

## NuScaleDCRaisPEm Resource

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**From:** Cranston, Gregory  
**Sent:** Monday, January 08, 2018 9:13 AM  
**To:** RAI@nuscalepower.com  
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**Subject:** Request for Additional Information No. 324 RAI No. 9256 (12.2)  
**Attachments:** Request for Additional Information No. 324 (eRAI No. 9256).pdf

Attached please find NRC staff's request for additional information concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk.

The NRC Staff recognizes that NuScale has preliminarily identified that the response to one or more questions in this RAI is likely to require greater than 60 days. NuScale is expected to provide a schedule for the RAI response by email within 14 days.

If you have any questions, please contact me.

Thank you.

Gregory Cranston, Senior Project Manager  
Licensing Branch 1 (NuScale)  
Division of New Reactor Licensing  
Office of New Reactors  
U.S. Nuclear Regulatory Commission  
301-415-0546

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**From:** Cranston, Gregory

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**Options**

**Priority:** Standard

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**Sensitivity:** Normal

**Expiration Date:**

**Recipients Received:**

## Request for Additional Information No. 324 (eRAI No. 9256)

Issue Date: 01/08/2018

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 12.02 - Radiation Sources

Application Section: 12.2

### QUESTIONS

12.02-9

#### 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 of 10 CFR Part 20. 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. Appendix A to Part 50—General Design Criteria (GDC) 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. GDC 4 requires applicants to ensure that structures, systems, and components important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation. The DSRS Acceptance Criteria section of NuScale DSRS section 12.2 “Radiation Sources,” states that the applications should contain the methods, models and assumptions used as the bases for all sources described in DCD Section 12.2.

#### Background

DCD Tier 2 Revision 0 Table 12.2-12, “Liquid Radioactive Waste System Component Source Term Inputs and Assumptions,” states that the dimensions of the Low Concentration Waste (LCW) Granular Activated Carbon (GAC) vessel is 3 feet (ft) diameter by 6 ft high, or 42.4 ft<sup>3</sup>. DCD Tier 2, Revision 0, Table 11.2-3, “Expected Liquid Waste Inputs,” indicates that the GAC filter is replaced once every 5 years (0.2 sluice events per year). NuScale Technical Report (TR) TR-1116-52065 Revision 0, “Effluent Release (GALE Replacement) Methodology and Results,” Table 2-1, “GALE applicability range,” list the shim bleed flow as 21 lbm/hour.

The radionuclide values listed in DCD subsection 12.2 are the basis of the information used to establish plant source terms. DSRS 12.2 Acceptance Criteria, states that all of the sources of radiation exposure to workers and members of the public (from contained sources) are identified, characterized, and considered in the design and operation of the facility. This section of the DSRS also states that unless described within other sections of the FSAR, source descriptions should include the methods, models, and assumptions used as the bases for all values provided in FSAR Section 12.2. These acceptance criteria are consistent with the relevant requirements of 10 CFR Part 20 and 10 CFR Part 50 and 10 CFR Part 52.

Key Issue 1: DCD Table 11.1-4, “Primary Coolant Design Basis Source Term,” list the concentration of Cobalt 60 (Co60) as 1.0100E-04  $\mu\text{Ci/g}$  (1.01 E-10 Curies [Ci] /g). However, using the information cited above, and the decontamination factor for the GAC units provided in DCD Table 12.2-12, the staff was unable to derive a Co60 activity at or below the 1.09E-01 Ci (1E-5  $\mu\text{Ci}$ ) of Co60, listed for the LCW GAC media, in DCD Table 12.2-13a, “Liquid Radioactive Waste System Component Source Terms - Radionuclide Content.” Based on information made available to the staff during the RPAC Chapter 12 Audit, the staff was not able to understand the methods, models and assumptions that resulted in the noted difference.

#### Question 1

Explain the apparent discrepancy/error in the aforementioned GAC activity value. 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 develop the radionuclide source term in the GAC media, and associated basis of the assumed input stream,
- Revise and update DCD Section 12.2 to reflect the methods, models and assumptions used, and the resultant changes in activity values, as applicable, and
- Identify/explain/correct any other reported activity values that may be affected,  
OR
- Provide the specific alternative approaches used and the associated justification.

## 12.02-10

Regulatory basis and background are in Question 30979 to this RAI.

Key Issue 2:

DCD Table 12.2-12: "Liquid Radioactive Waste System Component Source Term Inputs and Assumptions," provides decontamination factors (DF) for the liquid radioactive waste granulated activated charcoal (GAC) unit. As stated in the DCD, the source for the stated DFs is International Atomic Energy Agency (IAEA), "Combined Methods for Liquid Radioactive Waste Treatment," IAEA-TECDOC-1336. The DFs referenced were discussed in the paper, "The Volume Reduction of Liquid Radioactive Waste by Combined Treatment Methods," included in IAEA-TECDOC-1336. The specific DF values were stated in an unannotated table following FIG. 9, "The activity of the solid phase after 173L purified liquid volume." These DF values appeared to be from a single experiment that does not appear to represent a configuration used in the NuScale design. Also, it is not clear how the long term performance of the filtration media were assessed. While the assumed DFs may be suitable for estimating the amount of radioactive material retained in the GAC, overstated DFs non-conservatively reduce the amount of radioactive material in downstream components (e.g., dried drums) which could result in understating radiation zones and shielding requirements. Based on information made available to the staff during the RPAC Chapter 12 Audit, the staff was not able to understand the bases for the selection for the stated DFs.

### Question 2

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

- Explain/justify the use of experimental data contained in IAEA-TECDOC-1336 as the basis for the stated DFs,
- Explain/justify how these DFs are representative for the most limiting radiation zone and shielding requirements and
- Describe any process variables that are relevant to determining the claimed DFs and that may need to be controlled to meet the stated DFs.

OR

- Provide the specific alternative approaches used and the associated justification.