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

Commission Meeting
Tuesday, May 13, 2025

Opening Remarks

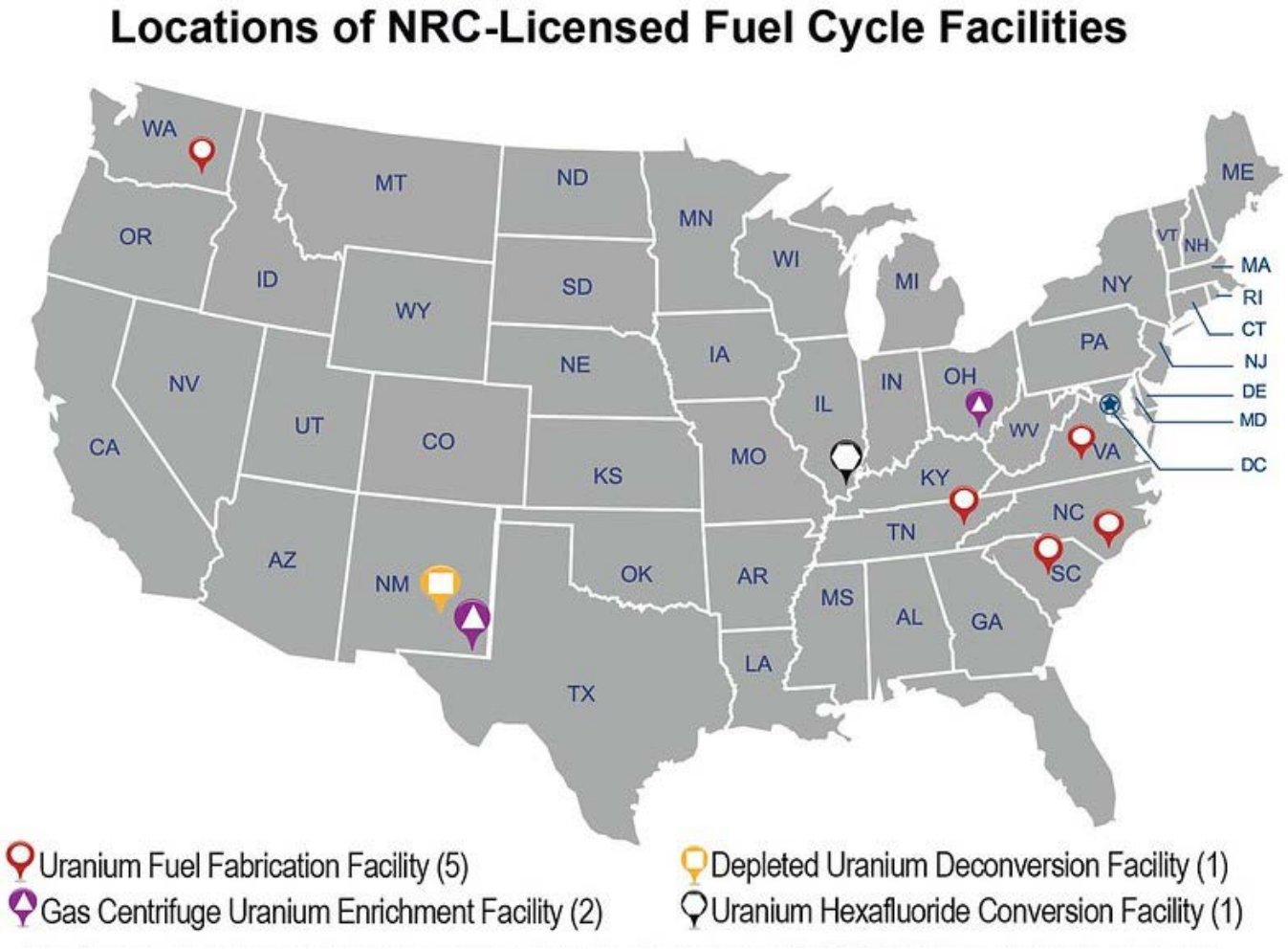
Mirela Gavrilas, Ph.D.

Executive Director for Operations

Fuel Facilities
Business Line Overview

John Lubinski
Director, NMSS

NRC's Fuel Cycle Program Overview



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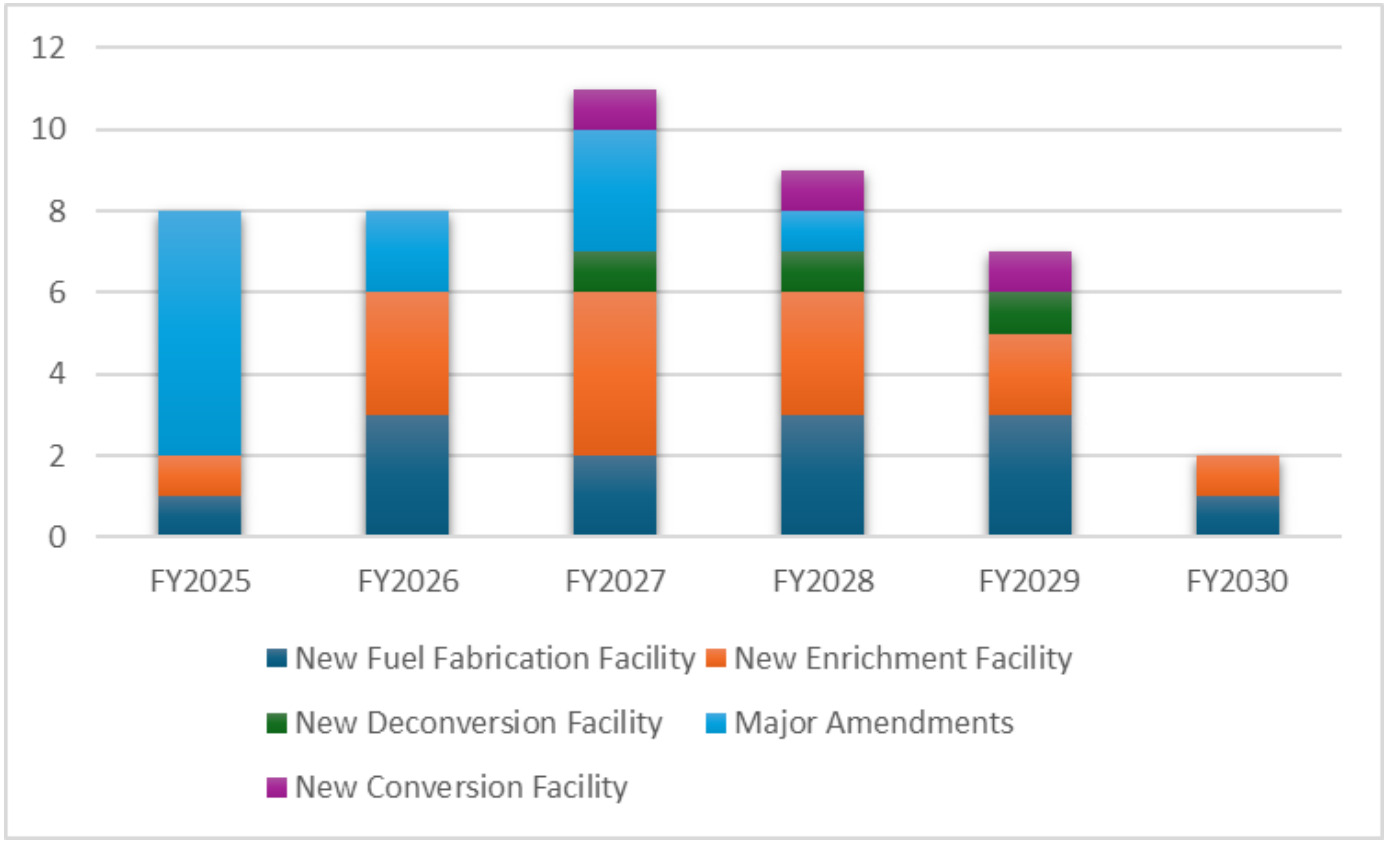
Anticipated New Fuels Licensing Actions



