

NRC's Preparations for Advanced Reactor Licensing

Wendy Reed

Office of Nuclear Regulatory Research

October 15, 2020

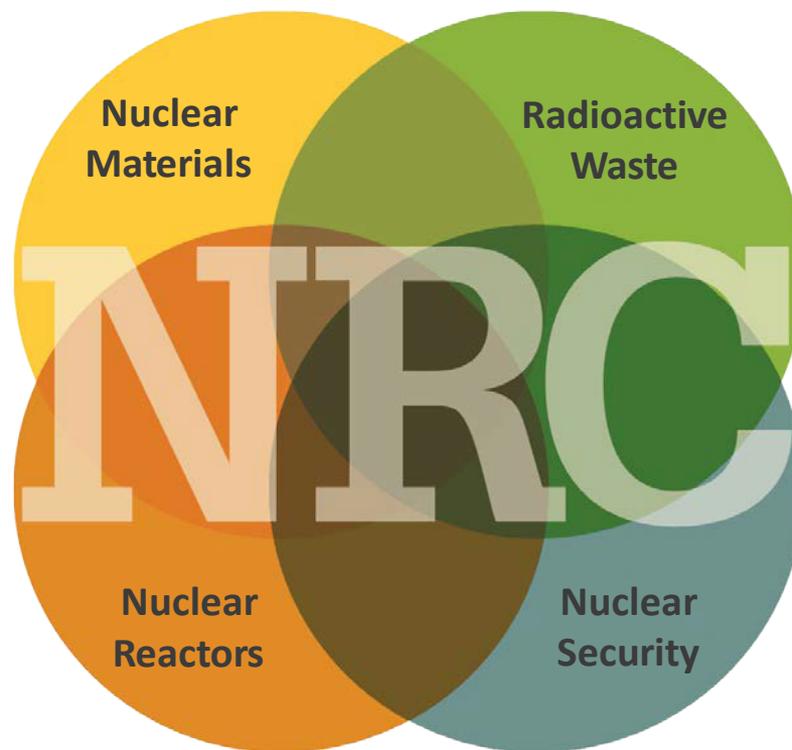


Outline

- Overview of the NRC
- Advanced Reactor Readiness at NRC
- Research Activities
- Update on Part 53 Rulemaking
- Cooperation and Communication
- Preparations for MSR Licensing

Overview of the NRC

- Independent agency that began operations in 1975
- Headed by a five-member commission
- Licenses and regulates activities in four key areas
- Congressionally-mandated Office of Nuclear Regulatory Research supports key areas



Broad Landscape of Designs

Liquid-Metal-Cooled Fast Reactors (LMFR)

GEH PRISM (VTR)
TerraPower
ARC

Sodium Cooled

Westinghouse
Columbia Basin
Hydromine

Lead Cooled

High-Temperature Gas-Cooled Reactors (HTGR)

X-energy
Framatome
StarCore

General Atomics

Molten Salt Reactors (MSR)

