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**Sent:** Friday, October 13, 2023 11:10 AM  
**To:** Request for Additional Information  
**Cc:** Alina Schiller; Mahmoud Jardaneh; Griffith, Thomas; Fairbanks, Elisa;  
NuScale-SDA-720RAIsPEm Resource  
**Subject:** NuScale SDAA Chapter 19 - Request for Additional Information No. 002 (RAI-10107-R1)  
**Attachments:** CHAPTER 19 - RAI-10107-R1-FINAL.pdf

Attached please find NRC staff's request for additional information (RAI) concerning the review of NuScale Standard Design Approval Application for its US460 standard plant design (Agencywide Documents Access and Management System (ADAMS) Accession No. ML222339A066).

Please submit your technically correct and complete response by the agreed upon date to the NRC Document Control Desk.

If you have any questions, please do not hesitate to contact me.

*Thank you.*

*Getachew Tesfaye* (He/Him)

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**REQUEST FOR ADDITIONAL INFORMATION No. 002 (RAI-10107-R1)  
BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
NUSCALE STANDARD DESIGN APPROVAL APPLICATION  
DOCKET NO. 05200050**

CHAPTER 19, "PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT  
EVALUATION,"  
NUSCALE POWER, LLC  
DOCKET NO. 05200050  
ISSUE DATE: 10/13/2023

## **Background**

By letter dated December 31, 2022, NuScale Power, LLC (NuScale or the applicant) submitted Part 2, Final Safety Analysis Report (FSAR), Chapter 19, "Probabilistic Risk Assessment and Severe Accident Evaluation," Revision 0 (Agencywide Documents Access and Management System Accession No. ML22365A010) of the NuScale Standard Design Approval Application (SDAA) for its US460 standard plant design. The applicant submitted the US460 plant SDAA in accordance with the requirements of Title 10 Code of Federal Regulations (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Subpart E, "Standard Design Approvals." The NRC staff has reviewed the information in Chapter 19 of the FSAR and determined that additional information is required to complete its review.

## **Question 19.5-1**

### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

### **Issue**

Section 19.5.1 states that the design-specific aircraft impact assessment of the Reactor Building (RXB) follows guidelines in NEI 07-13, Revision 8, "Methodology for Performing Aircraft Impact Assessments for New Plant Designs" with no exceptions. The RXB external steel-plate composite (SC) wall design uses a steel-concrete modular construction that is different from a reinforced concrete wall construction used in the NuScale DCA. Empirical formulas in NEI 07-13, Revision 8 are not applicable for assessing local damages to the external SC walls of the RXB. In Section 2.4.1 (4) of NEI 07-13, Revision 8, it acknowledges that past experience with aircraft impact analysis of nuclear power plant structures has not been all inclusive, and new plant designs may contain design features for which experimental and analytical experience is lacking. NEI 07-13, Revision 8 makes it clear that that these new design features may be subject to failure modes that are outside the existing experience base and may require experimentally verified analytical evaluations.

The application does not make clear whether an analytical evaluation and experimental verification has been performed for the RXB external SC walls subjected to the aircraft impact loading. The application also does not make clear whether there are exceptions taken to NEI 07-13, Revision 8.

### **Information Requested**

1. Clarify whether the design-specific aircraft impact assessment of the RXB considers the recommendation set forth in Section 2.4.1(4) of NEI 07-13, Revision 8, and clarify whether the design-specific aircraft impact assessment of the RXB includes an analytical evaluation and experimental verification of the RXB external SC walls subjected to the aircraft impact loading.
2. Clarify whether exceptions are taken to methodology in NEI 07-13, Revision 8 and provide the justification to explain why exceptions are taken.
3. Update the FSAR accordingly based on the responses above.

### **Question 19.5-2**

#### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

#### **Issue**

NuScale SDAA Section 19.5.4.1 states that the design of the RXB equipment door, as described in this section, is a key design feature for protecting core cooling equipment from impacts through the Radioactive Waste Building (RWB) trolley bay. The RXB equipment door consists of two doors (Figure 19.5-1). The outer door (impact door) serves as a barrier for aircraft impact and other design basis conditions. Section 19.5.3.2 states that no credit is taken for the RWB, Control Building (CRB) or the Turbine Generator Building (TGB) as intervening structures. All RXB elevations and faces above grade are vulnerable.

NuScale DCA Part 2, Tier 2, Section 19.5.3.2 states that the location of the RWB in relation to the RXB is a key design feature that limits potential strike locations to the west end of the RXB. The design of the exterior walls of the RWB, as described in Section 3.5.3.1.1, is a key design feature for crediting the RWB as an intervening structure.

The application does not make clear what the thickness and construction of the RXB equipment door is. Since the applicant does not credit the RWB as an intervening structure, the application does not make clear whether the applicant has performed a design-specific aircraft impact assessment to resist physical damage from all postulated aircraft strikes for protecting core cooling equipment from impacts through the RWB trolley bay when the RXB equipment door is open. Figure 19.5-1 is very schematic, and it does not reflect realistic conditions of the RXB external SC wall and the construction of the RXB equipment door.

