

Strategic Programmatic Overview of the Fuel Facilities and Spent Fuel Storage and Transportation Business Lines

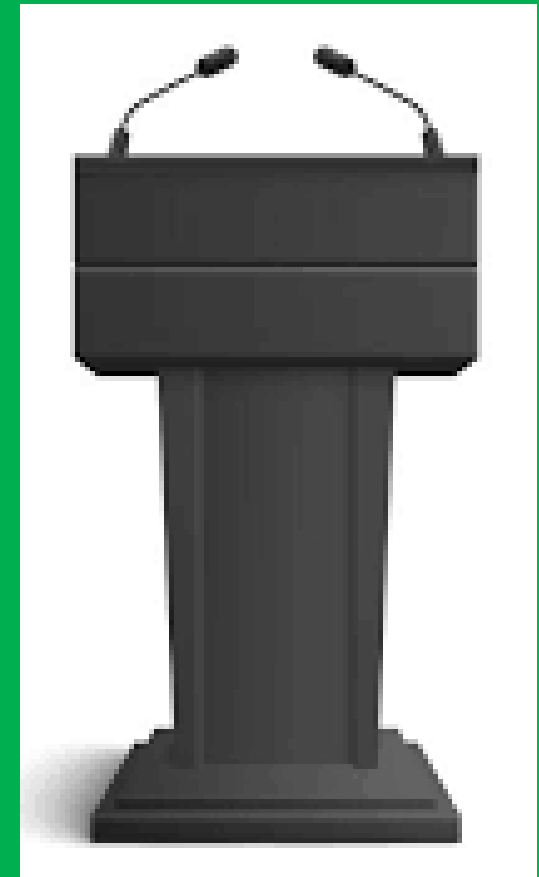
**Commission Meeting
Tuesday, April 23, 2024**

Opening Remarks

Ray Furstenau

Acting Executive Director for Operations

Speakers



Shana Helton, Director, Division of Fuel Management, NMSS

- Fuel Facilities Current Program Overview and Priorities
 - Engaging Stakeholders to Inform Workload Planning – Increasing Enrichment, Conversion, and Fabrication Activities

Samantha Lav, Chief, Fuel Facilities Licensing Branch, Division of Fuel Management, NMSS

- Adapting to an Evolving Fuel Facility Industry
 - Insights from Smarter Fuel Cycle Licensing Program Implementation
- Leveraging New Fuels Atlas and Regulatory Planner

Eduardo Sastre Fuente, International Safeguards Technical Analyst, Material Control and Accounting Branch, Division of Fuel Management, NMSS

- Implementing Safeguards for Advanced Reactors and Advanced Fuels

Nicole Covert, Acting Director, Division of Construction Oversight, Region II

- Insights on the Implementation of the Fuel Cycle Smarter Inspection Program
- Updating Oversight Program for Category II Facilities & New Construction Oversight



Fuel Fabrication Facility at GNF-A

Fuel Facilities Current Program Overview and Priorities

Shana Helton, Director, Division of Fuel Management, NMSS

Business Line Priorities Support Agency Mission and Needs



**Promote a culture
focusing on
knowledge
management and
staff development**



**Inspire stakeholder
confidence through
proactive and
transparent
communications**



**Ensure safety and
security of fuel
facilities through
effective
licensing and oversight**

Engaging Stakeholders to Meet Our Mission



IAEA



*Members of
the Public*





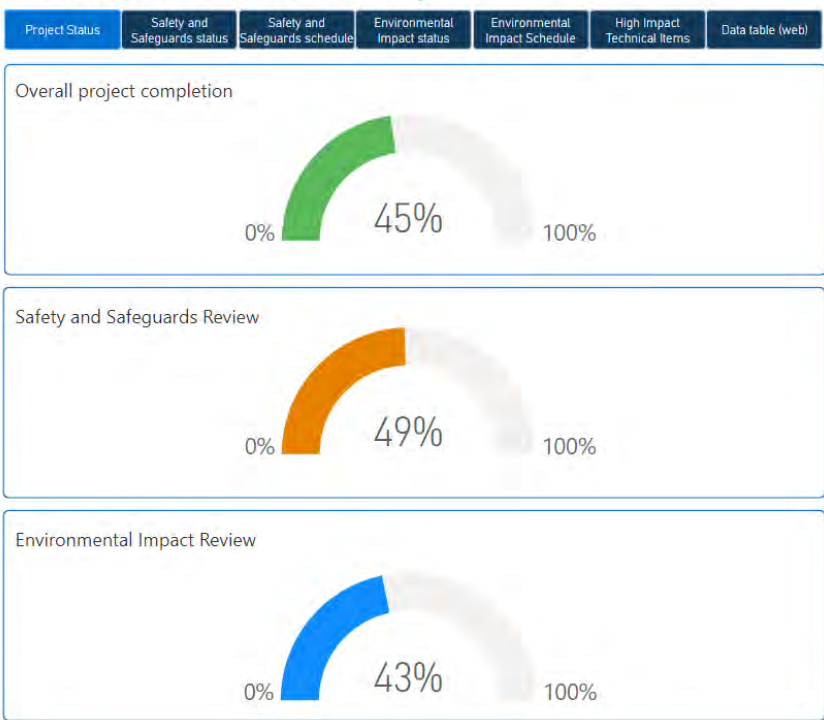
Adapting to an Evolving Fuel Facility Industry and Leveraging the New Fuels Atlas and Regulatory Planner

Samantha Lav, Chief, Fuel Facilities Licensing Branch, Division of Fuel Management, NMSS

