

## NuScaleDCRaisPEm Resource

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**From:** Cranston, Gregory  
**Sent:** Friday, January 26, 2018 9:23 AM  
**To:** RAI@nuscalepower.com  
**Cc:** NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Dudek, Michael; Lavera, Ronald; Markley, Anthony  
**Subject:** RE: Request for Additional Information No. 342 RAI No. 9293 (12.4)  
**Attachments:** Request for Additional Information No. 342 (eRAI No. 9293).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 this question 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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## **Request for Additional Information No. 342 (eRAI No. 9293)**

Issue Date: 01/26/2018

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: 12.4

### **QUESTIONS**

12.03-16

#### **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 52.47(a) (22) requires applicants to demonstrate how the operating experience insights have been incorporated into the plant design.

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 acceptance criteria of NuScale DSRS section 12.3-12.4 states that Regulatory Guide 8.19, “Occupational Dose Assessment in Light-Water Reactor Power Plants Design Stage Man-Rem Estimates,” provides a method acceptable to the staff for performing an assessment of collective occupational radiation dose as part of the ongoing design review process so that such exposures will be ALARA. The DSRS Acceptance Criteria section of NuScale DSRS section 12.3-12.4, “Radiation Protection Design Features,” states that the applications should describe how operating experience insights have been incorporated into the plant design, to reduce maintenance and improve reliability.

#### **Background**

DCD Tier 2 Section 12.4, “Dose Assessment,” states that the dose assessment presented in DCD Section 12.4 includes the estimated radiation exposures to plant personnel performing work activities involving normal operations, maintenance and inspections, refueling activities, and waste handling, using the methodology presented in RG 8.19 to demonstrate that the facility design is compliant with 10 CFR Part 20. To estimate the occupational radiation exposures for the NuScale facility, various work activities and work durations are compiled along with the expected significant (>0.1 mrem/hr) radiation fields that would be encountered. DCD section 12.4.1 states that the occupational radiation exposure (ORE) dose estimates for Special Maintenance and Refueling Activities were listed in DCD Table 12.4-5, “Occupational Dose Estimates from Special Maintenance,” and DCD Table 12.4-7, “Occupational Dose Estimates from Refueling Activities.”

Using information made available to the staff during the RPAC Chapter 12 Audit, the staff reviewed the bases for the estimated doses for the work activities described in these tables. The staff observed that the dose rates used for performing the dose estimates did not appear to be consistent with operating experience (e.g., Electric Power Research Institute (EPRI) Technical Report (TR) 1015119, “Application of the EPRI Standard Radiation Monitoring Program for PWR Radiation Field Reduction Final Report,” dated November, 2007.) For instance, the staff noted that the dose rates assumed for work in the vicinity of the steam generators did not appear to be within an order of magnitude to the median value depicted in TR-1015119. While it is not possible for the staff to quantitatively assess the change in dose rates associated with the smaller NuScale design, the staff did qualitatively consider the relative size of the plant on the assumed dose rates.

The guidance contained in RG 8.19 states that plant experience, available from industry groups like EPRI, provides useful information for performing this assessment. As noted in RG 8.19, an objective of the dose assessment process should be to develop a systematic process for considering and evaluating possible dose-reducing design changes and associated operating procedure changes as part of the comprehensive ongoing design review, and identification of principal ALARA-related changes resulting from the dose assessment. The occupational dose assessment should be based on anticipated radiation conditions after at least 5 years of plant operation. Analysis of the elements of the man-rem estimate (e.g., radiation levels, task duration, and frequency), treated qualitatively, can be of significant value in making engineering judgments regarding design changes for ALARA purposes. As noted in DSRS Section 12.3-12.4, the staff reviews the description of any additional dose-reducing measures taken because of the dose assessment process for specific functions or activities.

#### Key Issue 1

The ORE dose estimates provided in DCD Tier 2 Section 12.4, "Dose Assessment," do not appear to have been based upon relevant plant data. Based on the cited industry experience, the component dose rates used to perform the ALARA analysis appear to be biased low. The potential result is that the method for identifying possible changes to the plant design for the purpose of minimizing ORE, as required by 10 CFR 20.1101(b), may improperly determine that the dose savings do not justify the proposed design change.

#### Question 1

To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions with respect to potential ORE dose, the staff requests that the applicant:

- Justify/explain the basis of the dose rates assumed for performing the dose assessment, including the associated technical references,
- Justify/explain any design changes that were made as a result of the dose analysis performed using the guidance of RG 8.19,
- As necessary, revised section DCD Section 12.4.1, to reflect any changes to the dose assessment,

OR

Provide the specific alternative approaches used and the associated justification.