Cross-Cutting Integration DR/ST/IWM

SAND2019-xxxx

SFWD

Spent Fuel & Waste Disposition

Annual Working Group Meeting
UNLV-SEB – *Las Vegas, Nevada*
May 21-23, 2019

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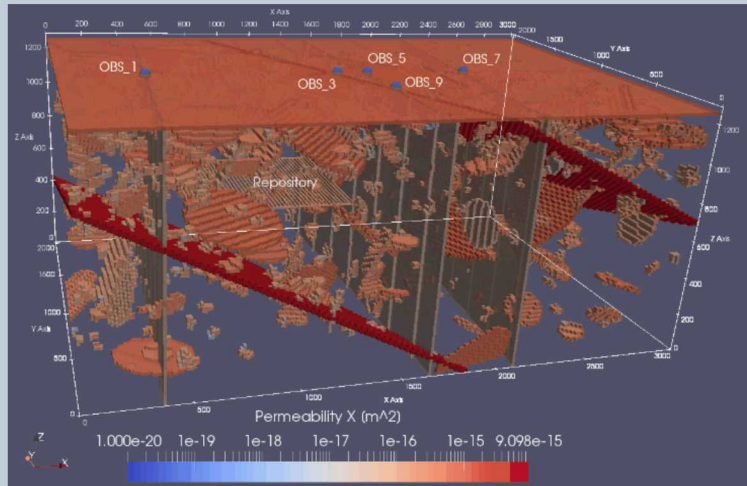


This is a technical presentation that does not take into account the contractual limitations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961). For example, under the provisions of the Standard Contract, DOE does not consider spent nuclear fuel in multi-assembly canisters to be an acceptable waste form, absent a mutually agreed to contract amendment. To the extent discussions or recommendations in this presentation conflict with the provisions of the Standard Contract, the Standard Contract provisions prevail.

TECHNICAL INTEGRATION – DR/ST/IWM

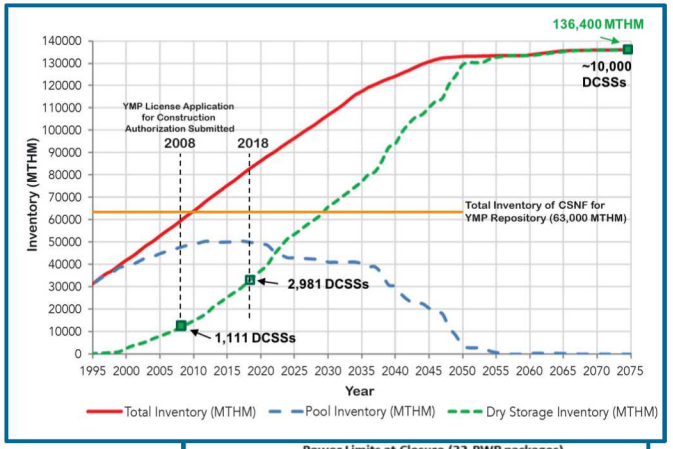
- Objectives
  - Promote identification and awareness of topical areas where there are opportunities for information sharing and integration between DR, ST, and IWM
  - Facilitate cross-cutting discussion, consistency, and collaboration in these topical areas

