POLICY ISSUE
(Information)

January 17, 2019 SECY-19-0009

FOR: The Commissioners

FROM: Frederick D. Brown, Director
Office of New Reactors

SUBJECT: ADVANCED REACTOR PROGRAM STATUS

PURPOSE:

The purpose of this paper is to provide the Commission with the status of the U.S. Nuclear Regulatory Commission (NRC) staff's activities related to advanced reactors. This paper informs the Commission about the progress and path forward on activities such as the resolution of key technology-inclusive policy issues, development of risk-informed and performance-based licensing approaches, and interactions with prospective applicants and other stakeholders. This paper does not address any new commitments or resource implications.

BACKGROUND:

As the NRC prepares to review and regulate a new generation of non-light-water reactors (non-LWRs), it has developed a vision and strategy to assure the agency's readiness to effectively and efficiently conduct its mission for these technologies. The staff described this vision and strategy in its report, "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," dated December 2, 2016.[1] To achieve the goals and objectives stated in this vision and strategy report, the staff developed an implementation action plan (the plan), dated July 12, 2017.

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1 See "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," dated December 21, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16356A670).

The plan identified specific activities the staff planned to conduct in the near term (within 5 years),[2] midterm (5–10 years), and long term (beyond 10 years).[3] The staff has made significant progress toward achieving the goals of the vision and strategy and executing the plan over the last year.

DISCUSSION:

As described in the plan, the staff has organized its non-LWR readiness efforts into six strategic areas: (1) staff development and knowledge management, (2) analytical tools, (3) regulatory framework, (4) consensus codes and standards, (5) resolution of policy issues, and (6) communications. Since issuance of the plan, the staff has made significant progress in activities related to all six of these areas. The staff has prioritized the advancement of risk-informed and performance-based approaches (strategy 3) and the resolution of key policy issues (strategy 5). In its efforts, the staff has worked closely with its counterparts at the U.S. Department of Energy, Department of Homeland Security, and the Federal Emergency Management Agency, and has engaged extensively with external stakeholders.

This paper covers progress made during calendar year 2018. The enclosure discusses the staff's accomplishments in more detail, including the following:

- Issued SECY-18-0076, "Options and Recommendation for Physical Security for Advanced Reactors," dated August 1, 2018.[4]

- Issued SECY-18-0096, "Functional Containment Performance Criteria for Non-Light-Water-Reactors," dated September 28, 2018.[5]

- Issued 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.[6]

- Issued final Regulatory Guide 1.232, "Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors," dated April 3, 2018.[7]

- Engaged with stakeholders on the industry-led Licensing Modernization Project (LMP) and issued preliminary Draft Regulatory Guide (DG)-1353, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water

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2 See "NRC Non-Light Water Reactor Near-Term Implementation Action Plans," dated July 12, 2017 (ADAMS Accession No. ML17165A069).

3 See "NRC Non-Light Water Reactor Mid-Term and Long-Term Implementation Action Plans," dated July 12, 2017 (ADAMS Accession No. ML17164A173).

4 See SECY-18-0076, "Options and Recommendation for Physical Security for Advanced Reactors," dated August 1, 2018 (ADAMS Accession No. ML18052B032) and Staff Requirements Memorandum (SRM) dated November 19, 2018 (ADAMS Accession No. ML18324A469)

5 See SECY-18-0096, "Functional Containment Performance Criteria for Non-Light-Water-Reactors," dated September 28, 2018 (ADAMS Accession No. ML18115A157) and SRM dated December 4, 2018 (ADAMS Accession No. ML18338A502)

6 See SECY-18-0103, "Proposed Rule: Emergency Preparedness for Small Modular Reactors and Other New Technologies (RIN 3150-AJ68)," dated October 12, 2018 (ADAMS Accession No. ML18134A076).

7 See Regulatory Guide 1.232, "Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors," dated April 3, 2018 (ADAMS Accession No. ML17325A611).

Reactors," dated August 16, 2018,[8] to endorse Nuclear Energy Institute (NEI) Working Draft 18-04, Revision 0, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development."[9]

- Completed an initial assessment of the information, data, and tools needed to support non-LWR reviews. In addition, the staff also has performed a preliminary assessment of existing computer codes and tools that have the potential to meet non-LWR review and other regulatory application needs. The assessment included overall life cycle costs and development schedule and considered NRC computer codes, computer codes developed by DOE under the Nuclear Energy Advanced Modeling and Simulation (NEAMS) project, and international computer codes.

- Issued final draft guidance NUREG-2159, "Acceptable Standard Format and Content for the Material Control and Accounting Plan Required for Special Nuclear Material of Moderate Strategic Significance," dated August 24, 2018.[10]

- Conducted ten public meetings to obtain stakeholder feedback on a variety of advanced reactor topics and seven briefings of the Advisory Committee on Reactor Safeguards (ACRS) Future Plant Subcommittee and four briefings of the ACRS Full Committee.