Fuel Facilities Domestic and International Activities

U.S.NRC

IAEA

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

DEPARTMENT OF STATE · UNITED STATES OF AMERICA

NNSA
National Nuclear Security Administration

DTRA
DEFENSE THREAT REDUCTION AGENCY
Detect. Deter. Defeat.

NMMSS

Bilateral meeting between SISUS and IAEA Safeguards

Shaping the Future of the Fuel Cycle Program

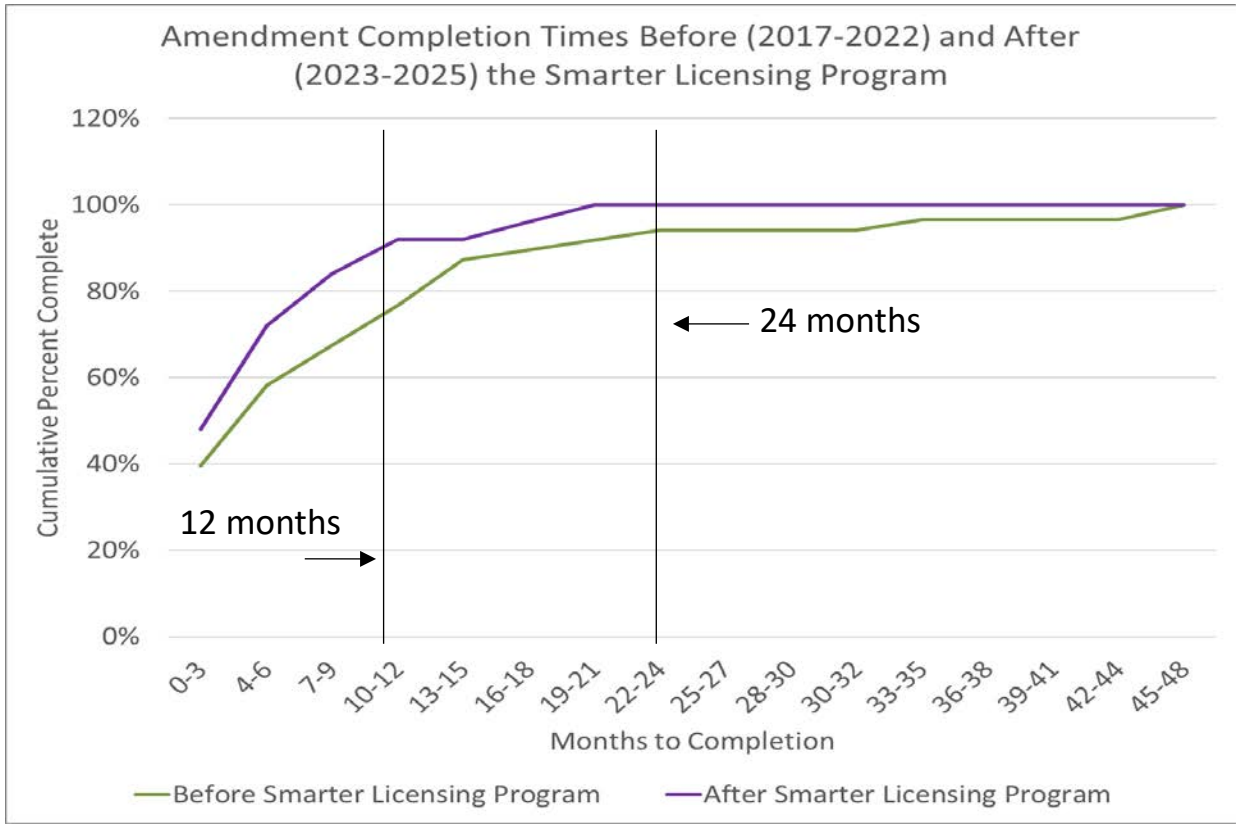
Kimyata Morgan-Butler, Ph.D.

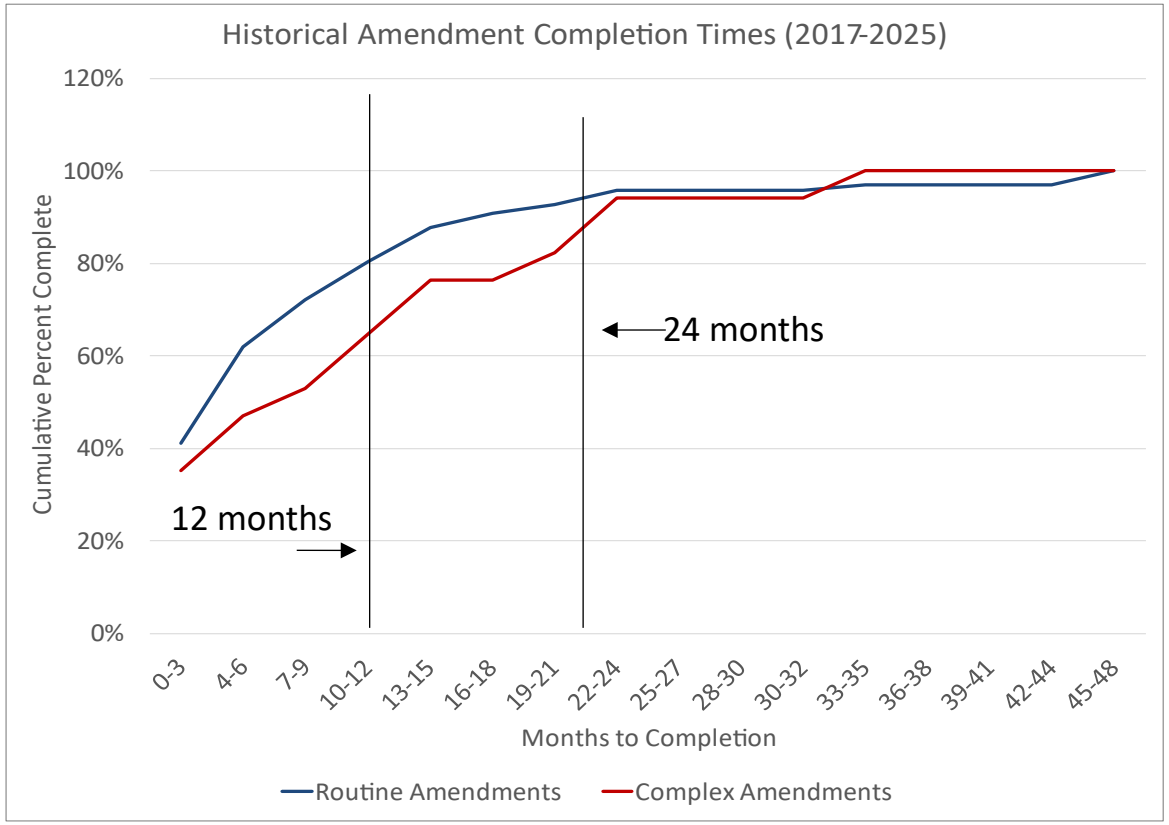
Deputy Director, Division of Fuel Management, NMSS