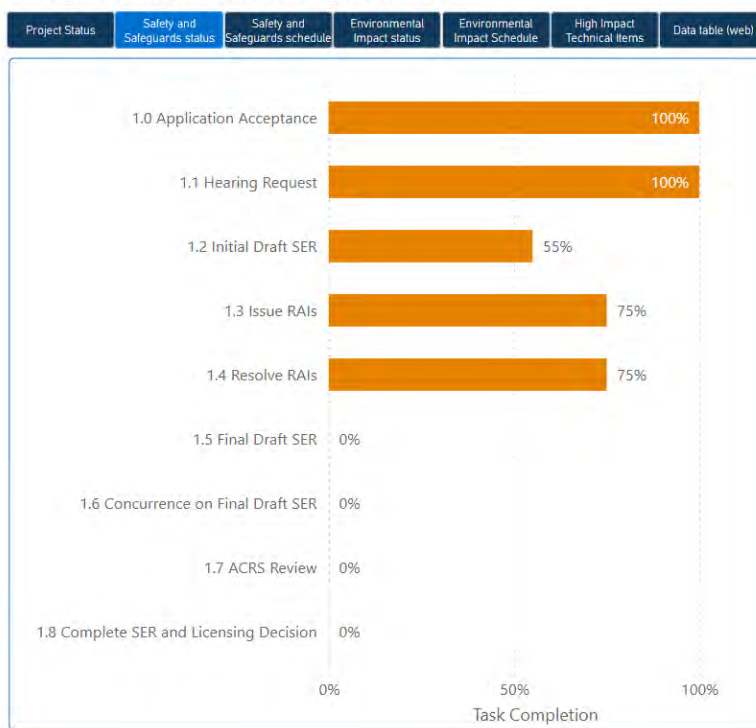
Successes in Improving Efficiency, Transparency, and Communication



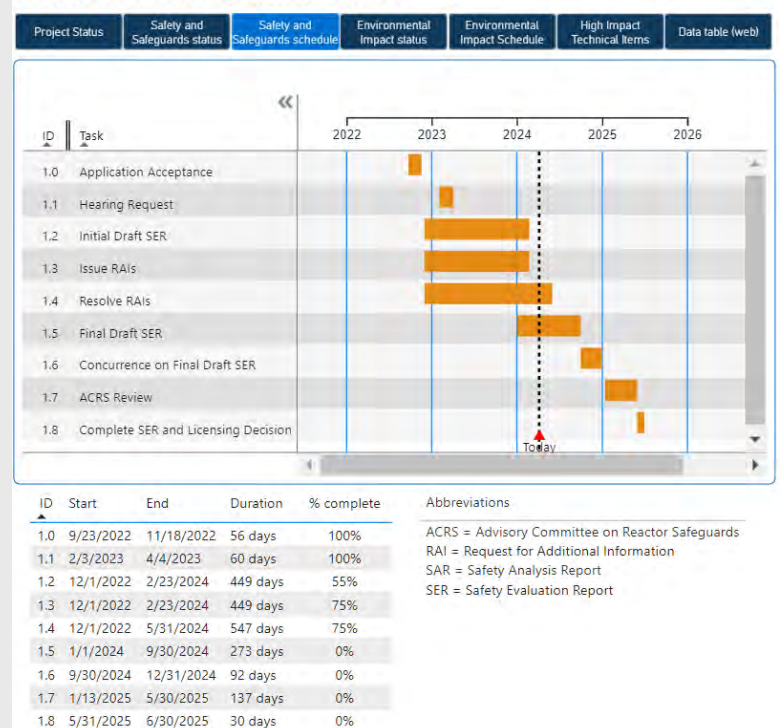
TRISO-X Review Status Summary



Safety and Safeguards Task Completion status



Safety and Safeguards Review Schedule



New Fuels Licensing Activities

15

ISSUED

NRC Issued 2 authorizations to begin enrichment operations and 13 licensing actions related to HALEU, ATF, and advanced reactor fuels since 2018

3

REVIEWING

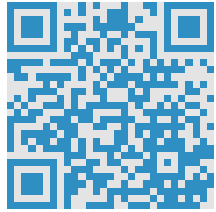
We are currently reviewing 3 major licensing actions

11-14

FUTURE

We anticipate receiving an additional 11-14 medium to high-confidence licensing action submittals in FY2024-2027

Leveraging the New Fuels Atlas and Regulatory Planner to Identify Gaps and Inform Future Workload



U.S. NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

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REPORT A SAFETY CONCERN [SEARCH]

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New Fuels

Traditional light-water reactor (LWR) fuel consists of uranium oxide fuel pellets enriched up to 5 weight percent uranium-235 (U-235), within an array of zirconium-based cladding. The nuclear industry is designing reactor fuels with operational conditions that differ significantly from traditional LWR fuels in that they may take different forms and include new materials. We recognize that there are considerations for these new fuel technologies across the entire nuclear fuel cycle, from enrichment to spent fuel management.

NEW FUELS
Readiness for new non-light water reactor FUELS

the Who, the What, and the How...

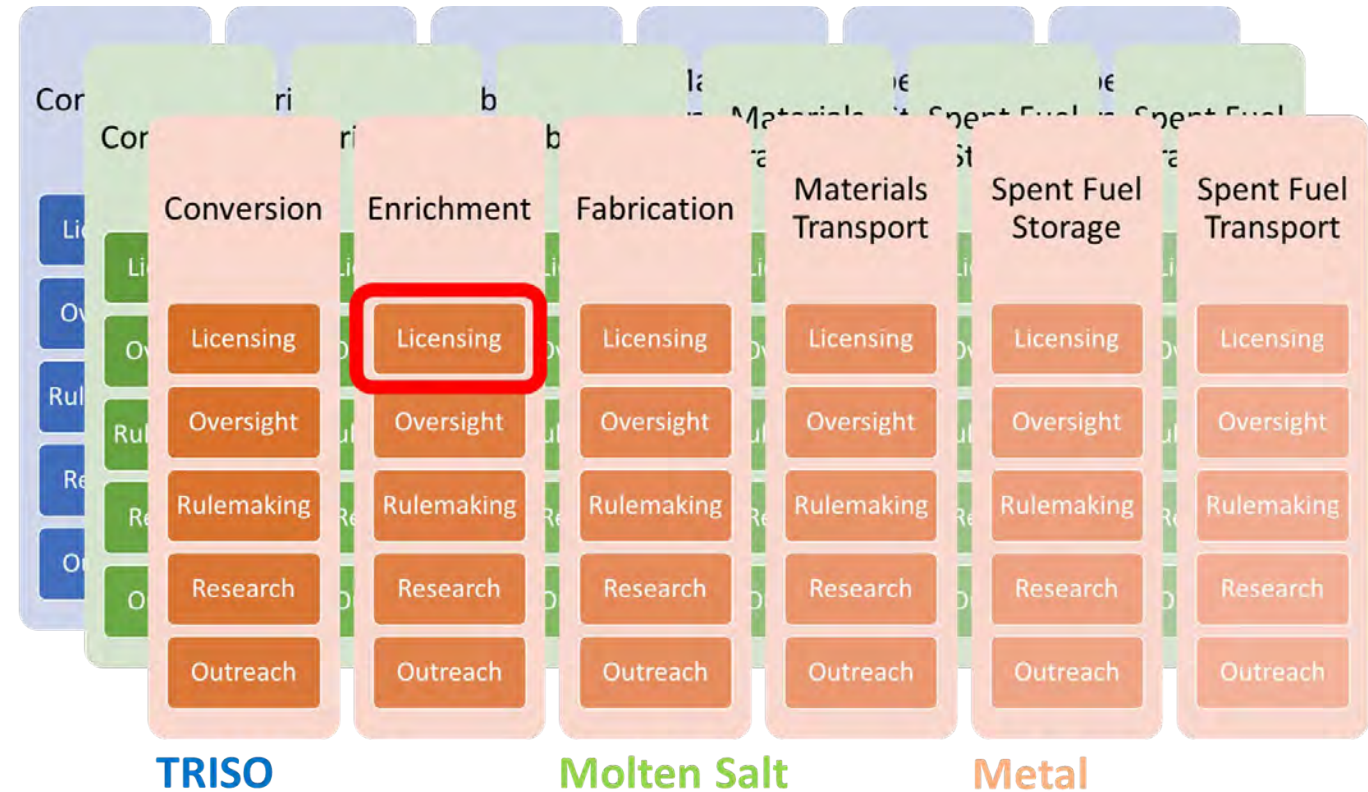
FUEL FACILITIES
Enrichment, Fuel Cycle, Spent Fuel

