

# Advanced Reactor Research Activities in Nuclear Innovation

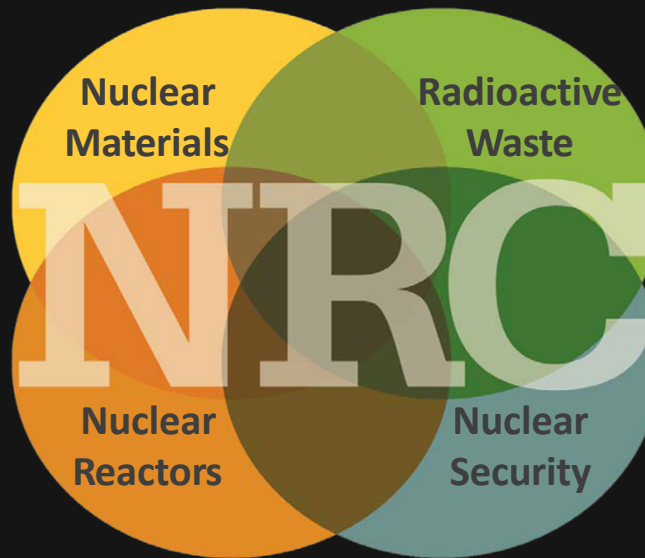
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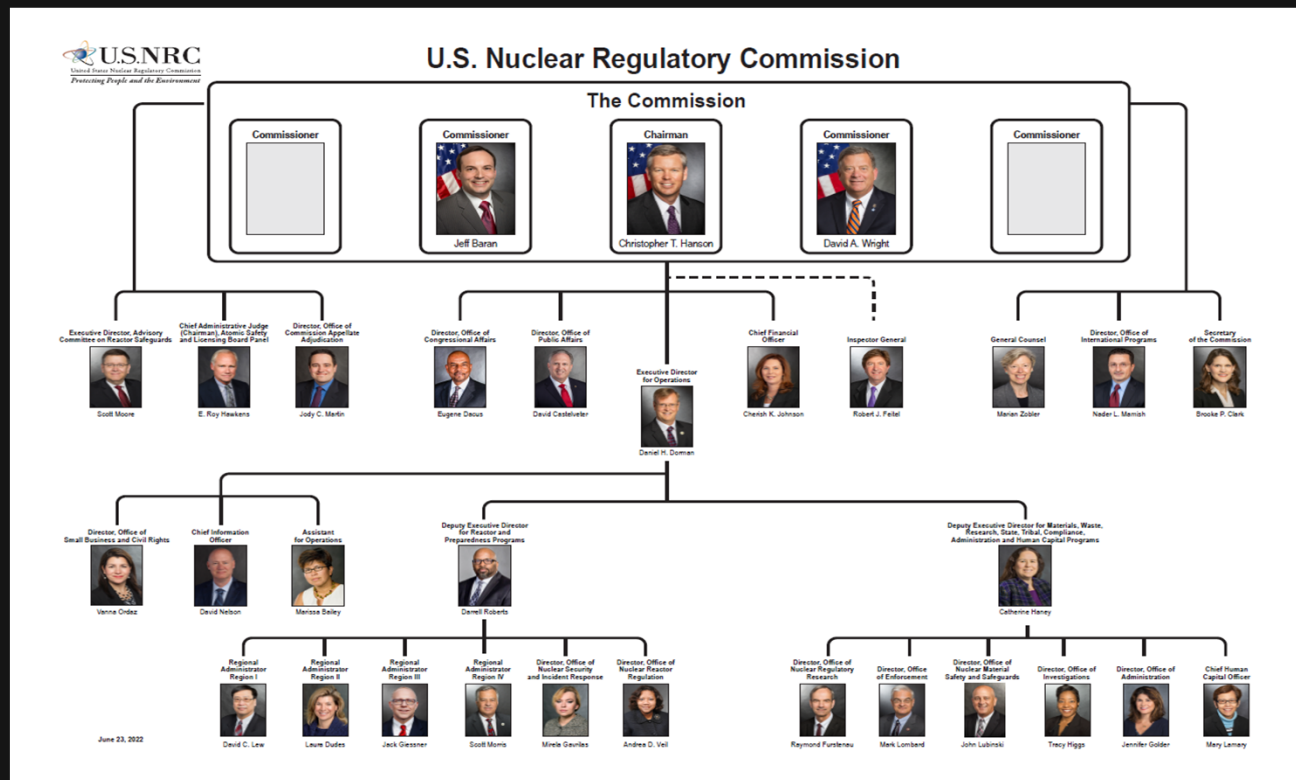


