



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

May 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 - HELICAL TUBE STEAM GENERATOR DESIGN

Dear Mr. Sunseri:

In your letter dated March 24, 2020 (Agencywide Documents Access and Management System Accession No. ML20091G387), 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 (SE) for the NuScale Power, LLC. (NuScale), area of focus - Helical Tube Steam Generator Design. I appreciate the time and effort that the ACRS has devoted to this review, as reflected in meetings held with the ACRS Subcommittee on February 4, 2020, and the ACRS Full Committee held between March 5 - 6, 2020.

Your letter offered the following conclusions and recommendations:

1. The design and performance of the steam generators have not yet been sufficiently validated because of uncertainties associated with unstable density wave oscillations (DWO) on the steam generator secondary side.
2. Accelerated wear of the alloy 690TT steam generator tubing material is a potential concern.
3. Having determined that steam generator integrity is not resolved, NuScale and the staff have proposed the following solutions.
 - a. The staff has proposed that the steam generator design not receive finality in the NuScale design certification.
 - b. NuScale has proposed a combined license (COL) item and Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) to address steam generator DWO.
4. Successful completion of these activities will address our concerns on steam generator performance at the design stage. Some uncertainty will remain until a NuScale Power Module is built and operated.

The NRC staff agrees with ACRS Conclusions and Recommendations items 1, 3, and 4. The staff has also found that NuScale has not yet sufficiently validated the design and performance of the steam generators to support its design certification application because of uncertainties associated with potential DWO on the steam generator secondary side. Therefore, the staff has proposed that the steam generator design not receive finality in the NuScale design certification.

As such, the COL applicant will be required to provide information, such as analysis or testing results, to demonstrate the design and performance of the steam generators associated with DWO. Once a COL is issued, the COL holder will be required to confirm the structural integrity of the steam generators by the successful completion of inspections, tests, and acceptance criteria related to the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* component analysis, and by the implementation of a Comprehensive Vibration Assessment Program, which would include analysis and testing. During the initial startup testing, the COL holder will confirm that the performance of the steam generators provides acceptable vibration and stress in the reactor internals.

Regarding Conclusion and Recommendation item 2, the NRC staff agrees that potential wear of the steam generator tubing is a concern, regardless of the material used for the tubing. The staff agrees that rapid forms of degradation could cause wear of the steam generator tubes and should be addressed in the reactor design. The staff has proposed that the design and performance of the steam generator, with respect to DWO, not receive finality in the NuScale design certification. Rapid wear could also result from flow-induced vibration in the steam generators, which a COL applicant will need to address in its development of a Comprehensive Vibration Assessment Program. Similarly, a COL applicant will address progressive forms of tubing wear in its steam generator inspection program included in the plant technical specifications. The NRC staff agrees that NuScale should continue to develop the wear model for the steam generator tubes as it finalizes the reactor design. As such, regardless of the type of wear analysis that is performed, actual wear patterns in the steam generators will be revealed during operation, and they will be managed by the COL holder.

The NRC staff appreciates the ACRS' review of this highly complex issue. The NRC staff plans to issue its SE for the NuScale design certification in September 2020.

Sincerely,

Ho K. Nieh, Director
Office of Nuclear Reactor Regulation

Docket No.: 52-048

cc: Chairman Svinicki
Commissioner Baran
Commissioner Caputo
Commissioner Wright
SECY

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