TRANSPORTATION
Spent Fuel

SPENT FUEL STORAGE
Spent Fuel

New Fuels Licensing Activities

Related Information:
 • Accident-Related Fuel
 • High-Assay Low-Enrichment Uranium (HALEU)
 • NRC's Regulatory Framework
 • Fuel Cycle Materials
 • Fuel Cycle Management



Implementing Safeguards for Advanced Reactors and Advanced Fuels

Eduardo Sastre Fuente

International Safeguards Technical Analyst

Material Control and Accounting Branch

Division of Fuel Management, NMSS

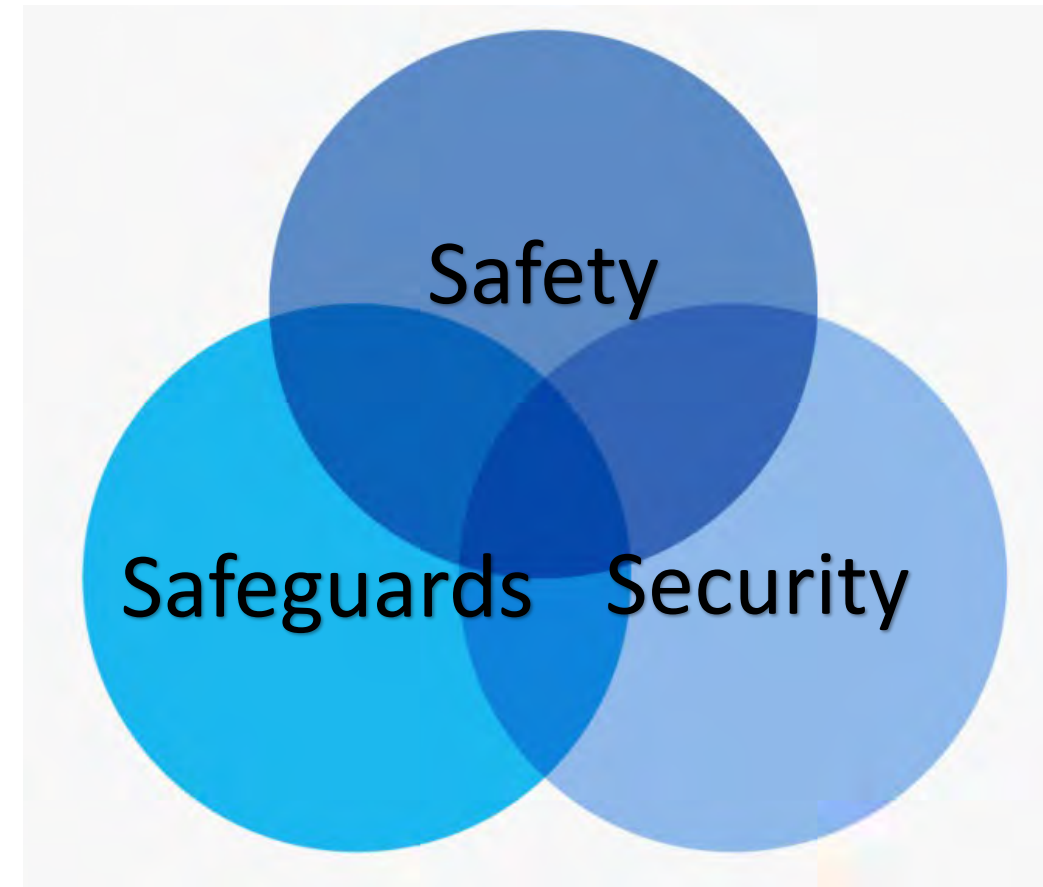
Implementing International Safeguards Across the U.S. Nuclear Fuel Cycle

- Committing to safeguards implementation across the nuclear fuel cycle
 - US-IAEA Safeguards Agreements
 - Section 123 Agreements
- Leading and Cooperating within the network of safeguards implementation



Engaging with Stakeholders to Ensure Clarity in Regulatory Framework

- Domestic and International Safeguards regulations are in place to support safeguards implementation at advanced facilities
- While Safeguards by Design is not a regulatory requirement, NRC recommends that International Safeguards be considered in the design process
- Addressing 3S integration early in the design stage can provide a unique opportunity to identify the importance of the interfaces and synergies among them



NRC Supports Pre-application Meetings for Safeguards



Insights on the Implementation of the Fuel Cycle Smarter Inspection Program & Updating Oversight Program for Category II Facilities & New Construction

**Nicole Coover, Director (Acting)
Division of Construction Oversight, Region II**

Insights on the Implementation of the Fuel Cycle Smarter Inspection Program

The Smarter Inspection Program (SIP) is effective:

- Ensures the safe and secure use of radioactive materials;
- Prioritizes inspection activities commensurate with their importance to safety and the lower risk profile of the fuel facilities; and
- Verifies that facilities are constructed and operated in accordance with their licensing bases requirements.