Improving Licensing and Oversight Processes

Licensing Recommendations	Oversight Recommendations
Encourage the Applicant/Licensee to Identify Potential Issues (Months Before Submitting)	Eliminate Public Meetings for Fuel Facilities When There Is No Area Needing Improvement
Use Licensing Audits and Clarification Calls	Optional Entrance/Exit Meetings for Operational Safety and Safeguards Inspections
Use of Request for Confirmatory Information	Extended Time Allowed Without Site Coverage by Resident Inspector

Data-Driven Metrics to Drive Performance





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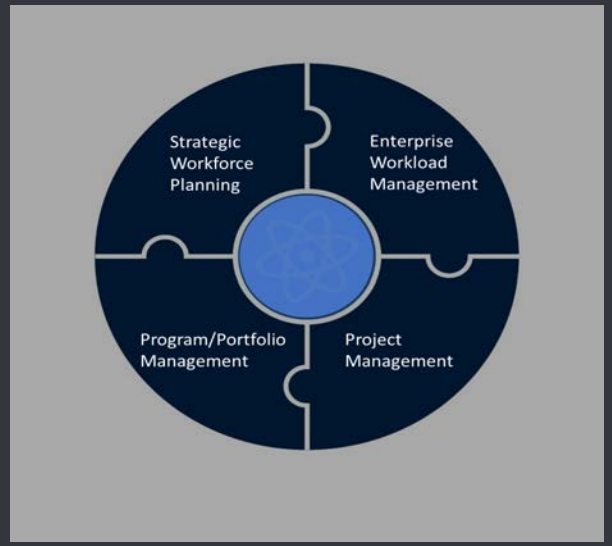
Staffing Strategies to Support Licensing & Oversight Activities

- Coordination with partners to ensure necessary skills sets are available
- Early adoption of the NRC Project Management Initiative



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New Fuels Licensing Accomplishments, Ongoing and Future Casework & Transparency and Accountability in the Licensing Process

Samantha Lav, Chief

Fuel Facilities Licensing Branch

Division of Fuel Management, NMSS

Licensing Casework is Increasing

30
Licensing Actions Completed Since April 2024

- 2 – Complex Amendments
- 22 – Routine Amendments
- 4 – Exemptions
- 1 – Terminations
- 1 – Renewal

20
Current Licensing Actions

- 1 – New License
- 3 – Complex Amendments
- 13 – Routine Amendments
- 1 – Exemptions
- 1 – Renewal
- 1 – License Transfers

63
Projected Licensing Actions through 2030

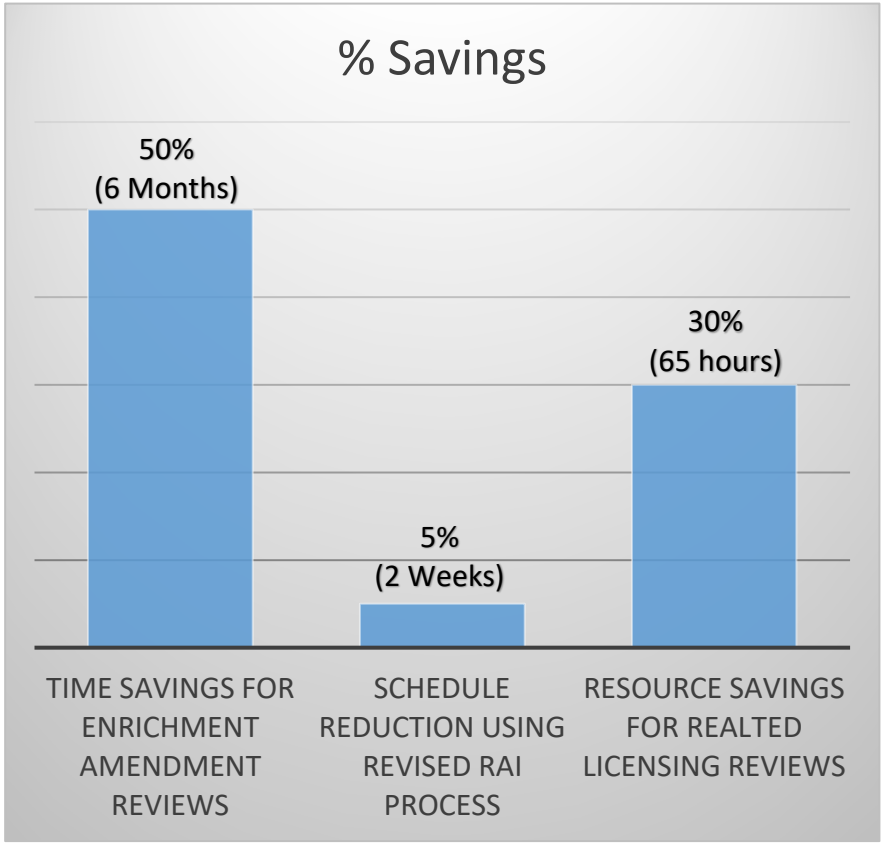
- 8 – New License Applications
- 5 – Complex Amendments
- 44 – Routine Amendments
- 2 – Exemptions
- 3 – Renewals
- 1 – License Transfers

Approving Notable Actions while Reducing Schedule and Resources

Major Licensing Action Approvals

- LES Amendment to Increase Enrichment Limits to 10 wt% - supports ATF with increased enrichment
- Centrus Phase II of the HALEU Demonstration – allows for increased production of HALEU
- NIST License Renewal – pilots draft GTCM Standard Review Plan

Signing of LES Amendment to Increase Enrichment Limits to 10 wt%



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Strategically Adjusting the Licensing Process

Pre-Application

- Consider previous agency-wide licensing actions
- Identify similar past reviews
- Facilitate in-depth topical discussions
- Conduct pre-app readiness assessments

Application Review

- Implement new review guidance using precedents
- Scale reviews
- Focus on new or changed information
- Apply new environmental review process
- Employ streamlined mandatory hearing process

Estimated Impact of Adjustments

- Provide substantive feedback and best practices in pre-application space
- Identify gaps in application early
- Shorter schedules and fewer resources
- Timelier issuance and response to RAIs
- More timely environmental reviews
- Reduction of hearing timeline

Using Data for Licensing Accountability and Transparency

Internal Accountability

- Tracking Metrics
- Schedule Adherence
- Resource Usage
- Identifying and Mitigating Project Risks
- Workload Prioritization
- Optimizing Schedules
- Developing Creative Solutions

External Transparency

- Regular Communication with Licensees and Applicants
- Project Progress vs. Schedule
- Estimated vs. Expended Resources
- Schedule Risks
- RAI Status

