



U.S. DEPARTMENT OF  
**ENERGY**

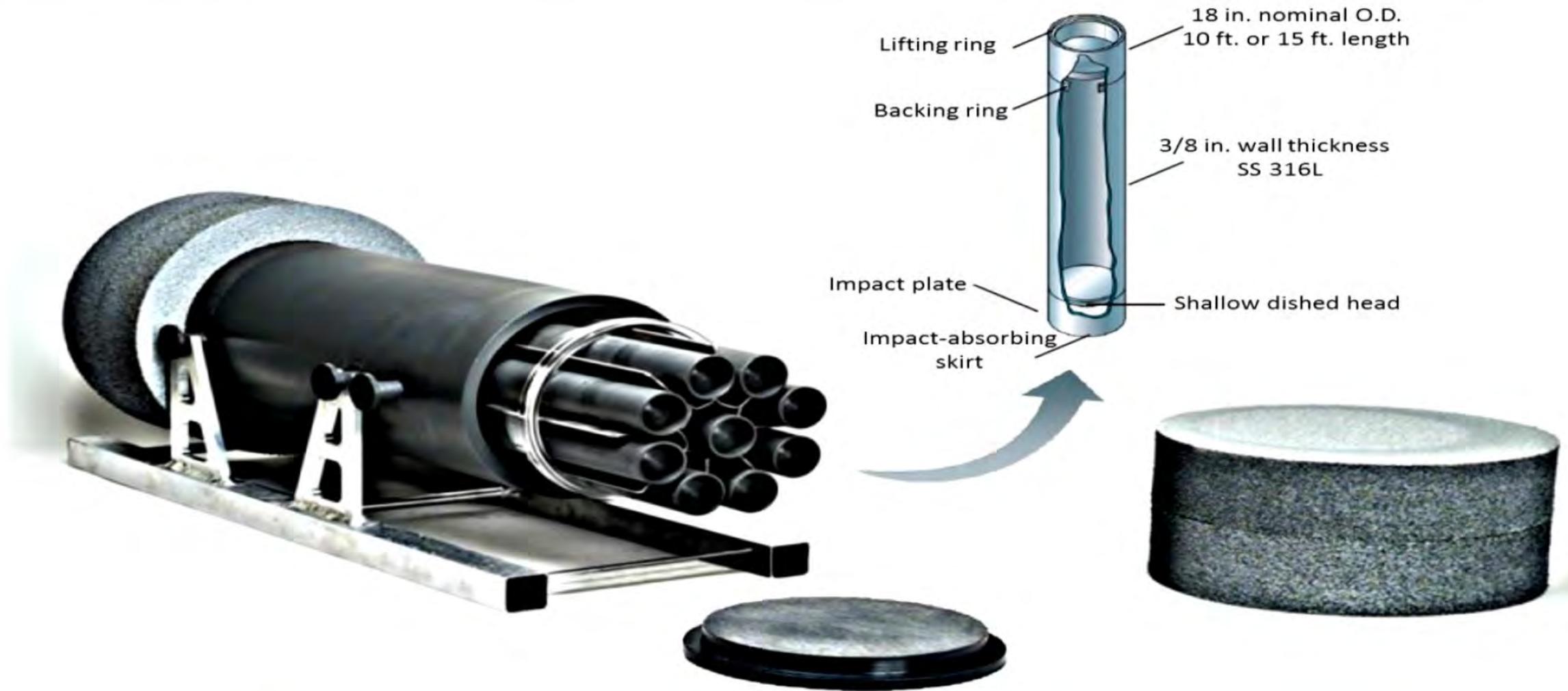


# Aluminum Spent Nuclear Fuel (ASNF) Dry Storage Technology Challenges

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*The SRS **Citizen's Advisory Board (CAB)**  
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# Dry Storage Overview



Envisioned transportation package for the U.S. Department of Energy standardized canister.

