National Spent Nuclear Fuel Program

Criticality Analysis for DOE Standardized Canisters

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Providing for safe, efficient transportation of DOE spent nuclear fuel

Outline

- *Overview*
- *Analyses assumptions*
- *Basket and Standardized Canister*
- *Analyses*
- *Summary*

Overview

- *Analyses bound all spent nuclear fuels packaged in the Standardized Canister using theType 1a basket*
- *ATR spent nuclear fuel establishes the boundary*
- *Standardized Canister provides moderator exclusion for criticality analysis*
- *Single Standardized Canister analyses*
  - *Extensive analyses with varying geometries*
  - *Degraded fuel in a cylinder geometry provides bounding case*
- *Analyses of a close-packed array*

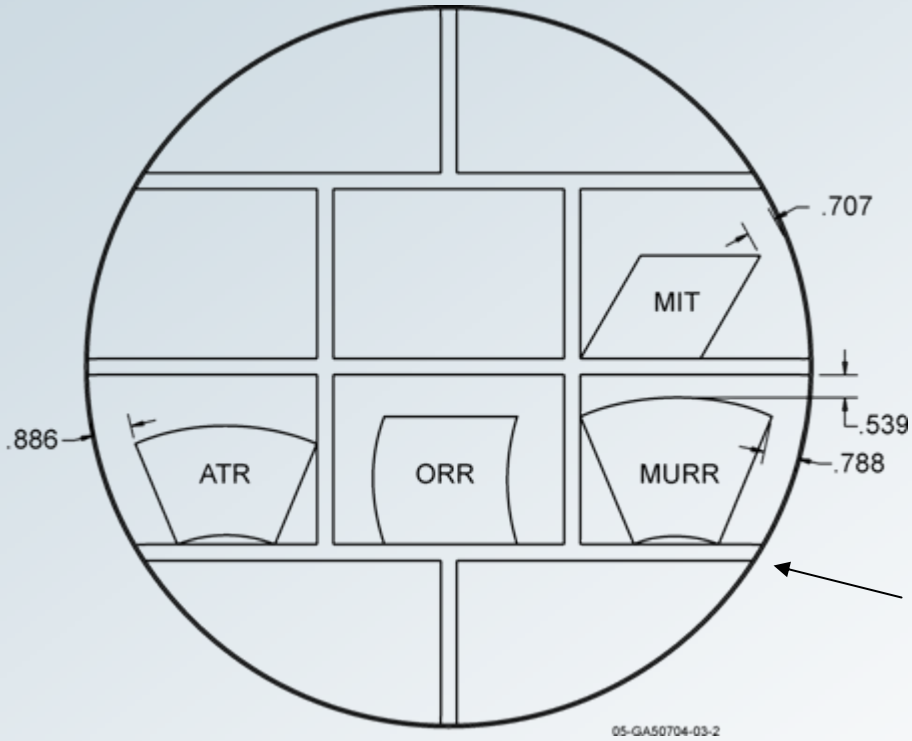
Analysis Assumptions

- *Each loaded Standardized Canister is treated as a closed system*
  - *Beginning-of-life fissile content*
  - *Fixed canister volume*
- *ATR fuel represents maximum total fissile mass*
- *Analyses assume 11 vol % water*

Analysis Assumptions (continued)

