



August 21, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 320 (eRAI No. 9280) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 320 (eRAI No. 9280)," dated January 04, 2018

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 Questions from NRC eRAI No. 9280:

- 12.03-4
- 12.03-5
- 12.03-6

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
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9280

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9280

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

eRAI No.: 9280

Date of RAI Issue: 01/04/2018

NRC Question No.: 12.03-4

Regulatory Basis

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 10 CFR Part 20.

Appendix A to Part 50—General Design Criteria for Nuclear Power Plants, Criterion 61—“Fuel storage and handling and radioactivity control,” requires systems which may contain radioactivity to be designed with suitable shielding for radiation protection and with appropriate containment, confinement, and filtering systems.

10 CFR 20.1101(b) and 10 CFR 20.1003, require the use of engineering controls to maintain exposures to radiation as far below the dose limits in 10 CFR Part 20 as is practical. The DSRS Acceptance Criteria of DSRS Section 12.3-12.4, “Radiation Protection Design Features,” states that the areas inside the plant structures, as well as in the general plant yard, should be subdivided into radiation zones, with maximum design dose rate zones and the criteria used in selecting maximum dose rates identified.

Background

In RAI-8860 Question 12.02-2 issued June 7 2017, regarding the radiation zone classification of the “Class A/B/C HICS Storage Area,” (shown on DCD Tier 2 Revision 0, Figure 1.2-30, “Radioactive Waste Building 100'-0" Elevation” as Room 030-034), the staff asked the applicant to identify whether drums from the drum dryer facility were allowed to be stored within the Class A/B/C HICS Storage Area. The applicant’s response to RAI-8860 Question 12.02-2, dated July 10 2017, stated that drums from the drum dryer facility are not stored in the Class A/B/C HIC Storage Area, but rather are stored in the Mixed/Chemical Waste Drum Storage Area (DCD Figure 1.2-30 Room 030-007).

DCD Tier 2 Revision 0 subsection 11.2, “Liquid Waste Management Systems,” notes that the drum dryer consists of a system designed to pump water into a 55 gallon drum (nominally 7.4

ft3) which is heated and evacuated, to rapidly evaporate the liquid in the drum until only solid material remains in the drum. The remaining concentrate contains all of the non-volatile radioactive material added to the drum, which in turn serves as the basis for establishing the dose rates near the drums. DCD Table 12.2-13b, "Liquid Radioactive Waste System Component Source Terms - Radionuclide Content," lists the quantities of the isotopes expected to be present in a drum. Using information made available to the staff during the RPAC Chapter 12 Audit, the staff's analysis of the radioactive material content of a dried drum was consistent with the information provided in DCD Table 12.2-13b.

DCD Table 12.3-1, "Normal Operation Radiation Zone Designations," states that an area defined as a radiation zone 3, has dose rates ≥ 2.5 mrem/hr and ≤ 5 mrem/hr. DCD Tier 2 Revision 0, Figure 1.2-28, "Radioactive Waste Building 71'-0" Elevation, shows the Drum Storage Area (room number 030-007) in the radioactive waste building. DCD Figure 12.3-2a "Radioactive Waste Building Radiation Zone Map – 71' Elevation," shows that the area labeled as the "Mixed/Chemical Waste Storage Area," corresponding to the Drum Storage Area on Figure 1.2-28 room 030-007, as a radiation zone III (3) (i.e., dose rates ≥ 2.5 mrem/hr and ≤ 5 mrem/hr).

DSRS section 12.3-12.4 states that the specific acceptance criteria for radiation zone designations, are based on the maximum dose rate defined for each zone. The source of radiation within the Drum Storage Area is the concentrated material contained within the dried drums. Since 10 CFR 20.1003 states that a High radiation area is defined at 30 centimeters (cm) (0.984 ft.) from the radiation source, a distance of 1 ft. from the source (the drum) is used by the staff for assessing radiation zone designations in the application,. The staff analysis indicated that the dose rate on a drum of dried liquid containing the amount of radioactive material listed in Table 12.2-13b, may exceed the indicated radiation zone depicted on Figure 12.3-2a, "Radioactive Waste Building Radiation Zone Map - 71' Elevation," for the Drum Storage Area by several orders of magnitude.

Key Issue 1

DCD Tier 2 Section 12.2.1.7, "Solid Radioactive Waste System," does not identify where the facility drums of radioactive waste resulting from the operation of the drum driers will be stored.

Question 1

To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions, with respect to the designation of radiation zones in the facility, the staff requests that the applicant:

- Revise as necessary, DCD Section 12.2.1.7 to include a description of where radioactive waste resulting from the operation of the drum driers will be stored,

OR

- Provide the specific alternative approaches used and the associated justification.
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NuScale Response:

The temporary storage of radioactive waste containers resulting from drum dryer activities has been changed to the Class A/B/C high integrity container (HIC) storage area in the Radioactive Waste Building. Shielding analysis for the Class A/B/C HIC storage area source term has been revised to include five dewatered HICs filled with spent resin from the spent resin storage tank, plus one drum filled with waste from one year's operation of the drum dryer.

FSAR Section 12.2.1.7 has been updated to describe this revised Class A/B/C HIC storage area source term. FSAR Figure 12.3-2a has been updated to reflect the changes described above, and is included with the NuScale response to RAI 9302.