Imports and Exports of Nuclear Fuel

Barry Miller, Senior International Policy Analyst

Export Controls & Nonproliferation Branch

Office of International Programs

The NRC's Export and Import Licensing Program Leverages the Fuel Facilities Business Line

- NRC licenses exports and imports of nuclear equipment and material under 10 CFR Part 110
  - Program leverages multiple NRC offices and business lines

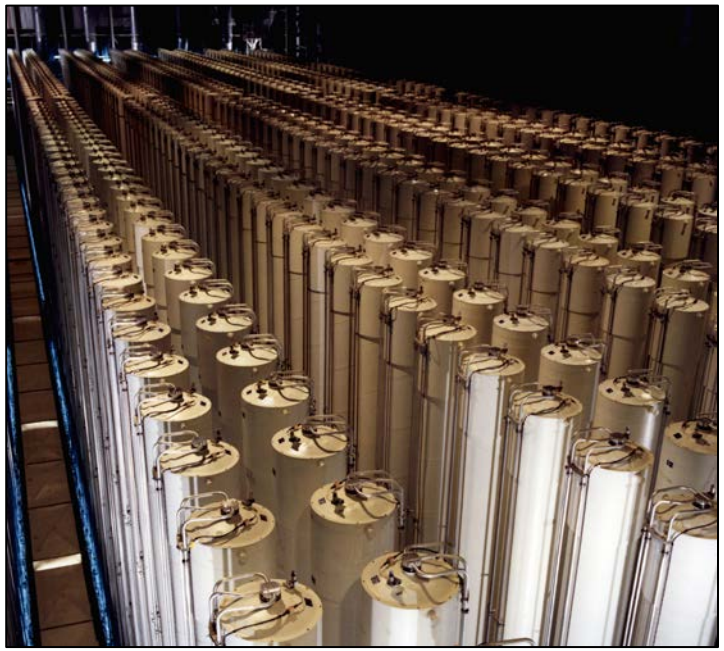
- International safeguards experts in the FF business line review all export licenses and 123 agreements
  - Approximately 50-70 export licenses issued each year
  - 123 Agreements enable U.S. companies to export nuclear material and equipment to partner countries

The "Prohibiting Russian Uranium Imports Act" (Public Law 118-62)

- Signed into law May 13, 2024; effective Aug 11, 2024
- Prohibits imports of LEU and natural uranium from Russia *unless* a waiver is granted by DOE
  - NRC has no role in the waiver process
  - No waivers beyond Jan 1, 2028
- Did not alter NRC's import licensing authority
  - NRC general license for import will still be used for any DOE-waived imports

Impact of the Prohibition on Imports of Russian Uranium

- In recent years, Russian uranium imports have accounted for up to 20% of U.S. fuel supply
- The prohibition law unlocked funds for DOE to award contracts to spur increased domestic enrichment capacity
- These actions are directly contributing to additional licensing work for NRC



Fuel Facility Inspector Training, Qualifications, and Readiness

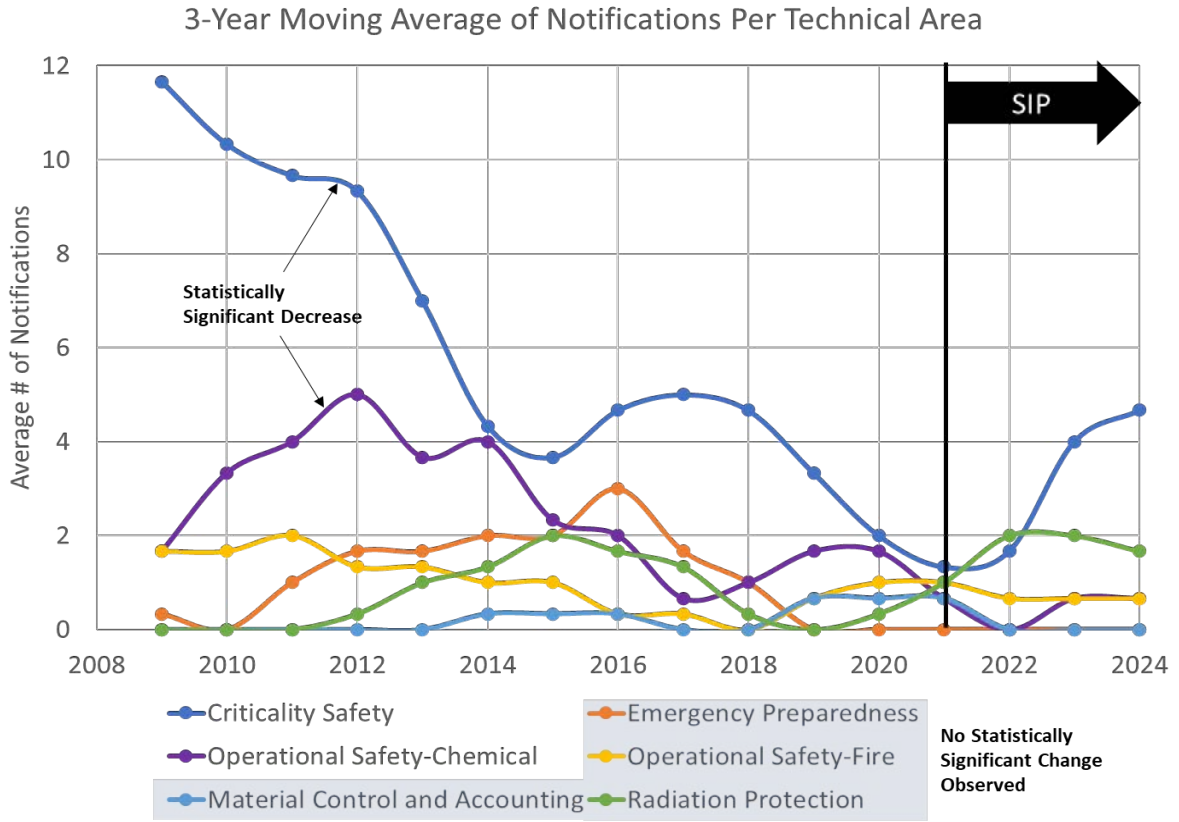
Ravi Penmetsa, Deputy Director

Division of Fuels, Radiological Safety, and Security

Region II

Smarter Fuel Cycle Inspection Program (SIP) Implementation and Realized Benefits

- Stable industry trends = Good foundation for ADVANCE ACT
- SIP's clarified guidance = 67% reduction in variance from resource estimates (from ±30% to ±10%)
- Standardized report templates = Improved consistency, traceability, and alignment with inspection procedures



