NRC STAFF PRESENTATION: OVERVIEW OF ADVANCED REACTOR FUEL ACTIVITIES

December 8, 2022

Status and issues associated with the path to licensing advanced reactor fuels.

OPENING REMARKS

Daniel H. Dorman

Executive Director for Operations of the United States Nuclear Regulatory Commission

Agenda

- Robert Taylor
  - Strategic overview of advanced reactor fuels activities
- Christopher Van Wert
  - Readiness for licensing of advanced reactor fuels, engagement, and recent licensing activities
- Jason Piotter
  - Readiness for the front-end and back-end of the advanced reactor fuel cycle
- Mirabelle Shoemaker
  - International safeguards considerations
- Wendy Reed
  - Research activities supporting the advanced reactor fuel cycle and modelling and simulation tools to prepare for advanced reactor fuels

Strategic overview of advanced reactor fuels activities

Robert Taylor

Deputy Office Director for New Reactors, Office of Nuclear Reactor Regulation (NRR)

Enabling the safe and secure use of advanced reactor fuels

Enhancing technical readiness

Develop and update
fuel analysis codes

Retain, develop, and recruit
highly qualified staff

Enhance
knowledge

Optimizing regulatory readiness

Data and risk insights to improve review and licensing efficiency.

Maintaining focus on safety.

Technology inclusive regulatory framework.

Flexible and practicable for a variety of technologies.

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Leveraging Communication

OUTREACH TO DOMESTIC AND INTERNATIONAL STAKEHOLDERS

CONSIDER OTHER PERSPECTIVES AND SHARE INSIGHTS

ENGAGE IN EARLY AND FREQUENT COMMUNICATION

LEVERAGE VARIOUS FORUMS

Readiness for licensing of advanced reactor fuels, engagement, and recent licensing activities

Christopher Van Wert

Senior Reactor Systems Engineer, Division of Advanced Reactors and Non-Power Production Utilization Facilities, NRR

