

From: Getachew Tesfaye
Sent: Sunday, March 31, 2024 2:07 PM
To: Request for Additional Information
Cc: Prosanta Chowdhury; Mahmoud -MJ- Jardaneh; Griffith, Thomas; Fairbanks, Elisa; NuScale-SDA-720RAIsPEm Resource
Subject: NuScale SDAA Section 3.4.1 - Request for Additional Information No. 022 (RAI-10167-R1)
Attachments: SECTION 3.4.1 - RAI-10167-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. ML23306A033).

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.

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Options

Priority: Normal
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**REQUEST FOR ADDITIONAL INFORMATION No. 022 (RAI-10167-R1)
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
NUSCALE STANDARD DESIGN APPROVAL APPLICATION
DOCKET NO. 05200050**

CHAPTER 3, "DESIGN OF STRUCTURES, SYSTEMS, COMPONENTS AND EQUIPMENT"
SECTION 3.4.1, "INTERNAL FLOOD PROTECTION FOR ONSITE EQUIPMENT FAILURES"

ISSUE DATE: 03/31/2024

Background

By letter dated October 31, 2023, NuScale Power, LLC (NuScale or the applicant) submitted Part 2, Final Safety Analysis Report (FSAR), Chapter 3, "Design of Structures, Systems, Components and Equipment," Revision 1 (Agencywide Documents Access and Management System Accession No. ML23304A321), of the NuScale Standard Design Approval Application (SDAA) for its US460 standard plant design. The applicant submitted the US460 standard 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 FSAR Chapter 3 of the SDAA and determined that additional information is required to complete its review.

Question 3.4.1-3

Regulatory Basis

- GDC 2 as it relates to the structures, systems, and components (SSCs) important to safety being designed to withstand the effects of natural phenomena such as earthquakes, tornados, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.
- GDC 4 as it relates to the SSCs important to safety being designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents.

Issue

Standard Review Plan (SRP) Section 3.4.1, "Internal Flood Protection for Onsite Equipment Failure," provides guidance for reviewing and evaluating the plant internal flood protection and includes all structures, systems, and components (SSCs) whose failure could prevent safe shutdown of the plant or result in uncontrolled release of significant radioactivity. The facility design and equipment arrangements presented in the FSAR are reviewed with respect to both internal (e.g., pipe break, tank failure) and external (e.g., failure of exterior tanks) causes.

SRP 3.4.1 evaluation criteria are to ensure applicant has provided sufficient information to identify all possible sources of internal flooding. Specific areas of review include safety-related SSCs that must be protected against flooding from both external and internal causes. This review also includes location of the safety-related SSCs relative to the internal flood level in various buildings, rooms, and enclosures that house safety-related SSCs.

The NRC staff compared SDAA Chapter 3 to what had been accepted under NuScale's US600 design review and noted significant changes from the US600 design related to the maximum flood heights. For example, NuScale US460 SDAA FSAR Table 3.4-1 lists flood heights of 15.0 feet, while NuScale US600 design application FSAR indicated flood levels of 22 inches for same elevations evaluated.

The SDAA provides considerations and assumptions used in the flooding analysis and limited flooding source information. The SDAA lacks a description of the safety related SSC's requiring protection, definition of analysis zones, or identification of systems within the evaluated zones. As such, the staff is unable to verify flood analysis methodology and conclude impacted SSCs are adequately evaluated or protected.

FSAR Section 3.4.1 states, "Internal flooding analyses is performed for the Reactor Building (RXB) and the Control Building (CRB) to confirm that flooding from postulated failures of tanks and piping or actuation of fire suppression systems does not cause loss of equipment required to perform safety functions. These SSC are "equipment subject to flood protection."" The staff is unable to verify whether the internal flood analysis has been performed to conclude equipment can perform their safety function.

During the audit, NRC staff questioned the lack of docketed information defining sources of flooding, areas of concern evaluated, and flood protection methodology for SSCs important to safety. NRC staff further noted the Table 3.4.1 flood height values contained within the SDAA being significantly different from US600 standard design. The staff reviewed the information provided in the audit for flood analysis, which defines its scope as used to identify potential flooding conditions. While the flooding analysis derives the bounding flood levels, it does not discuss evaluation of any SSC protection. The flood analysis concludes verification of SSCs protected per GDC 2 and GDC 4 will be determined in a future calculation.

FSAR Section 3.4.1.5 contains COL Item 3.4-1 which states, "An applicant that references the NuScale Power Plant US460 standard design will confirm the final location of structures, systems, and components subject to flood protection. The final routing of piping, and site-specific tanks or water source tanks are placed in locations that would not cause flooding to the Reactor Building or Control Building." The scope of what the COL applicant will "confirm" is unclear and challenges the staff's ability to make necessary findings. The COL item needs to address the purpose of the confirmation, and the specific criteria to be used.

FSAR Section 19.1.5.3.2 indicates chemical and volume control system (CVCS) vulnerability to flooding by stating, "The internal flood is assumed to cause loss of CVCS injection, because CVCS equipment is vulnerable to flooding in various locations in the reactor building (RXB); and the demineralized water system (DWS), upon which CVCS is dependent, could be affected by floods outside the RXB." However, SDAA Section 3.4.1 lacks any discussion of CVCS related to flooding or the need for protection.

Information Requested

Provide a summary of the evaluation of the flood analysis methodology and identify the SSCs subject to flood protection for RXB and CRB Flood Analysis and update the FSAR accordingly.

Provide a description of various flood zones analyzed in FSAR Table 3.4-1 and systems considered within the various flood zones susceptible to flood condition. As an example, confirm

whether any SSCs subject to flood protection in FSAR Table 3.4-1 with flood heights of 15.0 feet are evaluated for submergence or equivalent mitigating measure. Provide a description of SSCs subject to flood protection within the impacted zones.

Confirm whether the scope of COL item 3.4-1 requires the applicant to perform a detailed analysis to define the location and means of protection of all SSCs subject to flooding whose failure could prevent safe shutdown of the plant or result in uncontrolled release of significant radioactivity. Provide an update of the COL item to clarify the scope of COL confirmation and specific criteria to be used.