Kairos

Liquid Salt Cooled

TRISO Fuel

Terrestrial
TerraPower
Elysium
Thorcon
Muons
Flibe
Alpha Tech

Liquid Salt Fueled

Micro-Reactors

Westinghouse
BWX Technologies
X-energy
Radiant

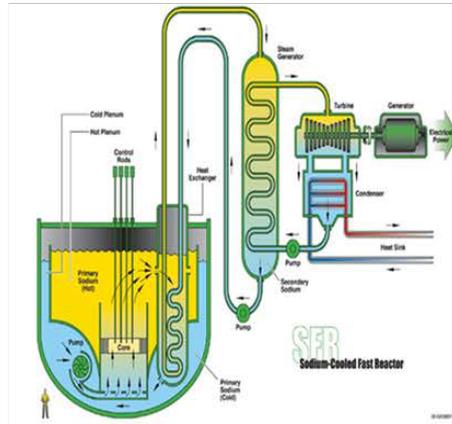
Transportable

Oklo
Ultra Safe

Stationary

 Indicates vendor has provided a response to Regulatory Issues Summary

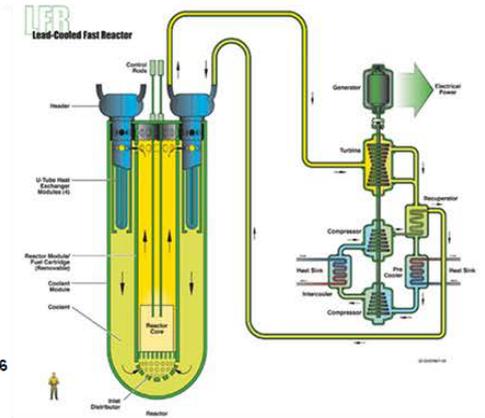
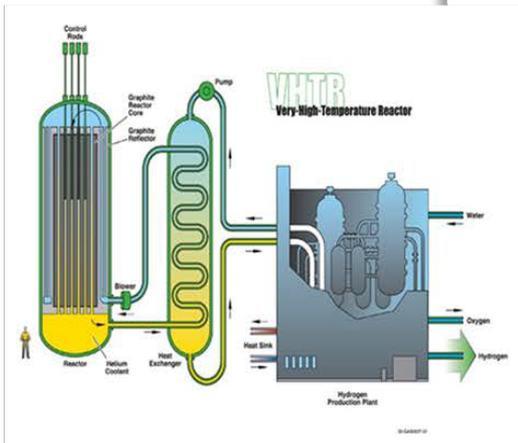
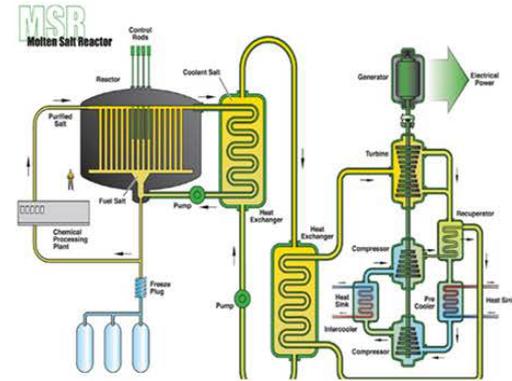
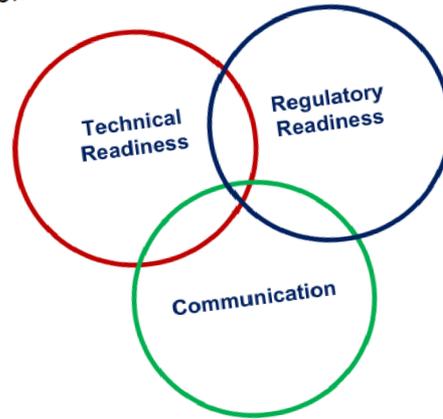
NRC's Advanced Reactor Program



