From:	Getachew Tesfaye
Sent:	Tuesday, October 31, 2023 5:12 PM
To:	Request for Additional Information
Cc:	Getachew Tesfaye; Mahmoud Jardaneh; Griffith, Thomas; Osborn, Jim; NuScale-SDA-720RAIsPEm Resource
Subject:	NuScale SDAA Section 6.3 - Request for Additional Information No. 008 (RAI-10081-R1)
Attachments:	SECTION 6.3 - RAI-10081-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)
Senior Project Manager
NRC/NRR/DNRL/NRLB
301-415-8013

Hearing Identifier: NuScale_SDA720_RAI_Public
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Options
Priority: Normal
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Reply Requested: No
Sensitivity: Normal
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REQUEST FOR ADDITIONAL INFORMATION No. 008 (RAI-10081-R1)
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
NUSCALE STANDARD DESIGN APPROVAL APPLICATION
DOCKET NO. 05200050
CHAPTER 6, "ENGINEERED SAFETY FEATURES"
SECTION 6.3, "EMERGENCY CORE COOLING SYSTEM"
ISSUE DATE: 10/31/2023

Background

By letter dated December 31, 2022, NuScale Power, LLC (NuScale or the applicant) submitted Part 2, Final Safety Analysis Report (FSAR), Chapter 6, "Engineered Safety Features," Revision 0 (Agencywide Documents Access and Management System Accession No. ML22365A021) 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 6 of the SDAA and determined that additional information is required to complete its review.

Question 6.3-1

Regulatory Basis

10 CFR 52.137(a)(2) states a standard design application must include "[a] description and analysis of the SSCs of the facility, with emphasis upon performance requirements, the bases, with technical justification, upon which the requirements have been established, and the evaluations required to show that safety functions will be accomplished." Additionally, 10 CFR 52.137(a)(4) states a standard design application must include "[a]n analysis and evaluation of the design and performance of SSC with the objective of assessing the risk to public health and safety resulting from operation of the facility and including determination of the margins of safety during normal operations and transient conditions anticipated during the life of the facility, and the adequacy of SSCs provided for the prevention of accidents and the mitigation of the consequences of accidents."

Issue

The NPM-20 emergency core cooling system (ECCS) relies on the actuation of the decay heat removal system (DHRS) to remove a portion of decay heat by condensing steam from the reactor primary coolant system. During the long-term cooling period following an anticipated operational occurrence (AOO) or postulated design basis accident, the DHRS system is actuated to remove core decay heat and other sensible heat by condensing reactor coolant system (RCS) steam. The primary side steam generated from the reactor core contains combustible gases, hydrogen, and oxygen, which are generated via radiolysis of water. After the steam condenses, the combustible gas may accumulate in the RCS. Over time, the accumulated gases may reach the combustion threshold concentration in localized subcompartments inside containment, which includes subcompartments in the RCS that could

cause loss of containment integrity or loss of appropriate mitigating features for design basis events given that the design basis events can last beyond 72 hours. This could result in severe degradation of the RCS, DHRS, and ECCS and prevent them from performing their safety functions and satisfying associated regulatory requirements, such as General Design Criteria 10, 15, 34, 35, and 10 CFR 50.46.

It is necessary to preclude local concentrations of combustible gases collecting in areas where unintended combustion or detonation could cause loss of containment integrity or loss of appropriate mitigating features. Operating reactors have addressed combustible gas control for design basis and beyond design basis severe accidents in accordance with 10 CFR 50.44, and its regulatory progression, through analyses, intrinsic design capabilities, installation of mitigative features, and reliance on operator actions to purge and vent. NuScale's NPM-20 design and approach to design basis event mitigation with no reliance on operator actions differs significantly from active operating reactors. Therefore, additional information is needed for the staff to evaluate standard design approval application (SDAA) Sections 6.3, 15.0.5, 15.6.5, Extended Passive Cooling and Reactivity Control Methodology Topical Report, and Loss-of-Coolant Accident Evaluation Model Topical Report regarding the potential for combustible gas generation and accumulation in the RCS.

Information Requested

Provide a quantitative analysis for the generation and transport of combustible gases within the RCS that demonstrates adequate performance of AOO and accident mitigating SSCs to accomplish their safety functions. A summary of pertinent portions of the analysis, including its results and conclusions, should be incorporated into the SDAA and associated topical reports.