Updating Oversight Program for Category II Facilities & New Construction



- The fuel facility inspection program and oversight process remains agile, scalable, and flexible.
- Updates to the oversight program for Category II facilities and new construction projects enhance efficiency and effectiveness and allow for a more transparent inspection program.



Public Outreach and Stakeholder Confidence



The staff proactively established multiple opportunities for public involvement to ensure proper and transparent regulation of nuclear activities and to inspire stakeholder confidence in the NRC.

Closing Remarks

Ray Furstenau
Acting Executive Director for Operations

Opening Remarks

Ray Furstenau
Acting Executive Director for Operations

Speakers



Shana Helton, Director, Division of Fuel Management, NMSS

- Spent Fuel Storage and Transportation Program Overview and Priorities
 - Overview of International Cooperation in Transportation
- New Fuels Licensing: Certifying Transportation Packages for Accident Tolerant Fuels and High-Assay, Low-Enriched Fuel

Bernie White, Senior Project Manager, Storage and Transportation Licensing Branch, Division of Fuel Management, NMSS

- Risk-Informing Dry Storage Spent Fuel Licensing
 - Insights from Early Use of the Dry Cask Storage Risk Tool for Licensing Reviews
- Transportable Microreactors
 - Landscape of Current and Future Regulatory Reviews
 - Risk Methodology for Project PELE

Paula Cooper, Senior Reactor Inspector, Engineering Branch 3, Division of Reactor Safety in Region II

- Effectiveness of the Spent Fuel Safety and Security Oversight Program
- Preparing for Aging Management Inspections to Ensure Safety During Extended Operations
 - Implementing Enhanced Inspection Guidance
 - Continuing to Ensure Safe Operations During Continuous Offloading Campaigns

Josh Whitman, Reactor Systems Engineer, Fuel and Source Term Code Development Branch, Division of Safety Analysis, Office of Nuclear Regulatory Research

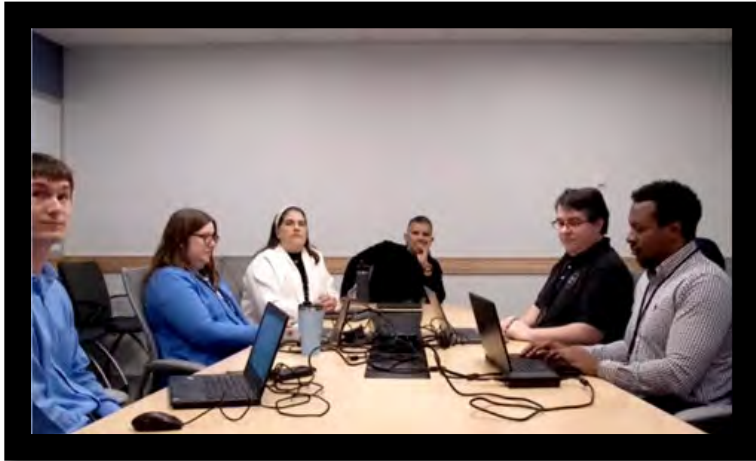
- Code Assessment to support ATF, High Burnup, and Extended Enrichment
- Cooperative Experimental Programs



Spent Fuel Storage and Transportation Program Overview and Priorities And New Fuels Licensing: Certifying Transportation Packages for Accident Tolerant Fuels and High-Assay, Low-Enriched Fuel

Shana Helton, Director, Division of Fuel Management, NMSS

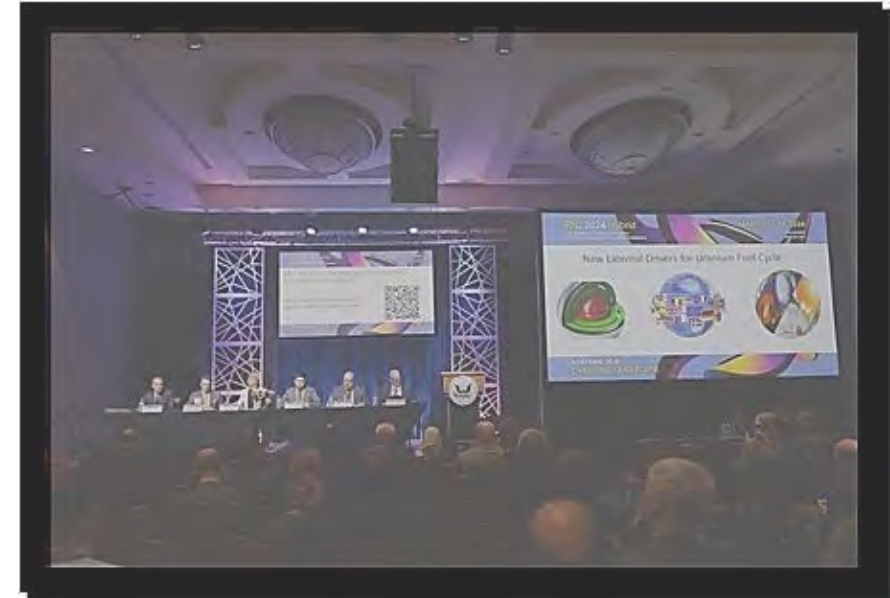
Business Line Priorities & Program Overview



We continue to focus on developing and hiring future talent for our BL needs



We place a strong emphasis on knowledge management



We continue to strongly focus on public confidence

SFST by the Numbers in FY23

66

LICENSING REVIEWS COMPLETED

Of transport package and storage cask designs and facility licenses

57

INSPECTIONS COMPLETED

(49 inspections related to dry cask storage installations)
(8 inspections related to transportation packages)

22

PUBLIC MEETINGS HELD

Overview of International Cooperation in Transportation



New Fuels Licensing: Certifying Transportation Packages for Accident Tolerant Fuels and High-Assay, Low-Enriched Fuel



Approval of several packages to ship new fuels



Leveraging the New Fuels Atlas



Engaging in a multi-office increased enrichment rulemaking effort

Risk-Informing Dry Storage Spent Fuel Licensing & Transportable Microreactors


Bernie White

Sr. Project Manager, Storage and
Transportation Licensing Branch

Division of Fuel Management, NMSS

Applying Risk-Informed Insights in Dry Cask Storage Reviews


- Catalyst for culture change to take advantage of qualitative risk information in technical reviews
- Used to guide the depth of staff reviews and knowledge management tool
- Living document as staff monitors its use and industry needs