ML16356A670

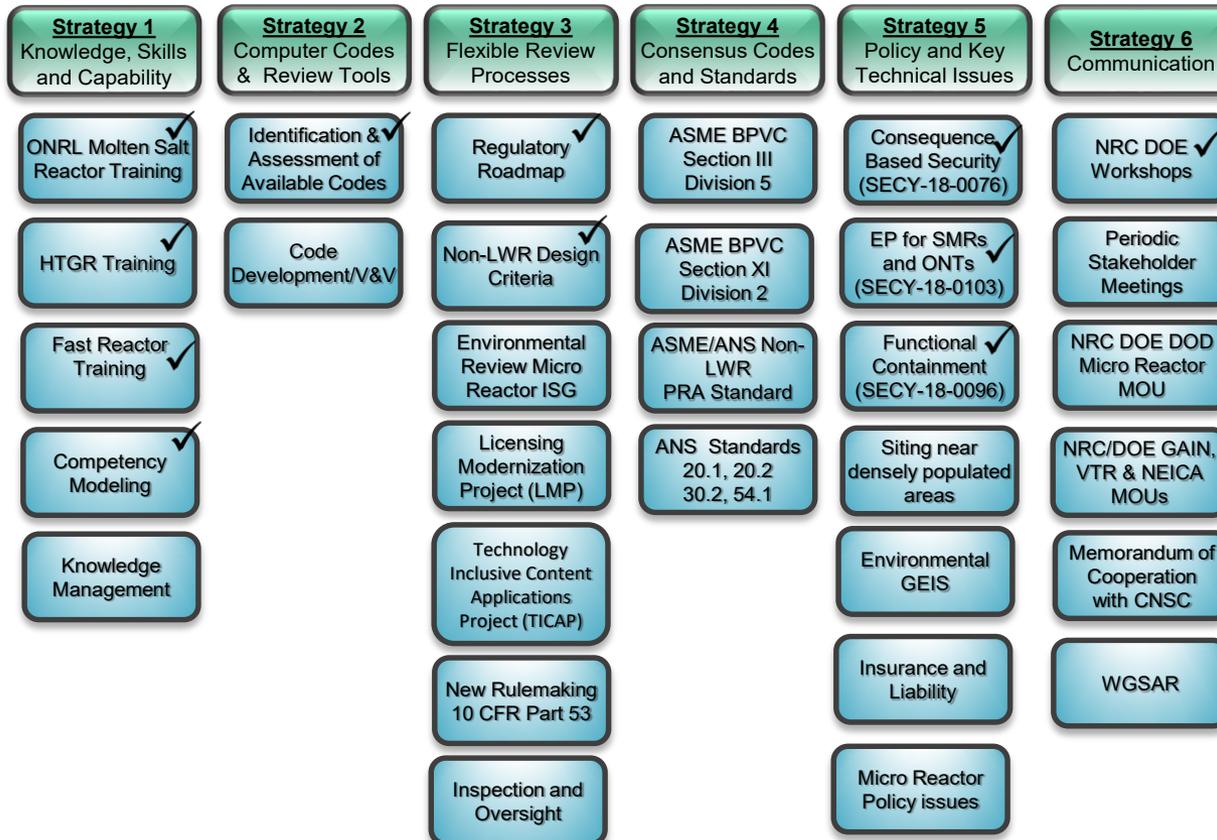


NRC Vision and Strategy:
Safely Achieving Effective and Efficient
Non-Light Water Reactor
Mission Readiness



December 2016

Implementation Action Plans



Materials Integrity
Readiness



Strategy 2

Objectives

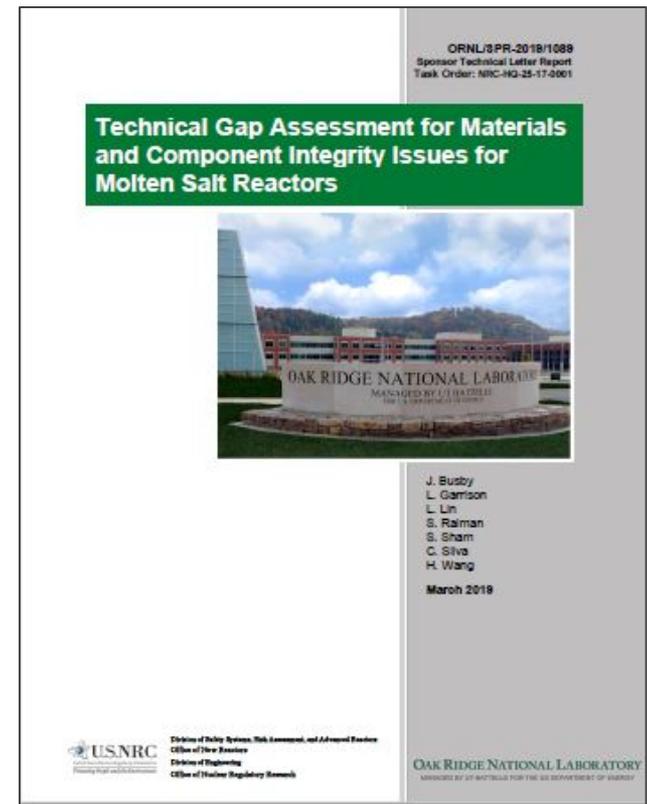
- **Assess performance needs/issues for materials and component integrity and build knowledge base**
- **Identify gaps in knowledge, data, and assessment tools**
- **Develop compendium of domestic and international operational experience**
- **Develop guidance endorsing consensus standards**

