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

November 12, 2020

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

SUBJECT: RESPONSE TO ACRS LETTER ON OBSERVATIONS AND LESSONS -LEARNED FROM ACRS LICENSING REVIEWS RELEVANT TO FUTURE ADVANCED REACTOR APPLICATIONS

Dear Chairman Sunseri,

On behalf of the U.S. Nuclear Regulatory Commission (NRC) staff, I would like to thank you for the letter from the Advisory Committee on Reactor Safeguards (ACRS or the Committee) dated August 25, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20267A655). In that letter, the Committee provided valuable insights from a self-assessment of ACRS reviews related to applications from NuScale Power, LLC, and other recent interactions with the staff on matters related to advanced reactors. The timing of your self-assessment is beneficial given the increased interest in the development and deployment of advanced reactor technologies. I appreciate the Committee's efforts into developing and sharing its observations and recommendations.

The ACRS letter included the following five recommendations:

1. A cross-cutting approach should be adopted by the staff and ACRS for conducting effective safety reviews of future applications, focused by initial chapter-by-chapter reviews that identify open items and significant cross-cutting design issues.

   Staff Response: The staff understands the cross-cutting review approach described by the Committee to encompass a multidisciplinary team with diverse expertise. The staff notes that it has applied this approach during past reviews. The staff anticipates future applications will involve a variety of advanced reactor and small modular reactor (SMR) designs and will continue to emphasize the attributes of risk profiles and safety significance associated with these designs. The development of focus areas for these reviews will correspondingly take advantage of probabilistic risk assessments and will likely be organized around safety functions versus the traditional safety analysis chapters developed for large light water reactors that your letter mentioned. The staff's reviews will also address cross-cutting issues with the potential to contribute to event scenarios or cumulative risks associated with a design. The desired outcome of these efforts aligns with your recommendation to ensure a more focused approach that is reflected in safety evaluations and interactions with the ACRS. Both the NRC and applicants should expect that this will streamline staff and ACRS reviews resulting in more efficiency and shorter schedules.

2. To avoid significant delays late in the review process, critical topical reports should be submitted and reviewed early, particularly methodology reports that underpin the design bases and accident analyses for advanced reactors.

   Staff Response: The staff notes that it has applied this approach during past reviews. It is important to note that the timing of topical report submittals is determined by the applicant. The staff continues to encourage potential applicants to prepare regulatory engagement plans and to interact with the NRC on submittal strategies that support early resolution of key issues to support timely and efficient licensing reviews. The staff has prepared various papers, including a recent draft preapplication engagement white paper (ADAMS Accession No. ML20281A761), and issued regulatory issue summaries to emphasize the importance of planning the timing of submittals, including topical reports. The staff will continue its efforts for timely communication and coordination of activities with the ACRS on each application to develop plans for reviews and meetings to minimize delays in the Committee's review schedule.

3. Staff should ensure that the completeness of proposed new reactor designs is sufficient to demonstrate that all structures, systems, and components (SSCs) important-to-safety are appropriately identified and to support requested exemptions and waivers from the General Design Criteria.

   Staff Response: The staff has activities underway to develop an infrastructure and review strategies for new SMR and advanced reactor applications. The staff recognizes that an applicant's ability to complete design details ahead of licensing reviews poses a challenge, especially for applications for first-of-a-kind (FOAK) projects. To help address this for future applications, the staff is considering whether to clarify what "essentially complete" means in its Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50/52 rulemaking efforts. The staff is interacting with stakeholders and the ACRS to develop technology-inclusive approaches that will focus on safety functions and those SSCs with significant contributions to event scenarios or cumulative risks associated with a design. Such an approach will allow applicants and the staff to identify those SSCs for which more information is warranted in the application on design detail, confirmatory testing, and supporting analyses, and those lower safety significant SSCs where less detail would be needed in the application. The staff will coordinate activities with the ACRS on each application to help identify specific challenges related to the status of design activities in relationship to the licensing process.

4. The time period of transient and accident analyses should be continued to the extent necessary to ensure that applicants demonstrate an effective and reliable means to place the plant in a safe, stable condition, with no ongoing degradation.

   Staff Response: The staff recognizes that it is important to consider temporal factors, end-states, and embedded assumptions as described in the ACRS letter to ensure safety analysis approaches can provide reasonable assurance that any plant can ultimately be secured in a safe, stable condition. The staff and future advanced reactor and SMR applicants have gained insights from the review of the NuScale design. The NRC expects future designs to share some attributes, such as the use of passive safety systems and increased thermal capacities of reactor systems. While offering some advantages over earlier designs, these attributes will require revisions to the traditional safety analyses. The staff will also need to ensure that it understands various phenomena related to reactor and cooling system functions, related degradation

mechanisms, and the role of plant personnel in possible restoration of SSCs. The staff expects approaches such as those described in Regulatory Guide (RG) 1.233, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light Water Reactors" (ADAMS Accession No. ML20091L698), to redefine how licensing basis events are identified and analyzed.

5. The staff should develop guidance for the application of critical deterministic safety examinations, hazards analyses, and risk-informed methods, as well as the need for additional demonstration testing, which could include a prototype. These complementary tools would provide a more effective licensing framework for advanced reactor design applications and their review.

   Staff Response: The staff is preparing guidance in many of these and other areas informed by the "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light-Water Mission Readiness" (ADAMS Accession No. ML16356A670), the implementation action plans (IAPs) (ADAMS Accession Nos. ML17165A069 and ML17164A173), and stakeholder input. The staff is interacting with the ACRS in several key areas associated with possible applications for advanced reactor designs. These interactions include the development of RG 1.233 as well as the ongoing review of American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) RA-S-1.4-2020, "Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants." In December 2017, the staff issued "A Regulatory Review Roadmap for Non-Light Water Reactors" (ADAMS Accession No. ML17312B567), which (1) described the relevant regulations governing the testing requirements for advanced reactors, (2) described the process for determining testing needs to meet the NRC's regulatory requirements, (3) clarified when a prototype plant might be needed and how it might differ from the proposed standard plant design, and (4) described licensing strategies and options that include the use of a prototype plant to meet the NRC's testing requirements. The staff will continue to coordinate its activities with the ACRS on each application to assess the supporting testing programs, identification of event sequences, and any proposed use of prototype reactors or programmatic controls to address FOAK designs.

As suggested in the ACRS letter, the staff will consider these items as it embarks on future reviews of advanced reactor and SMR designs and in ongoing efforts related to the NRC's development of a new regulatory framework and guidance for new reactor design reviews. The staff expects to have frequent interactions with the ACRS in the upcoming months as the NRC develops the proposed rule for the new risk-informed, technology-inclusive regulatory framework and associated guidance. The staff also expects to continue to engage the ACRS as it continues developing the Part 50/52 rulemaking.

The NRC staff appreciates the Committee's decision to undertake this self-assessment and provide the Committee's insights. The staff looks forward to further interaction with the Committee on upcoming advanced reactor topics.

Sincerely,

Ho K. Nieh Digitally signed by Ho K. Nieh
Date: 2020.11.12 17:00:08 -05'00'

Ho K. Nieh, Director
Office of Nuclear Reactor Regulation

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Commissioner Caputo
Commissioner Wright
Commissioner Hanson
SECY

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ADAMS Accession No.: ML20282A285 Package ***via e-mail** **EDO-002**

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