Structural Analysis



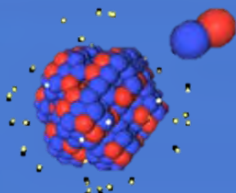
Materials Analysis



Thermal Analysis



Confinement Analysis



Criticality Analysis



Shielding Analysis

Transportable Micro-Reactor Landscape

- Staff emphasized the importance of pre-application engagement and vendor regulatory evaluation plans to:
 - inform its resource estimates,
 - obtain shared understanding of proposed licensing process, and
 - determine whether data gaps exist
- Engaged in technical and policy issues related to transportable micro-reactors across business lines.
- Gathering information from coordination activities with licensees, applicants, stakeholders, and international partners



Road transport of a large spent fuel package

Risk-Informed Methodology for Project Pele

- Risk-informed methodology review was based on two shipments for the Department of Defense.
- Project Pele (**P**ortable **E**nergy for **L**asting **E**ffects) risk-informed methodology was reviewed in collaboration with partner offices, NRR and RES.
- Existing transportation regulatory framework is adequate to approve transportable micro-reactor packages.

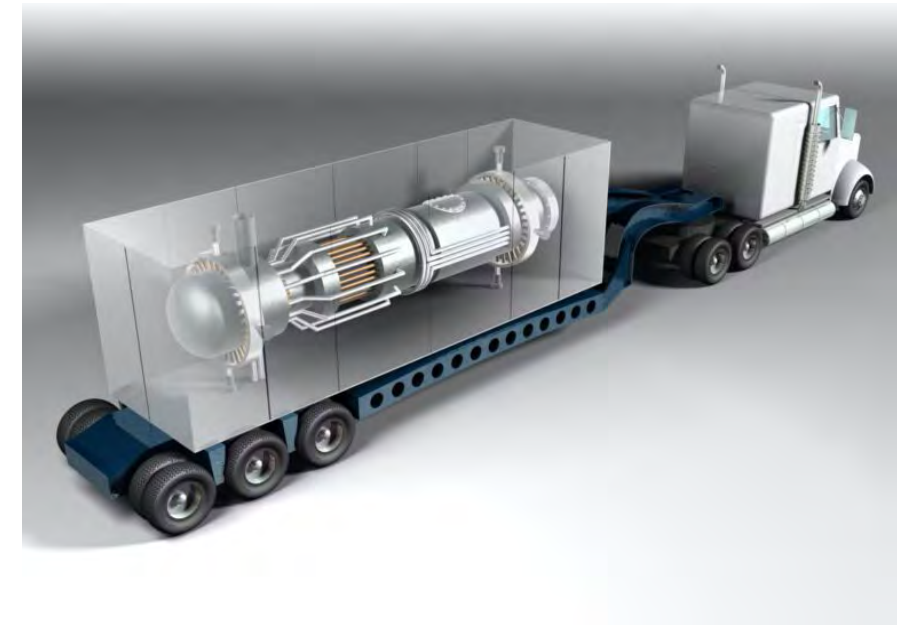


Photo courtesy of News & Technology for Global Energy Industry, April 21, 2022

<https://www.powermag.com/green-light-for-project-pele-defense-departments-mobile-nuclear-microreactor-demonstration/>

Effectiveness of the Spent Fuel Safety and Security Oversight Program & Preparing for Aging Management Inspections to Ensure Safety During Extended Operations

