

## NuScaleDCRaisPEm Resource

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**From:** Cranston, Gregory  
**Sent:** Monday, May 14, 2018 1:03 PM  
**To:** Request for Additional Information  
**Cc:** Lee, Samuel; Dudek, Michael; Lavera, Ronald; NuScaleDCRaisPEm Resource; Cranston, Gregory; Chowdhury, Prosanta  
**Subject:** Request for Additional Information No. 480 eRAI No. 9297 (12.3)  
**Attachments:** Request for Additional Information No. 480 (eRAI No. 9297).pdf

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

Please submit your technically correct and complete response by August 31, 2018 to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

Prosanta Chowdhury, Project Manager  
Licensing Branch 1 (NuScale)  
Division of New Reactor Licensing  
Office of New Reactors  
U.S. Nuclear Regulatory Commission  
301-415-1647

**Hearing Identifier:** NuScale\_SMR\_DC\_RAI\_Public  
**Email Number:** 509

**Mail Envelope Properties** (CY4PR09MB1287AAB560DDBB080C54E257909C0)

**Subject:** Request for Additional Information No. 480 eRAI No. 9297 (12.3)  
**Sent Date:** 5/14/2018 1:03:10 PM  
**Received Date:** 5/14/2018 1:03:15 PM  
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<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	541	5/14/2018 1:03:15 PM
Request for Additional Information No. 480 (eRAI No. 9297).pdf		74869

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**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

## Request for Additional Information No. 480 (eRAI No. 9297)

Issue Date: 05/14/2018

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 12.03-12.04 - Radiation Protection Design Features

Application Section: 12.3, 12.2

### QUESTIONS

12.03-59

#### 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. 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. NuScale DSRS section 12.3 "Radiation Protection Design Feature," states in the specific acceptance criteria that areas inside the plant structures should be subdivided into radiation zones, with maximum design dose rate zones and the criteria used in selecting maximum dose rates identified.

#### Background

NuScale DCD Tier 2, Revision 0 Figure 12.3-1g, "Reactor Building Radiation Zone Map - 100' Elevation," shows that the area above the reactor pool area (Room 010-022 per DCD Figure 1.2-216, "Reactor Building 100'-0" Elevation",) as a Radiation Zone II. DCD Tier 2 Revision 0 Table 12.3-1 "Normal Operation Radiation Zone Designations," shows that areas designated as radiation zone II have dose rates  $\geq 0.25$  mrem/hr and  $\leq 2.5$  mrem/hr.

DCD Tier 2 Revision 0, subsection 12.3.2.4.1, "NuScale Power Module," states that the bioshield design is described in (DCD Tier 2) Section 3.7.3. DCD Tier 2 Revision 0, Table 3.7.3-12, "Bioshield Face Plate Self-Weight," in conjunction with DCD Tier 2 Revision 0 Figure 3.7.3-2, "Conceptual Bioshield Vertical Face Plate," depict the Bioshield Face plate as a hollow space covered by two,  $\frac{1}{4}$  inch steel plates. The  $\frac{1}{2}$  inch of steel plating described in table 3.7.3-12 appears to represent a limited amount of neutron, or gamma, shielding material.

NuScale DCA Tier 2 Revision 0, Table 3C-6: "Normal Operating Environmental Conditions," states that the 60 Years Integrated N Dose (Rads) for the area outside of the containment vessel and under the bioshield is  $1.85E6$  rads (3.7 rads/hour). Figure 12.3-1g depicts the areas under the bioshield as a radiation zone VI (dose rates  $\geq 1$  Rad/hr and  $\leq 500$  Rad/hr from Table 12.3-1). Because there is a minimal amount of radiation attenuating material between the Radiation Zone VI located under the Bioshield area and the area above the reactor pool area (Room

010-022,) the staff is challenged to understand the applicant's basis for designation of this area (Room 010-022) as a radiation zone II.

DCD Tier 2, Revision 0 subsection 12.3.2.3 "Calculation Methods," states that the primary computer program used to evaluate shielding and for dose rate determinations is MCNP6.

The dose rates and radiation zones listed in DCD subsection 12.3 are the basis of the information used to establish plant radiation protection design features, described in NuScale DSRS 12.3 "Acceptance Criteria." The DSRS Acceptance Criteria are used by the staff to check that the applicant's method for performing shield design calculations, including shield and source geometries, are realistic and consistent with the assumed source term. The acceptance criteria of DSRS 12.3 are consistent with the relevant requirements of 10 CFR Part 20 and 10 CFR Part 50 and 10 CFR Part 52.

Key Issue: In light of the specific examples noted above, the staff is concerned that radiation zones that are identified in the DCD may be inconsistent with sources of radiation that may emanate from adjacent areas. This could result in radiation zone definitions that do not reflect the maximum dose rate in the zone.

## Question

To facilitate staff understanding of the application information in support of its reasonable assurance review regarding radiation zone assignments, the staff requests that the applicant:

- Explain/justify the methods, models, and assumptions, used to determine the aforementioned radiation zoning assignment.
- As necessary, revise and update section 12.3 of the NuScale DCD to accurately reflect plant radiation zones,

OR

Provide the specific alternative approaches used and the associated justification.