RAIO-0419-65181

April 16, 2019

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. 517 (eRAI No. 9657) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 517 (eRAI No. 9657)," dated February 15, 2019

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. 9657:

- 12.03-62

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 Carrie Fosaaen at 541-452-7126 or at cfosaaen@nuscalepower.com.

Sincerely,

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

Distribution: Gregory Cranston, NRC, OWFN-8H12
Samuel Lee, NRC, OWFN-8H12
Getachew Tesfaye, NRC, OWFN-8H12

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9657

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9657

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.: 9657
Date of RAI Issue: 02/15/2019

NRC Question No.: 12.03-62

As a follow-up to RAI-9258 Question 29 and RAI to RAI 9257, Question 12.02-14, the staff is requesting additional information on the used to determine the dose rates from pipes containing demineralizer resin, and the methods for assuring the presence of shielding sufficient to provide the indicated radiation zones.

The Regulatory Requirements:

10 CFR 52.47(a)(5) requires applicants to identify the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radiation exposures within the limits set forth in part 20 of this chapter.

10 CFR 52.47(a)(25) requires the applicant to provide interface requirements to be met by those portions of the plant for which the application does not seek certification. These requirements must be sufficiently detailed to allow completion of the FSAR.

10 CFR 52.47(a)(26) requires the applicant to provide justification that compliance with the interface requirements 10 CFR 52.47(a)(25) is verifiable through inspections, tests, or analyses. The method to be used for verification of interface requirements must be included as part of the proposed ITAAC.

Background:

The applicant's response to RAI-9257, Question 12.02-14, dated 8 August 2018 (ADAMS Accession No. ML18220B407), stated that that the size of the resin transfer line was modeled using the parameters described in DCD Table 12.2-6: "Chemical and Volume Control System

Component Source Term Inputs and Assumptions." This table list the resin transfer line as a 2 inch inside diameter pipe with a 0.154 inch thick wall (i.e., 2 inch schedule 40 pipe).

However, during the audit of the DBFFF change and the associated RAI responses as described in "Audit Plan for the Phase II Regulatory Audit of the Design Basis Failed Fuel Fraction for NuScale Power, LLC Design Certification Application," (ML18243A296), the staff noticed that the "RXB Dose Rates and Shielding Calculations" package specified the use of a 3 inch schedule 40 pipe as the basis for the resin transfer line. The staff asked the applicant about the apparent difference in the description of the size of construction of the pipe used to transfer resin from the CVCS Mixed Bed demineralizers located in the reactor building (RXB) to the Spent Resin Storage Tanks (SRST), located in the radioactive waste building (RWB), the applicant stated that the Pool Clean Up System (PCUS) resin transfer lines were 3 inch lines. The staff noted that because of the relative location of the CVCS MB demineralizers and the PCUS demineralizers, that there was a reasonable expectation by the staff that these two lines would join in the RXB before going to the SRST in the RWB and asked the applicant about the joint location. The applicant stated that they were unable to determine the location of that juncture because they had not yet done the design of the resin transfer lines.

Additionally, while trying to ascertain the potential impact of having a transfer line clogged with resin, the staff looked at the radiation zone designations in Figure 12.3-1a: "Reactor Building Radiation Zone Map - 24' Elevation," Figure 12.3-1b: "Reactor Building Radiation Zone Map - 35'-8" Elevation" and Figure 12.3-1c: "Reactor Building Radiation Zone Map - 50' Elevation," provided in the response to RAI-9281 (ML18235A654) and DCD Table 12.3-1: "Normal Operation Radiation Zone Designations." The applicant stated that because the dose rates were only transient dose rates, they did not identify that on these figures. The staff evaluated this response and noted a discrepancy with Figure 12.3-1c: "Reactor Building Radiation Zone Map - 50' Elevation," note 2, which does address transient radiation zones changes during resin transfers.

Questions:

The staff seeks to understand the technical bases for the radiation zone designations for the areas between the location of the CVCS demineralizers and the adjacent radioactive waste building, along the path of the resin transfer line. To confirm the technical appropriateness of the zonation, as it bears upon identifying the kinds and quantities of radioactive material used as the basis for the shielding design, the staff needs to understand either the specific size(s) of the pipe(s) used to transfer resin and locations where different sizes of pipes may contain resin from

the CVCS demineralizers, and the portions of the Reactor Building where it is located or a demonstration by the applicant of conservatisms built into the analyses to address uncertainties in pipe sizing.

