



POLICY ISSUE **(Notation Vote)**

April 13, 2020

SECY-20-0032

FOR: The Commissioners

FROM: Margaret M. Doane
Executive Director for Operations

SUBJECT: RULEMAKING PLAN ON "RISK-INFORMED, TECHNOLOGY-INCLUSIVE REGULATORY FRAMEWORK FOR ADVANCED REACTORS (RIN-3150-AK31; NRC-2019-0062)"

PURPOSE:

The purpose of this paper is to request Commission approval of the proposed approach to a rulemaking to develop the regulatory infrastructure to support the licensing of advanced nuclear reactors. This rulemaking would revise the U.S. Nuclear Regulatory Commission's (NRC's) regulations by adding a risk-informed, technology-inclusive regulatory framework for commercial advanced nuclear reactors in response to the Nuclear Energy Innovation and Modernization Act (NEIMA).

SUMMARY:

The staff has described its efforts to prepare for the licensing of advanced reactors in documents such as the report, "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," issued December 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16356A670) (Vision and Strategy report), and SECY-14-0095, "Status of the Office of New Reactors Readiness to Review Small Modular Reactor Applications," dated August 28, 2014 (ADAMS Accession No. ML14073A710).

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On January 14, 2019, the President signed NEIMA into law (Public Law 115 439). NEIMA directs the NRC to develop the regulatory infrastructure to support the development and commercialization of advanced nuclear reactors. This rulemaking would establish a technology-inclusive regulatory framework for optional use by applicants for new commercial advanced nuclear reactors. The regulatory requirements developed in this rulemaking would use methods of evaluation, including risk-informed and performance-based methods, that are flexible and practicable for application to a variety of advanced reactor technologies. The staff will hold public meetings and workshops with external stakeholders during each phase of this rulemaking.

BACKGROUND:

In the staff requirements memorandum (SRM) for SECY-15-0129, “Staff Requirements—SECY-15-0129—Commission Involvement in Early Stages of Rulemaking,” dated February 3, 2016 (ADAMS Accession No. [ML16034A441](#)), the Commission approved a new requirement for a streamlined rulemaking plan in the form of a SECY paper that would request Commission approval to initiate all rulemakings not already explicitly delegated to the staff. This present rulemaking is required by NEIMA Section 103(a)(4), which directs the NRC to “complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use by commercial advanced nuclear reactor applicants for new reactor license applications” by December 31, 2027. Because NEIMA provides discretion to the NRC on the content and scope of the rule, the staff is seeking Commission approval of the proposed scope of this rulemaking, as described in this paper.

This rulemaking will build on previous agency efforts in this area. Specifically, the NRC has engaged in several preapplication interactions with designers of advanced reactors and developed policies and guidance to support the potential licensing of advanced reactor facilities. The NRC first published its policy statement on the regulation of advanced reactors in the *Federal Register* on July 8, 1986 (51 FR 24643), with an objective of providing all interested parties, including the public, with the Commission’s views concerning the desired characteristics of advanced reactor designs. The NRC acknowledged in its “Report to Congress: Advanced Reactor Licensing,” issued August 2012 (ADAMS Accession No. [ML12153A014](#)), that while the safety philosophy inherent in the current regulations applies to all reactor technologies, the specific and prescriptive aspects of those regulations clearly focus on the current fleet of large light-water reactor facilities. More recently, the NRC’s Vision and Strategy report for non-light-water reactors identified a potential long-term rulemaking to establish a regulatory framework for advanced nuclear reactor licensing that would be risk-informed, performance based, and technology inclusive. The staff described earlier efforts by the NRC to establish a technology-neutral approach to the regulation of nuclear reactors in an advance notice of proposed rulemaking (ANPR) titled, “Approaches to Risk-Informed and Performance-Based Requirements for Nuclear Power Reactors,” dated May 4, 2006 ([71 FR 26267](#)).