# Overview of the NRC

- 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



# NRC Organization Chart



# Vision and Strategy for Advanced Reactors



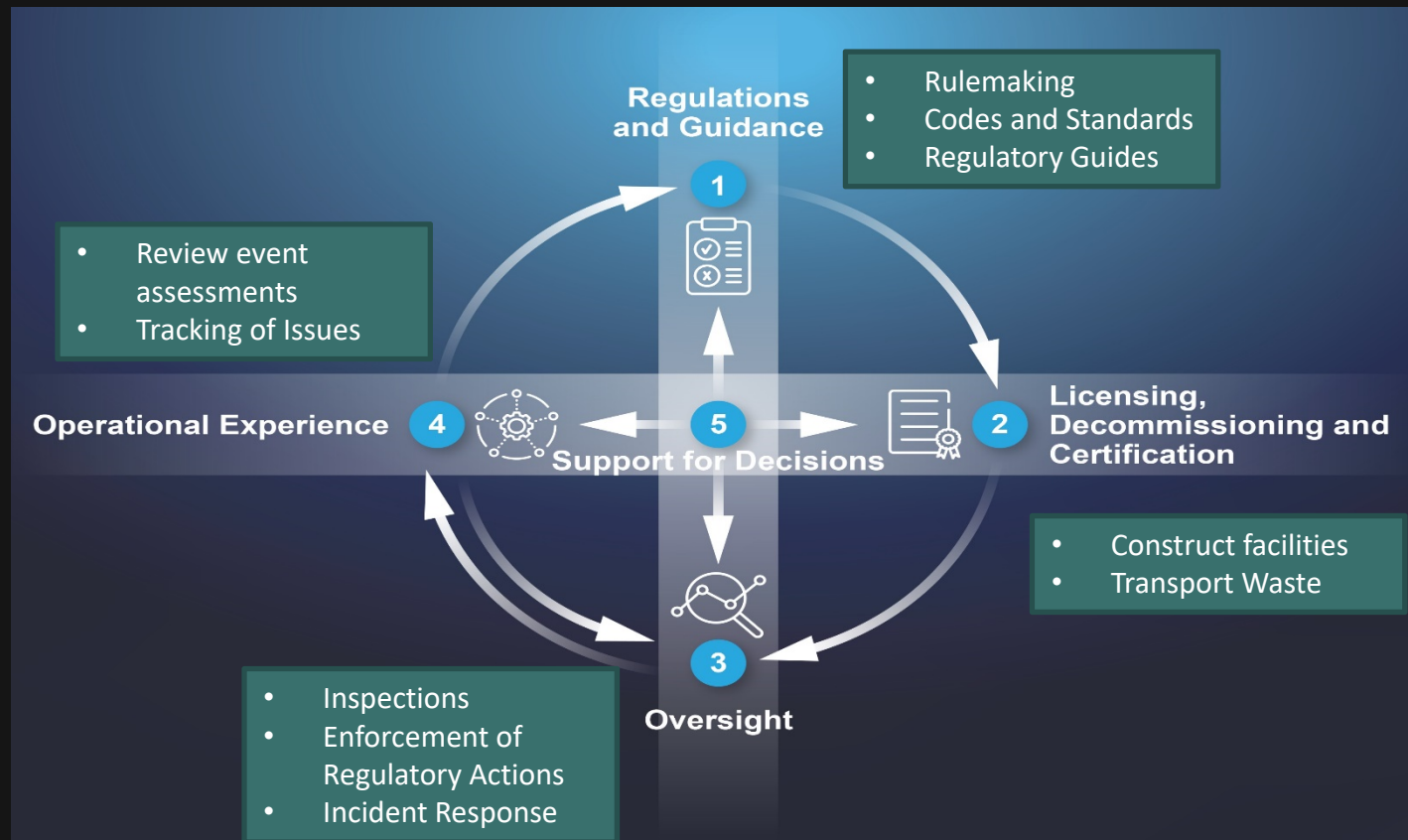
VISION

STRATEGY

Safely achieving effective and efficient non-light water reactor mission readiness by enhancing technical readiness, optimizing regulatory readiness, and expanding communication.