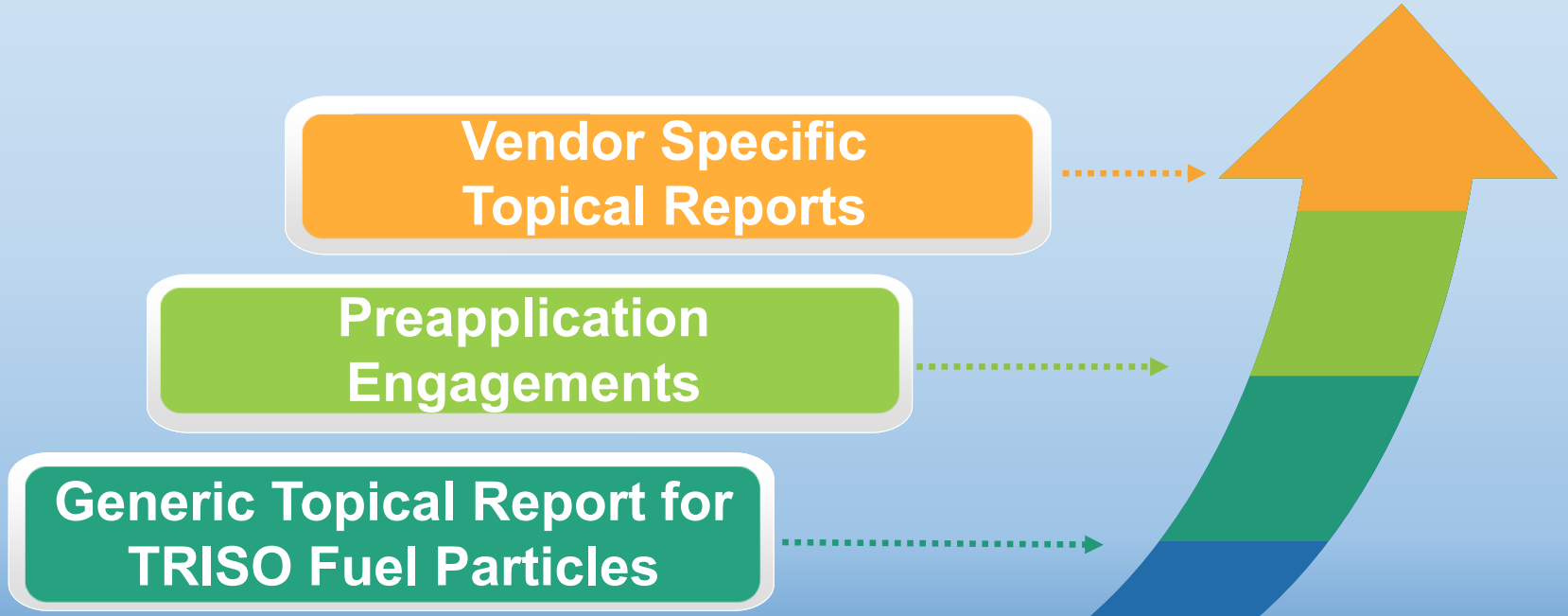
Readiness for Review

Development of Guidance

Development of Tools

Engagement and Collaboration

Recent Licensing Activities – TRISO Fuel Qualification



Readiness for the review of applications relating to the front-end and back-end of the advanced reactor fuel cycle

Jason Piotter

Senior Project Manager, Division of Fuel Management, Office of Nuclear Material Safety and Safeguards (NMSS)

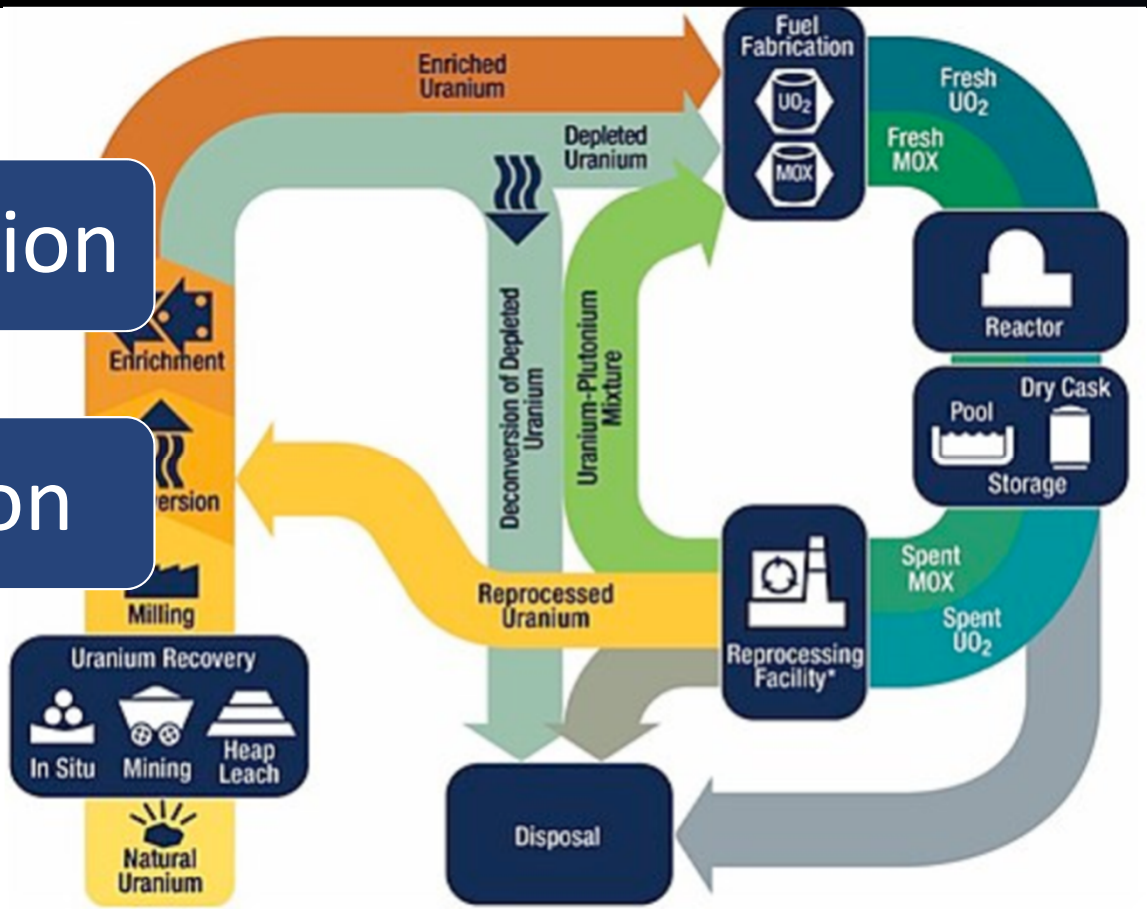
Readiness to License Advanced Fuels

- Licensing Experience
- Preliminary Technical Evaluations
- Regulatory Framework

