

## NuScaleDCRaisPEm Resource

---

**From:** Cranston, Gregory  
**Sent:** Tuesday, October 16, 2018 2:15 PM  
**To:** Request for Additional Information  
**Cc:** Lee, Samuel; Dudek, Michael; Stutzcage, Edward; Tesfaye, Getachew; Chowdhury, Prosanta; NuScaleDCRaisPEm Resource  
**Subject:** Request for Additional Information No. 508 eRAI No. 9621 (12.2)  
**Attachments:** Request for Additional Information No. 508 (eRAI No. 9621).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 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.

**Hearing Identifier:** NuScale\_SMR\_DC\_RAI\_Public  
**Email Number:** 547

**Mail Envelope Properties** (BN1PR09MB0258DA64B81F0F55624DDA3C90FE0)

**Subject:** Request for Additional Information No. 508 eRAI No. 9621 (12.2)  
**Sent Date:** 10/16/2018 2:15:05 PM  
**Received Date:** 10/16/2018 2:15:13 PM  
**From:** Cranston, Gregory

**Created By:** Gregory.Cranston@nrc.gov

**Recipients:**

"Lee, Samuel" <Samuel.Lee@nrc.gov>  
Tracking Status: None  
"Dudek, Michael" <Michael.Dudek@nrc.gov>  
Tracking Status: None  
"Stutzcage, Edward" <Edward.Stutzcage@nrc.gov>  
Tracking Status: None  
"Tsfaye, Getachew" <Getachew.Tsfaye@nrc.gov>  
Tracking Status: None  
"Chowdhury, Prosanta" <Prosanta.Chowdhury@nrc.gov>  
Tracking Status: None  
"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>  
Tracking Status: None  
"Request for Additional Information" <RAI@nuscalepower.com>  
Tracking Status: None

**Post Office:** BN1PR09MB0258.namprd09.prod.outlook.com

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	364	10/16/2018 2:15:13 PM
Request for Additional Information No. 508 (eRAI No. 9621).pdf		106267

**Options**

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

## Request for Additional Information No. 508 (eRAI No. 9621)

Issue Date: 10/16/2018

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

12.02-32

#### 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 part 20 of this chapter.

GDC Criterion 60—"Control of releases of radioactive materials to the environment," requires that the nuclear power unit design include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences.

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.

RG 1.143 provides design guidance for radwaste systems based on the radioactive material contents within the systems.

DSRS Section 12.3-12.4 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 the response to RAI 9161, Question 11.01-1, the applicant revised the source terms for the gaseous radioactive waste system components in Table 12.2-16 and 12.2-17, based on the revisions to the assumed design basis failed fuel fraction and other associated changes. The staff notes that in comparing the original Table 12.2-16 and 12.2-17 to the revised tables, the source terms for the gaseous radioactive waste system components have decreased, yet the response does not provide any information describing why the source term would decrease when the design basis failed fuel fraction has increased. Also, it is unclear why there would be an overall decrease in the gaseous radioactive waste management system source terms in the response to RAI 9161, Question 11.01-1.

In addition, in DCD Sections 9.3.4.2.3 and 9.3.4.5, state that the reactor pressure vessel high point degasification line is the primary method for removing non-condensable gases that accumulate in the pressurizer gas/vapor space. Section 9.3.4.2.3 also states that these gases consist of fission gases and gases introduced by system ingress. Finally, Section 9.3.4.2.3 specifies that pressurizer venting is used during NPM shutdown to remove non-condensable gases and accelerate hydrogen removal from the RCS.

During the GALE audit, as part of the staff's review of gaseous radioactivity source terms and gaseous releases, staff reviewed the inputs to the gaseous radwaste management system. The radioactivity in the gaseous radwaste management system appeared to be based on gases stripped by a degasifier in the low conductivity waste subsystem and leaked gases sent to the gaseous radwaste system from the containment evacuation system. While this accounts for all the radioactivity that would be expected to accumulate in the gaseous radwaste system when all units are operating, it does not account for the radioactivity that could be expected to accumulate when the RCS is degassed through the pressurizer during shutdown. When degasifying through the pressurizer for shutdown, staff expects a significantly greater flow rate of gas to the gaseous radwaste systems, which will likely result in a

significant spike in radioactivity in the gaseous radwaste system guard and decay beds. Since a NuScale plant could have up to 12 nuclear power modules operating, with 2 year fuel cycles, the process of degassing through the pressurizer could occur once every two months. The assumed holdup time in the beds for Xenon and Krypton in DCD Table 11.3-1, is 45 days and 1.9 days, respectively. Therefore, a spike in radioactivity in these beds from degassing for shutdown could impact the source terms in these components for a significant portion of plant operation, since an outage will occur every 60 days.

Also, during the GALE audit, staff asked NuScale if they considered degassing through the pressurizer during shutdown in calculating the design basis source terms for the gaseous radwaste management system. NuScale had specified that the increased source term that could occur as a result of degasifying through the pressurizer for shutdown was not explicitly modeled.

The staff has determined that the gaseous radwaste system guard and decay beds are expected to be significant radiation sources with significant dose rates. In the current DCD, the room with these beds are radiation zone 5, greater than 100 mrem/hour and less than 1 Rad/hour. Staff review indicates that considering degasifying for shutdown in the source terms could significantly increase the dose rate from these components, likely increasing the radiation zoning in the room and potentially increasing the dose rates and zoning in surrounding areas. Furthermore, based on the current source terms, the gaseous guard bed and decay beds are currently classified as RW-IIb, per the guidance of RG 1.143. The increased source term due to degasification for shutdown could result in the components being re-classified to the higher design classification of RW-IIa.

### **Key Issues**

The applicant does not adequately explain the changes made to the gaseous radioactive waste system component source terms in DCD Tables 12.2-16 and 12.2-17 in the response to RAI 9161, Question 11.01-1. In addition, the revised gaseous waste management system source terms do not appear to appropriately account for shutdown degasification and the application does not appear to address the effects that shutdown degasification could have on radiation zoning, system design classifications, etc.

### **Questions**

1. Explain the changes in assumptions in the gaseous radwaste system source term calculations between DCD Revision 1 and the response to RAI 9161, Question 11.01-1, that resulted in an overall decrease to the gaseous radioactive waste system source terms provided in DCD Tables 12.2-16 and 12.2-17. The description should be sufficient for the staff to understand why the source term decreased, even though the design basis failed fuel fraction more than doubled. Provide appropriate justification for the changes in assumptions made. Ensure that the DCD is updated to document these changes, if necessary.
2. Please update the DCD to account for increases in the gaseous radioactive waste system source terms due to degasifying for shutdown or provide justification for why the current source terms provided in DCD Tables 12.2-16 and 12.2-17 are adequate. If changes are made to the source terms, revise the DCD as appropriate to account for the change, including changes to RG 1.143 classifications and radiation zoning, as appropriate.