RAIO-0418-59545

April 13, 2018

Docket No. 52-048

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

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 64 (eRAI No. 8863) on the NuScale Design Certification Application

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 64 (eRAI No. 8863)," dated June 20, 2017
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 64 (eRAI No.8863)," dated August 21, 2017

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

The Enclosure to this letter contains NuScale's supplemental response to the following RAI Question from NRC eRAI No. 8863:

- 06.02.04-4

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
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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 8863

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 8863

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

eRAI No.: 8863
Date of RAI Issue: 06/20/2017

NRC Question No.: 06.02.04-4

10 CFR 50.34(f)(2)(xiv) part (D) requires that an applicant provide containment isolation systems that utilize a containment set point pressure for initiating containment isolation as low as is compatible with normal operation (additional background information can be found in DSRS 6.2.4 and NUREG-0737). NuScale's pressure set point is determined by taking the analytical limit and subtracting total loop uncertainty (see NuScale's setpoint methodology Technical Report: TR-0616-49121-P Rev. 0). Applying NuScale's setpoint methodology results in a set point that is based off the analytical limit and does not consider normal operation as required by the TMI regulation cited above. Therefore, based on the regulation and staff guidance, the NRC staff requests that the NuScale design certification applicant provide information that addresses the TMI regulation related to containment pressure set point given that NuScale's set point methodology does not explicitly require or account for the TMI requirement. As part of the response, provide a mark-up of the FSAR, as appropriate.

In addition, NuScale utilizes a temperature set point (under the bioshield) to initiate containment isolation. In a similar manner as discussed above for the pressure set point, NuScale's temperature set point is determined by taking the analytical limit and subtracting total loop uncertainty (see NuScale's setpoint methodology Technical Report: TR-0616-49121-P Rev. 0). For the temperature setpoint, the NRC staff request that the NuScale design certification applicant provide information on how NuScale arrives at a minimum containment isolation temperature set point that is in keeping with the approach used to determine the containment isolation pressure set point (as low as is compatible with normal operation). As part of the response, provide a mark-up of the FSAR, as appropriate.

NuScale Response:

The response to eRAI 8863, Question 06.02.04-4, transmited by NuScale letter RAIO-0817-55516, dated August 17, 2017 addressed the high containment pressure containment isolation signal setpoint and the high under the bioshield temperature containment isolation signal setpoint. This supplemental response replaces the high containment pressure containment isolation setpoint discussion in RAIO-0817-55516. The response to Question

06.02.04-4 in RAIO-0817-55516 continues to address the high under the bioshield temeprature containment isolation setpoint.

NUREG-0737 - Item II.E.4.2 provides additional guidance to 10CFR50.34(f)(2)(xiv)(D). In the section marked "Clarification,", item (6) states:

> *The containment pressure history during normal operation should be used as a basis for arriving at an appropriate minimum pressure setpoint for initiating containment isolation. The pressure setpoint selected should be far enough above the maximum observed (or expected) pressure inside containment during normal operation so that inadvertent containment isolation does not occur during normal operation from instrument drift or fluctuations due to the accuracy of the pressure sensor. A margin of 1 psi above the maximum expected containment pressure should be adequate to account for instrument error. Any proposed values greater than 1 psi will require detailed justification. Applicants for an operating license and operating plant licensees that have operated less than one year should use pressure history data from similar plants that have operated more than one year, if possible, to arrive at a minimum containment setpoint pressure.*

The NuScale design has no relevant operating history to base a lower containment setpoint below the high containment pressure analytical limit upon. Therefore, it is impossible to select a setpoint far enough above the observed (or expected) pressure inside containment during normal operation, that accounts for instrument drift or fluctuations, due to the pressure sensor accuracy. Additionally, the NuScale containment operates under vacuum conditions, and the high containment pressure analytical limit is also subatmospheric, therefore, there is no need to develop an isolation setpoint 1 psi above the normal operating pressure, to prevent a release to the environs. Therefore, 10 CFR 50.34(f)(2)(xiv)(D) is not technically relevant to the NuScale design. FSAR Table 1.9-2 is revised accordingly.

Impact on DCA:

Table 1.9-5 has been revised as described in the response above and as shown in the markup provided in this response.

RAI 06.02.04-4S1, RAI 06.02.04-7S1, RAI 06.02.04-9, RAI 06.02.04-9S1, RAI 08.01-1, RAI 08.02-4, RAI 08.02-6, RAI 08.03.02-1, RAI 09.02.06-1

Table 1.9-5: Conformance with TMI Requirements (10 CFR 50.34(f)) and Generic Issues (NUREG-0933)