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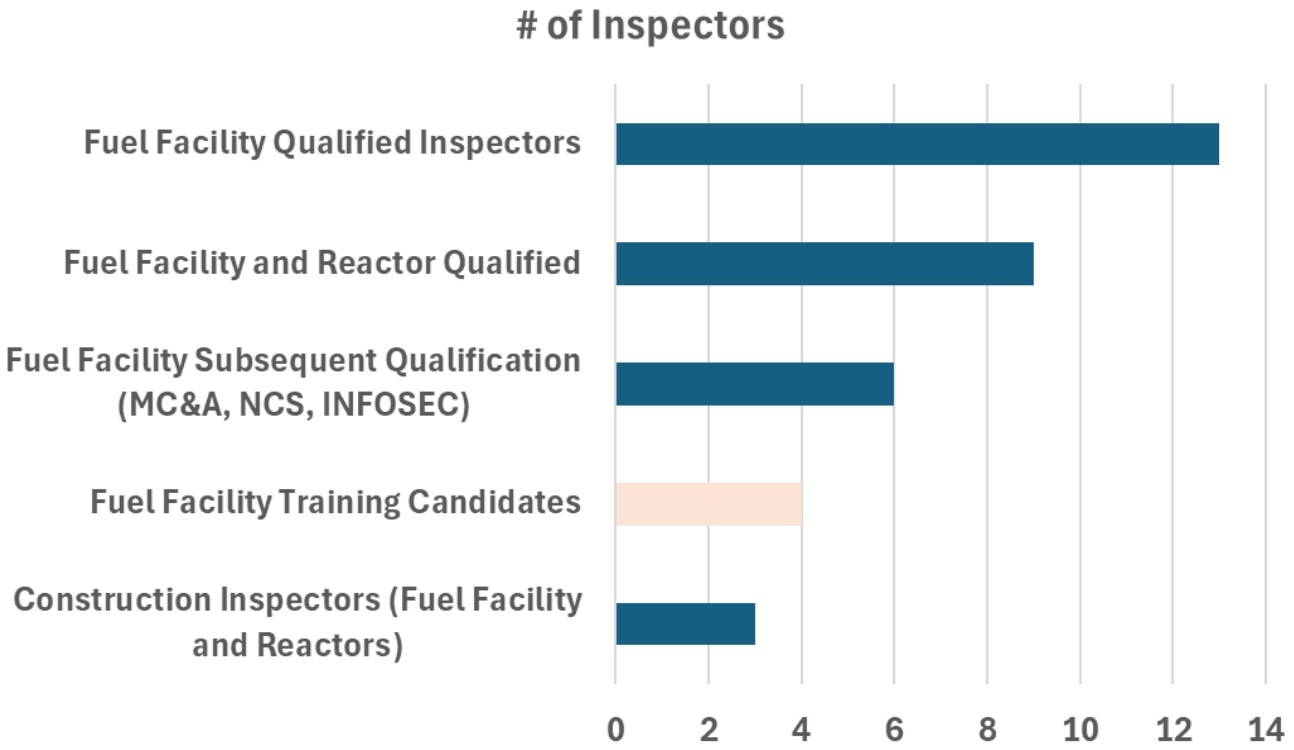
Developing a Skilled and Qualified Workforce

- **Oversight Capability**: Maintaining operational continuity and depth by ensuring adequate number of qualified and trainee inspectors.

- **Strategic Cross-Qualification**: Leveraged cross-qualification to enhance inspection coverage and agility.



Closing Remarks

Mirela Gavrilas, Ph.D.

Executive Director for Operations

Opening Remarks

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Executive Director for Operations

Spent Fuel Storage and Transportation Business Line Overview

John Lubinski

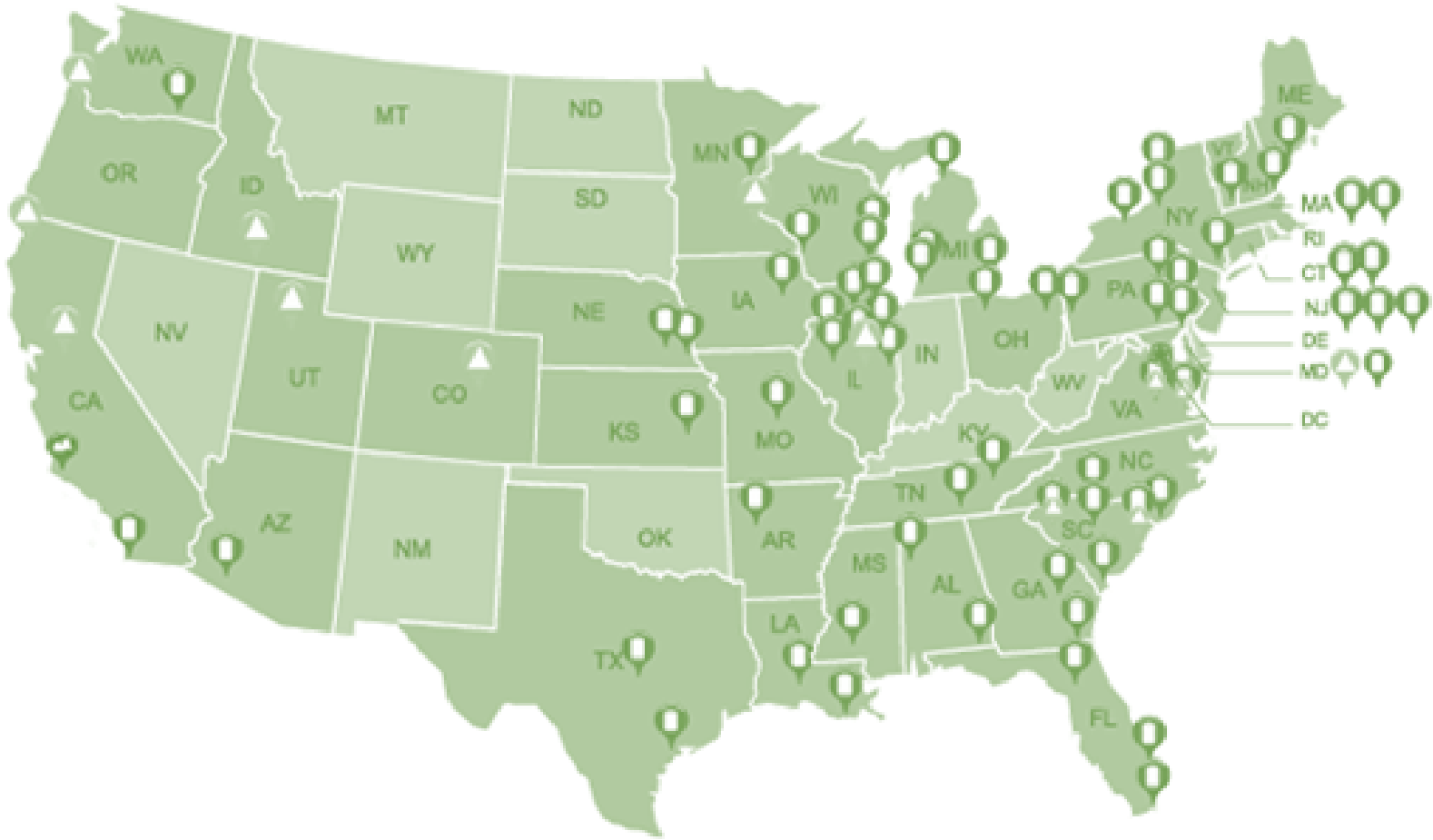
Director, NMSS

SFST Program Overview

97
Transportation Packages (Domestic)

50
Transportation Packages (International)

82 ISFSIs in 36 States



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Driving Results to Meet the Mission – Today and for the Future