As stated in NEIMA, the purpose of the statute is, in part, to provide “a program to develop the expertise and regulatory processes necessary to allow innovation and the commercialization of advanced nuclear reactors.” NEIMA includes the following definitions for “advanced nuclear reactor,” “regulatory framework,” and “technology-inclusive regulatory framework”:

- (1) **ADVANCED NUCLEAR REACTOR**—The term “advanced nuclear reactor” means a nuclear fission or fusion reactor, including a prototype plant (as defined in sections 50.2 [Definitions] and 52.1 [Definitions] of title 10, Code of Federal Regulations (as in effect on the date of enactment of this Act)), with significant

improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act, including improvements such as—

- (A) additional inherent safety features;
- (B) significantly lower levelized cost of electricity;
- (C) lower waste yields;
- (D) greater fuel utilization;
- (E) enhanced reliability;
- (F) increased proliferation resistance;
- (G) increased thermal efficiency; or
- (H) ability to integrate into electric and nonelectric applications.

(9) REGULATORY FRAMEWORK—The term “regulatory framework” means the framework for reviewing requests for certifications, permits, approvals, and licenses for nuclear reactors.

(14) TECHNOLOGY-INCLUSIVE REGULATORY FRAMEWORK—The term “technology-inclusive regulatory framework” means a regulatory framework developed using methods of evaluation that are flexible and practicable for application to a variety of reactor technologies, including, where appropriate, the use of risk-informed and performance-based techniques and other tools and methods.

The NRC has provided its current regulations for nuclear reactor licensing in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” and 10 CFR Part 52, “Licenses, Certifications and Approvals for Nuclear Power Plants.” This rulemaking, if approved, would create 10 CFR Part 53, “Licensing and Regulation of Advanced Nuclear Reactors,” in keeping with the NRC Vision and Strategy report and the statutory provisions in NEIMA Section 103(a)(4).

DISCUSSION:

Title

Risk-informed, Technology-Inclusive Regulatory Framework for Advanced Reactors Rulemaking.

Regulation

The staff proposes to develop a new 10 CFR Part 53, “Licensing and Regulation of Advanced Nuclear Reactors.” The development of 10 CFR Part 53 would require corresponding and supportive changes to many other parts, such as 10 CFR Parts 2, 20, 21, 50, 51, 52, 54, 55, 73, 100, 170, and 171.

Regulatory Issue

The current application and licensing requirements, developed for large light-water and non-power reactors as outlined in 10 CFR Part 50 and 10 CFR Part 52, do not fully consider the variety of designs for advanced nuclear reactors. For example, existing requirements are not easily adaptable to concepts such as microreactors, which could be transported from factories to multiple temporary siting locations throughout their operating lives. Through this rulemaking,

the staff is proposing to amend the regulations by creating an alternative regulatory framework for licensing advanced nuclear reactors. The new alternative requirements and implementing guidance would adopt technology-inclusive approaches, and include the appropriate use of risk-informed and performance-based techniques, to provide the necessary flexibility for licensing and regulating a variety of advanced nuclear reactor technologies and designs.

This new approach would: (1) continue to provide reasonable assurance of adequate protection of public health and safety and the common defense and security, (2) promote regulatory stability, predictability, and clarity, (3) reduce requests for exemptions from the current requirements in 10 CFR Part 50 and 10 CFR Part 52, (4) establish new requirements to address non-light-water reactor technologies, (5) recognize technological advancements in reactor design, and (6) credit the response of advanced nuclear reactors to postulated accidents, including slower transient response times and relatively small and slow release of fission products.

The staff considered several possible approaches to this rulemaking. For example, the staff assessed the feasibility of limiting the focus to initial issuances of licenses, certifications, or approvals and adding to or revising existing requirements to reflect differences between advanced nuclear reactors and existing light-water reactors. The staff considered the desired flexibility described in NEIMA as well as lessons learned from the Next Generation Nuclear Plant project and other NRC initiatives related to advanced nuclear reactors. The staff gave special attention to the interrelationships among the reactor design process, initial licensing, and the programmatic controls that need to be in place throughout the construction, operation, and decommissioning of any advanced nuclear reactor. The staff also considered the opportunity to implement the Commission's goals to increase the use of risk-informed and performance-based approaches within its regulatory programs through the development of regulations for advanced nuclear reactors. The staff concluded that the long-term licensing and regulation of advanced nuclear reactors would be best served through issuing a new 10 CFR part (including, where possible, references to existing requirements) that could address performance requirements, design features, and programmatic controls for a wide variety of advanced nuclear reactors throughout the life of a facility. The staff took into consideration interactions with external stakeholders during public meetings on August 15, 2019 (ADAMS Accession No. [ML19322B637](#)), and October 10, 2019 (ADAMS Accession No. [ML19288A183](#)) to develop the proposed approach.

