POLICY ISSUE
(Information)

January 25, 2018 SECY-18-0011

FOR: The Commissioners

FROM: Victor M. McCree
Executive Director for Operations

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 will inform the Commission about the progress and path forward on each of the implementation action plan (IAP) strategies. It also provides an overview of the various external factors influencing the staff's activities to prepare for possible licensing and deployment of advanced reactors. 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), the staff developed a vision and strategy to assure readiness to effectively and efficiently conduct its mission for these technologies, including fuel cycles and waste forms. "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Mission Readiness"[1] (non-LWR Vision and Strategy Document) is the overarching document that describes the objectives, strategies, and contributing activities necessary to achieve non-LWR mission readiness.

CONTACT: Lucieann Vechioli, NRO/DSRA
301-415-6035

[1] See "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," dated December 2, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16356A670).

To achieve the goals and objectives stated in the NRC's vision and strategy, the staff has developed IAPs. The IAPs identify the specific activities the staff will conduct in the near-term (within 5 years), mid-term (5–10 years), and long-term (beyond 10 years). The staff released its draft IAPs to obtain stakeholder feedback during a series of public meetings held between October 2016 and March 2017. The staff also briefed the Advisory Committee on Reactor Safeguards (ACRS) on March 8 and 9, 2017. The staff considered the ACRS comments and stakeholder feedback in the final near-term,[2] mid-term, and long-term[3] IAPs, which were issued on July 12, 2017.

DISCUSSION:

The near-term IAP address six individual strategies:

(1) Acquire/develop sufficient knowledge, technical skills, and capacity to perform non-LWR regulatory reviews.

(2) Acquire/develop sufficient computer codes and tools to perform non-LWR regulatory reviews.

(3) Develop guidance for a flexible non-LWR regulatory review process within the bounds of existing regulations, including the use of conceptual design reviews and staged-review processes.

(4) Facilitate industry codes and standards needed to support the non-LWR life cycle (including fuels and materials).

(5) Identify and resolve technology-inclusive [not specific to a particular non-LWR design or category] policy issues that impact regulatory reviews, siting, permitting, and/or licensing of non-LWR nuclear power plants.

(6) Develop and implement a structured, integrated strategy to communicate with internal and external stakeholders having interests in non-LWR technologies.

The staff has made incremental progress in activities related to all six near-term IAP strategies. It has transitioned from strategic planning to execution of the IAPs to prepare for anticipated applications in the next 2 to 4 years. Based on stakeholder feedback on the draft near-term IAP and recommendations of the ACRS, the staff has put a priority on using available resources to advance risk-informed and performance-based approaches and resolution of key policy issues through its execution of Strategies 3 and 5 in the near term; however, some activities are ongoing in support of all six strategies commensurate with available resources. In its efforts, the staff has worked closely with its counterparts at the U.S. Department of Energy (DOE) and has engaged extensively with external stakeholders.

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[2] See "NRC Non-Light Water Reactor Near-Term Implementation Action Plan," 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).

This paper covers progress through December 2017. Enclosure 1 includes the status of each specific strategy described in this paper. Enclosure 2 provides information on the various external factors influencing the staff's development and execution of the IAPs. It addresses the dynamic landscape of the design, research, and development, as well as other activities of reactor developers, DOE, and other stakeholders. As discussed in more detail in Enclosure 1, the staff completed a number of significant readiness activities to date that support the six near-term IAP strategies, including the following:

- Issued draft regulatory guide DG-1330, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors," dated February 3, 2017[4].

- Issued draft and final reports titled, "A Regulatory Review Roadmap for Non-Light Water Reactors," dated December 26, 2017,[5] describing flexible review approaches under existing regulations, including the use of a staged review process and the use of conceptual design assessments during the preapplication period.

- Issued draft and final guidance, "Nuclear Power Reactor Testing Needs and Prototype Plants for Advanced Reactor Designs," dated December 26, 2017.

- Reviewed and provided feedback on industry submittals on licensing-basis event selection, the use of probabilistic risk assessment (PRA), and safety system classification in support of the industry-led Licensing Modernization Project 's plan to develop and request NRC endorsement of technology-inclusive, risk-informed, and performance-based guidance for licensing non-LWRs.

- Issued the draft and final regulatory basis for the rulemaking, "Emergency Preparedness for Small Modular Reactors (SMRs) and Other New Technologies."[6]

- Issued draft white papers on the following subjects:

  – functional containment performance criteria for advanced reactors,
  – physical security for SMRs and advanced reactors, and
  – siting considerations related to population for SMRs and non-LWRs.

- Conducted 14 public meetings to obtain stakeholder feedback on a variety of advanced reactor topics.

- Conducted the third in a series of joint NRC/DOE advanced non-LWR workshops.

