RAIO-0617-54581

June 22, 2017

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 20 (eRAI No. 8770) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 20 (eRAI No. 8770)," 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. 8770:

- 03.05.01.01-1

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,

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

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8770

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8770

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

eRAI No.: 8770
Date of RAI Issue: 05/10/2017

NRC Question No.: 03.05.01.01-1

10 CFR 50, Appendix A, General Design Criteria 4 (GDC 4), in part, requires structures, systems, and components (SSCs) to be protected from internally generated missiles. In addition, 10 CFR 52.47(a)(2) requires the applicant to provide “a description and analysis of the SSCs of the facility, with emphasis upon performance requirements, the bases, with technical justification…required to show that safety functions will be accomplished.”

FSAR Tier 2, Section 3.5.1.1.1 contains a discussion of components that are not considered credible missile sources; however, an adequate explanation or technical justification as to why bolted bonnet valves and pressure-seal bonnet valves are not credible missile sources is not provided. For example, the FSAR states, valves “constructed in accordance with ASME codes and standards are not considered credible missiles,” without specifying the specific ASME code requirement to be applied. Typically, the staff only finds valves designed to ASME Section III standards to be non-credible pressurized missile sources.

The applicant is requested to provide in FSAR Tier 2, Section 3.5.1.1.1, the specific codes and standards applied that demonstrate a high level of quality (e.g. material, design, fabrication, examination, testing) assuring structural integrity of the valves in order to conclude that the missile sources are non-credible.

NuScale Response:

FSAR Tier 2, Section 3.5.1.1.1, Pressurized Systems, is revised to provide the specific codes and standards that are applied to bolted bonnet valves and pressure-seal bonnet valves.

Bolted bonnet valves and pressure-seal bonnet valves constructed in accordance with ASME Section III, ASME B16.34 or to an equivalent consensus standard are not considered credible missiles. The use of consensus standards provides reasonable assurance that the components are designed, manufactured and constructed in a manner that demonstrates a high level of quality (e.g., material, design, fabrication, examination, testing). The use of ASME B16.34 and other recognized industry Codes and Standards provides reasonable

assurance that the valve maintains its structural integrity during normal and upset conditions and that bolted bonnet valves and pressure-seal bonnet valves cannot become credible missiles.

Impact on DCA:
FSAR Tier 2, Section 3.5.1.1.1, Pressurized Systems, has been revised as described in the response above and as shown in the markups provided in this response.

2) If (P_1) is greater than 10^{-7} per year, its probability of impacting each safety-related or risk-significant target (P_2) is determined. If the combined probability is less than 10^{-7} per year, the missile and target combination is not considered statistically significant and is dismissed from further consideration.

3) If the product of (P_1) and (P_2) is greater than 10^{-7} per year, the probability for damage to the target (P_3) is assessed. If the combined probability is less than 10^{-7} per year, the missile and target combination is not considered statistically significant and is dismissed.

4) If the product of (P_1), (P_2) and (P_3) is greater than 10^{-7} per year, barriers or other measures are taken to protect the SSC.

3.5.1.1 Internally Generated Missiles (Outside Containment)

Internally generated missiles are missiles from plant equipment or processes. Missiles can be generated from pressurized systems and components, from rotating equipment, from explosions, or from improperly secured equipment. However, not all potential missiles are credible. The following provides discussion on when missiles do not need to be considered credible ($P_1 < 10^{-7}$).

3.5.1.1.1 Pressurized Systems

Moderate and low energy systems have insufficient stored energy to generate a missile. As such, the probability of missile occurrence (P_1) from systems with operating pressures less than 275 psig is considered to be less than 10^{-7} (i.e., not credible).

Although high energy piping failures could result in dynamic effects, they do not form missiles as such because the whipping section remains attached to the remainder of the pipe. Section 3.6 addresses the dynamic effects associated with pipe breaks. Therefore, potential missiles from high energy piping are the attached components: valves, fasteners, thermowells, and instrumentation.

Missiles from piping or valves designed in accordance with ASME Section III, (Reference 3.5-1) and maintained in accordance with an ASME Section XI (Reference 3.5-2) inspection program are not considered credible.

RAI 03.05.01.01-1

Bolted bonnet valves and pressure-seal bonnet valves~~,~~ constructed in accordance with ASME Section III, ASME B16.34 or to an equivalent consensus standard are not considered credible missiles. The use of consensus standards provides reasonable assurance that the components are designed, manufactured and constructed in a manner that demonstrates a high level of quality (e.g., material, design, fabrication, examination, testing). The use of ASME B16.34 and other recognized industry Codes and Standards provides reasonable assurance that the valve maintains its structural integrity during normal and upset conditions and that bolted bonnet

valves and pressure-seal bonnet valves cannot become credible missiles.~~codes and standards are not considered credible missiles. Bolted bonnets are prevented from becoming missiles by limiting stresses in the bonnet-to-body bolting material and by designing flanges in accordance with applicable code requirements. Pressure-seal bonnets are prevented from becoming missiles by the retaining ring, which would have to fail in shear, and by the yoke capturing the bonnet or reducing bonnet energy.~~

Valve stems are not considered as credible missiles if at least one feature (in addition to the stem threads) is included in their design to prevent ejection. Valve stems with back seats are prevented from becoming missiles by this feature. In addition, the valve stems of valves with power actuators, such as air- or motor-operated valves, are effectively restrained by the valve actuator.

Nuts, bolts, nut and bolt combinations, and nut and stud combinations have only a small amount of stored energy and thus are not considered as credible missiles.

Thermowells and similar fittings attached to piping or pressurized equipment by welding are not considered as credible missiles. The completed joint has greater design strength than the parent metal. Such a design makes missile formation not credible.

Instrumentation such as pressure, level, and flow transmitters and associated piping and tubing are not considered as credible missiles. The quantity of high energy fluid in these instruments is limited and will not result in the generation of missiles. The connecting piping and tubing is made up using welded joints or compression fittings for the tubing. Tubing is small diameter and has only a small amount of stored energy.

3.5.1.1.2 Pressurized Cylinders

Industrial compressed gas cylinders and tanks are used for the control room habitability system. In addition, smaller portable tanks or bottles used for the chemical and volume control system and maintenance activities may also be stored within the buildings. Cylinders, bottles, or tanks containing highly pressurized gas are considered missile sources unless appropriately secured.

The control room habitability system air bottles are mounted in Seismic Category I racks to ensure that each air bottle is contained and does not become a missile. Plates at the end of each bottle retain horizontal movement and pipe straps are installed to prevent vertical movement.

Procedures developed in accordance with Section 13.5.2.2 ensure that portable pressurized gas cylinders or bottles are moved to a location where they are not a potential hazard to equipment subject to missile protection, or seismically restrained to prevent them from becoming missiles.