



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

April 5, 2021

The Honorable Christopher T. Hanson,  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**SUBJECT: SUMMARY REPORT – 682<sup>nd</sup> MEETING OF THE ADVISORY COMMITTEE  
ON REACTOR SAFEGUARDS, FEBRUARY 3-5, 2021**

Dear Chairman Hanson:

During its 682<sup>nd</sup> meeting, February 3-5, 2021, which was conducted virtually due to the COVID-19 pandemic, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters. The ACRS completed the following correspondence:

**LETTER REPORT**

Letter Report to Christopher T. Hanson, Chairman, U.S. Nuclear Regulatory Commission (NRC), from Matthew W. Sunseri, Chairman, ACRS:

- Review of Advanced Reactor Computer Code Evaluations, dated March 1, 2021, Agency-wide Documents Access and Management System (ADAMS) Accession No. ML21053A024

**LETTERS**

Letters to Margaret M. Doane, Executive Director for Operations (EDO), NRC, from Matthew W. Sunseri, Chairman, ACRS:

- Proposed Draft Regulatory Guide 1.105, Revision 4, Setpoints for Safety-Related Instrumentation, dated March 1, 2021, ADAMS Accession No. ML21054A204
- Safety Evaluation for Topical Report NEDC-33911P, "BWRX-300 Containment Performance," dated March 1, 2021, ADAMS Accession No. ML21049A340

**MEMORANDA**

Memoranda to Margaret M. Doane, EDO, NRC, from Scott W. Moore, Executive Director, ACRS:

- Documentation of Receipt of Applicable Official NRC Notices to the Advisory Committee on Reactor Safeguards for February 2021, dated February 11, 2021, ADAMS Accession No. ML21040A047
- Regulatory Guides, dated February 11, 2021, ADAMS Accession No. ML21040A057

## HIGHLIGHTS OF KEY ISSUES

### 1. Review of Advanced Reactor Computer Code Evaluations

The staff has completed a set of reports addressing Strategy 2, Computer Codes, of the NRC Vision and Strategy document. The two draft documents the staff shared with the Committee complete their near-term action plan for identifying and assessing the available computer codes and databases. Strategy 2 is described in an overview report and five supporting volumes.

The Committee's letter report of November 4, 2019 (ADAMS Accession No. ML19302F015), provided the ACRS's review of four documents produced by the staff evaluating computer codes to be used for analyses of advanced non-LWR reactors: an overview report — "Code Assessment Plans for NRC's Regulatory Oversight of Non-Light Water [non-LWR] Reactors," Volume 1 — "Computer Code Suite for Non-LWR Design Basis Event Analysis," Volume 2 — "Fuel Performance Analysis for Non-LWRs," and Volume 3 — "Computer Code Development Plans for Severe Accident Progression, Source Term, and Consequence Analysis." The remaining two volumes are the subject of the February 2021 ACRS review.

Volume 4 describes the staff's approach to identify and assess computer codes and data used for licensing and siting dose assessment. Dose assessment codes have three major components: (1) source term input, in-plant transport, and release to the environment; (2) atmospheric transport and diffusion models and environmental pathways models; and (3) a dose consequence model. The report identifies and describes the computer codes the staff uses for (1) licensing reviews for design basis accidents, control room habitability, atmospheric concentration in building wake, and ground level concentrations for accident releases; (2) siting codes used in environmental reviews for the routine effluent source term and routine effluent dose assessment; (3) emergency response assessments; (4) decommissioning termination surveys; and (5) other purposes such as environmental dosimetry and severe accident consequences.

Volume 5 describes the staff's plan to assess changes to the existing fuel cycle analyses for non-LWR designs. It focuses on the staff's ability to (1) perform independent fuel cycle safety analyses and consequence assessments; (2) identify gaps in knowledge and in computer codes; and (3) assess readiness. These are the essential elements required to ensure that they can effectively review non-LWR applications.

This report has a strong focus on the technical gaps — analytical capability gaps, modeling capability gaps, analytical modeling gaps, nuclear data gaps, and validation gaps — that need to be identified and closed before the staff will be ready to review submissions for each non-LWR type. It will be important for the staff to include chemical toxicity and flammability for relevant non-LWR fuel cycles. Currently, ten reports are planned. Each fuel cycle report will describe scenarios, identify strategies to close capability gaps, and demonstrate through analysis the readiness of the NRC to review non-LWR fuel cycle activities. The staff should summarize the analysis approach that will find gaps and assess capability.