Description of Rulemaking: Scope

This rulemaking will define technology-inclusive, performance-based requirements for advanced nuclear reactors. The staff plans to focus the rulemaking on risk-informed functional requirements building on existing NRC requirements, Commission policy statements, and recent activities undertaken to implement the NRC's vision and strategy for non-light-water reactors. The performance requirements will support a risk-informed approach that will acknowledge design features intended to prevent adverse consequences. The performance requirements will also include appropriate corresponding mitigation measures needed to limit the risk to public health and safety from unplanned releases of radioactive materials. The requirements will be consistent with the framework of the Atomic Energy Act of 1954, as amended (AEA) while ensuring the common defense and security and protecting public health and safety.

While the proposed 10 CFR Part 53 is expected to support licensing under either the construction permit and operating license processes described in 10 CFR Part 50 or the licensing, certification, and approval processes described in 10 CFR Part 52, the staff intends to

build 10 CFR Part 53 with as few connections as possible to any prescriptive or programmatic criteria specified in 10 CFR Part 50 and 10 CFR Part 52. However, the staff intends to incorporate attributes of 10 CFR 50 and 52 that staff and stakeholders determine will facilitate regulatory reliability and clarity due to demonstrated efficacy in prior regulatory activities. In addition, the proposed rulemaking may also involve the development of a new licensing process, distinct from and in addition to the licensing processes available under 10 CFR Part 50 and 10 CFR Part 52, for alternative use by applicants for advanced nuclear reactors. This new approach may use regulatory tools that could build additional procedural flexibility into the licensing process. To accomplish this flexibility in the past, the Commission has used tools such as rules of particular applicability and hearing orders. The 10 CFR Part 53 rulemaking would also address other stages of the project life cycle following licensing, including construction, operation, and decommissioning.

The staff plans to build upon ongoing activities such as those described in SECY-19-0117, “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,” dated December 2, 2019 (ADAMS Accession No. [ML18311A264](#)), to develop the associated performance criteria. Such an approach supports implementing the NEIMA requirements and is consistent with the Commission’s direction in the SRM for SECY-10-0121, “Modifying the Risk-Informed Regulatory Guidance for New Reactors,” dated March 2, 2011 (ADAMS Accession No. [ML110610166](#)). In that SRM, the Commission stated that “[n]ew reactors with these enhanced margins and safety features should have greater operational flexibility than current reactors. This flexibility will provide for more efficient use of NRC resources and allow a fuller focus on issues of true safety significance.” The methodology described in SECY-19-0117, which in turn describes the methodology of the Licensing Modernization Project detailed in the Nuclear Energy Institute (NEI) industry guidance document NEI 18-04, Revision 1, “Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development,” issued August 2019 (ADAMS Accession No. [ML19241A472](#)), includes identifying the potential benefits provided by design features and programmatic controls in terms of the margins between estimated doses and the reference values in NRC regulations and the margins between estimated health effects and the NRC’s safety goals. SECY-18-0096, “Functional Containment Performance Criteria for Non-Light-Water-Reactors,” dated September 28, 2018 (ADAMS Accession No. [ML18115A157](#)), and SECY-18-0103, “Proposed Rule: Emergency Preparedness for Small Modular Reactors and Other New Technologies (RIN 3150-AJ68; NRC-2015-0225,” dated October 12, 2018 (ADAMS Accession No. [ML18134A076](#)), provide examples of how those margins are used within performance criteria for potential operational flexibilities.