The staff is seeking clarification on whether the shielding design for the resin transfer line is complete, or if it is expected to be completed at a later date. If the design of the shielding for the resin transfer line is not complete, then the staff seeks to understand the regulatory process to be used by the applicant to ensure that the shielding is designed and installed consistent with the stated radiation zone designations. Therefore, please provide the following information:

A. Option 1

- Revise DCD Tier 2 Section 12.3 to indicate which portions of the application are considered outside of the scope of the design,

- Provide a proposed COL Item for DCD Tier 2 Section 12.3 stating that that the COL applicant that references the NuScale Power Plant design certification will describe the radiation shielding design measures used to shield those portions of the resin transfer lines located within the Reactor Building,

- Provide the regulatory basis in 10 CFR 52.79 that supports the proposed COL Item that will facilitate the staff's review during the COL application review.

B. Option 2

- Provide a proposed COL Item for DCD Tier 2 Section 12.3 stating that the COL applicant that references the NuScale Power Plant design certification will describe the radiation shielding design measures used to shield those portions of the resin transfer lines located within the Reactor Building,

- Identify this shielding as an interface requirement in accordance with 10 CFR 52.47(a)(24) and revise DCD Tier 2 Section 12.3 to indicate which portions of the application are considered outside of the scope of the design,

- Consistent with the requirements of 10 CFR 52.47(a)(25) and 10 CFR 52.47(a)(26) to provide interface requirements to be met by those portions of the plant for which the application does not seek certification and the associated method to be used for

verification of the interface requirement, revise DCD Tier 2 Table 1.8-1: "Summary of NuScale Certified Design Interfaces with Remainder of Plant listing the interface requirements for its design," to include the proposed interface requirement.

C. Option 3

- State that resin from the CVCS demineralizers is only in 2 inch lines while in the Reactor Building, or add the description of the 3 inch line to DCD Table 12.2-6, and describe in the DCD, including the RXB figures in DCA Section 12.3, the routing of the different sections of the resin transfer lines,

- State that the design of the shielding for the resin transfer line within the RXB is complete, and describe the shielding for the horizontal runs of the resin transfer line in DCA Tier 2 Table 12.3-7: "Radioactive Waste Building Shield Wall Geometry," and DCA Tier 1 Table 3.11-1: "Reactor Building Shield Wall Geometry,"
- Describe in DCD Tier 2 Section 12.3, the methods, models, and assumptions used as the basis for the design of the radiation shielding for the resin transfer lines.

NuScale Response:

The NuScale staff believes that Option 1 is not appropriate because the COL applicant is required per 10 CFR 52.97(a)(1)(iii) to complete the final design in accordance with the description provided in the FSAR. In this case, an applicant would be required to comply with FSAR Sections 12.3.1.2.1 and 12.3.1.2.3. A COL item would be redundant to the requirements already imposed on a COL applicant.

The NuScale staff believes that Option 2 is also not appropriate because a COL item would be redundant to a COL applicant that is already required per 10 CFR 52.97(a)(1)(iii) to complete the design in accordance with the description provided in the FSAR.

The NuScale staff believes that Option 3 is not appropriate because the final detailed pipe routing design has not yet been completed. However, the transition of the resin transfer line from two to three inches occurs in the Radioactive Waste Building, as reflected in the NuScale design documents, but this level of detail in not appropriate for the FSAR.

As mentioned above, the final detailed design of the routing of pipes, ducts, and cables has not been completed, including those routes that may penetrate radiation shield walls or be routed through various rooms and corridors. However, FSAR Sections 12.3.1.2.1 "Pipe Routing," and 12.3.1.2.3 "Penetrations," describe the design features utilized to ensure that the facility

conforms to the ALARA principles. FSAR Section 12.3.1.1.10 "Demineralizers," describes that the resin transfer lines are shielded, or administrative controls enacted to protect plant personnel.