- Participated actively in the development of consensus codes and standards, including American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Division 5, for high-temperature materials and the joint ASME/American Nuclear Society probabilistic risk assessment standard for advanced non-LWR plants.

- Chaired the Nuclear Energy Agency working group on the safety of advanced reactors.

The staff described previous accomplishments and provided background information in SECY-18-0011, "Advanced Reactor Program Status," Enclosure 1, "Non-Light Water Reactor Implementation Action Plan—Progress Summary and Future Plans," dated January 25, 2018.[11]

Although the staff has made significant progress, much work remains to be accomplished for the agency to be fully prepared for effective and efficient non-LWR licensing reviews. The staff will continue to prioritize work to make the most effective use of allocated resources and to support potential near-term applications. The staff will also maintain its attention to specific challenge areas to ensure continued success in 2019. This includes using innovative approaches to managing contracts to ensure that the staff has the capability to shift resources in response to an evolving landscape and to accelerate activities, where possible, to minimize carryover.

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8 See DG-1353, "Guidance for 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," dated August 16, 2018 (ADAMS Accession No. ML18264A093).

9 See NEI Working Draft 18-04, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development," dated September 28, 2018 (ADAMS Accession No. ML18271A172).

10 See final draft NUREG-2159, "Acceptable Standard Format and Content for the Material Control and Accounting Plan Required for Special Nuclear Material of Moderate Strategic Significance," dated August 24, 2018 (ADAMS Accession No. ML18236A394).

11 See SECY-18-0011, Advanced Reactor Program Status," Enclosure 1, "Non-Light Water Reactor Implementation Action Plan—Progress Summary and Future Plans," dated on January 25, 2018 (ADAMS Accession No. ML17334B184).

Regulatory Information Summary (RIS) RIS-17-08, "Process for Scheduling and Allocating Resources for Fiscal Years 2020 Through 2022 for the Review of New Licensing Applications for Light-Water Reactors and Non-Light-Water Reactors," requested potential applicants to provide design, licensing, construction, and pre-application plans and schedules for the period FY 2020 through 2022. As shown in Figure 1, five non-LWR developers have notified the staff of their intent to begin regulatory interactions. RIS responders are in different stages of development and based on their responses, the staff started formal preapplication interactions with three of the five: Oklo, Inc. (Oklo), in November 2016 on its micro fast-reactor design; X-Energy, LLC (X-Energy), in September 2018 on its pebble bed high-temperature gas-cooled reactor (HTGR); and Kairos Power (Kairos) in October 2018 on its pebble-fueled, molten-fluoride-cooled reactor. The staff is also engaged with X-Energy on preapplication interactions for a fuel fabrication facility to produce tristructural isotropic (TRISO) fuel. The staff anticipates starting additional preapplication reviews in fiscal year (FY) 2019 and beginning one or more application reviews in the next 1 to 3 years. Figure 1 summarizes some of the diverse designs currently in development.[12]