# Oxide Layers

- **Aluminum Surface Oxide Layers**
  - Reactor Operations
  - Post-Discharge Storage
- **Large Surface Area**
- **Oxide Layers Absorb Water**
  - Potential for Pressure
  - Potential for Flammable Gas
  - Potential for Corrosion



*High Flux Isotope Reactor Fuel Element*



*Research Reactor fuel in bad quality water*



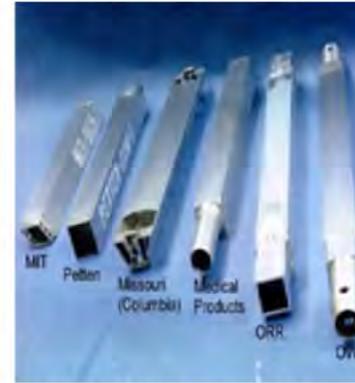
*Corrosion debris from Gibbsite/Bayerite in vented dry storage*

# Challenges – DOE ASNF Comparison to Commercial SNF

- **ASNF is Mostly Highly Enriched Uranium (HEU)**
  - Need criticality control
  - Security challenges
- **AI has Challenging Physical Characteristics**
  - More Susceptible to Corrosion than Zr, SS
  - Lower Melting Temperature than Zr, SS
    - *Heating Challenges to Remove all water*



*Research Reactor fuel in good quality water (Brazil)*



**Research Reactor Fuel**



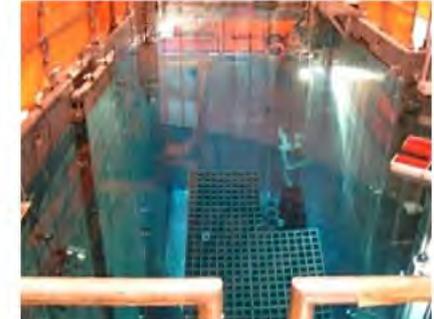
**RR Fuel in Wet Storage**



**RR Fuel Dry Storage Facility**



**Power Reactor Fuel**



**PR Fuel in Wet Storage**



**PR Fuel in Storage Casks**

# Closure of Technology Gaps

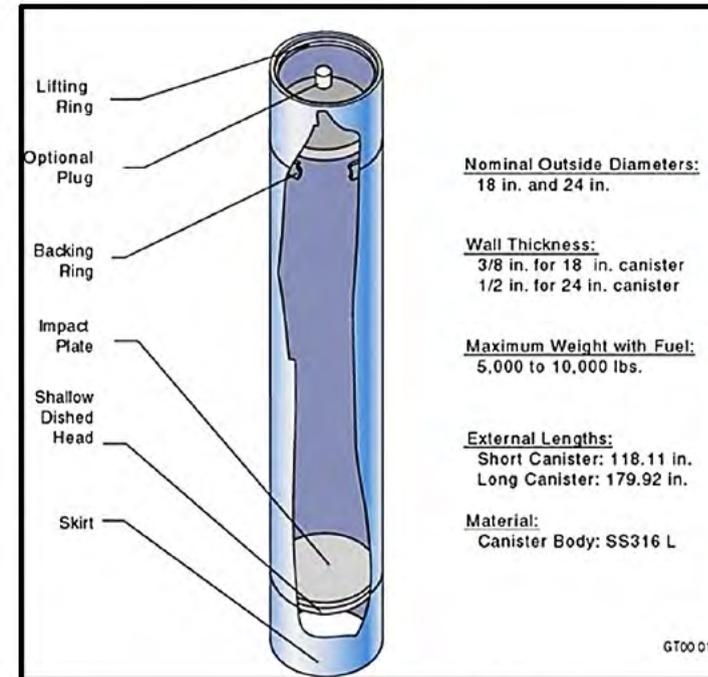
- 2017 Report on Technology Gaps & Path Forward
- SRNL/INL Collaboration
- Laboratory Studies/Modeling/Demonstration
  - Develop Defensible Drying & Canister Loading Approach
    - Testing Range of Oxide Layers (lab & actual)
    - Modeling
    - Heat & Radiolytic Tests
    - Pursue Drying Tests



Uruguay Fuel Plates



Hot Wall Test: Oxide Growth



Standardized DOE Spent Nuclear Fuel Canister