Committed to Process Improvement and Risk Based Decision-making

Focused on Resource Utilization

Enabling Safe Deployment of New Technologies

Shaping the Future of the Spent Fuel Storage and Transportation Program

Cinthya Roman-Cuevas

Deputy Director, Division of Fuel Management, NMSS

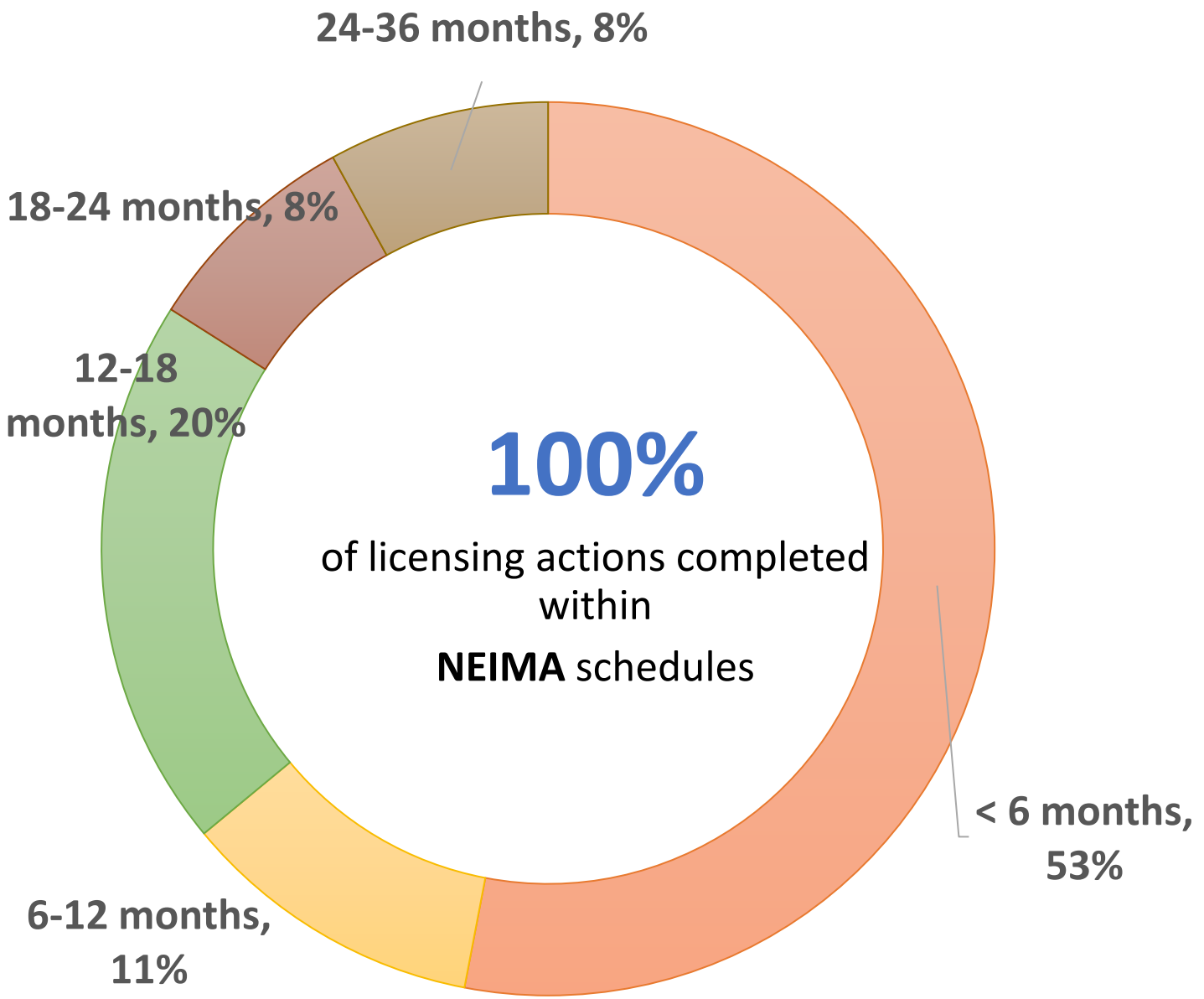
Timeliness Goals: Ensuring Accountability in SFST

96

Licensing Actions Completed

85

Tracked Under NEIMA



Spent Fuel Storage & Transportation: Navigating the Next Five Years

- **Workload remains steady. Nature of work evolves.**
  - **Decreasing workload areas:**
    - Currently, 1 renewal application for a site specific Independent Spent Fuel Storage Installation (ISFSIs) in house – no additional renewal applications are expected.
    - 2 Storage CoC Renewals in the next 5 years.
  - **Increasing Workload Areas:**
    - Storage cask amendments.
    - Renewals of existing Transportation packages.
    - Licensing actions for the transportation of higher enrichment, new fuels, and higher burnup.
    - CoC applications for the transportation of fueled microreactors.
    - DOT Revalidations.

AI generated images

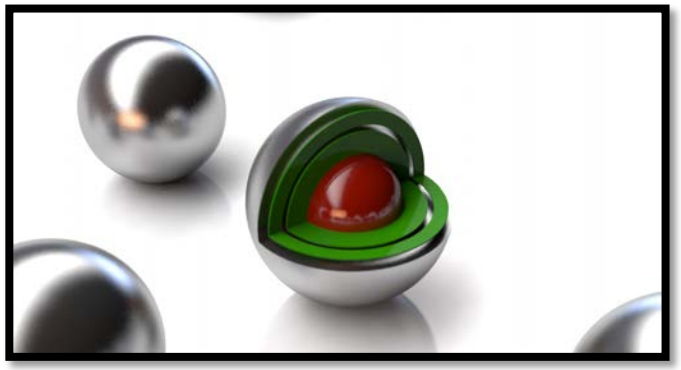
Readiness for Regulating New Fuels Is One of Our Top Priorities

Regulatory Framework Scan

- Existing regulations support new fuels and new technologies /conservatisms needed to address uncertainties
- Scan will prioritize research and data needs, code updates, and potential guidance updates

Increased Enrichment Rulemaking

- Support transportation campaigns of UF6 enriched up to 10%
- Responsive to stakeholder feedback



TRISO Phenomena Identification Ranking Table (PIRT)

- TRISO and Metal Spent Nuclear Fuels Workshop in December 2024 to discuss PIRT
- +300 participants/Targeted outreach to subject matter experts

Applying Risk Insights to Improve Resource Utilization

- Chloride Induced-Stress Corrosion Cracking (CISCC)
  - Leverage research and operating experience to reduce in-service inspection frequency from 20 years to 40 years (Regulatory Guide 3.78)
    - Resulting in savings of ~$26 Millions in 40 years
  - Additional short-term research could result in additional savings with a high return on investment
- Refining Decommissioning Funding Plan Review Process
  - Expected savings up to ~50% of resources

Storage and Transportation Licensing Activities, Ongoing and Future Casework Coordination with Federal Partners on Transportation of Radioactive Materials