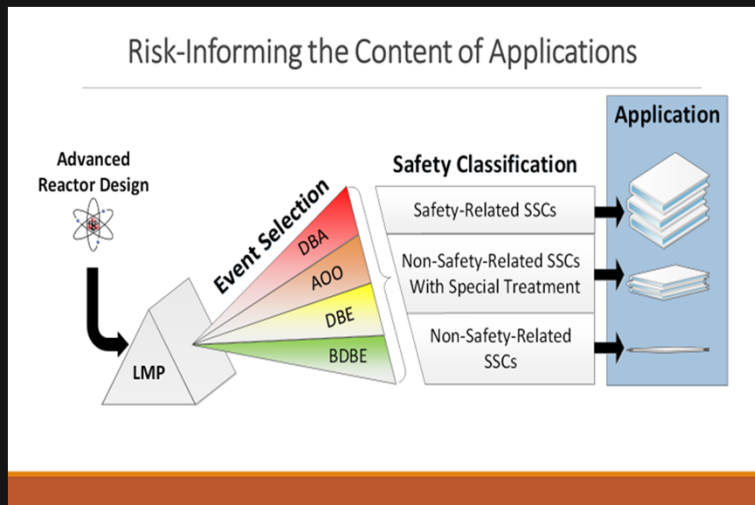
# Regulatory Considerations



# Collaboration



# Advanced Reactor Licensing



## Licensing Modernization Project

- Licensing basis events
- Structures, systems and components classification
- defense in depth features

## NMSS Assessment Process for Advanced Reactor Fuels

- Generic technical assessments
- Assess the impacts of accident tolerant fuels, increased enrichment and higher burnup fuels.
- Stakeholder Engagement
- External Coordination and Collaboration
- No show-stoppers



TRISO fuel particle

# Spent-Fuel Reprocessing- Timeline

2009:  
regulatory  
gap analysis  
(SECY-09-  
0082)

2011: draft  
regulatory  
basis (SECY-  
11-0163)

2013: Part  
7X, focus on  
Gap 5 (SECY-  
13-0093)

2016: work  
stopped

2021:  
Rulemaking  
discontinued  
(SECY-21-  
0026)

# Research Activities

## Molten Salt Chemistry

- Molten Salt Compatibility/Corrosion
- Modeling & Simulation
- Molten Salt processing for metallic and molten salt fuels

## Reliability of Components & Risk Reduction

- Component Performance/Integrity
- Performance monitoring
- Surveillance programs
- Advanced sensors
- Off-gas control

## Fuel Cycle

- Graphite waste and disposal
- Technical challenges: enrichment, fabrication and transportation of HALEU fuel
- Storage systems for waste streams from MSRs



# Front-End Considerations

- Fuel salt enrichment, production, blending
  - Chemical reactivity hazards
  - Production of uranium and thorium fuel salts
- Transportation package designs to support off-site operations
  - Moderator inclusion / Criticality
  - Containment performance