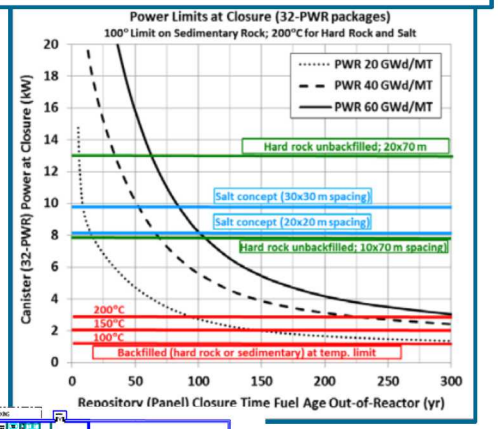
Technical Integration – Sessions

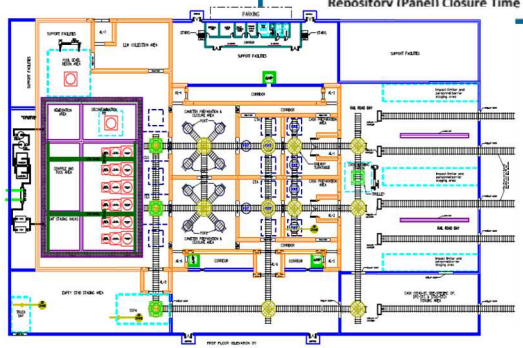
- Tuesday
  - 10:20-11:45am: DR Integration (D. Sevougian)
  - 10:20-11:45am: Standardization Path Forward (IWM/DPC)
  - 03:30-05:30pm: Inventory, Characteristics, and Databases (IWM)
- Wednesday
  - 08:00-10:00am: Triple Purpose Canister R&D (IWM/DPC)
  - 10:20-11:30am: Onsite Fuel Handling and Remediation (J. Carter)
  - 03:20-05:15: DPC Direct Disposal (E. Hardin)
- Thursday
  - 08:00-09:00am: Transport Collaboration ST/IWM (E. Kalinina)
  - 09:00-10:10: ST/IWM Collaboration Open Forum
  - 10:30-11:30: DR Synthesis and Integration

Topical Areas

- Direct Disposal of DPCs
  - Cost tradeoffs (repackaging)
  - Thermal management
  - Operations (handling/emplacement)
  - Criticality consequence and mitigation
  - Postclosure process and PA modeling
    - cladding, in-package TH and chemistry, …
- Standardization / IWM Facilities and Equipment / System Analyses
- Inventory
  - OWL, UNF-ST&DARDS, Nati
- Waste Form Degradation
  - FMDM, cladding behavior, fuel-in-air

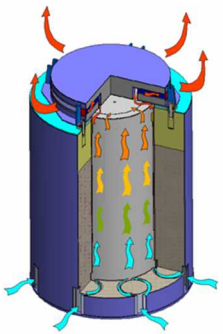


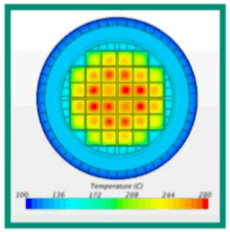




Topical Areas

- Cladding integrity (extended storage)
- Canister integrity (extended storage)
  - Cold spray, friction stir welding
  - SCC, consequence analysis of cracks
  - Gas, dust, thermal sampling
- Canister thermal performance
  - Peak cladding temperatures
  - Thermal lifetime modeling (storage, transport, and disposal)
- Transportation
  - Loads
  - Rail car design
- Standards (ASME, ASTM)

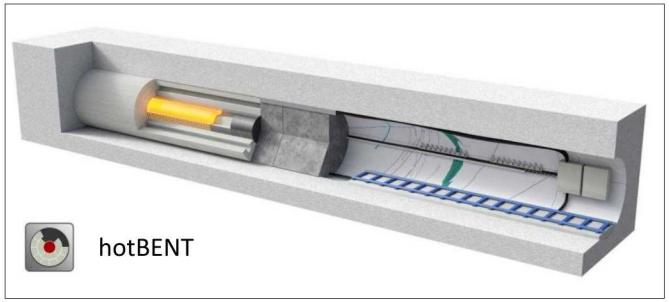




Topical Areas

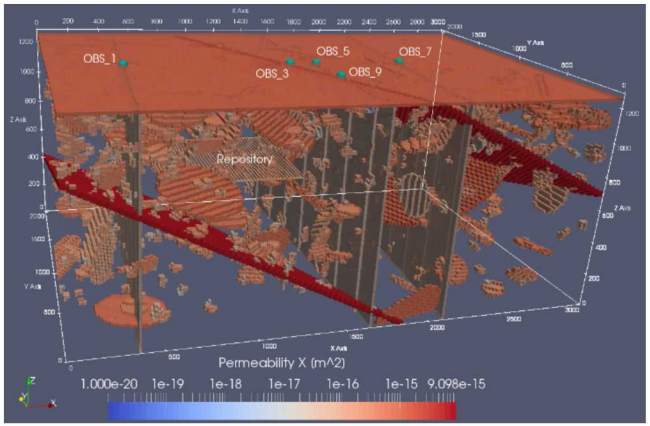
- 2019 Roadmap Update high priority topics:
  - High-temperature processes
  - Criticality
  - Waste package degradation
  - In-package chemistry
  - Gas Flow in the EBS (assumes gas generation)