Impact on DCA:

FSAR Section 12.2.1.7 has been revised as described in the response above and as shown in the markup provided in this response.

The estimated input flows from various sources to the high-conductivity waste (HCW) collection tanks, the low-conductivity waste (LCW) collection tanks, and the detergent collection tank are listed in Table 11.2-3. These inputs are processed in batches by the liquid radioactive waste processing skids and sent to the HCW and LCW sample tanks for final disposition. The assumed values for the LRW processing equipment radionuclide collection efficiencies are listed in Table 12.2-14. The LRWS component source terms are provided in Table 12.2-15a and Table 12.2-15b, and source strengths are provided in Table 12.2-16a and Table 12.2-16b. To establish the shielding design downstream of the GAC filter, the radionuclide concentration in the outlet stream from the GAC filter is assumed to not be reduced by the GAC filter.

12.2.1.6 Gaseous Radioactive Waste System

Radioactive fission gases are produced in the reactor core and assumed to be released to the primary coolant, as discussed in Section 11.1. The radionuclide input to the gaseous radioactive waste system (GRWS) comes primarily from the LRWS degasifier, which strips the dissolved gases from the primary coolant that enters the degasifier from the CVCS. The gases from the degasifier are sent to the GRWS for conditioning and processing. Table 12.2-17 lists the assumed values pertaining to the GRWS source geometries and Table 11.3-1 describes the GRWS processing parameters. The GRWS component source terms are provided in Table 12.2-18 and the source strengths are provided in Table 12.2-19.

12.2.1.7 Solid Radioactive Waste System

RAI 12.02-2, RAI 12.03-4

The solid radioactive waste system (SRWS) handles solid radioactive waste from various waste streams, as described in Section 11.4. The waste inputs to the SRWS components are collected, resulting in a radionuclide source term for the SRWS components. The assumed values used to develop the SRWS component source terms are listed in Table 12.2-20. Table 12.2-22 lists the radionuclide inventory of the major SRWS components and Table 12.2-24 lists the SRWS component source strengths. As described in Section 11.4, there is storage space provided in the Radioactive Waste Building for processed waste packages that contain spent filters, dewatered resins, and other solid wastes. For shielding design purposes, it is assumed that the Class A/B/C high integrity container storage area contains five high integrity containers loaded with Class B/C dewatered spent resins from the spent resin storage tank, which has been decayed for approximately two years (one fuel cycle), and one 55-gallon drum filled with waste from the LRWS drum dryer. Table 12.2-15b provides the radionuclide inventory of the drum dryer and Table 12.2-16b provides the drum dryer source strength. Storage areas are shielded to limit the radiation level to be compliant with the designated radiation zone.

12.2.1.8 Reactor Pool Water

RAI 12.02-6, RAI 12.02-14

The reactor pool is housed within the RXB and contains up to 12 NPMs, which are partially immersed in the reactor pool water. Because the spent fuel pool

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

eRAI No.: 9280

Date of RAI Issue: 01/04/2018

NRC Question No.: 12.03-5

The Regulatory Basis and Background are in RAI-9280 Question 31029

Key Issue 2

The radiation zones for the drum storage room depicted in DCD Figure 12.3-2a does not appear to be consistent with the radioactive material content of a dried drum as described in DCD Table 12.2-13b.

Question 2

To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions, with respect to the designation of radiation zones in the facility, the staff requests that the applicant:

- Explain/Justify the radiation zone designation for Drum Storage Room, to reflect the dose rate from the number of drums allowed to be stored in the drum storage room zone,
- Revise as necessary, DCD Figure 12.3-2a to reflect the maximum dose rate in the area,

OR

Provide the specific alternative approaches used and the associated justification.

NuScale Response:

The NuScale response to RAI 9280 (Q12.03-4) describes the storage location of the waste drums generated by the liquid radioactive waste system's drum dryer. The drum storage room depicted in FSAR Figure 12.3-2a is the storage location for drums containing mixed wastes and drums containing contaminated oil. These drums are filled with contaminated materials that are expected to be less than 100 mCi each. The licensee's radiation protection programs will ensure that the designated radiation zones are not exceeded.



Impact on DCA:

There are no impacts to the DCA as a result of this response.

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eRAI No.: 9280

Date of RAI Issue: 01/04/2018

NRC Question No.: 12.03-6

The Regulatory Basis and Background are in RAI-9280 Question 31029

Key Issue 3

DCD Table 12.2-12 does not describe the bounding source term in the drum storage room (i.e., the number of drums assumed to be stored in the drum storage room) potentially resulting in a non-conservative estimate of the maximum dose rate in the zone.

Question 3

To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions, the staff requests that the applicant:

- Provide the methods, models and assumptions used to establish radiation shielding and zoning for the Drum Storage Room,
- Revise as necessary, DCD Table 12.2-12 to describe the basis for the shielding and radiation zoning of the Drum Storage Room.

OR

Provide the specific alternative approaches used and the associated justification.

NuScale Response:

The NuScale response to RAI 9280 (Q12.03-5) describes materials stored in the drum storage area. The Radioactive Waste Building shielding calculation assumes there are no radioactive sources in the drum storage area (Room #030-007). The radiation zone is determined based on the attenuated sources in the adjacent room.



Impact on DCA:

There are no impacts to the DCA as a result of this response.