Current Licensing and Certification for Advanced Fuels

Fuel Fabrication

Transportation



Looking Forward: Potential Regulatory Needs

Advanced Fuels Roadmap

Fuel Cycle Front End

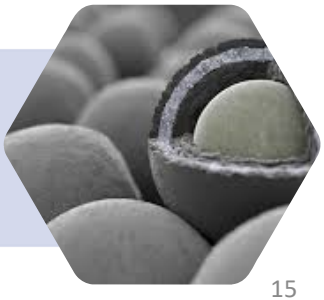
- Critical Experiments
- Code Validation
- Operations
- Security

Transportation

- Critical Experiments
- Code Validation

Fuel Cycle Back End

- Source Terms
- Criticality & Shielding
- Thermal & Materials
- Operations



International safeguards considerations

Mirabelle Shoemaker

International Safeguards Analyst, Division of Fuel Management, NMSS

Promoting Nuclear Nonproliferation Through Safeguards Implementation

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- Committing to safeguards implementation in foreign agreements.
- Incorporating safeguards measures in the regulatory framework.
- Leading and cooperating within the network of safeguards implementation.

Using the Regulatory Framework to Implement Safeguards for Advanced Fuels

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- Domestic and International Safeguards regulations are in place to support safeguards implementation at advanced fuel facilities
- NMMSS is ready to receive data from the advance reactor and fuel cycle licensees
- The NRC has published MC&A guidance for Category II facilities in support of regulatory compliance

Engaging with Domestic and International Partners

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Domestic Safeguards

- DOE & national lab collaboration
- Subgroup for Implementation of Safeguards in the US (SISUS)
- US Interagency (Departments of State and Energy/National Nuclear Security Administration)

International Safeguards

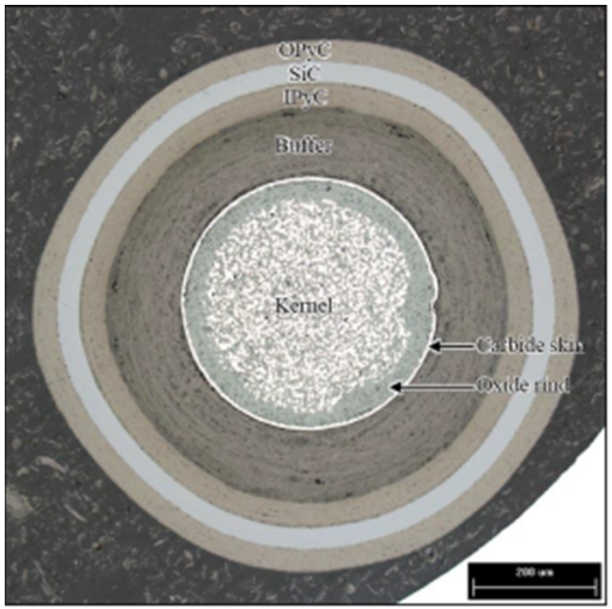
- International Atomic Energy Agency (IAEA)
- Nuclear Cooperation Authorities Group (NCAG)

Research activities supporting the advanced reactor fuel cycle and modelling and simulation tools to prepare for advanced reactor fuels

Wendy Reed

Metallurgist, Division of Engineering, Office of Nuclear Regulatory Research

Independent Analysis for Advanced Fuel Qualification



INL/EXT-21-64279

Development of TRISO fuel models for FAST and enhancement of existing metallic fuel capabilities to perform code assessments

Assessment revealed FAST is ready for metallic and TRISO fuel analysis

Further enhancements to reduce uncertainties

Engagement with DOE on latest data and code developments

Monitor future technologies for advanced fuel assemblies

Support for Advanced Fuel Cycle Regulatory Readiness

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Holistic approach to assessing technical considerations

- Preliminary assessment of front-end activities for molten salt reactors
- Modelling and simulation to assess uncertainty in MC&A measurements
- Integration of Safeguards-Security-Safety by design

Forward Thinking on the Advanced Fuel Cycle Back-end

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- Enhance knowledge of unique waste streams and potential novel waste forms
- Improve understanding of off-gas management for molten salt reactors
- Monitoring ARPA-E and DOE programs

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CLOSING REMARKS

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Executive Director for Operations of the United States Nuclear Regulatory Commission