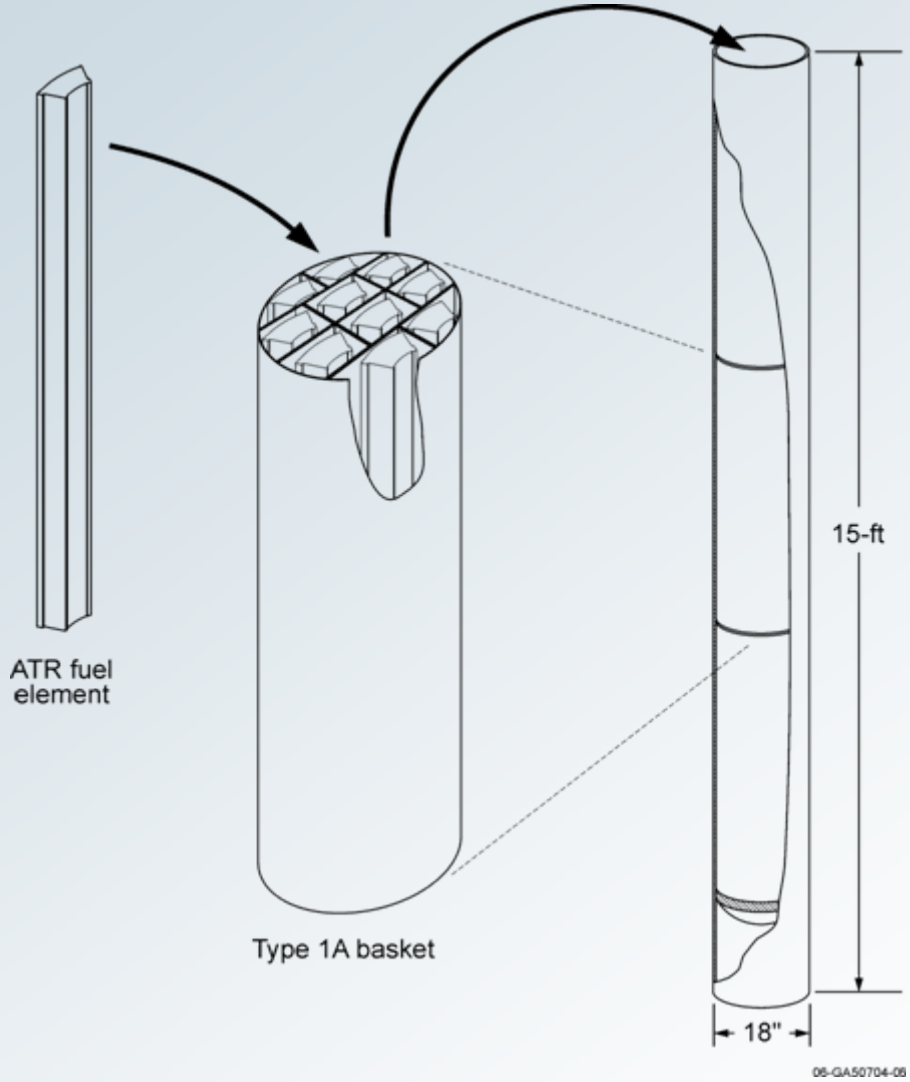
- *Loss of geometry*
  - *All fuel rubblized and retained within the Standardized Canister*
  - *Vertical Standardized Canister orientation represents most reactive system due to axial reconfiguration*
- *Effects of neutron poisons minimized*

Type 1a 18-inch Diameter Basket



Advanced Neutron Absorber

Standardized Canister and Basket Loading



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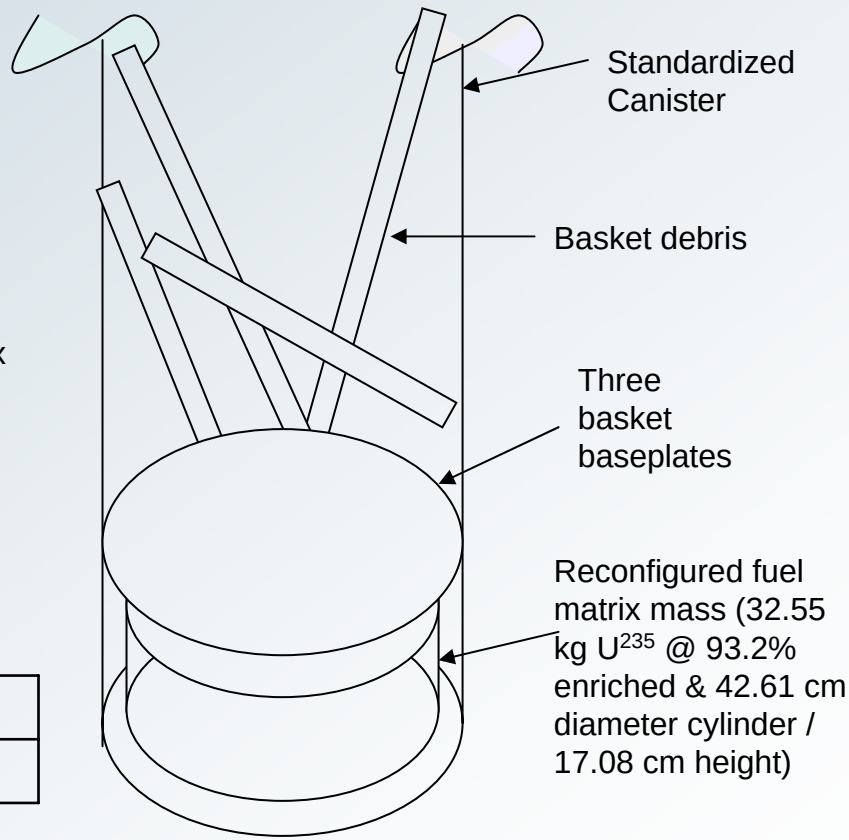
Criticality Analyses Matrix

