



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

June 12, 2019

The Honorable Kristine L. Svinicki
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

**SUBJECT: SUMMARY REPORT – 663rd MEETING OF THE ADVISORY
COMMITTEE ON REACTOR SAFEGUARDS, May 2 - 3, 2019**

Dear Chairman:

During its 663rd meeting, May 2 - 3, 2019, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following correspondence:

LETTER

Letter to Margaret M. Doane, Executive Director for Operations (EDO), NRC, from Peter C. Riccardella, Chairman, ACRS:

- “Interim Letter: Chapters 4 and 5 of the NRC Staff’s Safety Evaluation Report with Open Items Related to the Design Certification Application Review of the NuScale Small Modular Reactor,” dated May 30, 2019, Agencywide Documents Access and Management System (ADAMS) Accession No. ML19151A306.

MEMORANDA

Memorandum to Margaret M. Doane, Executive Director for Operations, NRC, from Andrea D. Veil, Executive Director, ACRS:

- “Documentation of Receipt of Applicable Official NRC Notices to the Advisory Committee on Reactor Safeguards for May 2019,” dated June 2, 2019, ADAMS Accession No. ML19151A579.
- “Regulatory Guide,” dated June 2, 2019, ADAMS Accession No. ML19151A602, as summarized below.

- RG 4.13, Revision 2, “Environmental Dosimetry—Performance Specifications, Testing, and Data Analysis” (no review)
- RG 1.188, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses” (no review)

HIGHLIGHTS OF KEY ISSUES

1. Interim Letter: Chapters 4 and 5 of the NRC Staff’s Safety Evaluation Report with Open Items Related to the Design Certification Application Review of the NuScale Small Modular Reactor

The Committee met with representatives of the NRC staff and NuScale to review Chapter 4, “Reactor,” Chapter 5, “Reactor Coolant System and Connecting Systems,” and the associated technical topical report, TR-1015-18177, “Pressure and Temperature Limits Methodology” (PTLM) of the safety evaluation report (SER) with open items associated with the NuScale design certification application (DCA).

Chapter 4 of the DCA describes the reactor and the reactor core design, the fuel rod and fuel assembly design, the core control and monitoring components, and the nuclear and thermal-hydraulic design. The fuel rod and fuel assembly design features, analyses and anticipated performance have been adapted from PWR fuel technology currently in-service in the operating fleet. The operational linear power levels are below current designs and fuel assembly limits are within the operating fleet experience. Modern design features have been adopted to address fuel failure mechanisms.

The staff is evaluating NuScale responses to RAIs on the ability of the reactor design to maintain long-term reactivity control following anticipated operations occurrences (AOOs) or postulated accidents. We agree that these Chapter 15 accident analysis issues need to be reviewed and resolved to demonstrate acceptability of the NuScale reactor design in meeting General Design Criterion (GDC) 27 and GDC 35.

NuScale defines Operating Mode 4 as that mode required prior to transport of the power module to the refueling station, and this transport operation may be an important contributor to risk. It would be prudent to provide additional margin to criticality by specifying, in the core operating limits report, that the refueling-mode boron concentration be established before the reactor state is changed from Mode 3 (safe shutdown) to Mode 4.

Chapter 5 describes the reactor coolant system (RCS) design, which provides for the circulation of the primary coolant. The reactor design relies on natural circulation flow of the water coolant and does not include reactor coolant pumps or an external piping system. The RCS is a subsystem of the NuScale Power Module and includes the reactor vessel, the integral pressurizer, the reactor vessel internals, the reactor safety valves, two steam generators integrated into the reactor vessel, the decay heat removal system (DHRS), and RCS piping inside the containment and associated RCS instrumentation. Chapter 15 accident analysis issues are being reviewed to demonstrate acceptability of the DHRS design in satisfying GDC

34 and 35. Verification testing of the system performance has been proposed by the applicant to demonstrate predicted capability for the first-plant to go into operation.

Committee Action

The Committee issued a report to the EDO on these Chapters and associated safety evaluation with open items, dated May 30, 2019, with the following conclusions and recommendations: there are a number of Chapter 4 and Chapter 5 open items related to Chapter 15 accident analysis issues that must be reviewed and resolved in order to demonstrate acceptability of the NuScale reactor design in satisfying GDC 27, GDC 34 and GDC 35. We have not identified any additional major issues at this time for Chapter 4 and Chapter 5.

RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS

- The Committee considered the letter from the Director of the Office of New Reactors dated April 10, 2019, "Response to ACRS letter of September 26, 2018, on Chapters 7 and 8 of the U.S. Nuclear Regulatory Commission Staff's Safety Evaluation Report with Open Items Related to the Certification of the NuScale Small Modular Reactor," ADAMS Accession No. ML19100A008. The Committee was satisfied with the response.
- The Committee considered the letter from the Director of the Office of New Reactors dated April 17, 2019, "Chapter 2, "Site Characteristics and Site Parameters," and Chapter 17, "Quality Assurance and Reliability Assurance," of the U.S. Nuclear Regulatory Commission Staff's Safety Evaluation Report with Open Items Related to the Certification of the NuScale Power, LLC, Small Modular Reactor," ADAMS Accession No. ML19072A215. The Committee is still reviewing the response and intends to interact further with the staff on the issue of unverified design assumptions.
- The Committee considered the letter from the Director of the Office of New Reactors dated April 17, 2019, "Chapter 13 and 18 of the U.S. Nuclear Regulatory Commission Staff's Safety Evaluation Report with Open Items Related to the Certification of the NuScale Small Modular Reactor," ADAMS Accession No. ML19099A135. The Committee was satisfied with the response.
- The Committee considered the letter from the Director of the Office of New Reactors dated April 18, 2019, "Response to the Advisory Committee on Reactor Safeguards' Letter Regarding Draft SECY Paper and Guidance Documents to Implement a Technology-Inclusive, Risk-Informed, and Performance-Based Approach to Inform the Contents of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors," ADAMS Accession No. ML19101A292. The Committee was satisfied with the response.

SCHEDULED TOPICS FOR THE 664th ACRS MEETING

The following topics are on the agenda for the 664th ACRS meeting scheduled for June 5 - 7, 2019:

- Reactor Oversight Program Enhancement Project
- Appendix D to NEI 96-07 and Associated Draft Regulatory Guide for Digital Upgrades under 10 CFR 50.59
- NuScale DCA Safety Evaluation with Open Items for Chapters 3.9.2, 14, 19 and 21
- Unverified design assumptions/Open Design Items as part of a Design Certification Application

Sincerely,

/RA/

Peter C. Riccardella, Chairman

June 12, 2019

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