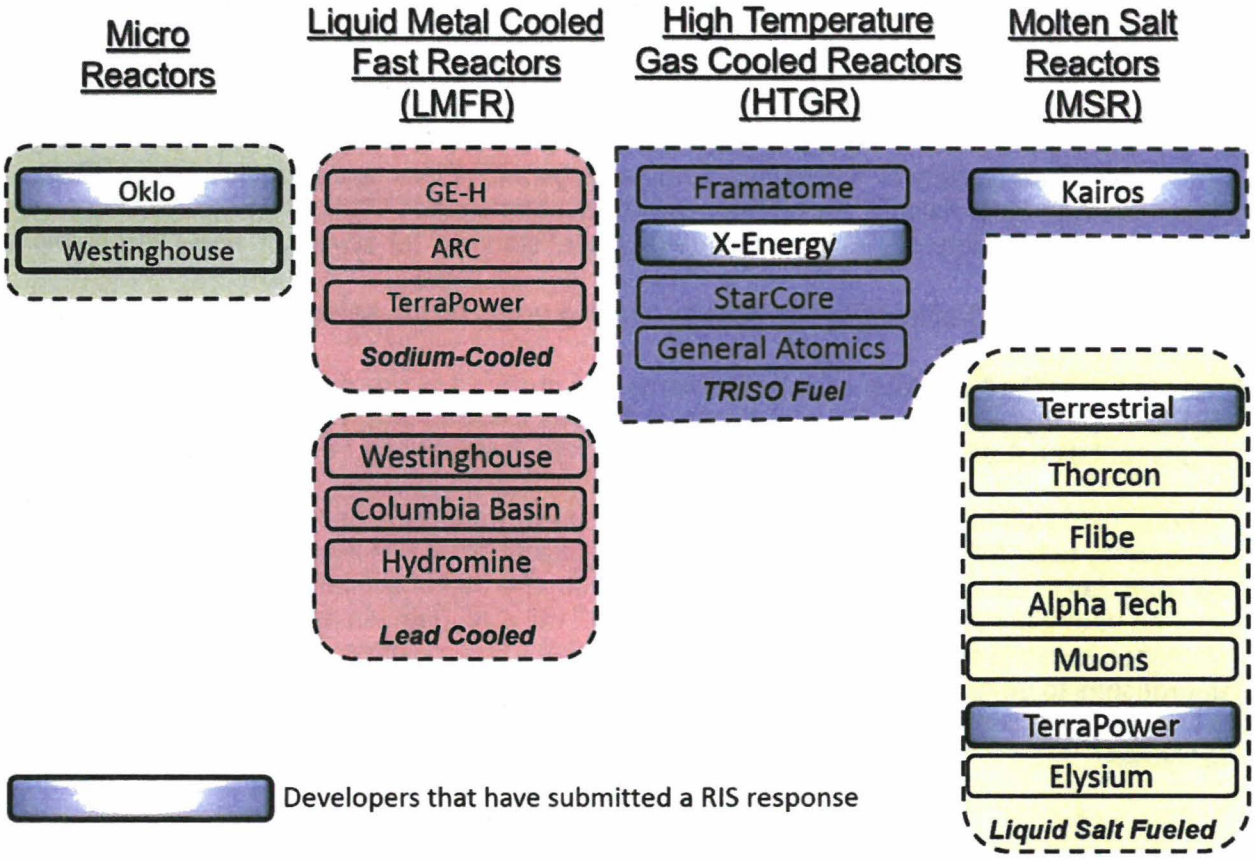

Figure 1: Companies developing non-LWR designs

12 The list does not include technologies such as fusion energy or accelerator-driven systems and may not be inclusive of all companies actively developing designs even within the listed categories of micro reactors, liquid-metal-cooled fast reactors (LMFRs), HTGRs, and molten salt reactors (MSRs).

The staff continues to implement flexible and staged non-LWR regulatory review processes to engage with developers and to align the NRC's activities with the developers' needs as described in the guidance document published in December 2017 "A Regulatory Review Roadmap for Non-Light Water Reactors."[13] The staff also continues to use the non-LWR core review team approach to conduct effective non-LWR preapplication reviews. The core review team comprises specifically assigned staff members across a range of technical disciplines. These staff members bring experiences from, among other things, recent initial licensing activities, non-power reactors and reviews of fuel qualification and fuel cycle facilities. The concept provides stability and consistency to the developer while ensuring the efficient and agile use of available NRC resources. The core review team includes staff from the Office of New Reactors (NRO), the Office of Nuclear Reactor Regulation, the Office of Nuclear Material Safety and Safeguards, the Office of Nuclear Security and Incident Response, the Office of Nuclear Regulatory Research, and the Office of the General Counsel (OGC). This approach has worked successfully for ongoing preapplication reviews, and the staff plans to continue to use this approach to support future regulatory interactions with non-LWR developers. With the anticipated increase in preapplication interactions in FY 2019 and projected application submittals, the staff is working to strategically build core review team capacity and capability to conduct non-LWR reviews.

The status of the NRC's non-LWR readiness activities is accessible to the public through the NRC's public Web site (https://www.nrc.gov/reactors/new-reactors/advanced.html). To ensure that the Web site is current, NRO project managers routinely review and update this information.

CONCLUSION:

The staff has made progress in preparing for effective and efficient non-LWR application reviews consistent with available resources. The staff plans to continue non-LWR readiness activities in FY 2019, with a priority on advancing risk-informed and performance-based licensing approaches and addressing key policy issues and will continue to engage in preapplication interactions with prospective applicants. The staff will continue to keep the Commission informed of the status of its non-LWR readiness activities and plans for potential licensing applications. The staff also plans to continue to seek Commission decisions in FY 2019 on advanced reactor policy topics, such as the staff's potential endorsement of the technology-inclusive, risk-informed and performance-based framework described in NEI 18-04.

COORDINATION:

OGC has reviewed this paper and has no legal objections.

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Enclosure:
Non-LWR Implementation Action Plan—
Progress Summary and Future Plans

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13 See "A Regulatory Review Roadmap for Non-Light Water Reactors", dated December 26, 2017, (ADAMS Accession No. ML17312B567)

ADVANCED REACTOR PROGRAM STATUS DATED _____

SRM-M170511-4

ADAMS Accession No: ML18346A075 (pkg) ***via e-mail** SECY-012

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