Field and Lab



- A few associated high priority activities:
  - New waste package concepts and models
  - Post-closure DPC criticality analysis
  - THMC modeling of DPC disposal
  - SNF degradation testing
  - Waste package degradation testing

Modeling

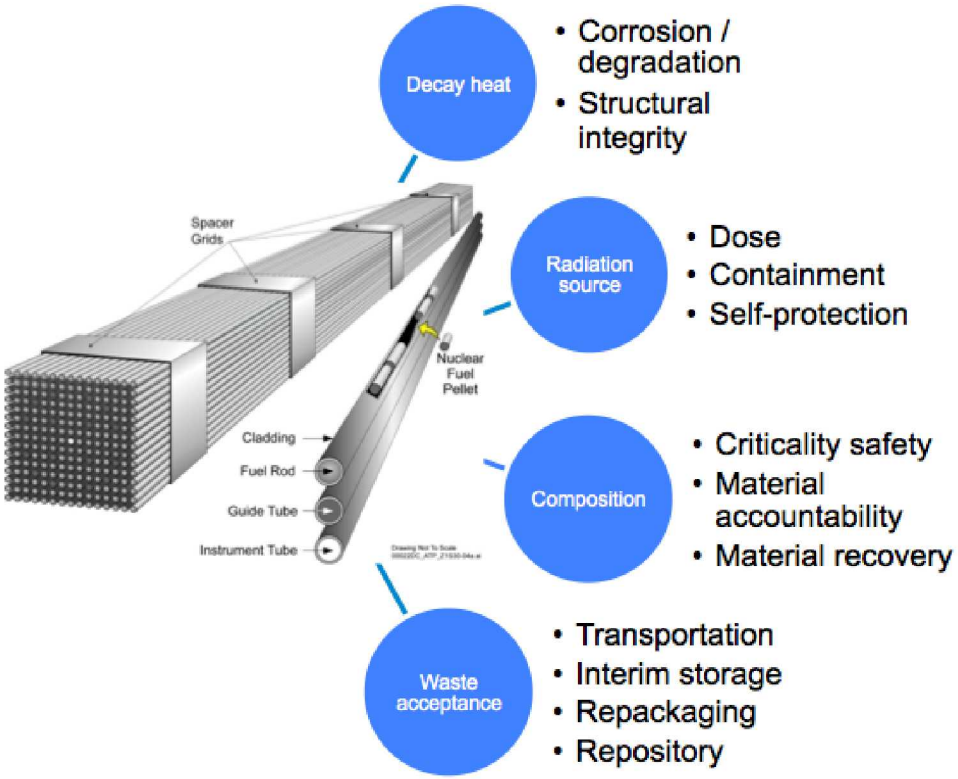


Integration Examples

- Areas where teams can use consistent:
  - description of design features, physical phenomena, and couplings, as well as the description of the waste forms, packaging, and facility features and equipment barrier system
  - consistent assumptions, technical bases, data, and models
  - consistent boundary and initial conditions where appropriate
- Areas where teams can leverage each others' data, models, and analyses to "move the ball down the field"

Example: Consistent Initial SNF characteristics are available to Modelers and analysts

- SNF and related systems characteristics can be categorized into:
  - Base Characteristics: fuel geometry, materials, reactor irradiation histories (e.g., cycle length, specific power etc.), cask system, cask loading patterns used to store SNF
  - Derived Characteristics: decay heat, isotopic composition, radiation sources, cask criticality, transportation cask dose rates



Example: SNF cladding – pellet system data and Models Can be leveraged

- Mechanical models and data developed from sister rods can be used as foundation for models needed for storage and transportation analyses and for material handling facilities and equipment
- Improved estimates of failed cladding/fuel quantities that may be handled at a packaging facility are possible
- Decades old assumptions and data on the behavior of SNF in air can be challenged and spent fuel degradation models for surface facilities and repository performance assessments can be revisited.

Questions?

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