The staff has completed a workable set of draft reports on NRC Vision and Strategy, Strategy 2, Computer Codes. Substantial development work on specific codes remains. Reiterating the Committee's thoughts from the November 4, 2019 letter, four principles suggest the way to judiciously move forward: simplicity, completeness, working the problem backwards, and a graded, risk-informed licensing review. The analysis approach should be to start simple and only get detailed as needed. The staff should find a way to make the licensing effort commensurate with the associated risk. Something akin to the approach used for research reactors could be considered for small simpler designs, which would likely simplify the required analyses.

### Committee Action

The Committee issued a letter on March 1, 2021, with the following conclusions and recommendations:

1. The five volumes of the Strategy 2 report supporting the Vision and Strategy document describe the staff's approach for identifying and assessing non-LWR computer codes and data that may be used to support licensing reviews of non-LWR submittals. The staff has met its primary goal in this work to ensure readiness to review submittals for many different types of non-LWR designs.
  2. Volume 4 provides descriptions and evaluations of computer codes the NRC staff uses for radiation protection and dose assessment. It describes knowledge gaps and code development needs for non-LWRs and, given the large number of codes to be improved and consolidated, the approach proposed by the staff is comprehensive and workable.
  3. Volume 5 considers the computer codes NRC staff uses for radionuclide characterization, criticality, shielding, and transport throughout the fuel cycle. It is a plan for preparing a series of subsequent reports evaluating computer code development needs and identifying knowledge gaps that need to be closed for a range of non-LWR designs and fuel cycles. It represents a flexible and workable strategy for continuing development of the regulatory review process for new designs.
  4. The Committee urges the staff to keep in mind the four principles elucidated in our letter report of November 4, 2019: simplicity, completeness, working the problem backwards, and scaling down the level of effort of licensing review proportionately as the hazard decreases.
2. Proposed Draft Regulatory Guide (RG) 1.105, Revision 4, Setpoints for Safety-Related Instrumentation

The purpose of RG 1.105 is to provide guidance for meeting regulatory requirements to ensure that:

- a) setpoints for safety-related instrumentation are established to protect nuclear power plant safety and analytical limits, and
- b) the maintenance of instrument channels implementing these setpoints ensures they are functioning as required, consistent with the plant technical specifications.

Proposed Revision 4 of RG 1.105 updates the staff endorsement to American National Standards Institute/International Society of Automation Standard (ANSI/ISA) 67.04.01-2018, "Setpoints for Nuclear Safety-Related Instrumentation." The staff review of updated ANSI/ISA- 67.04.01-2018 confirmed that the RG 1.105, Revision 3, positions have been addressed and that the issues addressed by Regulatory Issues Summary 2006-17 and technical specification task force traveler-493, Revision 4 have been incorporated. Thus, the staff concludes and endorses ANSI/ISA-67.04.01-2018 as a method acceptable to the NRC staff for use in complying with the agency's regulations to ensure that: a) setpoints for safety-related instrumentation are established to protect nuclear power plant safety and analytical limits, and b) the maintenance of instrument channels implementing these setpoints ensures they are functioning as required, consistent with the plant technical specifications without exceptions or additional clarifying guidance.

The Committee heard a different view about the establishment of the limiting trip setpoint uncertainties. The approach outlined in the different view would decrease the probability of exceeding the analytic limit but would have an insignificant impact on execution of the safety function, because the analytic limits have margin built-in based on engineering design.

#### Committee Action

The Committee issued a letter on March 1, 2021, with the following conclusion and recommendation:

- The approach to establishment of setpoints described in RG 1.105, Revision 4 is a significant improvement and should be issued.

#### 3. Safety Evaluation for Topical Report NEDC-33911P, "BWRX-300 Containment Performance"

Licensing topical report (TR) NEDC-33911P provides the design requirements, analytical methods, acceptance criteria, and regulatory bases for the containment performance design functions. Specifically, the TR addresses in detail the design requirements for the containment, the passive containment cooling system (PCCS), the containment isolation valves (CIVs), and the acceptance criteria for BWRX-300 containment performance.

