



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

March 21, 2019

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

SUBJECT: SUMMARY REPORT – 660th MEETING OF THE ADVISORY
COMMITTEE ON REACTOR SAFEGUARDS, FEBRUARY 6-8, 2019

Dear Chairman:

During its 660th meeting, February 6-8, 2019, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following reports, letters, and memorandum:

REPORTS

Reports to Kristine L. Svinicki, Chairman, NRC, from Peter C. Riccardella, Chairman, ACRS:

- “Draft Secy Paper and Guidance Documents to Implement a Technology-Inclusive, Risk-Informed, and Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications, and Approval for Non-Light-Water Reactors,” dated March 19, 2019
- “Non-Power Production or Utilization Facilities Proposed License Renewal Rulemaking,” dated February 28, 2019

LETTERS

Letters to Margaret M. Doane, Executive Director for Operations, NRC, from Peter C. Riccardella, Chairman, ACRS:

- “Interim Letter: Chapters 2 and 17 of the NRC Staff’s Safety Evaluation Report with Open Items Related to the Certification of the NuScale Small Modular Reactor,” dated February 21, 2019

- “Safety Evaluation for ANP-10332P, Revision 0, AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Loss-of-Coolant Accident Scenarios,” dated February 22, 2019

MEMORANDUM

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 February 2019,” dated March 19, 2019

HIGHLIGHTS OF KEY ISSUES

1. Technology-Inclusive, Risk-Informed, Performance-Based Approach for Approving Non-Light-Water Reactors

The Committee met with representatives of the NRC staff and the nuclear power industry to review the draft SECY paper, “Technology-Inclusive, Risk-Informed, Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors,” and the associated draft regulatory guide DG-1353, as well as Nuclear Energy Institute’s guidance document NEI 18-04, “Risk-Informed, Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development.”

The staff has prepared a draft SECY paper and guidance document (DG-1353) to implement a technology-inclusive, risk-informed, and performance-based approach to inform the content of applications for licenses, certifications, and approvals for non-light-water reactors. The SECY paper seeks Commission approval to adopt that methodology. The draft regulatory guide endorses, with clarifications, the methodology documented in NEI 18-04. The methodology would be used by licensees to select licensing basis events; to classify structures, systems, and components; and to assess the adequacy of defense-in-depth for new designs. This is an iterative approach, one beginning in the design stage and continuing through operations.

The draft SECY paper and DG-1353 are an integrated set, with the paper describing the new approach and the DG describing how the approach can be applied. In the SECY paper, the staff argues convincingly that the proposed methodology is consistent with 2008 Commission policy statement on advanced reactors, the Staff Requirements Memorandum for SECY-03-0047 and SECY-15-0168.

Committee Action

The Committee issued a report to the NRC Chairman on this matter, dated March 19, 2019, with the following conclusions and recommendation: 1) The draft SECY paper proposes the next evolution of a licensing approach that has been developed over the past thirty years,

2) The paper proposes an approach to accomplish three objectives: to select licensing basis events; to classify structures, systems, and components; and to assess the adequacy of defense-in-depth for new designs. The approach has matured to the point of being ready for application, 3) We recommend that the Commission adopt the approach proposed by the staff for a technology-inclusive, risk-informed, and performance-based methodology for informing the licensing basis and content of applications for non-light-water reactors, 4) The guidance proposed in DG-1353 is adequate to support implementation of the approach described in the SECY paper, with the exception that guidance for developing mechanistic source terms should be expanded, and 5) DG-1353 should be finalized and published for comment.

2. Non-Power Production or Utilization Facilities License Renewal Rulemaking

The Committee met with representatives of the NRC staff to review the draft final Non-Power Production or Utilization Facilities Proposed License Renewal rulemaking. The Atomic Energy Act accords to research reactors and testing facilities special status and specifies that these reactors be subject to minimal regulation consistent with adequate protection of the public health and safety. The current regulatory process for these reactors permits renewable licenses of twenty-year duration. For a variety of reasons, a backlog in the processing of the license renewals has developed. The staff has undertaken a revision of the regulations to avoid recurrence of such a backlog and to improve the safety documentation for the research reactors and testing facilities.