Strategy 2: Completed Activities

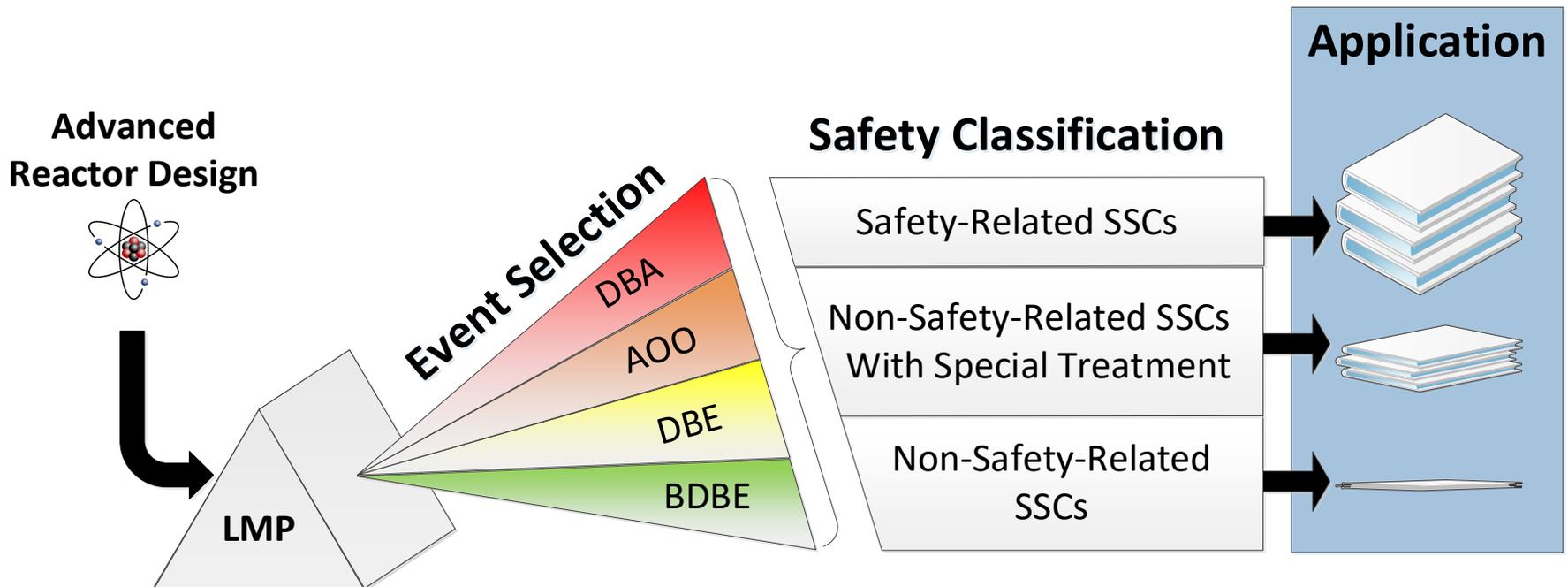
“International operational experience with SFRs and HTGRs, focused on materials and component integrity (ADAMS [ML18353B121](#))

“**Technical Gap Assessment for Materials and Component Integrity Issues for Molten Salt Reactors**” (ADAMS [ML19077A137](#))

ANL-19/13, “Environmental creep-fatigue and weld creep cracking: a summary of design and fitness-for-service practices,” January 31, 2020 (ADAMS Accession No. [ML20099A140](#))



Risk-Informing the Content of Applications



Pathway to New Regulatory Framework

- **“Part 53”**
 - NEIMA required rulemaking to establish a technology-inclusive, risk-informed and performance based regulatory framework
- **Rulemaking Plan Issued in April 2020 – SECY-20-0032 (ML19340A056)**
 - Builds on current activities including the Licensing Modernization Project
- **1st public meeting held September 22, 2020**
- **Staff Requirements Memorandum issued October 2, 2020 (ML20276A293)**
 - Commission instructed staff to issue final rule by October 2024

