NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Friday, December 22, 2017 12:37 AM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Burkhart, Lawrence; Lavera, Ronald; Markley, Anthony
Subject: RE: Request for Additional Information No. 311 RAI No. 9265 (12.02)
Attachments: Request for Additional Information No. 311 (eRAI No. 9265).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.

The NRC Staff recognizes that NuScale has preliminarily identified that the response to the 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

Hearing Identifier: NuScale_SMR_DC_RAI_Public
Email Number: 337

Mail Envelope Properties (MWHPR09MB1200E21A94DAD997C51F01C090020)

Subject: RE: Request for Additional Information No. 311 RAI No. 9265 (12.02)
Sent Date: 12/22/2017 12:37:03 AM
Received Date: 12/22/2017 12:37:07 AM
From: Cranston, Gregory

Created By: Gregory.Cranston@nrc.gov

Recipients:
"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"Chowdhury, Prosanta" <Prosanta.Chowdhury@nrc.gov>
Tracking Status: None
"Burkhart, Lawrence" <Lawrence.Burkhart@nrc.gov>
Tracking Status: None
"Lavera, Ronald" <Ronald.LaVera@nrc.gov>
Tracking Status: None
"Markley, Anthony" <Anthony.Markley@nrc.gov>
Tracking Status: None
"RAI@nuscalepower.com" <RAI@nuscalepower.com>
Tracking Status: None

Post Office: MWHPR09MB1200.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
MESSAGE	965	12/22/2017 12:37:07 AM
Request for Additional Information No. 311 (eRAI No. 9265).pdf	105913	

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

Request for Additional Information No. 311 (eRAI No. 9265)

Issue Date: 12/22/2017
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, 11.1

QUESTIONS

12.02-5

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.

10 CFR 50.49 and 10 CFR Part 50, Appendix A, Criterion 4 require that certain components important to safety be designed to withstand environmental conditions, including the effects of radiation, associated with design basis events, including normal operation, anticipated operational occurrences, and design basis accidents. The Acceptance Criteria of DSRS section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment," states that the radiation environment should be based on the integrated effects of the normally expected radiation environment over the equipment's installed life, plus the effects associated with the design-basis event during or following which the equipment is required to remain functional.

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 12.2 "Radiation Source," regarding the identification of isotopes and the methods, models and assumptions used to determine dose rates. 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

DCD Tier 2 Revision 0 DCD Table 11.1-2, "Parameters Used to Calculate Coolant Source Terms," list the value of the reactor coolant system (RCS) mass as 117,400 lbm. DCD Section 12.2.1, "Contained Sources," states that the contained radiation sources are developed for normal operation and shutdown conditions and are based on the design basis primary coolant activity concentrations from DCD Section 11.1. DCD 12.2.1.3, "Chemical and Volume Control System," DCD Table 12.2-9, "Reactor Pool Cooling, Spent Fuel Pool Cooling, Pool Cleanup, and Pool Surge Control Systems Component Source Term Inputs and Assumptions," and DCD Table 12.2-12, "Liquid Radioactive Waste System Component Source Term Inputs and Assumptions," provide additional assumptions used for calculating source terms described in DCD Section 12.2, but do not provide alternate RCS masses.

Based on the review of material made available to the staff during the RPAC Chapter 12 Audit, the staff noticed that the different calculation packages reviewed by the staff often used different values for the amount of water in the RCS. In some cases, the changes appeared to be the result of several processes, including: rounding during conversion from volume to mass, incorrect application of temperature/density effects at the time and point of application, or assumptions related to the amount of water in the reactor vessel. The staff understands some of the changes, such as the use of a different mass to generate a more conservative value for the specific analysis being performed. However, in a number of cases observed by the staff, the changes made were not in a conservative direction for the particular analysis, and the application of the change was not identified in the DCD. For example, the value of the mass of RCS in the reactor vessel (RV) and containment vessel (CNV) was greater than the value specified in DCD Table 11.1-2. The increased mass added additional shielding material, and decreased the specific activity of the coolant. Both of these changes result in non-conservative changes in estimated dose rates. In another case, the density of the coolant at normal operating temperature and pressure (NOP/NOT) was used for a fluid at room temperature, resulting in underestimating the amount of radioactive material by about 25%.

Key Issue 1:
Based on the review of material made available to the staff during the RPAC Chapter 12 Audit, the staff determined that the applicant used different RCS mass values for different calculations performed to determine source terms applied to the review of radiation exposure to personnel and equipment, but the use of different RCS masses was not identified as part of the assumptions stated in DCD Section 12.2 and in some cases is non-conservative.

Question

- Explain/clarify the assumptions for RCS mass and ensure such assumptions are appropriate or conservative for the source terms for analysis results described or used in DCD Section 12.2 and DCD Section 3.11,
- As necessary, revise the assumptions documented in DCD Section 12.2 to reflect mass of RCS used for the specific analysis.

OR

Provide the specific alternative approaches used and the associated justification.