In the draft final rule, the staff has proposed the following changes to the regulations governing NPUFs. The use of a calculated accident dose is a more risk-informed, performance-based approach than the power level of the reactor to distinguish between types of NPUFs. The NPUF definition excludes all production facilities as defined under paragraphs (1) and (2) of the definition of "production facility" in 10 CFR 50.2. Following license renewal, research reactors will be granted licenses that do not expire; the NRC will continue to monitor and inspect these reactor facilities as in the past; licensees will be required to update their update their final safety analysis report every five years. The 10 CFR 50.59 regulation will be applicable regardless of decommissioning status. The Committee concurs with these staff recommendations.

Committee Action

The Committee issued a report to the NRC Chairman on this matter, dated February 28, 2019, with the following recommendation: The staff should proceed with this rulemaking for license renewal of Non-Power Production or Utilization Facilities (NPUFs).

3. Interim Letter: Chapters 2 and 17 of the NRC Staff's Safety Evaluation Reports with Open Items Related to the Certification of the NuScale Small Modular Reactor

The Committee met with representatives of the NRC staff and NuScale to review Chapter 2, "Site Characteristics and Site Parameters," and Chapter 17, "Quality Assurance and Reliability Assurance," of the safety evaluation report with open items associated with the NuScale small modular reactor design certification application.

Chapter 2 discusses the assumed site envelope for the NuScale design and focuses on the geography and demography, nearby facilities, and postulated site parameters for the design, including meteorology, hydrology, geology, seismology, and geotechnical parameters. A combined license applicant needs to demonstrate that their site falls within this assumed site envelope or demonstrate by other means that the proposed facility is acceptable at the proposed site. The staff found that the NuScale approach to define the site envelope was acceptable with one open item to be resolved related to accidental radioactive releases. NuScale has revised its source term methodology. The staff is currently evaluating these revisions to the accident source term and the methodology for calculating the offsite χ/Q values used in determining the exclusion area boundary and the low population zone in relation to the NuScale design or in a combined license application referencing this design.

Chapter 17 describes the quality assurance program during the design phase, construction phase and operation phase. In addition, the chapter describes the reliability assurance program as it applies to safety-related and non-safety-related structures, systems, and components identified as being risk significant.

Committee Action

The Committee issued a report to the NRC Chairman on this matter, dated February 21, 2019, with the following conclusions and recommendations: 1) We have not identified any major issues in Chapters 2 and 17 at this time. However, there are some items, as noted below, that need to be resolved. 2) The NuScale methodology for calculating accident offsite χ/Q values for the exclusion area boundary and low population zone coupled with the accident source term methodology for the NuScale design needs to be completed and reviewed by the staff. 3) The staff has requested an exemption from the Commission from requiring an inspection, test, analysis, and acceptance criterion, or ITAAC for the NuScale design reliability assurance program and this remains an open item. 4) The applicant's Open Design Items for structures, systems, and components covered by Chapter 17 requirements need to be identified for eventual closure.

4. Review of AURORA-B for LOCA Scenarios

The Committee met with representatives of the NRC staff, their contractors, and Framatome to review topical report ANP-10332P, Revision 0, "AURORA-B: An Evaluation Model for Boiling Water Reactors; Application to Loss of Coolant Accident Scenarios," and the associated NRC staff draft safety evaluation.

AURORA-B is a multi-physics, multi-code package developed for predicting the dynamic response of boiling-water reactors during a variety of transient and accident scenarios. We completed our review of applications of AURORA-B for anticipated operational occurrences in October 2017 and control rod drop accidents in March 2018. Together, these applications cover most of the transient and accident events described in Chapter 15 of the NRC's Standard Review Plan (NUREG-0800). ANP-10332P, extends AURORA-B applicability to loss-of-coolant accident analysis to demonstrate compliance with the criteria in 10 CFR 50.46.

The staff safety evaluation specifies 28 limitations and conditions to the applicability of the AURORA-B loss-of-coolant accident methodology. Most of them enforce limitations to use the methodology within the validated range of applicability using the agreed conservatisms. However, a number of limitations impose requirements for future licensees to justify the acceptability of a number of AURORA-B models on a plant-specific basis. The staff has informed us that they are exploring change-process guidelines that would apply to all vendors and would facilitate resolving these limitations on a generic basis. This is a good example of efforts by the staff to make the NRC more efficient while not losing focus on safety, and we encourage it. We look forward to interacting with the staff as these efforts mature.