As described in FSAR Section 12.3.2.4.3, the radiation zone maps in FSAR Section 12.3 were developed using radiation shielding analyses that model a generic CVCS shielded resin transfer line in the Reactor Building (RXB) as a two-inch line that transitions to a three-inch line after it enters the Radioactive Waste Building, as is reflected in the engineering design documents, but is beyond the level of detail for inclusion in the FSAR. This two-inch resin transfer pipe, both the horizontal and vertical portions, is also modeled as being shielded in pipe chases. This shielding analysis was done consistent with other shielding analysis of the NuScale design using the industry standard MCNP6 particle transport code. The horizontal portion of the pipe chase has not been specifically routed nor has the design been finalized. The completion of the detail design will be completed by a COL applicant in accordance with the ALARA design features described in the FSAR.

To clarify the FSAR pertaining to the radiation shield geometry modeled in the shielding analyses, FSAR Table 12.3-6 Reactor Building Shield Wall Geometry has been revised to include a description of the horizontal CVCS pipe chase that traverses the RXB from the CVCS demineralizer area to the vertical pipe chase on the west-end of the RXB.

Impact on DCA:

FSAR Table 12.3-6 has been revised as described in the response above and as shown in the markup provided in this response.

RAI 03.11-19, RAI 12.03-17, RAI 12.03-23, RAI 12.03-62

Table 12.3-6: Reactor Building Shield Wall Geometry

Elev.	Room # (Note 1)	Room Name	North Wall (Note 2)	East Wall (Note 2)	South Wall (Note 2)	West Wall (Note 2)	Floor (Note 3)	Ceiling (Note 3)	Source Term
24’	010-040	Module 1 CVCS ion exchanger sluice room	20” Structural steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-041	Module 2 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20”Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-042	Module 3 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20”Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-043	Module 4 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-044	Module 5 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-045	Module 6 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-051	Module 7 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-050	Module 8 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-049	Module 9 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20”Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-048	Module 10 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24’	010-047	Module 11 CVCS ion exchanger sluice room	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	20” Concrete/steel partition wall	10’ Concrete (ground floor)	20” Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed

Table 12.3-6: Reactor Building Shield Wall Geometry (Continued)

Elev.	Room # (Note 1)	Room Name	North Wall (Note 2)	East Wall (Note 2)	South Wall (Note 2)	West Wall (Note 2)	Floor (Note 3)	Ceiling (Note 3)	Source Term
24′	010-046	Module 12 CVCS ion exchanger sluice room	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	10′ Concrete (ground floor)	20″ Concrete/steel composite slab	CVCS mixed bed and CVCS cation bed
24′	010-012	Degasifier room "A"	5′ Concrete, RXB exterior wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation)	Degasifier
24′	010-009	Degasifier room "B"	5′ Concrete, RXB exterior wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation)	Degasifier
24′	010-008	Pool cleanup filter room "A"	5' Concrete, RXB wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	5′ concrete, RXB exterior wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation)	The dose rate from the PCU filters is assumed to be 10% of that from a PCU demineralizer.
24′	010-007	Pool cleanup filter room "B"	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	5′ concrete, RXB exterior wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation)	The dose rate from the PCU filters is assumed to be 10% of that from a PCU demineralizer.
24′	010-052	PCUS demin room #1	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	5′ Concrete, RXB exterior wall	20″ Concrete/steel partition wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation	PCUS demineralizer
24′	010-054	PCUS demin room #2	20″ Concrete/steel partition wall	20″ Concrete/steel partition wall	5′ Concrete, RXB exterior wall	20″ Concrete/steel partition wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation	PCUS demineralizer
24′	010-053	PCUS demin room #3	20″ Concrete/steel partition wall	20″Concrete/steel partition wall	5′ Concrete, RXB exterior wall	20″ Concrete/steel partition wall	10′ Concrete (ground floor)	3′ Concrete (floor of 50′ elevation	PCUS demineralizer
35′-8″	N/A	Horizontal Pipe Chase	20″ Concrete	20″ Concrete	20″ Concrete	20″ Concrete	20″ Concrete	20″ Concrete	CVCS resin transfer pipe