The staff is preparing this proposed rulemaking specifically for commercial advanced nuclear reactors, including light-water small modular reactor, non-light-water reactor, and fusion reactor designs. While aspects of the alternative, technology-inclusive requirements might be relevant for large light-water reactors, the staff does not expect the scope of the rule to include large light-water reactors.¹

¹ The staff interprets NEIMA’s definition of an advanced nuclear reactor, which states that such a reactor will have “significant improvements compared to commercial nuclear reactors under construction” as of January 14, 2019, as excluding “Generation III+” designs from the definition because the AP1000 reactors were under construction at the time of NEIMA’s enactment.

Description of Rulemaking: Preliminary Backfitting and Issue Finality Analysis

The staff expects that the backfitting and issue finality regulations would not apply to this rulemaking. The new regulations would not constitute backfitting because the rulemaking would provide alternative requirements for the design, construction, and operation of advanced nuclear reactors. An applicant for a license, certification, or approval for a commercial nuclear power reactor could still use the existing regulations (e.g., 10 CFR Part 50 or 10 CFR Part 52). Therefore, the staff is not required to prepare a backfit analysis for the proposed rulemaking.

Description of Rulemaking: Estimated Schedule

The NRC provided the following estimated schedule for the rulemaking in Volume 36 of NUREG-1100, "Congressional Budget Justification, Fiscal Year 2021" (ADAMS Accession No. ML20024D764; consistent with NEIMA section 103(a)):

- Publish ANPR—October 2020.
- Publish proposed rule—April 2025.
- Publish final rule—August 2027

However, the staff will develop a more detailed schedule as the rulemaking progresses that may identify opportunities and efficiencies that would support completing the rulemaking and related guidance earlier.

The staff is planning to undertake significant public outreach activities during this rulemaking, including the development of an ANPR and the hosting of public meetings and workshops. The staff is also exploring innovative outreach approaches to solicit diverse stakeholder feedback, including from entities who have not historically been significant participants in the NRC rulemaking process. As part of these activities, the NRC staff plans to occasionally release preliminary proposed rule language for public discussion and proposes to adopt a streamlined process for these releases. Therefore, staff requests that the Commission delegate the signature authority for the ANPR to the Executive Director for Operations and delegate the signature authority for the release of preliminary rule language to the Director – Division of Rulemaking, Environmental, and Financial Support (REFS) in the Office of Nuclear Material Safety and Safeguards (NMSS).

The staff's schedule does not include developing and publishing a regulatory basis for this rulemaking action, because the planned public outreach activities will provide the staff with sufficient technical, legal, and policy information to support the rulemaking without the need for a regulatory basis document. The staff would use the time saved from not developing a regulatory basis document to hold extensive interactions with external stakeholders and the Advisory Committee on Reactor Safeguards (ACRS) on the content of the rule. The staff will keep the Commission informed on the progress of the rulemaking at key milestones using existing communication tools (e.g., annual advanced reactors status reports and other commission notifications).

Description of Rulemaking: Preliminary Recommendation on Priority

Based on the Common Prioritization of Rulemaking (CPR) prioritization methodology (ADAMS Accession No. [ML18263A070](#)), the preliminary priority for this rulemaking activity is high. Based on the existing CPR prioritization method, the staff has determined that this activity would be a

high-priority rulemaking because: (1) it would be a significant contributor toward the NRC's safety and security goals, (2) it would be a moderate contributor toward attaining the strategies in the NRC Strategic Plan to further risk-inform the regulatory framework for safety and security, (3) it would significantly support the Commission and congressional interest in advanced nuclear reactors as directed by NEIMA with a future regulatory benefit, and (4) the level of public interest in this topic is moderate.