  Developed molten-salt reactor training and conducted three training sessions for NRC and DOE staff. About 90 NRC staff from the Office of New Reactors (NRO), the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Regulatory Research (RES), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of Nuclear

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4 See "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors," dated February 3, 2017 (ADAMS Accession No. ML16301A307).

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

6 See SECY-16-0069 "Rulemaking Plan on Emergency Preparedness for Small Modular Reactors and Other New Technologies," dated May 31, 2016 (ADAMS Accession No. ML16020A388).

Security and Incident Response (NSIR), and the Office of General Counsel (OGC), along with some DOE staff, registered in the training.

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

- Completed an evaluation of available analysis codes that the staff could use to perform confirmatory analysis for non-LWRs and selected a preliminary suite of tools for further consideration and development.

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

- Held the second annual NRC Standards Forum, at which some candidate standards for non-LWRs were identified and a dedicated advanced reactors standards workshop to foster progress in the standards was planned.

The accomplishments above are significant when viewed relative to the allocated advanced reactor resources. Much work remains to be accomplished 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.

The staff has received responses to Regulatory Issue Summary (RIS)-16-08, "Process for Scheduling and Allocating Resources in Fiscal Year 2019 for the Review of New Licensing Applications for Light-Water Reactors and Non-Light-Water Reactors," dated June 7, 2016[7], from five non-LWR developers expressing their intent to begin regulatory interactions. Based on these responses, the staff started formal preapplication interactions with Oklo, Inc. (Oklo), in November 2016 on its compact fast-reactor design and anticipates starting additional preapplication reviews in fiscal years (FY) 2018 and 2019. The staff also anticipates one or more application reviews to begin in the next 2 to 4 years.

The staff is implementing flexible and staged non-LWR regulatory review processes to engage with Oklo, as described in the regulatory review roadmap, to align the NRC's activities with the developer's needs. Oklo submitted a topical report describing its quality assurance program in April 2017 that the staff has under review. Oklo also submitted two technical reports in November 2017. The first report discusses the Oklo core design, and the second addresses risk analysis and source term. The staff met with Oklo on December 4 and 7, 2017, to provide feedback on these technical reports.

The staff is implementing transformational change by forming a small core team to support the effective non-LWR preapplication reviews. The core review team concept provides stability and consistency to the developer while ensuring efficient and agile use of available NRC resources. The core review team comprises staff from NRO, NRR, NMSS, NSIR, RES and OGC. This approach has worked successfully for the Oklo preapplication review, and the staff plans to continue to use this approach to support future regulatory interactions with non-LWR developers.

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[7] See "Process for Scheduling and Allocating Resources in Fiscal Year 2019 for the Review of New Licensing Applications for Light-Water Reactors and Non-Light-Water Reactors," dated June 7, 2016 (ADAMS ML16082A218).

The staff plans to continue non-LWR readiness activities in FY18 with a priority on advancing risk-informed and performance-based licensing approaches and addressing key policy issues. The staff plans to use available budgeted resources to accomplish the following activities this year:

- issue final regulatory guide "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors;"
- address policy issues regarding consequence based security and containment functional performance;
- review industry white papers on defense-in-depth, high-assay low enriched uranium, and research and test reactors;
- continue robust stakeholder engagement through periodic stakeholder meetings (every 6 - 8 weeks) and other outreach opportunities;
- continue to participate in standards development activities; and
- continue to engage in pre-application interactions with prospective applicants.

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, project managers in NRO 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 will continue to keep the Commission informed of the status of its non-LWR readiness activities and plans for potential licensing applications.

COORDINATION:

OGC has reviewed this paper and has no legal objections.

/RA/

Victor M. McCree
Executive Director
for Operations

Enclosures:
1. Non-Light Water Reactor Implementation Action Plan—Progress Summary & Future Plan
2. Non-Light Water Reactor Landscape

ADVANCED REACTOR PROGRAM STATUS DATED January 25, 2018

SRM-M170511-4

Accession No: Package: ML17334B217
Paper: ML17334B199
Enclosure 1 ML17334B184
Enclosure 2 ML17334A907
SECY: ***via e-mail** SECY-012

OFFICE	NRO/DSRA	NRO/DSRA	NRO/DSRA	QTE*
NAME	LVechioli	ACubbage	WReckley	JDougherty
DATE	11/20/17	11/29/17	11/29/17	12/6/17
OFFICE	BC:NRO/DSRA	NRR/DLP*	NSIR/DPCP*	NSIR/DPR*
NAME	JSegala	LLund	JAnderson	MScott
DATE	12/12/17	12/19/17	12/18/17	12/20/17
OFFICE	NMSS/FCSE*	RES*	OGC*	NRO/DSRA
NAME	CErlanger	MWeber	MCarpenter	JMonninger
DATE	12/19/17	12/19/17	12/20/17	01/05/18
OFFICE	NRO	EDO		
NAME	FBrown	VMcCree		
DATE	01/22/18	01/25/18		

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