



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 1, 2020

Matthew W. Sunseri, Chairman
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: NUSCALE AREA OF FOCUS—PROBABILISTIC RISK ASSESSMENT AND
EMERGENCY CORE COOLING SYSTEM VALVE PERFORMANCE

Dear Mr. Sunseri:

In your letter dated June 1, 2020 (Agencywide Documents Access and Management System Accession No. ML20149K596), the Advisory Committee on Reactor Safeguards (ACRS or the Committee) reported on the Committee's review of the U.S. Nuclear Regulatory Commission (NRC) staff's safety evaluation for the NuScale Power, LLC (NuScale), Area of Focus—Probabilistic Risk Assessment and Emergency Core Cooling System Valve Performance. I appreciate the time and effort that the ACRS has devoted to this review, as reflected in meetings held with the ACRS Subcommittee on March 3, 2020, and with the ACRS Full Committee April 8–10, 2020.

Your letter offered the following conclusions and recommendations:

1. The NuScale DCA meets the 10 CFR 52.47(a)(27) requirement to include a description of the design-specific PRA and its results in the DCA.

Staff Response: The staff agrees with the ACRS conclusion.

2. A primary purpose of the PRA at the DCA stage is to inform the design to reduce risk. The PRA scope is sufficient to enable the discussion of risk results and insights, and the level of detail in the PRA is consistent with its intended uses in support of design certification; i.e., to identify design alternatives, operational vulnerabilities, and to provide risk-informed support for other programs. However, the risk insights identified in Chapter 19 should not be considered final because there are omissions in the existing Final Safety Analysis Report (FSAR) that need to be properly reflected in the PRA.

Staff Response: The staff agrees that the primary purpose of the probabilistic risk assessment (PRA) in the design certification application (DCA) is to: (1) identify and address potential design features and plant operational vulnerabilities and (2) reduce or eliminate the significant risk contributors of existing operating plants applicable to the new design, by introducing appropriate design features and requirements. The staff will continue to evaluate the extent to which the design changes associated with boron redistribution affect the risk

results and insights identified in FSAR Chapter 19 and their use in related programs. As the staff finalizes its review of the affected information associated with FSAR Chapter 19, the staff will reaffirm its safety findings regarding NuScale's DCA.

3. In our Chapter 15 letter, we identified a boron dilution issue that remains open. We are concerned that this class of events could lead to a potential reactivity insertion accident and core damage. The applicant is working on resolution of this issue. This resolution needs to be evaluated to determine if these scenarios should be included in the PRA at the DCA stage. Such inclusion could impact the reported risk measures and the risk insights as presented in Chapter 19.

Staff Response: The staff will continue to evaluate the extent to which the design changes associated with boron redistribution affect the risk results and insights identified in FSAR Chapter 19. The staff will ensure that the PRA adequately reflects the applicant's resolution of the boron redistribution concerns. The staff will also ensure that the PRA accounts for all known significant risk contributors and that the identification of risk insights is acceptable for the staff to make its safety findings as described in Section 19.0, "Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition."

4. The risk measures of core damage frequency (CDF) and large release frequency (LRF), quantified in the PRA, suggest that the NuScale design meets the Commission's Safety Goals with large margins. However, recently identified design issues, underlying omissions, and uncertainties indicate that the large margins between CDF and LRF and safety goals cannot be substantiated at this time.

Staff Response: The staff will continue to evaluate the NuScale design for consistency with the Commission's goals for CDF and LRF once the applicant has adequately addressed the impact of boron redistribution issues on the PRA.

5. To promote identification of valid risk insights through the Combined License (COL) process, we provide recommendations on several other topics: ECCS valve performance and qualification; risk importance of the chemical and volume control system (CVCS); errors of commission associated with reactor building crane (RBC) operations; risk increase to single unit operation with multiple unit operation and buildout; steam generator integrity; post-accident combustible gas monitoring; and more rigorous treatment of sensitivities and uncertainties.

The risk insights will be better supported when the COL applicant addresses the requirements of the NuScale design certification rule appendix to 10 CFR Part 52. This includes addressing the COL items, closing the Inspections, Tests, Analyses, and Acceptance Criteria items,

updating the site and plant-specific PRA before fuel load, and, of particular interest with respect to the NuScale design, addressing the additional requirements and restrictions in the rule appendix to address design completeness.

Staff Response: The staff will continue to evaluate the extent to which the risk results and insights affect FSAR Chapter 19; however, consistent with the Part 52 process risk insights will be better supported when a future COL applicant addresses the requirements in the NuScale design certification appendix to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, certifications, and approvals for nuclear power plants," assuming that the NuScale design is approved for certification. During the COL application phase, additional details on the design and operations will become available. The staff will review these details for applicability to the COL application PRA under COL Information Item 19.1-8. Under COL Information Item 19.1-8, the COL applicant will confirm assumptions and data supporting the PRA.

6. We cannot reach a final conclusion on the safety of the NuScale design until the issue of the potential for a reactivity insertion accident due to boron dilution in the downcomer is resolved to our satisfaction.

Staff Response: The staff acknowledges the ACRS's viewpoint.

The NRC staff appreciates the ACRS's review of this highly complex issue. The NRC staff looks forward to continued engagement with ACRS as it continues the review of the NuScale DCA.

Sincerely,

Ho K. Nieh, Director
Office of Nuclear Reactor Regulation

Docket No.: 52-048

cc: Chairman Svinicki
Commissioner Baran
Commissioner Caputo
Commissioner Wright
Commissioner Hanson
SECY

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 EMERGENCY CORE COOLING SYSTEM VALVE PERFORMANCE
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