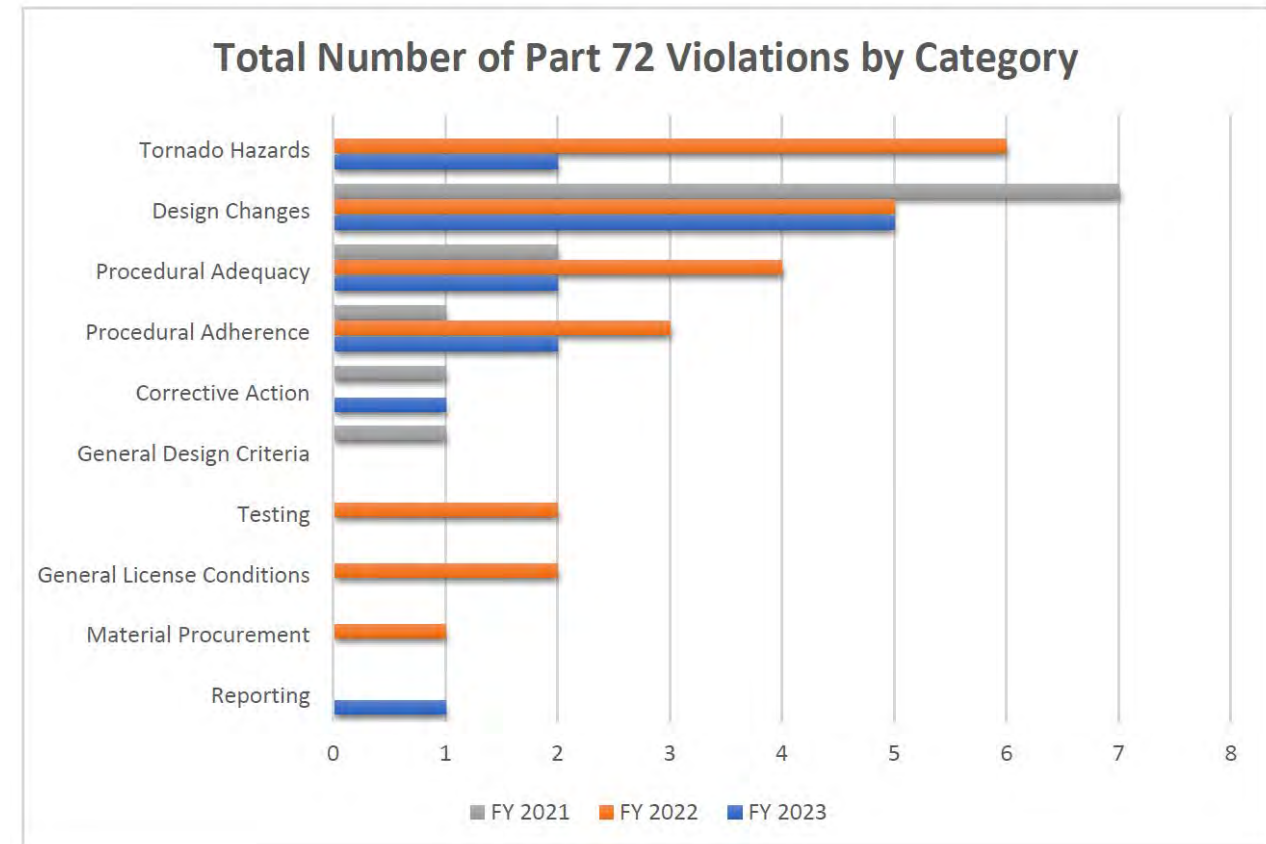
Paula Cooper

Senior Reactor Inspector, Engineering Branch 3

Division of Reactor Safety, Region II

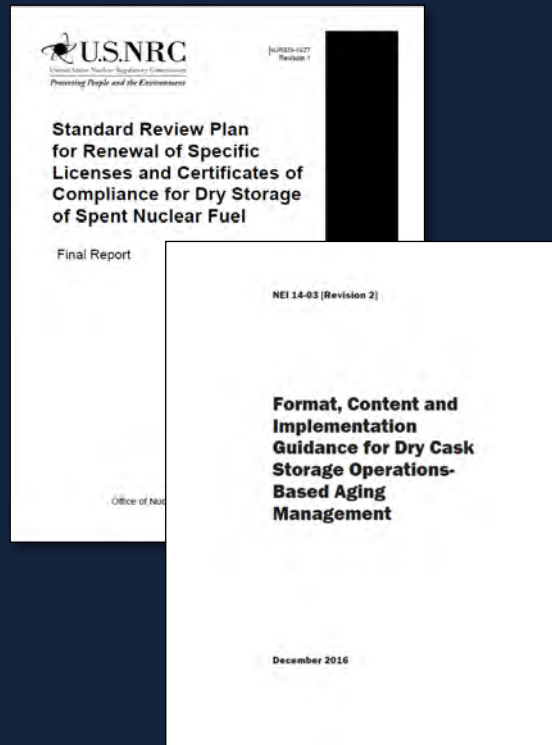
Maintaining an Effective Approach to ISFSI Inspections

- 2020 Enhancement Initiative
 - Cross Qualification Program
- Spent Fuel Storage and Transportation Operating Experience Report
 - RG 3.77, “Weather-Related Administrative Controls at Independent Spent Fuel Storage Installations”
- Conduct Reoccurring Self-Assessments

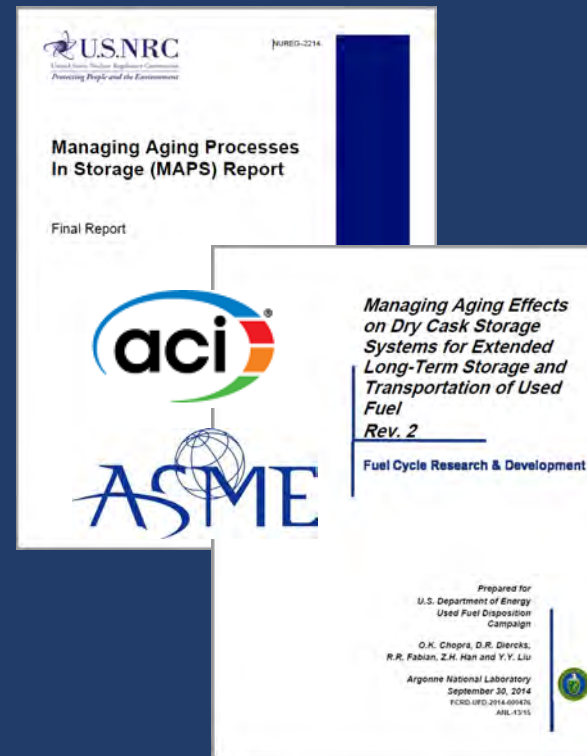


Working with Counterparts to Prepare for Aging Management Inspections

Aging Management Methodology



Technical Basis



Operating Experience and Oversight



Working with Counterparts to Prepare for Aging Management Inspections

TI 2690/11 “Review of Aging Management Programs at ISFSI”