### **Information Requested**

1. Describe the thickness and construction of the RXB equipment door.
2. Update Figure 19.5-1 to reflect realistic conditions of the RXB external SC wall and the RXB equipment door.
3. Clarify (a) whether a design-specific aircraft impact assessment has been performed to resist physical damage from all postulated aircraft strikes in order to protect core cooling equipment from impacts through the RWB trolley bay when the RXB equipment door is open; or (b) the RWB could be credited as an intervening structure in the design-specific aircraft impact assessment of the RXB; or (c) provide justification based on expected frequency and duration of when the door will be open, including the administrative controls in place, that the RXB equipment door when open has sufficiently low likelihood to be subjected to aircraft impact.
4. Update the FSAR accordingly based on the responses above.

### **Question 19.5-3**

#### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

#### **Issue**

Section 19.5.4.1 states that local reinforcement provided as required at the wall-to-slab connection at the 146 feet 6-inch elevation is a key design feature. The staff reviewed Figures 1.2-16 and 1.2-17 for the Reactor Building Section Views. The wall-to-slab connections at the 146 feet 6 inch elevation could be perimeter external SC wall-to-slab connections or interior SC wall-to-slab connections. In addition, the application does not make clear how the local reinforcing bars are configured, including their sizes, spacing and lengths.

### **Information Requested**

1. Clarify locations of the wall-to-slab connections at the 146 feet 6 inch elevation which are applicable to this key design feature.
2. Provide detailed section views to show configurations of local reinforcing bars, their sizes, spacing and lengths.
3. Clarify whether this key design feature is applicable to the wall-to-slab connections at other elevations.
4. Update the FSAR accordingly based on the responses above.

#### **Question 19.5-4**

##### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

##### **Issue**

Section 19.5.4.1 states that local detailing in the wall-to-wall connection region as required using ties is a key design feature. The application does not make clear where these wall-to-wall connections are located on plans and elevations, and the configurations of local reinforcing bars, including their sizes, spacing and lengths.

##### **Information Requested**

1. Clarify the locations of the wall-to-wall connections on plans and elevations.
2. Provide detailed section views to show reinforcing ties including their configurations, sizes, spacing and lengths between the 100 feet and 146 feet 6 inch elevations and above the 146 feet 6 inch elevation.
3. Update the FSAR accordingly based on the responses above.

#### **Question 19.5-5**

##### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

##### **Issue**

Section 19.5.4.1 states that the structural beam seat connections of roof beams on the 187 feet elevation are key design features. The application does not make clear where the structural beam seat connections of roof beams on the 187 feet elevation are located and what are the details of the structural beam seat connections. The application also does not make clear whether the wall-to-slab connection on the 187 feet elevation is a key design feature.

##### **Information Requested**

1. Clarify where the structural beam seat connections of roof beams on the 187 ft elevation are located.

2. Provide section views and reinforcing details of the structural beam seat connections of roof beams and the wall-to-slab connections on the 187 ft elevation.
3. Explain why the structural beam seat connections of roof beams on the 187 ft elevation are key design features.
4. Clarify whether the wall-to-slab connections on the 187 ft elevation are key design features and clarify where they are located.
5. Update the FSAR accordingly based on the responses above.

### **Question 19.5-6**

#### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

#### **Issue**

Section 19.5.4.1 states that the design of the RXB penetration and piping protections are key design features for preventing physical damage and fire from entering the RXB. The exterior wall penetration protection (awning) is designed and constructed to provide strength to prevent perforation due to a direct aircraft strike. The exterior wall penetration protections are constructed of 7000 psi concrete with two #11 bars at 12 inches on each face of the awning and each way (horizontal and vertical directions). In addition, the awning protection has #5 shear ties at 12 inches on center. The application does not make clear where these exterior wall penetrations (awnings) and piping protections are located and how they are constructed with the RXB external SC walls.

#### **Information Requested**

1. Provide detailed reinforcing drawings of the RXB penetration protections (awnings) and piping protections connecting with the RXB external SC walls.
2. Describe where the exterior wall penetration protections (awnings) and piping protections are located.
3. Update the FSAR accordingly based on the responses above.

### **Question 19.5-7**

#### **Regulatory Basis**

Title 10 of the *Code of Federal Regulations* Section 50.150(b) requires the applicant to include the following descriptions in the final safety analysis report: (1) The design features and functional capabilities identified in paragraph (a)(1) of 10 *CFR* 50.150; and (2) How the design

features and functional capabilities identified in paragraph (a)(1) of 10 CFR 50.150 meet the assessment requirements in paragraph (a)(1) of 10 *CFR* 50.150.

### **Issue**

NuScale SDAA Section 19.5.4.1 states that the design and location of the reactor building crane (RBC), as described in Section 9.1.5, is a key design feature for protecting the NPMs. NuScale DCA Part 2, Tier 2, Section 19.5.4.1 states that the design and location of the RBC, as described in Section 9.1.5, is a key design feature for protecting the NPMs and the reactor pool lining. The application does not make clear whether the reactor pool lining needs to be protected by the key design feature in NuScale SDAA.

### **Information Requested**

1. Clarify whether the reactor pool lining needs to be protected by the key design feature in NuScale SDAA. If the reactor pool lining needs to be protected in this key design feature, update the key design feature, otherwise provide the justification why the reactor pool lining does not need to be protected in this key design feature.
2. Update the FSAR accordingly based on the response above.