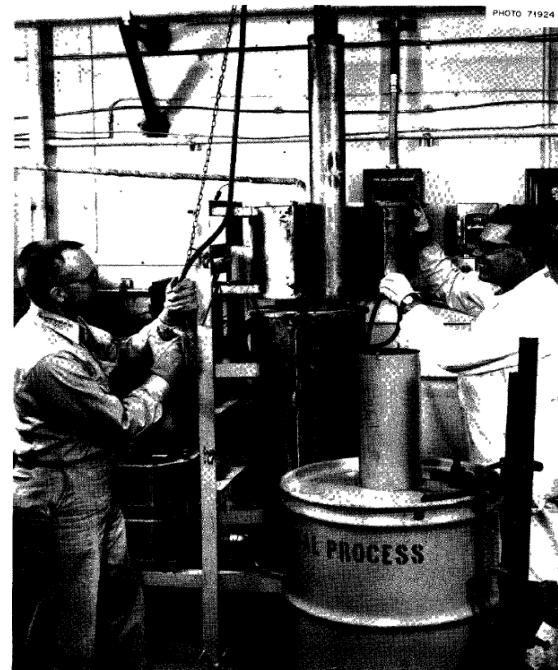
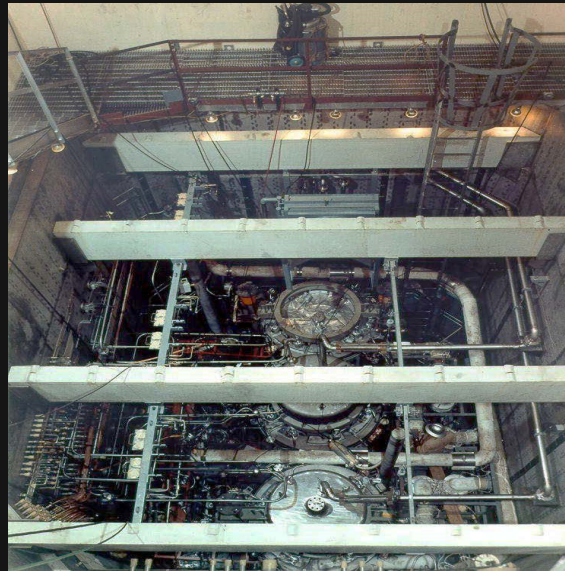


Fig. 26. Fluoride Production for MSRE – Storage Container and Holder for Enriched Fuel Concentrate Mixture.

Fluoride Production for MSRE

# Back-End Considerations

- Confinement materials compatibility
- Dose management
- Fluorine gas generation
- Graphite waste management



Fuel Drain Tanks/Fuel  
Flush Tank in MSRE Drain  
Tank Cell



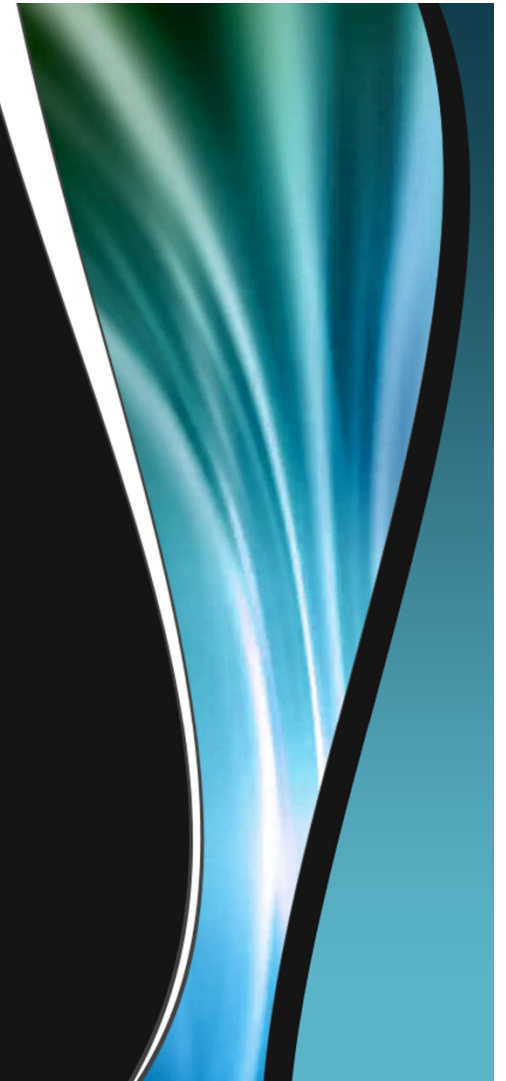
Dry Spent Fuel  
Casks on Concrete  
Pad at Plant Site

# Summary

Advanced reactors pose unique challenges for front-end and back-end operations

RES collaborating with program offices on establishing future activities to ensure readiness for licensing and certification reviews

Continued/expanded engagement with DOE and industry will support mutual understanding of technical and regulatory information needs



# Questions? Need More Information?



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