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NUCLEAR REGULATORY COMMISSION  
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September 30, 2022

Joy L. Rempe, Chairman  
Advisory Committee on Reactor Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

SUBJECT: RESPONSE TO THE ADVISORY COMMITTEE ON REACTOR  
SAFEGUARDS, "FOURTH INTERIM LETTER ON 10 CFR PART 53  
RULEMAKING LANGUAGE"

Dear Chairman Rempe:

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 2, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22196A292). This letter addressed the ACRS review of the NRC staff's efforts to develop alternative licensing frameworks for new commercial nuclear plants in the then-existing preliminary version of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 53, "Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants" (Part 53). I appreciate the time and effort that the ACRS continues to devote to this subject, as reflected in the robust engagement with the NRC staff during numerous subcommittee and full committee meetings, including the most recent ACRS Full Committee meeting on July 6, 2022.

In its August 2, 2022, letter, the ACRS recognized that the NRC staff "has done an excellent job of balancing flexibility and predictability" in the development of the preliminary proposed rule language for Part 53, while also acknowledging that the staff is considering viewpoints from a broad spectrum of stakeholders. Evaluating and integrating a large volume of stakeholder feedback, in combination with the breadth of requirements that must be developed for licensing frameworks covering the entire lifecycle of a commercial nuclear plant, make the development of Part 53 a complex rulemaking activity. The NRC staff provides the following responses to the eight recommendations in the ACRS letter:

- (1) There are limitations of the existing quantitative health objectives (QHOs) to fully capture the value and risk of nuclear technologies and the large uncertainties associated with evaluating individual and societal risk. This could inhibit flexibility and opportunities for more innovative approaches as the regulator and applicants learn from new nuclear technologies and associated missions.

**Staff Response:** The NRC staff appreciates the perspectives of the ACRS on the use of the existing QHOs in Part 53. The NRC staff provided the Commission with a rulemaking plan for Part 53 in SECY-20-0032, "Rulemaking Plan on 'Risk-Informed, Technology-Inclusive

Regulatory Framework for Advanced Reactors' (RIN-3150-AK31; NRC-2019-0062)," dated April 13, 2020 (ML19340A056). The Commission approved the rulemaking plan in its staff requirements memorandum (SRM) dated October 2, 2020 (ML20276A293). The plan described how the rulemaking would build on previous agency experience and activities, such as the Licensing Modernization Project, and would be consistent with the Commission's direction in SRM-SECY-10-0121, "Staff Requirements—SECY-10-0121—Modifying the Risk-Informed Regulatory Guidance for New Reactors," dated March 2, 2011 (ML110610166). In that SRM, the Commission stated the following:

The Commission reaffirms that the existing safety goals, safety performance expectations, subsidiary risk goals and associated risk guidance (such as the Commission's 2008 Advanced Reactor Policy Statement and Regulatory Guide 1.174), key principles and quantitative metrics for implementing risk-informed decision making, are sufficient for new plants.

As proposed in both frameworks of the Part 53 preliminary proposed rule text, the QHOs are used in combination with other performance requirements. Framework A has received the most attention in this area since it has proposed to include the QHOs within the performance standards cited in the proposed regulations. Specifically, in Framework A, the QHOs would be included as safety criteria for licensing basis events that are not design basis accidents, as proposed in 10 CFR Section 53.220.

However, as described in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 3, issued January 2018 (ML17317A256), the evaluation of plant risks as represented by a comparison of the QHOs is only one of five key principles of risk-informed decision-making. Other performance standards in the proposed frameworks include (1) establishing regulations to address plant design and operation using both deterministic and risk-informed elements, (2) providing and maintaining defense in depth, (3) establishing and maintaining safety margins, and (4) establishing performance monitoring strategies. The NRC staff has incorporated all these concepts into Part 53 such that the QHOs and these other performance requirements collectively provide reasonable assurance of adequate protection.

In this broader context, the NRC staff continues to maintain that the QHOs described in the NRC's safety goal policy statement<sup>1</sup> remain valid and valuable parts of the decision-making process for existing and future plants. Additionally, the NRC staff believes that an effort to redefine the QHOs is beyond the scope of this current rulemaking and could not realistically be undertaken within the schedule defined for this rule. In developing the preliminary rule language, the NRC staff has recognized that future efforts may support the development of surrogates for demonstrating that various advanced reactor technologies satisfy the QHOs. The proposed preliminary rule language would support using such surrogates to demonstrate that the regulations are satisfied.

- (2) Critical safety functions are foundational to the licensing process. As such, the requirements for identifying critical safety functions should be common to both frameworks.

