

## NuScaleDCRaisPEm Resource

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**Subject:** Request for Additional Information No. 348 RAI No. 9300 (12.3)  
**Attachments:** Request for Additional Information No. 348 (eRAI No. 9300).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. .

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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**Options**

**Priority:** Standard

**Return Notification:** No

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**Sensitivity:** Normal

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**Recipients Received:**

## Request for Additional Information No. 348 (eRAI No. 9300)

Issue Date: 01/28/2018

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

### QUESTIONS

12.03-28

#### 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 Part 20 requires the use of engineering features to control and minimize the amount of radiation exposure to members of the public and occupational workers, from both internal and external sources. 10 CFR 50.49(e)(4) requires applicants to identify the type of radiation and the total dose expected during normal operation over the installed life of the equipment. 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. NuScale DSRS 12.2 DSRS Acceptance Criteria states that the applicant should describe the radiation fields in sufficient detail for evaluating the inputs to shielding codes and the establishment of facility design features. The characteristics of the radiation fields evaluated during the staff review under NuScale DSRS 12.2, are used as inputs for the evaluation performed by the staff for NuScale DSRS 12.3-12.4, related to the acceptability of the shielding design, the establishment of radiation zones, the impact on systems, structures and components, and the activation of material.

#### Background

NuScale DCD, Tier 2 Revision 0, subsection 12.2.1.1 "Reactor Core," states that the fission neutron, n-gamma and fission gamma source strength and neutron energy spectrum information are provided in Table 12.2-1. DCD Table 12.2-1 states that the Fission gamma source strength is  $1.81E+20$  particles/sec. However, NuScale Technical Report TR-0116-20781-P Rev. 0 "Fluence Calculation Methodology and Results," does not provide any information about photon/gamma strength nor spectrum information.

DCD Table 12.2-1 states that Fission neutron source strength is  $2.37E+19$  particles/sec, and later states that the Fission neutron n-gamma source strength is  $2.37E+19$  particles/sec. It is not discernible to the staff the intended difference between the two listed parameters, and how each value is expected to be used. In the case of the Fission neutron n-gamma source strength parameter, it is not evident if or how it is related to the Fission gamma source strength, which Table 12.2-1 shows as  $1.81E+20$  particles/sec.

TR-0116-20781-P section 3.5 Neutron Source, states that the calculated fission neutron intensity for the NPM is estimated as  $1.24E+19$  neutrons per second. However, DCD Table 12.2-1 states that Fission neutron source strength is  $2.37E+19$  particles/sec, because clarifying information (e.g., peaking factor, enrichment, etc.) was not provided, it is not apparent to the staff how the value in table 12.2-1 was calculated.

The neutron spectrum and flux information evaluated during the staff review under NuScale DSRS 12.2, are subsequently used as inputs for the evaluation performed by the staff for NuScale DSRS 12.3-12.4 and DSRS 3.11, related to the acceptability of the shielding design, the establishment of radiation zones, the impact on systems, structures and components, and the activation of material. NuScale DSRS 12.2 Acceptance Criteria, states that the source descriptions should include all pertinent information required for input to shielding codes used in the design process, establishment of related facility design features, and determination of radiation dose to electrical equipment important to safety as described in 10 CFR 50.49, and GDC 4, as well as the controlling radiation exposure to workers, consistent with 10 CFR 20 and GDC 61. DSRS 12.2 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 50 and 10 CFR Part 52.

Key Issue: The neutron flux and energy spectrum listed in DCD Table 12.2-1 are not well-defined nor is the derivation of stated values explained in the DCD. Based on information made available to the staff during the RPAC Chapter 12 Audit, the staff was not able to characterize the neutron radiation fields in the aforementioned areas. The staff needs to know the neutron flux, energy spectrum and appropriate supporting information to evaluate and confirm activation products and resulting dose rates in the FSAR. The information provided in the DCD is insufficient to allow the staff to confirm that the methods, models and assumptions stated in the DCD support the derivation of other data evaluated by the staff to make their safety finding.

**Question**

To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions, with respect to the kinds and quantities of radioactive materials and radiation fields within the facility, the staff requests that the applicant:

- Identify and describe the methods, models and assumptions used to calculate the values listed in Table 12.2-1.
- Revise and update DCD section 12.2, to add clarification and provide information not currently included in DCD section 12.2, which is needed to evaluate the neutron flux and spectra used to assess activation products and dose rates. As appropriate, provide corrected information and pointers or references to applicable sections of the DCD or supporting technical report,

OR

Provide the specific alternative approaches used and the associated justification.