Committee Action

The Committee issued a report to the NRC Chairman on this matter, dated February 22, 2019, with the following conclusion and recommendation: 1) The AURORA-B loss-of-coolant accident evaluation model provides an acceptable methodology to estimate safety margins for boiling-water reactors during loss-of-coolant events in accordance with Appendix K to 10 CFR Part 50 and 2) The staff's safety evaluation provides a comprehensive evaluation of this methodology and imposes limitations and conditions to ensure its appropriate application. It should be published.

RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS

- The Committee considered the Executive Director for Operations' response of December 12, 2018, to the November 15, 2018 ACRS letter, "Report on the Safety Aspects of the License Renewal Application for the River Bend Station, Unit 1." The Committee was satisfied with the Executive Director for Operations' response.
- The Committee considered the Executive Director for Operations' response of December 12, 2018, to the November 21, 2018 ACRS letter, "Report on the Safety Aspects of the License Renewal Application for the Waterford Steam Electric Station, Unit 3." The Committee was satisfied with the Executive Director for Operations' response.
- The Committee considered the Executive Director for Operations' response of November 9, 2018, to the October 19, 2018 ACRS letter, "Draft Proposed Rule, "Emergency Preparedness for Small Modular Reactors and Other New Technologies." The Committee was satisfied with the Executive Director for Operations' response.

- The Committee considered the Executive Director for Operations' response of December 21, 2018, to the November 8, 2018 ACRS letter, "Draft Digital Instrumentation & Controls Interim Staff Guidance Digital I&C ISG-06, 'Licensing Process,' Revision 2." The Committee was satisfied with the Executive Director for Operations' response.
- The Committee considered the Executive Director for Operations' response of October 15, 2018, to the September 26, 2018 ACRS letter, "Safety Evaluation of the NuScale Power, LLC, Topical Report TR-0915-17564, Revision 1, 'Subchannel Analysis Methodology.'" The Committee was satisfied with the Executive Director for Operations' response.
- The Committee considered the Executive Director for Operations' response of October 30, 2018, to the September 26, 2018 ACRS letter, "Chapter 7, 'Instrumentation and Controls,' and Chapter 8, 'Electric Power,' of the U.S. Nuclear Commission Staff's Safety Evaluation Report with Open Items Related to the Certification of the NuScale Power, LLC Small Modular Reactor." The Committee issued a response to the Executive Director for Operations informing the staff that the Committee's concern regarding the need for the PCS Unidirectional Data Diode and MCS Unidirectional Data Diode to be one-way hardware devices that neither use nor are configured by software to demonstrate complete isolation from external communications. NuScale's October 24, 2018 submission of mark-ups of a future revision to Chapter 7 indicate that the data diodes in question will be one-way only, reinforced in the hardware design, not software. Our concern stated in Recommendation 2 of our September 26 letter will be resolved when these proposed changes are included in a future revision to the NuScale design certification application.
- The Committee considered the Executive Director for Operations' response of January 11, 2019, to the December 19, 2018 ACRS letter, "Report on the Safety Aspects of the License Renewal Application for the Seabrook Station, Unit 1." The Committee was satisfied with the Executive Director for Operations' response.

SCHEDULED TOPICS FOR THE 661st ACRS MEETING

The following topics are scheduled for the 661st ACRS meeting, to be held March 7-8, 2019:

- NuScale Safety Evaluation with Open Items for Chapters 13 and 18

Sincerely,

/RA/

Peter C. Riccardella
Chairman

March 21, 2019

SUBJECT: SUMMARY REPORT – 660th MEETING OF THE ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS, FEBRUARY 6-8, 2019

Accession No: ML

Publicly Available (Y/N): _Y__

Sensitive (Y/N): N

If Sensitive, which category?

Viewing Rights: NRC Users or ACRS only or See restricted distribution

OFFICE	ACRS	SUNSI Review	ACRS	ACRS
NAME	LBurkhart	LBurkhart	AVeil	PRiccardella (AVeil for)
DATE	03/ 21 /19	03/ 21 /19	03/ 21 /19	03/ 21 /19

OFFICIAL RECORD COPY