



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

April 27, 2020

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

**SUBJECT: SAFETY EVALUATION REPORT FOR TOPICAL REPORT TR-0516-49416,
REVISION 2, "NON-LOSS-OF-COOLANT ACCIDENT ANALYSIS
METHODOLOGY"**

Dear Mr. Sunseri:

In your letter dated March 25, 2020 (Agencywide Documents Access and Management System Accession No. ML20085K048), 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) of the NuScale Power, LLC (NuScale), Topical Report TR-0516-49416, Revision 2, "Non-Loss-Of-Coolant Accident Analysis Methodology," issued November 30, 2019. I appreciate the time and effort that the ACRS has devoted to this review, as reflected in meetings with the ACRS Subcommittee on February 19–20, 2020, and the ACRS Full Committee on March 5, 2020.

Your letter offered the following conclusions and recommendations:

1. The Non-Loss-Of-Coolant Accident (non-LOCA) Analysis Methodology topical report, with the limitations and conditions imposed by the staff SE report, provides an acceptable methodology to analyze anticipated occurrences, infrequent events, and postulated accidents for the NuScale Power Module (NPM).
2. The staff should include an additional condition that allows application of this topical report with any critical heat flux (CHF) correlation approved for use in NPM applications.
3. The staff's SE report should be issued with this additional condition.

With regard to these conclusions and recommendations, the NRC staff's review of the prescreening CHF correlation employed in the non-LOCA methodology includes an examination of various references^{1,2,3}. The NRC staff has concluded that the behavior of the prescreening CHF correlation noted by the ACRS is expected, and the references support, the validity of the

¹ Todreas, Neil E., and Mujid Kazimi, *Nuclear Systems, Volume 1*, 2nd Edition, Boca Raton, FL: CRC Press (2011).

² RELAP5-3D® Code Manual, Volume IV: Models and Correlations, Revision 4.3, The RELAP5-3D® Code Development Team, Idaho National Laboratory (October 2015).

³ Hejzlar, Pavel, and Neil E. Todreas, "Consideration of critical heat flux margin prediction by subcooled or low quality critical heat flux correlations," *Nuclear Engineering and Design*, Volume 163, Issues 1–2, pp. 215–223 (June 1996).

correlation for comparing relative minimum CHF ratio values (e.g., for identifying limiting CHF cases) but not for calculating absolute values (e.g., for quantifying thermal margins).

The prescreening CHF correlation described in the non-LOCA topical report and the NSP correlations, implemented in the VIPRE-01 subchannel code, produce similar trends given variations in the input parameters as shown in the non-LOCA topical report. This information was confirmed by the NRC staff's audit (ADAMS Accession No. ML19039A090). The NRC staff, therefore, finds the prescreening CHF correlation to be acceptable because it can be reasonably expected to identify the limiting CHF cases to be further analyzed using VIPRE-01. The NRC staff emphasizes that the non-LOCA prescreening CHF correlation is used for relative comparisons only and is not used to determine thermal margins.

While the NRC staff understands the ACRS's desire for flexibility in the prescreening CHF correlation, reflected in Conclusions and Recommendations 2 and 3, the NRC staff notes that the applicant has not requested NRC approval of other CHF correlations for prescreening. As such, the NRC staff has not reviewed other CHF correlations for this purpose. The condition and limitation proposed by ACRS would necessitate additional justification from the applicant, and review findings by the NRC staff, that other CHF correlations approved for NPM applications can reliably identify the limiting CHF cases relative to the NSP correlations in VIPRE-01. The NRC staff does not believe that that the proposed condition and limitation is needed given that a methodology acceptable to the NRC staff already exists. Should an applicant or licensee wish to use a different approach as part of its non-LOCA CHF prescreening process in the future, it should submit a change to the topical report for the NRC staff's review and approval.

The NRC staff appreciates the ACRS's review and will issue the SE with no additional conditions and limitations by June 2020.

Sincerely,

Ho 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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