Single Canister#	Increasing Degradation
Fuel is horizontally reconfigured and settled	
Fuel is vertically reconfigured and settled	
Basket compartment plates reconfigured - horz. drop	
Basket compartment plates & fuel reconfigured - vert. drop	
Baskets w/ Gd separated from fuel - fissile sphere formed	
Baskets w/ Gd separated from fuel - fissile cylinder formed	
9-Canister Array	
No water leakage into cask cavity	
10% water density within cask cavity	
Cask cavity flooded	

Fuel Rubblization Forming a Cylinder

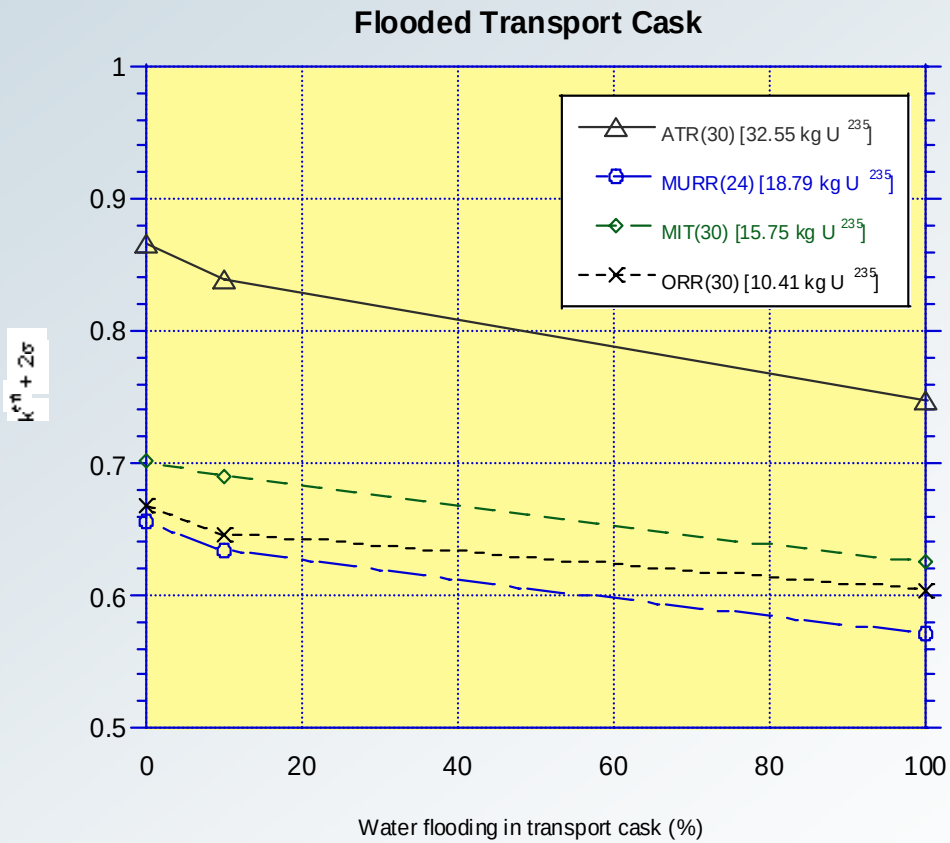
- 30 ATR fuel assemblies rubblized
- Standardized Canister is fully water reflected
- 11 vol% water saturation of fuel matrix



Configuration	k_{eff}
cylinder w/ 11% H_2O	***0.6249***

(This configuration analyzed in subsequent 9-pack inside a transport cask)

Flooded transport cask with nine Standardized Canisters



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Summary

Based on leak-tight Standardized Canister criticality safety analysis demonstrates significant safety margins

Meeting Agenda

10:00 a.m.	Introductions
10:10 a.m.	Meeting Objectives
10:30 a.m.	DOE-EM SNF Canister Integrity
11:00 a.m.	DOE-EM Canister Criticality Safety
11:15 a.m.	**Summary and Conclusions**
11:30 a.m.	Staff Feedback
11:45 a.m.	Public Comments
12:00 p.m.	Adjourn