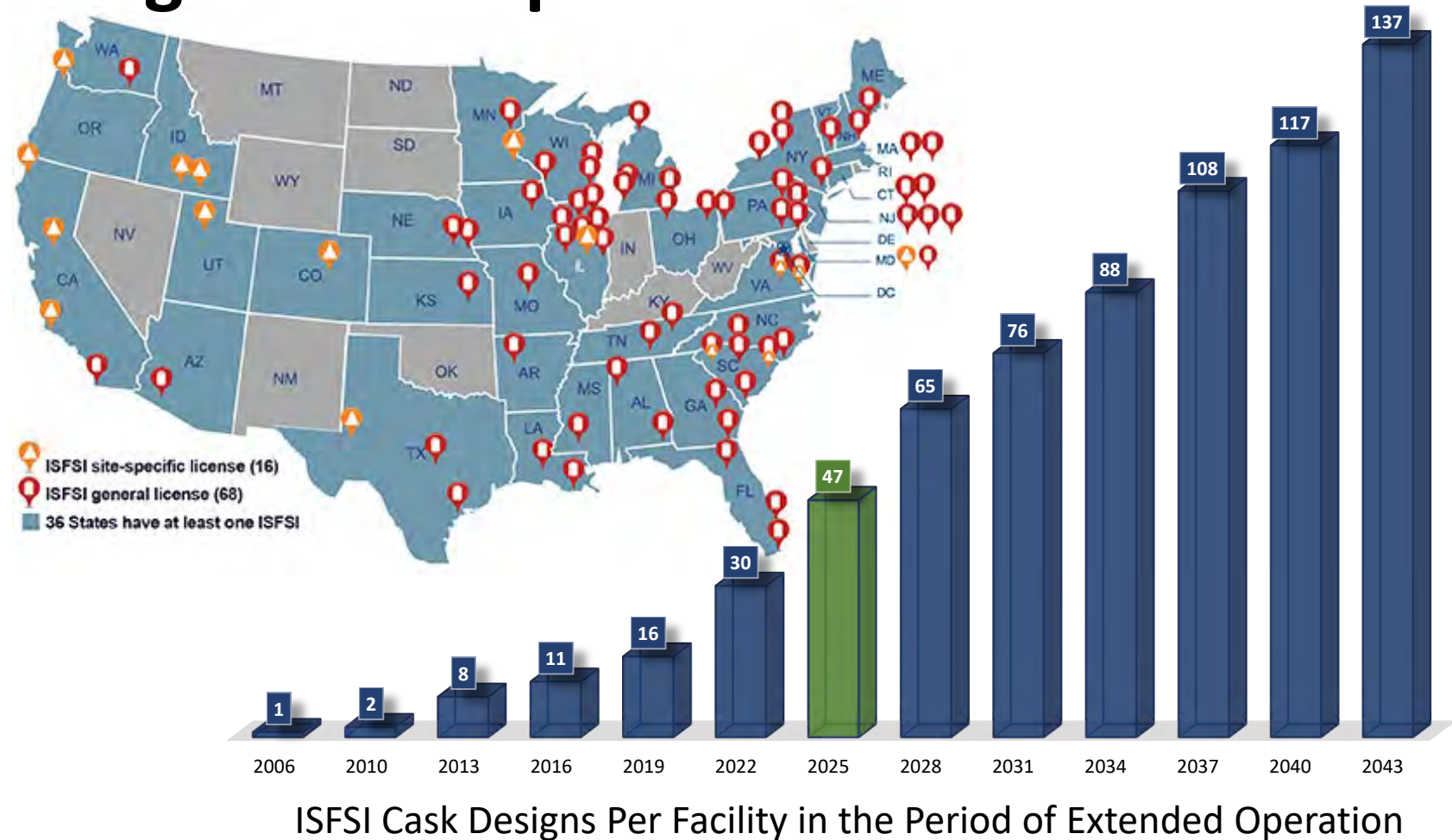
- Prairie Island
- Oconee
- H.B. Robinson
- Arkansas Nuclear One

Draft IP 60859 – “ISFSI License Renewal Inspection”

- Three Mile Island

Final IP 60859 – “ISFSI License Renewal Inspection”

- Start in 4Q 2024



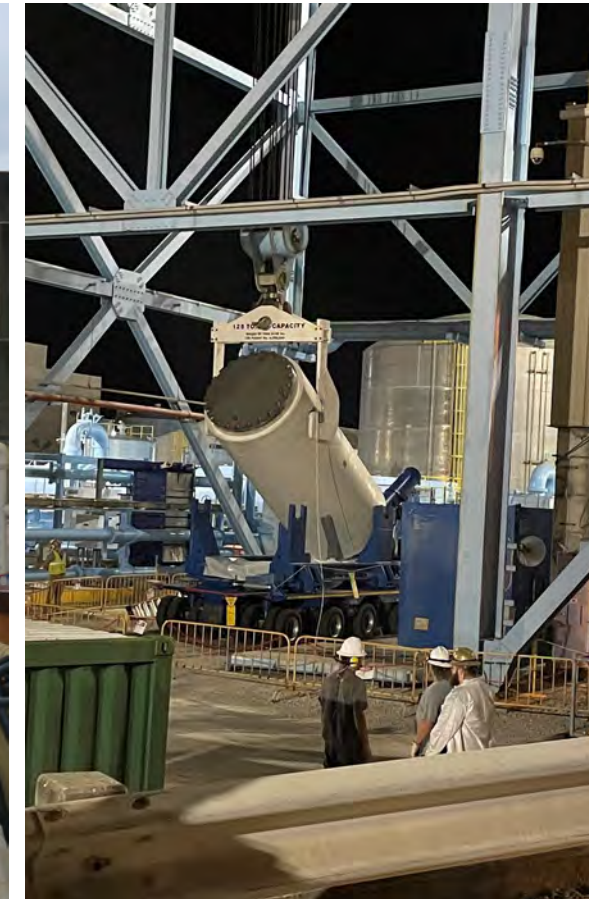
Maintaining a Strong Focus on Safety through Risk-Informed Inspection Guidance

- 2020 Enhancement Initiative developed a risk prioritization tool in IMC 2690 Appendix D, “Guidance for Risk-Informed Inspection Prioritization”
 - Priority level 1 – highest level of inspection effort
 - Priority level 3 – lowest level of inspection effort
- Majority of staff spent 50-75 percent of their time on priority level 1 activities

<u>Activity</u>	<u>Priority Level</u>	
Transfer Cask Lift to Stack-up (V) - Activity is only applicable to vertical cask loadings	1	★
Canister Transfer (V)	1	
Storage Cask Lid Placement (V)	3	
Transfer Cask Down Ending (H) - Activity is only applicable to horizontal cask loadings	1	★
Storage Cask Removal from Building	3	
Cask Transfer to Pad	3	



Joseph M. Farley Nuclear Plant
Holtec HI-STORM 100



St. Lucie Nuclear Plant
Transnuclear NUHOMS® HD

Maintaining Consistency in Inspection Frequency to Ensure Safe Operation

- ISFSI Enhancement Initiative aligned inspection frequencies for all Regions and Activities
 - Loading Campaigns – Triennial (ROP Cycle)
 - Continuous Offload – Quarterly
- 100% of ISFSI loading campaign inspections completed during 8th triennial inspection cycle (CY2020, 2021, & 2022)
- 100% Continuous Offloading Sites (7) met the quarterly inspection frequency



Photo Credit: Holtec International

Strategic Research to Support Current and Future Regulatory Needs

Josh Whitman, Reactor Systems Engineer
Fuel & Source Term Code Development Branch
Division of Safety Analysis
Office of Nuclear Regulatory Research

