RAIO-0518-59921

May 08, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 444 (eRAI No. 9295) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 444 (eRAI No. 9295)," dated April 30, 2018

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 9295:

- 12.03-55

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Steven Mirsky at 240-833-3001 or at smirsky@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9295

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9295

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Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 9295
Date of RAI Issue: 04/30/2018

NRC Question No.: 12.03-55

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 20.1101(b) states that "the licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA)." 10 CFR 20.1003 states that ALARA "means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest."

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.

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

The dose rates and radiation zones listed in DCD Subsection 12.3 are the bases 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. This acceptance criteria is consistent with the requirements of 10 CFR Part 20 and 10 CFR Part 50 and 10 CFR Part 52.

Specifically, NuScale DCD Tier 2, Revision 0, Figure 12.3-1g "Reactor Building Radiation Zone Map - 100' Elevation," shows that the area between column lines RX4 and RX6 (east and west of the reactor pool), RXA and RXB (north of the reactor pool) and between column lines RXD and RXE (south of the reactor pool) as depicted on DCD Figure 1.2-216, "Reactor Building 100'-0" Elevation" as Steam Galleries, Rooms 010- 411 and 010-418 respectively, are labelled as a Radiation Zone 0. DCD Tier 2, Revision 0, Table 12.3-1 "Normal Operation Radiation Zone Designations, " shows that areas designated as radiation Zone 0 have dose rates ≤ 0.05 mrem/hr.

However, the staff noted that DCD Tier 2 Revision 0, Figure 3.6-16 "Postulated High- Energy Main Steam System Pipe Routing Beyond the NuScale Power Module (COL Applicant Scope)," and Figure 3.6-17 "Postulated High-Energy Feedwater System Pipe Routing Beyond the NuScale Power Module (COL Applicant Scope)," show the main steam and main feedwater lines passing through the reactor building pool wall (RXD or RXB).

Specifically 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 ≥ 1 rad/hr and ≤ 500 rad/hr from Table 12.3-1.) DCD Subsection 12.3.2 "Shielding," does not discuss any specific shielding features between the Nuclear Power Module (NPM) bay under the bioshield and the Steam Galleries to prevent neutron streaming into the Steam Galleries (Rooms 010-411 and 010-418). DCD Subsection 12.3.2.2 "Design Considerations," does not discuss any considerations of the types of shielding material, or the environmental controls provided to ensure shielding integrity, for shielding material that may be installed around the high temperature main steam and main feedwater lines. DCD Table 12.3-6, "Reactor Building Shield Wall Geometry," does not discuss the neutron fluence from under the bioshield area as a shielding consideration for the Steam Galleries. Therefore, the staff is unable to substantiate the applicant's designation of the Steam Galleries as a radiation Zone 0.

Key Issue: The bases for establishing claimed radiation zones are not readily discernable from the information provided. Based on information made available to the staff during the application review and the Chapter 12 audit, the staff was not able to characterize the neutron radiation fields in the aforementioned areas. The staff needs to understand the methods, models, and assumptions used by the applicant to calculate the radiation sources that were used to determine the radiation zones depicted in DCD Chapter 12.3.

Question

To facilitate staff understanding of the underlying methods, model and assumptions, in support of its reasonable assurance review regarding the designation of facility radiation zones, the staff requests that the applicant:

1. Explain/Justify the methods, models, and assumptions used by the applicant to calculate the radiation sources that were used to determine the radiation zones depicted in DCD Chapter 12.3.
2. Provide appropriate and sufficient information, including shielding, absorption, and attenuation effects, to justify significant decreases in dose in the adjacent radiation zones.
3. As necessary, revise and update Section 12.3 of the NuScale DCD as appropriate, with respect to plant radiation zones,

OR

Provide the specific alternative approaches used and the associated justification.

NuScale Response:

FSAR Figures 3.6-16 and 3.6-17 are labeled as "Postulated" and "COL applicant scope" because the actual pipe routing and penetration shielding has not yet been finalized, and has been identified as COLA scope.

FSAR Section 12.3.1.2.3 Penetrations and FSAR Section 12.3.2.2 Design Considerations, state that shield wall penetrations may be configured and shielded, as necessary, to prevent excessive radiation streaming into accessible spaces.

The details of the NuScale penetrations and penetration shielding design are not finalized, but will be finalized during a future design phase. The NuScale design is not unique in this respect and the detailed design of shield wall penetration compensatory measures will utilize standard industry practices to ensure the design complies with the FSAR.

Impact on DCA:

There are no impacts to the DCA as a result of this response.