Description of Rulemaking: Estimate of Resources

The staff estimates the proposed action to involve significant costs, largely from creating a methodology for developing and maintaining the licensing basis for advanced nuclear reactors and preparing related guidance documents. It estimates the proposed action to result in the benefits of: (1) fewer exemption requests as compared to those made under the current regulations for advanced reactors, (2) the potential use of a more risk-informed, performance-based licensing process, (3) improved clarity on the relationships between the prevention of licensing basis events and mitigation measures, and (4) an integrated approach to developing design features and associated programmatic controls. NEIMA authorizes the appropriation of funds for fiscal years 2020 through 2024 to carry out the rulemaking. The staff will address FY 2020 needs by shifting resources within the Advanced Reactors business line. The annual budget requests for the activities related to the development of regulatory infrastructure for advanced nuclear reactor technologies will include this funding.

Cumulative Effects of Regulation

This rulemaking would have a net positive impact on the cumulative effects of regulation because: (1) it would potentially reduce the regulatory burden for applicants requesting a license for an advanced nuclear reactor, (2) no known activities would significantly impact the implementation of the proposed rule, and (3) the staff plans to develop an ANPR, hold multiple public meetings and workshops during in the rulemaking process, provide an extended public comment period for the proposed rule, and conduct additional public outreach as needed or as new means of interaction are identified.

Additionally, the staff recognizes that there are other rulemaking projects related to advanced nuclear reactors (e.g., Emergency Preparedness for Small Modular Reactors and Other New Technologies, Incorporation of Lessons Learned from the New Reactor Licensing Process). The staff will coordinate with these other rulemaking activities to limit overlapping attributes and requirements for advanced nuclear reactor design, licensing, and operation to minimize the cumulative effects of regulation on applicants and licensees.

Agreement State Considerations

The staff identified no Agreement State considerations for this rulemaking at this time. The staff notes that the development of requirements for fusion reactors could potentially include regulatory approaches similar to those for the regulation of accelerators, which may include Agreement State considerations. The staff will consult with Agreement States, as appropriate, if such considerations arise in this rulemaking.

Guidance

The staff estimates that it will develop one or more new guidance document(s) in parallel with this rulemaking. Additionally, the staff may update some current guidance for operating reactors to address advanced nuclear reactors.

Advisory Committee on Reactor Safeguards Review

The staff has determined that this rulemaking falls within the scope of the ACRS charter. The staff will meet with the ACRS during the development of the regulations and guidance.

Committee to Review Generic Requirements Review

The staff recommends that review by the Committee to Review Generic Requirements (CRGR) will not be necessary because the backfit regulations do not apply, as described in the section of this paper titled, "Description of Rulemaking: Preliminary Backfitting and Issue Finality Analysis."

Analysis of Legal Matters

The Office of the General Counsel has reviewed this rulemaking plan and has not identified any issues necessitating a separate legal analysis at this time.

COMMITMENT:

If the Commission approves initiation of the rulemaking, in accordance with SECY-16-0042, "Recommended Improvements for Rulemaking Tracking and Reporting," dated April 4, 2016 (ADAMS Accession No. ML16075A070), the staff will add this rulemaking activity to the agency's rulemaking tracking tool.

RECOMMENDATION:

The staff recommends that the Commission approve this rulemaking plan to develop the regulatory infrastructure to support the licensing of advanced nuclear reactors.

The staff also recommends that the Commission approve its recommendation to delegate signature authority for the ANPR to the Executive Director for Operations and the release of preliminary rule language to the Director – NMSS/REFS.

The staff also recommends that the Commission approve its recommendations on ACRS review and no CRGR review

RESOURCES:

Enclosure 1 describes the resources needed for the rulemaking.

COORDINATION:

The Office of the General Counsel has no legal objection to this action. The Office of the Chief Financial Officer has reviewed this paper and has no concerns with the resource estimates in the enclosure.

Margaret
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Executive Director
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Enclosure:
Projected Resources

SUBJECT: RULEMAKING PLAN—RISK-INFORMED, TECHNOLOGY-INCLUSIVE REGULATORY FRAMEWORK FOR ADVANCED REACTORS (RIN-3150-AK31; NRC-20191-0062) DATED: APRIL 13, 2020

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SECY: ML19340A056

Enclosure 1: ML19340A059

***Via e-mail**

SECY-012

SRM-OGC190122-23

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