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<sup>1</sup> NRC Policy Statement, "Safety Goals for the Operations at Nuclear Power Plants," August 4, 1986 (51 FR 30028).

**Staff Response:** In response to ACRS feedback, the NRC staff is proposing a new definition for the term *safety function* in Subpart A that is common to both frameworks. The new definition would denote how both frameworks address safety functions and would clarify the term and its proposed use. The proposed requirements for Framework A (10 CFR 53.230) explicitly address requirements for safety functions as part of a top-down approach to meeting overarching, high-level safety criteria.

Under Framework B, applicants would establish and design against principal design criteria (PDC) similar to the bottom-up approach used in the existing 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," regulations for providing the same protections of public health and safety. The PDC implicitly address the key safety functions for a given design (e.g., PDC are established to ensure that reactivity control functions are met). The definition of *safety function* and the revised requirements related to PDC in Framework B will reflect this concept.

The safety functions are also implicitly incorporated in the organization of the general design criteria in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 and in Regulatory Guide 1.232, "Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors," issued April 2018 (ML17325A611), both of which use safety functions to group the design criteria contained in each document. The NRC staff is also updating its preliminary Draft Regulatory Guide DG-1413, "Technology-Inclusive Identification of Licensing Events for Commercial Nuclear Plants" (ML22146A045), to clarify the primary and supporting safety functions and the role of safety functions in the NRC's various licensing frameworks.

- (3) The staff should require, early in the preapplication process, each applicant to identify numeric safety dose criteria, the critical safety functions, the safety design criteria, and the underlying rationale for their selection and application in the design.

**Staff Response:** The NRC staff fully supports voluntary preapplication engagement with potential applicants for new reactor technologies and sites. Preapplication engagement allows the NRC staff to become familiar with key features of proposed designs and to ensure a common understanding of the NRC's regulatory requirements with the applicant. These preapplication engagements are also beneficial opportunities for early identification and discussion of key technical and policy issues that will facilitate more timely and efficient licensing reviews. However, no regulatory requirement exists for preapplication engagement under Parts 50 or 52, and the NRC staff has not identified a basis to require such engagement from potential Part 53 applicants nor to dictate which topics must be covered in preapplication engagement.

Nonetheless, the staff is developing guidance that includes several topics recommended for discussion by potential applicants during preapplication engagement that align with and envelope those recommended by the ACRS.

- (4) The staff needs to ensure that the fire protection requirements in both frameworks are fully technology-inclusive.

**Staff Response:** The NRC staff agrees with the ACRS recommendation and is proposing significant revisions to the text of the draft preliminary proposed rule for fire protection

requirements in Framework B to ensure that the requirements are technology inclusive, and performance based. The staff will discuss these revisions with the ACRS at the upcoming October 2022 subcommittee meeting. The most recently proposed draft preliminary fire protection requirements in Framework A are technology inclusive.

- (5) The current approach with self-contained requirements for each of the two frameworks is very long. Furthermore, the rule has a significant amount of implementation detail that could be better located in regulatory guidance. The optics of this approach run counter to a streamlined more efficient licensing process, which is an expectation for many stakeholders. As a result, the rule may be too cumbersome to implement and may not be used.

**Staff Response:** The NRC staff agrees that a streamlined, efficient regulatory framework is both desirable and beneficial. To achieve this, the staff is continuing to identify opportunities to further consolidate the proposed rule by identifying areas where referencing other regulations is advantageous or where certain requirements may be more appropriately addressed in regulatory guidance. For example, the NRC staff is updating the draft preliminary proposed fire protection requirements in Framework B by moving some of the information to guidance.

However, the NRC staff disagrees that the two frameworks in Part 53 are very long and would benefit from a significant amount of detail being relocated to regulatory guidance. Each framework in its entirety is less than half of the length of existing regulations for commercial nuclear power reactors found in 10 CFR Parts 50, 52, 55, and 100. Further, the NRC staff disagrees that Frameworks A and B are cumbersome – rather, they are each standalone and each provide options to support flexible licensing approaches. This has the effect of streamlining and consolidating the requirements for future applicants and licensees—each framework provides all requirements in one location, with references as needed, and thereby largely avoids needing to jump between sections of rule text. This construct will also ensure clarity by directing applicants to only the portions of the rule relevant to their licensing approach.

Additionally, in the Part 53 rulemaking plan, the NRC staff identified regulatory stability, predictability, and clarity as key objectives, and is carrying out these objectives in development of the proposed rule. The staff is leveraging performance-based requirements, while also including an appropriate level of detail to ensure sufficient clarity and predictability. This approach, while necessitating some rule language, seeks to provide an optimal mix of high-level and specific requirements in the regulations to provide regulatory certainty and reduce the need for exemptions, relief requests, or other case-by-case reviews. This balanced approach will also support predictable, timely, and efficient future licensing reviews of novel technologies. Nonetheless, the NRC staff is continuing to refine the rule language, which may result in reducing its length while sufficiently defining requirements needed to protect the public from the risks posed by future commercial nuclear plants.