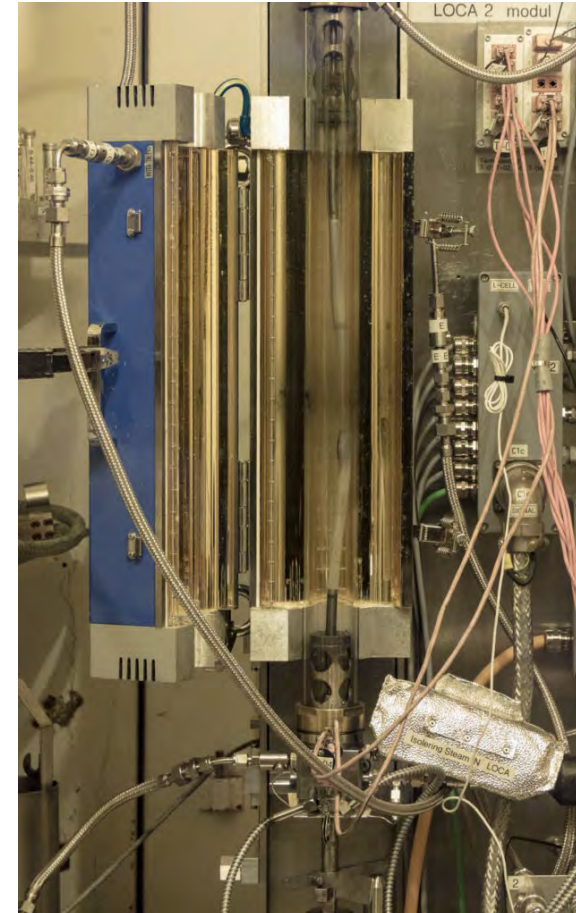
PIRTs and Code Assessment Support Technical Reviewers on ATF, HBU, and Increased Enrichment

- PIRTs on ATF, HBU, and increased enrichment provide importance rankings based on input from multiple experts in the field.
 - SFST PIRT panel to meet in May.
- Staff have assessed the SCALE neutronics code for ATF, HBU, and EE to evaluate impacts on key figures of merit.
 - SCALE provides independent calculations on shielding, decay heat, and source term.
 - Assessments are summarized in multiple NUREG/CRs and other reports.
- PIRT reports and assessment reports support technical reviewers.
 - Reports provide background to allow reviewers to focus reviews.
 - Assessment reports and confirmatory calculations further improve review efficiency and effectiveness.



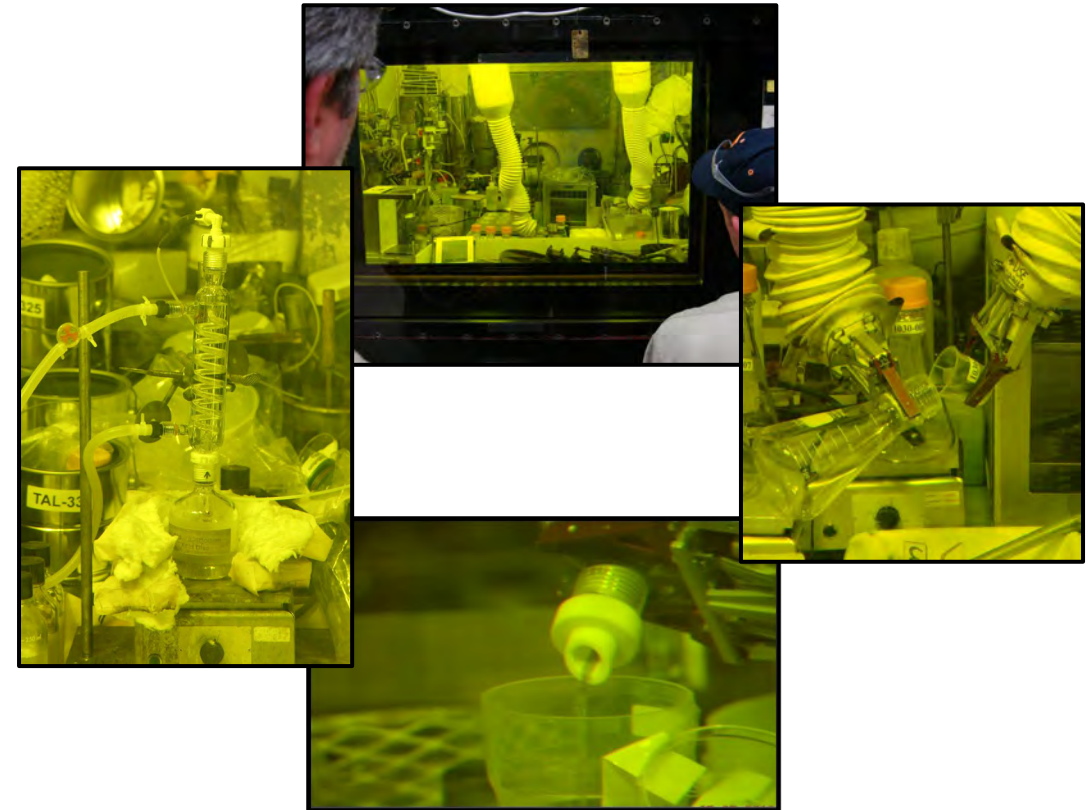
RES Leverages Cost-Shared Data Through Collaborations with International and Domestic Partners

- Participation in SCIP provides data on higher burnup fuel aging in dry storage.
 - FAST code can perform confirmatory calculations on fuel in dry storage
 - SCIP data improves our confidence in FAST code fuel performance simulation results
 - SCIP provides excellent value for our monetary contribution
- DOE's HBU demonstration cask project is providing complementary data on fuel performance during long-term dry storage.
 - Data on fission gas release is used to benchmark and improve FAST
- Sandia National Laboratories is providing high quality Computational Fluid Dynamics (CFD) validation data as part of the Dry Cask Vacuum Drying Experiment



Radiochemical Assay Provides Important Benchmark Data

- RES contracted with ORNL to use leftover material from sibling rod program for Radiochemical Assay
 - Detailed isotopic composition used to benchmark SCALE for burnup credit and decay heat applications
 - Data and NUREG/CR publicly released
- RES is leveraging relationships with DOE to perform RCA on HBU and ATF specimens



DOE/NRC Criticality Safety Benchmarks Support Safety Analyses for HALEU Fuels

- Energy Act of 2020 directed DOE in consultation with NRC to develop criticality safety data
- Currently available criticality benchmark data is focused on LWR fuel less than 5 wt% and HEU.
- This program aims to fill in gaps in the data-set, reducing uncertainty in criticality safety for HALEU and advanced reactor fuels
- Data will:
 - help validate NRC codes, such as the SCALE neutronics code,
 - be used directly during review of applications for HALEU facilities and transportation packages
 - Be released publicly



Closing Remarks

Ray Furstenau
Acting Executive Director for Operations