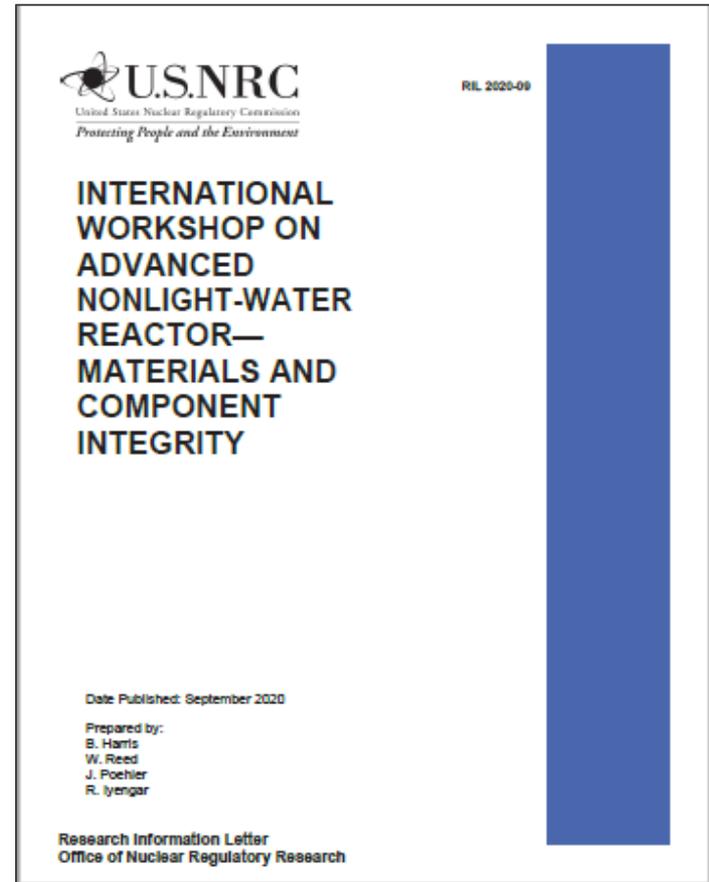


NRC's “*Be Ready*” Attitude

- MOU and MOC with DOE and CNSC, respectively
- Engagement with EPRI, National Labs, NEA
- Improve mission value through cooperation
 - Deliver cost savings
 - Reduce duplication of effort
 - Build staff expertise; e.g. NRAN program
 - Bring regulatory perspectives to new ideas