- (6) The proposed general[ly] licensed reactor operator description should provide for qualified operating personnel. However, the associated guidance for implementing 10 CFR Part 55 can be amended to accommodate the objectives of the proposed rule without the additional voluminous text.

**Staff Response:** The NRC staff has developed a new framework for operator licensing under Part 53 that is technology inclusive and creates significant flexibilities compared to

10 CFR Part 55, "Operators' Licenses," including the establishment of an entirely new category of licensed operator. To accommodate these flexibilities and ensure compliance with statutory requirements relevant to licensed operators, the requirements for generally licensed reactor operators must be codified in regulations and not relocated to guidance. Without the proposed approach in Part 53, applicants would be required to adhere to the requirements in 10 CFR Part 55 or the equivalent proposed in Part 53. While revised or new guidance could be developed, applicants would be required to seek one or more exemptions and justify the pursuit of such an alternative approach, requiring NRC staff reviews on an application-specific basis. The proposed approach in Part 53 will remove the need for exemptions and enhance regulatory reliability and clarity.

- (7) The results of the probabilistic risk assessment (PRA) can be used to inform structures, systems and components (SSC) classification by aligning the risk assessment and deterministic safety analysis. This should result, in most cases, in just two tiers for classification of SSCs: Safety Related/Safety Significant and Not Safety Related/Low Safety Significant.

**Staff Response:** The NRC staff has found that two tiers of SSC classification are too limiting to address most cases of risk-informed and performance-based licensing. Both frameworks in the draft preliminary proposed rule text for Part 53 use a variation of the current SSC classification for safety-related SSCs, which sets forth a clear role for SSCs in deterministic safety analyses. The safety-related SSCs relied on for some events (e.g., large-break loss-of-coolant accidents) are required to be addressed by quality assurance programs established under the Part 53 equivalents to Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50.

Based on the NRC staff's experience in preapplication discussions with various advanced reactor vendors, there are likely non-safety-related SSCs in some designs that either have important roles in ensuring defense in depth or are risk-significant and warrant special treatment. This typically necessitates a third category of SSCs in addition to safety-related SSCs and non-safety related SSCs. Framework A reflects this through the inclusion of a category of "non-safety-related but safety-significant SSCs," and Framework B includes important to safety SSCs and allows for SSCs not categorized as safety-related to be credited in the mitigation of beyond-design-basis events.

The NRC staff will outline its rationale for the proposed SSC classifications used in both frameworks in the forthcoming Part 53 *Federal Register* notice preamble discussion (statements of consideration). This information will be shared with the ACRS before the October 2022 subcommittee meeting on Part 53. The NRC staff looks forward to further discussion of this topic during the meeting.

- (8) The simple novel analysis that provides the technical basis for the entry criteria to be able to use the Alternative Evaluation of Risk Insights (AERI) should be documented either in an appendix to the draft regulatory guide (DG)-1414 or in another appropriate document (e.g., NUREG).

**Staff Response:** The NRC staff agrees with the ACRS recommendation. The NRC staff in the Office of Nuclear Reactor Regulation is currently working with the NRC's Office of Nuclear Regulatory Research to perform MELCOR Accident Consequence Code System (MACCS) calculations to confirm the acceptability of the proposed AERI entry conditions. The results of

this collaborative effort with the Office of Nuclear Regulatory Research and the original simple novel approach to determine the AERI entry conditions will be documented and made publicly available in a format that has yet to be determined.

The NRC staff appreciates the continued engagement from the ACRS on Part 53 and considers the Committee's recommendations to be valuable input to this complex rulemaking effort. Further, the staff looks forward to discussing the integrated, draft preliminary proposed rule text for Part 53 and the draft preamble (statements of consideration) during the upcoming Regulatory Rulemaking, Policies, and Practices: Part 53 subcommittee meeting in October 2022.

Sincerely,



Taylor, Robert signing on behalf  
of Veil, Andrea  
on 09/30/22

Andrea D. Veil, Director  
Office of Nuclear Reactor Regulation

cc: Chairman Hanson  
Commissioner Baran  
Commissioner Wright  
Commissioner Caputo  
Commissioner Crowell  
SECY

SUBJECT: RESPONSE TO THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS,  
"FOURTH INTERIM LETTER ON 10 CFR PART 53 RULEMAKING LANGUAGE"  
DATED: SEPTEMBER 30, 2022

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