whip and discharging fluids resulting from high- or moderate-energy pipe breaks. The staff evaluated the design description of the reactor building and found that this building is classified as an A1 structure, which means this structure is determined to be both safety-related and risk-significant. Therefore, the adequate design of the RXB structure should be evaluated as part of the certification application, not the COL

application.

It is not clear to the staff how the applicant determined that the safety-related RXB has been adequately designed to handle all accident scenarios if the applicant has not yet evaluated the consequences of pipe failures inside safety-related structures, particularly in areas that house high-energy lines of several nuclear power modules (NPMs). The staff finds that, in order to clearly demonstrate conformance with the requirements of GDC 4, the applicant needs to discuss how all essential SSCs, including structures, are protected against the effects of pipe whip, discharging fluids, and overpressure resulting from high- or moderate-energy pipe breaks.

Therefore the staff requests the applicant to:

a. discuss in the FSAR how the essential structures (including subcompartments) that house high- and moderate-energy lines are designed and/or protected against the dynamic and environmental effects of a high- and/or moderate-energy pipe break,

b. identify in the FSAR the bounding conditions (for example; impact loads and peak subcompartment pressure) that the essential structures (and its subcompartments) are designed to withstand.

NuScale Response:

The approach and results have been incorporated into FSAR Section 3.6, and are summarized briefly below.

- Essential structures in the reactor building are those necessary to maintain the integrity of the building and of the reactor pool. Analysis of dynamic and environmental effects of high energy and moderate energy line breaks is performed on a bounding basis for lines outside the reactor pool bay because piping arrangements are not finalized. The areas containing main steam system (MSS) pipes are evaluated for MSS ruptures. The areas containing chemical and volume control system (CVCS), but no MSS piping, are evaluated for CVCS ruptures. Analysis of blast effects, pipe whip, jet impingement, and subcompartment pressurization is documented in FSAR Section 3.6.2 (flooding is in Section 3.4) to show that essential structures are not compromised. Subcompartment pressure loads are combined with other building loads (e.g., dead weight, seismic) to verify acceptance criteria are met. Moderate energy effects are bounded by those of high energy systems.

- Where necessary, venting of internal spaces is provided so that reactor building structural walls and floors subjected to subcompartment pressure loads do not exceed their differential pressure limit. Impact of a bounding MSS pipe whip does not result in through wall penetration, and damage is localized (less than 25 percent maximum depth

over an area with a diameter of about 13 inches). Jet impingement loads are also localized and bounded by pipe whip impact (maximum impingement force for MSS rupture of 57,200 lbf spread over an area of 90.8 square inches, i.e., a bounding surface load of 630 psi).

Impact on DCA:

The FSAR Tier 2, Section 3.6 has been revised as described in the response above. The FSAR markup is being provided by a separate letter.