Yoira Diaz-Sanabria

Chief, Storage and Transportation Licensing Branch

Division of Fuel Management, NMSS

Improving Licensing and Rulemaking Processes

Expediting Dry Cask Storage Safety Reviews

- Immediate operational needs by general licensees (GLs) to conduct loading campaigns at 20 sites
- Safety review completed in approximately 4 months
  - ➢Saving about 8 months (Baseline Scheule: 12 months)
  - ➢Approximately 60% schedule savings
- Accomplished by:
  - ➢Holding early pre-application meetings
  - ➢Conducting audits with licensees for timely resolution of issues
  - ➢Using risk-informed insights and lessons from previous reviews

Improving Storage Certificates of Compliance (CoCs) Rulemaking Timeline

- Supporting GLs operational need dates by expediting rulemaking CoCs
- Completed the rulemaking review in 18 weeks
  - ➢Saving up to 8 weeks (Baseline Schedule: 26 weeks)
  - ➢Approximately 30% on schedule savings
- Accomplished by:
  - ➢Early alignment with rulemaking center of expertise, overlapping safety and rulemaking process steps while developing rulemaking package
  - ➢Consistency in the *Federal Register Notice* language

Core Team Approach in Transportation CoCs

- Immediate shipment needs of TRISO compacts to support advance reactors
- Completed the review in over 13 months and approximately 500 hours
  - ➢Saving about 12 months and approximately 800 hrs. (Baseline: 2 years and estimated 1,300 hrs.)
  - ➢Approximately 50% schedule savings
- Accomplished by:
  - ➢Conducting early pre-application and post-application engagements with applicant
  - ➢Using core team approach to achieve early alignment on technical issues
  - ➢Issuing one round of requests for additional information
  - ➢Receiving timely responses and quality information

Working with Partners to Achieve Results

Removal of self-shielded irradiator at NRC-licensed facility

- *Supported Nuclear National Security Administration's (NNSA)* to remove self-shielded irradiators by 2027.
- *Collaborated with NRC's and Federal partners*
  - Addressing technical challenges
  - Streamlining the regulatory process
  - Ensuring safe and secured transport of radioactive material

Transportation revalidation reviews supporting programs

- DOE's MARVEL microreactor project
- DOE's Foreign Research Reactor Program
- NNSA source recovery program under National Defense Authorization Act 2019

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OAS

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA

NNSA
National Nuclear Security Administration

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Maximizing Relationships with Federal Partners

M-290 package
NRC approved December 2014
(max. height 30 ft., weight 260 tons)

2024 NAVAL Emergency Preparedness Demonstration

- NRC observed real-life emergency preparedness example.
- New staff getting insights on collaboration among Federal, Tribal, and local officials.

DOE High Burnup (HBU) cask project at North Anna

Transportation of High Burnup Research Cask Project

- In 2027, DOE will ship cask to Idaho National Laboratory.
- Fuel stored for 10 years.
- Data will provide additional insights on fuel performance while in transport.

Regional Insights and Measures to Achieve Consistency in our Spent Fuel Storage Oversight Programs

Jeff Josey

Chief, Decommissioning, ISFSI, and Operating Reactor Branch
Region IV

Achieving Consistency through Collaboration and Dialogue

- 82 Independent Spent Fuel Storage Licenses
- 36 States
- 4 Regions

ISFSI Program Enhancements and Realized Benefits

Photo Credit: Holtec International

Projected FTE Savings:

- 0.4 FTE for Inspection Procedure 60855 change.
- 0.5-1 FTE for change to IMC 0610, ISFSI report process.
- ISFSI security inspection procedure changes.

Preparing the Spent Fuel Storage and Transportation Oversight Program Response to the ADVANCE Act

Initiatives Under Consideration:

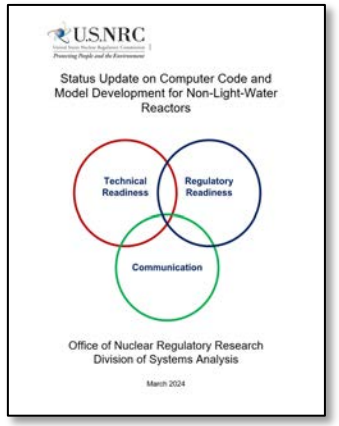
- Not doing on-site inspections for sites expanding their ISFSI pad.
- Eliminating on-site inspections for not-important-to-safety concrete pad inspections.
- We estimate these 2 changes would result in a combined savings of 1 FTE.

Strategic Research to Support Current and Future Regulatory Needs

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

RES Simulation Codes Supports Fuel Cycle Licensing

Strategic Planning



scale

MELCOR

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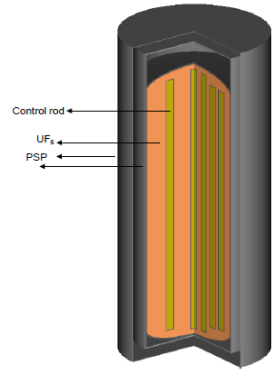
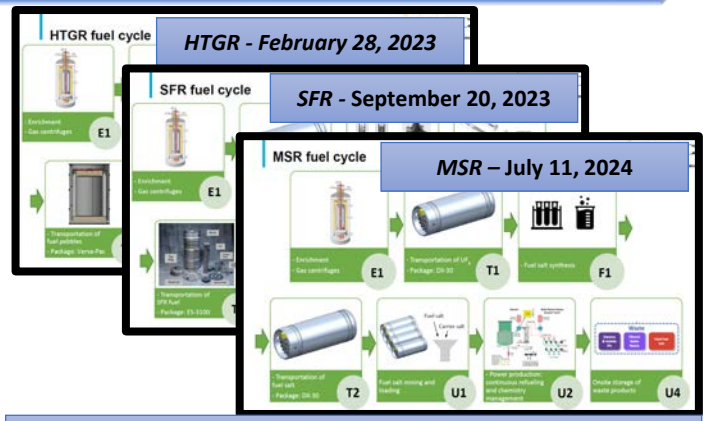
Implementation