Item	Regulation Description / Title	Conformance Status	Comments	Section
50.34(f)(1)(i)	Perform a plant/site-specific probabilistic risk assessment, the aim of which is to seek such improvements in the reliability of core and containment heat removal systems as are significant and practical and do not impact excessively on the plant (II.B.8)	Partially Conforms	Design certification will address reliability of core and containment heat removal systems, with an update required by COL applicant to reflect site-specific conditions.	19.0 19.1 19.2
50.34(f)(1)(ii)	Perform an evaluation of the proposed auxiliary feedwater system (II.E.1.1)	Not Applicable	This rule requires an evaluation of proposed PWR auxiliary feedwater (AFW) systems. The NuScale plant design does have an AFW system like a typical LWR. Neither the literal language nor the intent of this rule applies to the NuScale design.	Not Applicable
50.34(f)(1)(iii)	Perform an evaluation of the potential for and impact of reactor coolant pump seal damage following small-break LOCA (II.K.2.16 and II.K.3.25)	Not Applicable	The NuScale reactor design differs from large PWRs because the NuScale design does not require or include reactor coolant pumps. Rather, the NuScale design uses passive natural circulation of the primary coolant, eliminating the need for reactor coolant pumps.	Not Applicable
50.34(f)(1)(iv)	Perform an analysis of the probability of a small-break LOCA caused by a stuck-open power-operated relief valve (PORV) (II.K.3.2)	Not Applicable	This guidance is applicable only to PWRs that are designed with power-operated pressurizer relief valves. The NuScale design does not use power-operated relief valves.	Not Applicable
50.34(f)(1)(v)	Perform an evaluation of the safety effectiveness of providing for separation of high pressure coolant injection and reactor core isolation cooling system initiation levels (II.K.3.13)	Not Applicable	This requirement applies only to BWRs.	Not Applicable
50.34(f)(1)(vi)	Perform a study to identify practicable system modifications that would reduce challenges and failures of relief valves (II.K.3.16)	Not Applicable	This requirement applies only to BWRs. Regardless, the issue contemplated by this requirement was related to power-operated relief valves. The NuScale design does not use power-operated relief valves.	Not Applicable

Table 1.9-5: Conformance with TMI Requirements (10 CFR 50.34(f)) and Generic Issues (NUREG-0933) (Continued)

Item	Regulation Description / Title	Conformance Status	Comments	Section
50.34(f)(2)(xiv) 50.34(f)(2)(xiv)(A) 50.34(f)(2)(xiv)(B) 50.34(f)(2)(xiv)(C) 50.34(f)(2)(xiv)(D) 50.34(f)(2)(xiv)(E)	Provide containment isolation systems that (A) ensure all non-essential systems are isolated automatically; (B) ensure each non-essential penetration (except instrument lines) have two isolation barriers in series; (C) do not result in reopening of the containment isolation valves on resetting of the isolation signal; (D) use a containment set point pressure for initiating containment isolation as low as is compatible with normal operation; and (E) include automatic closing on a high radiation signal for all systems that provide a path to the environs (II.E.4.2)	Departure	~~The containment evacuation system has the potential for an open path from containment to the environs but is isolated upon a high containment vessel pressure signal, a low-low pressurizer level signal, a low alternating current voltage signal, or high under the bioshield temperature. Additionally, the CES discharge is re-directed into the gaseous radioactive waste system upon a high radiation signal.~~The NuScale design conforms to 50.34(f)(2)(xiv)(A), (B), and (C). The requirements of 50.34(f)(2)(xiv)(D) and (E) are not technically relevant to the NuScale design. For 50.34(f)(2)(xiv)(D), NUREG 0737 - Item II.E.4.2 provides additional guidance to 10 CFR 50.34(f)(2)(xiv)(D). Specifically, the clarification states the minimum containment pressure history during normal operation should be used as a basis for an appropriate minimum pressure setpoint for initiating containment isolation. The NuScale design has no relevant operating history to base an isolation setpoint upon. Furthermore, the containment high pressure analytical limit is subatmospheric, therefore, any pressure setpoint up to and including the analytical limit will prevent a release to the environs. For 50.34(f)(2)(xiv)(E), The NuScale design differs from that of a traditional large water reactor design of a TMI-era vintage because reactor core uncovery, and resulting core damage, cannot occur without reaching the low low pressurizer level containment isolation setpoint. The pressurizer is an integral part of the reactor vessel, located well above the reactor core, and not connected to the reactor core by piping. Design basis events meet their thermal	5.2.5 6.2.4 7.1.5 7.2.13 9.3.6 19.2

Table 1.9-5: Conformance with TMI Requirements (10 CFR 50.34(f)) and Generic Issues (NUREG-0933) (Continued)

Item	Regulation Description / Title	Conformance Status	Comments	Section
			and hydraulic acceptance criteria without reliance on isolating the CES in a high radiation signal. No design basis event results in degraded or damaged core conditions. Section 19.2 analyses demonstrate severe accident conditions, with resultant core damage, also result in generation of reliable containment isolation signals, without reliance on isolation on high containment radiation. An in-containment event resulting in core damage or degradation also results in containment isolation on low low pressurizer level and high containment pressure. An event that leads to core damage or degradation also results in containment isolation on low low pressurizer level. These features provide a reliable alternative means to prevent radiological release from the CES to the environs.	
50.34(f)(2)(xv)	Capability for containment purging/venting designed to minimize the purging time consistent with as low as reasonably achievable (ALARA) (II.E.4.4)	Not Applicable	The NuScale containment vessel is smaller than a typical containment building, does not contain sub-compartments and does not does not require or incorporate a purge or venting system function as contemplated by this requirement. Personnel access during reactor operation is not needed. In addition, the NuScale ECCS design does not include pumps, and does not involve a typical PWR ECCS recirculation mode where ECCS pump performance relies on containment pressure. Thus purge or vent capability as prescribed by 10 CFR 50.34(f)(2)(xv) is neither required nor included in the NuScale design. This requirement is not technically relevant to the NuScale design.	Not Applicable