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Risk-Informing Spent Fuel Storage and Transportation Regulatory Activities

Goals

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- Focus regulatory efforts on storage at this time
- Develop a qualitative risk-informed framework to:
  - Better enable the staff to focus its regulatory efforts
  - Improve guidance and streamline casework activities
  - Evaluate requests for exemptions to regulations while maintaining appropriate margins of safety and security

NMSS
Division of Spent Fuel Management

Scope and Implementation

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- Literature search of available information
- Define defense-in-depth
- Define decision metrics and acceptable risk criteria
- Develop a preliminary framework
- Pilot the preliminary framework
- Finalize framework
- Develop staff training

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Literature Search

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- **EPRI-100969**, "Probabilistic Risk Assessment (PRA) of Bolted Storage Casks", 2004.
- **NUREG-1864**, "A Pilot Probabilistic Risk Assessment of a Dry Cask Storage System At a Nuclear Power Plant," 2007.
- **Risk-Informed Decision making for Nuclear Material and Waste Applications**, (NMSS) Rev. 1, 2008.
- **NEI PRM 72-7**, "Spent Fuel Cask Certificate of Compliance Format and Content," 2012.
- **NUREG-2150**, "A Proposed Risk Management Regulatory Framework", 2012.
- **NUREG/CR-7016**, "Human Reliability Analysis-Informed Insights on Cask Drops," 2012.
- **SECY-13-0132**, "U.S. Nuclear Regulatory Commission Staff Recommendation for the Disposition of Recommendation 1 of the Near-Term Task Force Report," 2013.

Questions from Literature Search

- Will the risk from spent fuel dry storage continue to be low considering operating experience and uncertainties from aging and other unknowns?
- If yes, how can the licensing and certification process be adjusted in order to reflect the associated risk?

Defense-In-Depth

(Three Phases of Dry Spent Fuel Storage)

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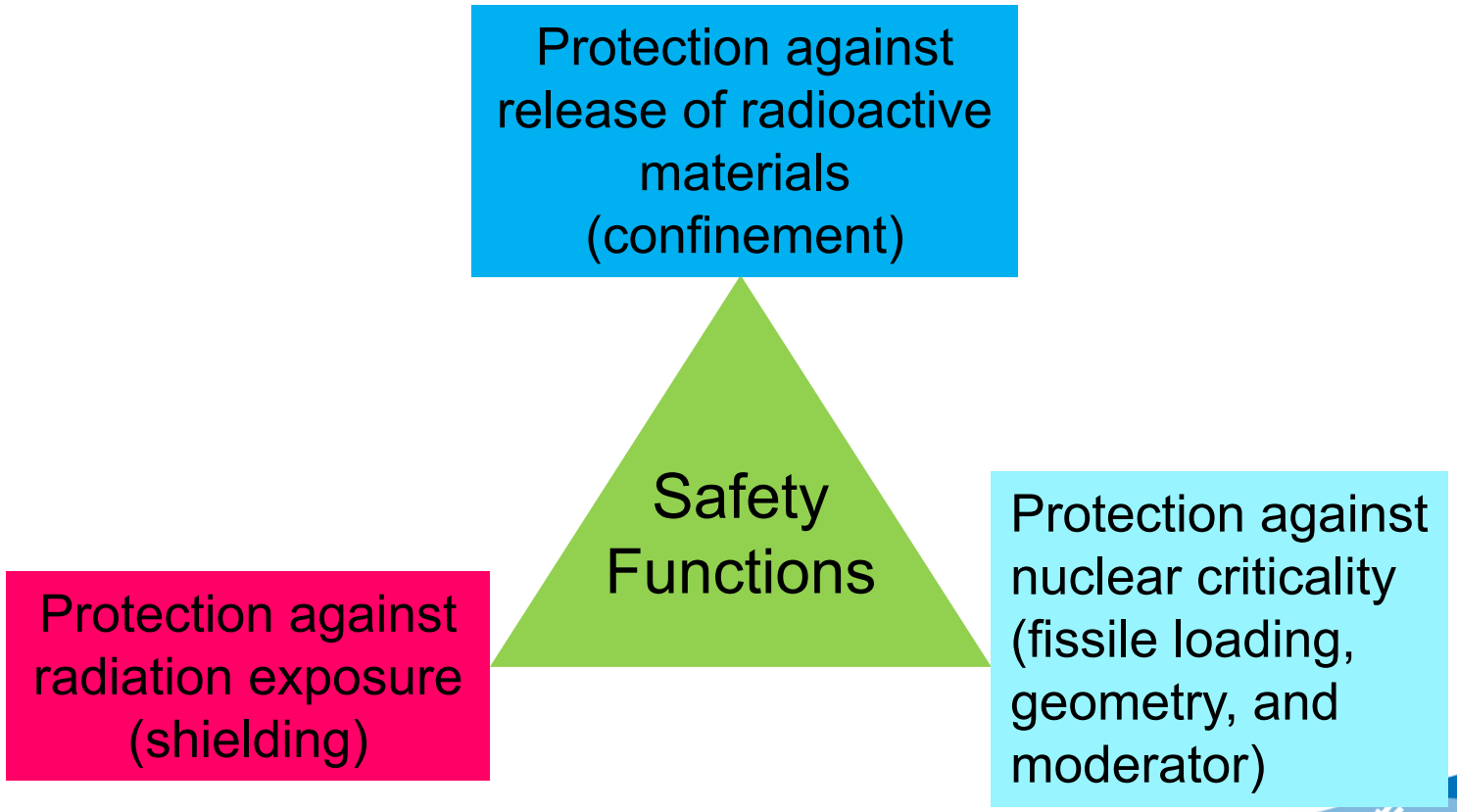
Loading and Transfer

Storage in ISFSI

Transfer and Unloading

Defense-In-Depth

(Three Main Safety Functions in Dry Spent Fuel Storage)



Defense-in-Depth

(Three levels of safety)

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Level 1, Prevention

- site selection
- engineered barriers (cladding, canister, overpack)
- procedures and monitoring

Level 2, Mitigation

- accident assessment
- perform remedial actions
- repair confinement

Level 3, Emergency Actions

- accident detection/assessment
- notification
- protective response

Possible Risk Assessment Approach

- Operational Phase [Storage]
  - Safety Function [Confinement]
    - Components of Defense [Canister]
      - Key Components [Primary Confinement]
        - Sub-components [Lid-to-Shell Weld]
          - » Data

1) **Expert Opinion**
2) **Operating Experience**
3) **PRAs/HRAs**

Failure Mechanism	Failure Frequency	Failure to Detect	Consequence	Risk
Delayed Hydrogen Cracking	Low	High	Low	Low

Path Forward

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- Develop a qualitative approach informed by:
  - Quantitative data from previous PRAs and other sources
  - Operating experience
  - Uncertainties due to aging and other unknowns
  - Linking licensing and certification to the three principle safety functions
- Will include:
  - Developing a decision criteria
  - Developing implementation plan for a pilot
  - Collaboration with stakeholders