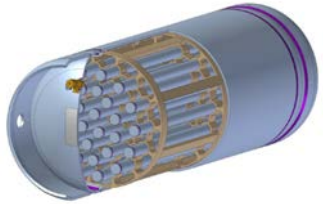
DN30-X SCALE Model

VersaPac SCALE Model



NRC Fuel Cycle Demonstration Public Workshop

Benefits to NRC Licensing



NRC's approval of ORANO's DN30-X for UF6 up to 20 wt.% U-235

NRC's approval of NAC's Optimus-L for TRISO compacts

Future Licensing Support

Westinghouse

TerraPower

energy

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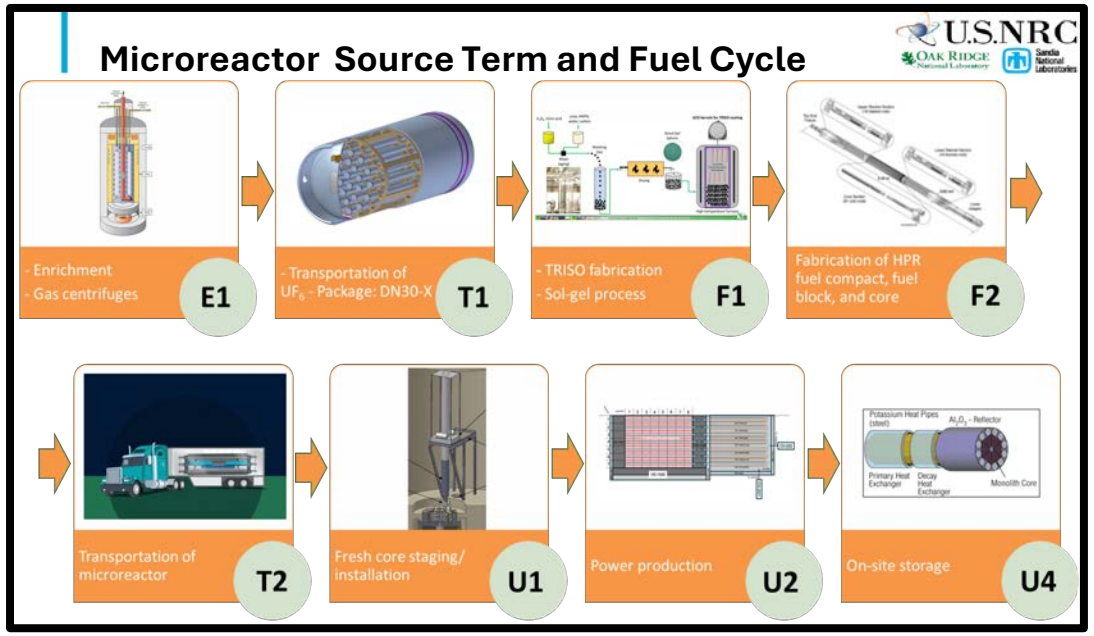
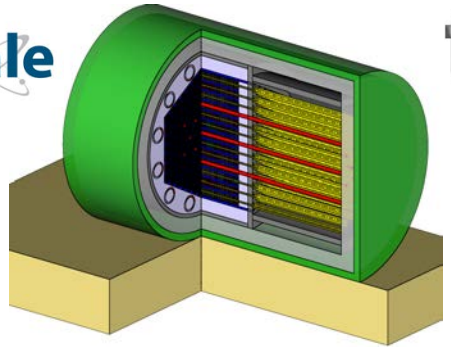
RES Preparations to Support Microreactor Licensing

March 26, 2025, NRC Public Workshop



Public workshop videos, slides, reports at the NRC advanced reactor source term webpage

scale



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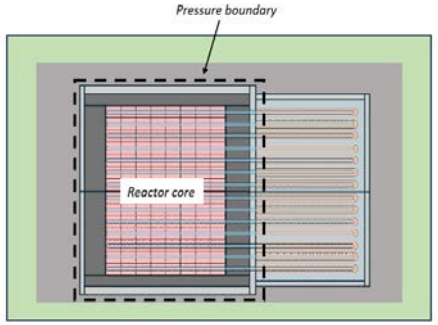
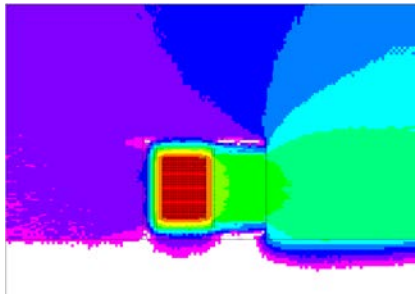
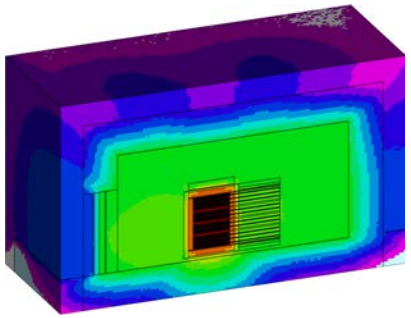




Radiation dose map during hypothetical accident conditions



Radiation dose map during normal conditions of transport

Section 208 of the ADVANCE Act focuses on regulatory requirements for micro-reactors, directing the NRC to develop risk-informed and performance-based strategies and guidance for licensing (including focus on the transportation of fueled micro-reactors and source term)

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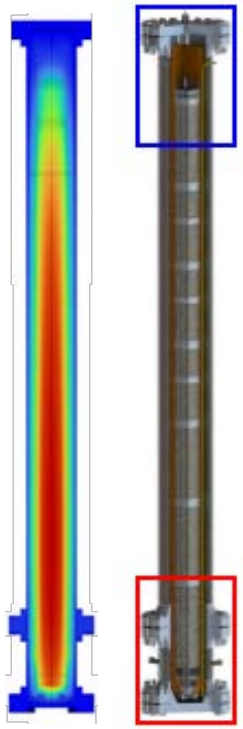
RES Collaborations Strengthen Licensing



Advanced Drying Cycle Simulator Experiment & CFD Predictions

National Criticality Experiments Research Center for DNCSH

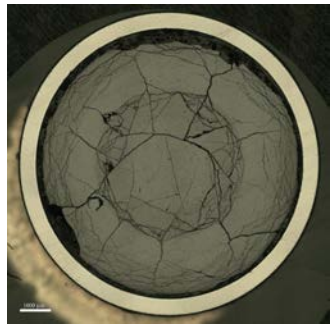
Research programs are driven by licensing needs and informed by engagement through domestic programs and international collaborations

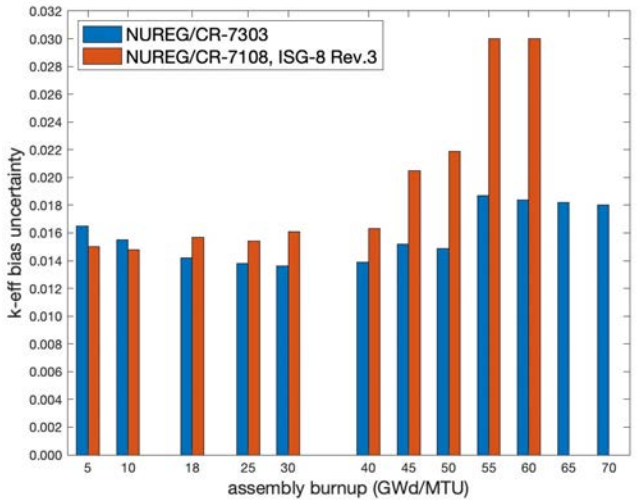
Radiochemical Assay Programs

- **D**OE/**N**RC Criticality Safety for **C**ommercial-**S**cale **H**ALEU fuel cycle and transportation (DNCSH) fills in gaps to reduce criticality uncertainty in advanced fuels
- Radiochemical Assay (RCA) programs result in high quality validation data for SCALE for LWRs and for LEU+, HBU, non-LWRS
- RES ran experiments of dry cask configurations for CFD validation and reviewing thermal design of SFST and transportation casks
- RES is supporting the Integrated Safety Analysis (ISA) review of TRISO-X and GLE fuel facility license applications

RES Programs Are Informed by Industry Advancements

- RES is forward-looking and aligns research programs and code development priorities with industry
- Extended Storage Collaboration Program (ESCP) provides insight into industry plans for long-term fuel storage and future transportability
- Recent work on criticality uncertainty significantly improved the validation basis, allowing additional margin for licensing without negatively impacting safety
- RES supported the NMSS workshop in December, engaging industry on NRC analysis capabilities for advanced fuels in fuel performance and neutronics (RIL 2025-04)





Closing Remarks

Mirela Gavrilas, Ph.D.

Executive Director for Operations