Advanced Reactor Workshop December 9-11, 2019

- **MSR Topics**
 - Graphite
 - Chemistry
- **ADAMS Accession No.
ML20245E186**

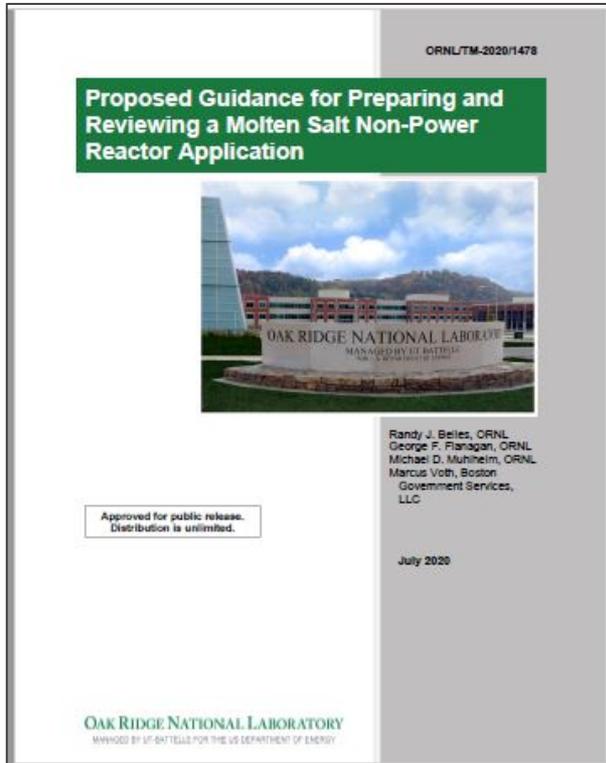


Closing Thoughts

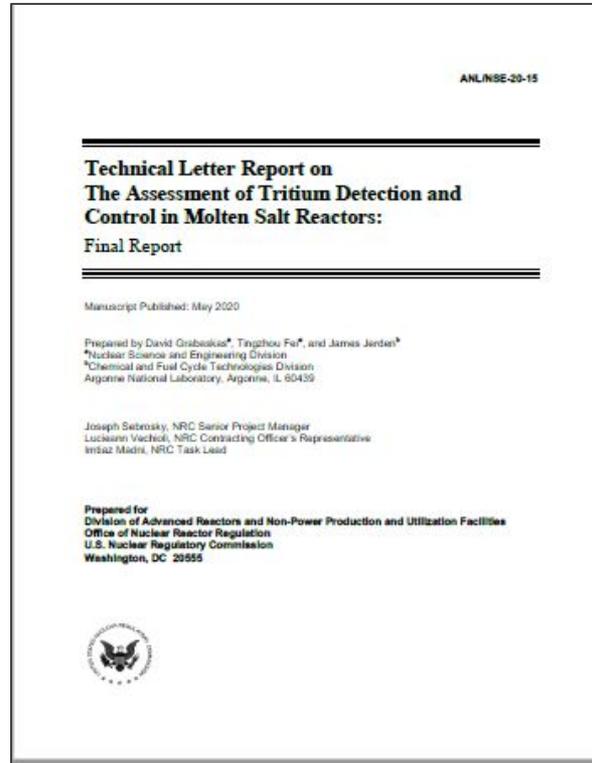
- The vision and strategy for advanced reactors is being executed through the Implementation Action Plans.
- The NRC plans to issue a final rule establishing a technology-inclusive, risk-informed and performance based regulatory framework for advanced reactors by October 2024
- Communication and cooperation is key for effective and efficient licensing of molten salt reactor technologies

Background Slides

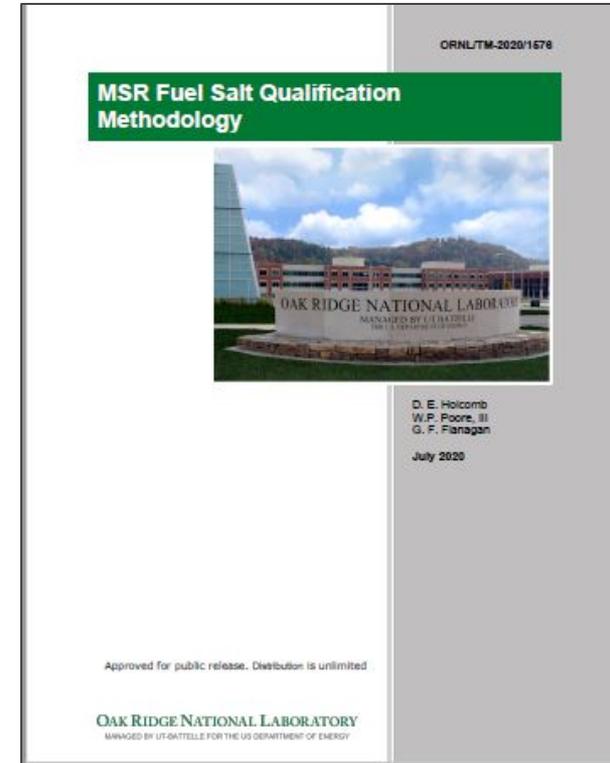
MSR Technical Reports



ML20219A771



ML20157A155



ML20197A257

References

- NRC Vision and Strategy (ML16356A670)
- Implementation Action Plans (ML17165A069 and ML17164A173)
- Regulatory Review Roadmap including prototype guidance (ML17312B567)
- RG 1.232, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors" (ML17325A611)
- NEI-18-04, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development," (ML18271A172)
- DG 1353, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Approach to Inform the Content of Applications," (ML18312A242)
- 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," (ML18311A264)
- SECY-20-0032, "Rulemaking Plan on "Risk-informed, Technology-inclusive Regulatory Framework For Advanced Reactors (ML19340A056)
- SRM-SECY-20-0032, "" Staff Requirements – SECY-20-0032 - Rulemaking Plan on "Risk-informed, Technology-inclusive Regulatory Framework For Advanced Reactors (ML20276A293)