In addition, the TR describes the general methodology for evaluating containment performance by identifying items, such as the transients to consider and the break locations, but it does not provide sufficient detail on the computer codes to obtain regulatory approval at this time. Those details, along with Phenomena Identification and Ranking Table (PIRT) results, benchmark data, and analyses to demonstrate conservatism in the application, are expected within a separate TR, NEDC-33922P, "BWRX-300 Containment Evaluation Method," which is currently under staff review. After this TR is reviewed and approved, the NRC staff will be in a position to evaluate the compliance of the BWRX-300 final design with the requirements documented in NEDC-33911P.

The TR presents a comprehensive review of all applicable regulatory requirements and guidance, including Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, General Design Criteria (GDC), Regulatory Guides, and the Standard Review Plan (SRP). The staff regulatory evaluation, as presented in Section 5 of the SE report, is thorough. However, compliance with GDC 55, "Reactor Coolant Pressure Boundary Penetrating Containment," requires special treatment.

The staff has imposed Limitation and Condition 2 that requires an evaluation of the safety consequences of Isolation Condenser System pipe breaks outside containment to be submitted as part of future licensing activities. The staff will use this design-specific data to make a regulatory decision whether the final design meets SRP Section 6.2.4 criteria and, thus, satisfies GDC 55.

### Committee Action

The Committee issued a letter on March 1, 2021, with the following conclusion and recommendation:

- The proposed design requirements, acceptance criteria, and regulatory basis for containment performance functions documented in NEDC-33911P, subject to the limitations and conditions imposed in the staff SE, are appropriate to evaluate the BWRX-300 containment performance.
- The safety evaluation report should be issued.

### DISCUSSIONS AT THE PLANNING AND PROCEDURES SESSION

The Committee discussed the Full Committee and Subcommittee schedules through June 2021 as well as the planned agenda items for Full Committee meetings.

The Executive Director also led a discussion of significant notices issued by the Agency since the last Full Committee meeting in December (this activity is documented in the memorandum dated February 11, 2021).

The Committee discussed recommendations on review of draft and final regulatory guides as documented in the memorandum dated February 11, 2021.

Member-at-large Kirchner, the lead for the OKLO Subcommittee, provided a brief update on the status of the OKLO combined license application review.

Chairman Sunseri led a discussion of Members' workload balance and the Committee reviewed the Subcommittee assignment chart. It was agreed that Members would provide input to the Chairman via email and that the Chairman would finalize Member assignments accordingly.

Chairman Sunseri also led a discussion of proposed changes to the bylaws. A copy of the proposed changes was sent to all Members and it was agreed that a line by line review of the bylaws would take place during the Planning and Procedures session of the March 2021 Full Committee meeting.

During the discussion of the reconciliation on the Committee's letter and staff response regarding the branch technical position 7-19, "Guidance For Evaluation Of Defense-In-Depth And Diversity To Address Common Cause Failure Due To Latent Defects In Digital Safety Systems," it was decided that Member Brown would draft a potential response to the staff and that the Committee would discuss how to proceed on this issue.

During the closed session of the planning and procedures session, Member Ballinger led a discussion of the status of the SHINE operating license application review.

SCHEDULED TOPICS FOR THE 683<sup>rd</sup> ACRS MEETING

The following topics are on the agenda for the 683<sup>rd</sup> ACRS meeting scheduled for March 3-5, 2021:

- Integrated Human Analysis System – General Methodology Report Preparation,
- Regulatory Guide 1.240, "Fresh and Spent Fuel Criticality Analyses,"
- Presentation from Department of Energy representatives on Gateway for Accelerated Innovation in Nuclear (GAIN) and Advanced Reactor Demonstration Program (ARDP),
- Regulatory Basis for Potential Rulemaking for Title 10 of the *Code of Federal Regulations*, Parts 50 and 52,
- Briefings from U.S. NRC staff on the topics of Be riskSMART and Embark Venture Studios Activities

Sincerely,

Matthew W. Sunseri  
Chairman

April 5, 2021

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