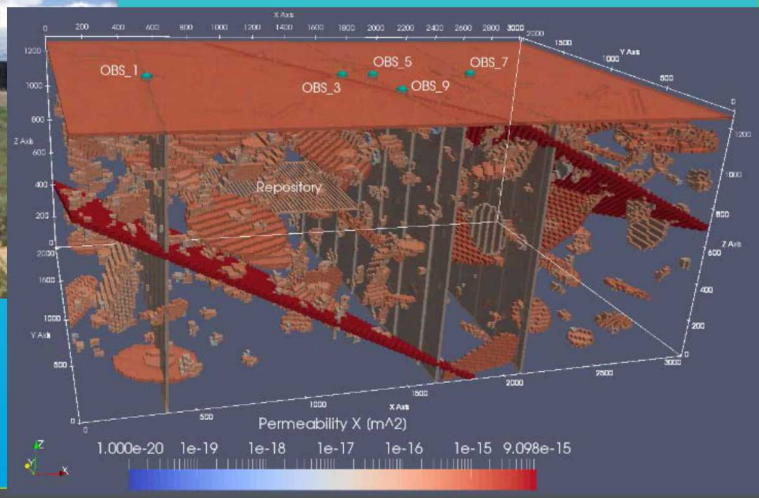
Department of Energy Office of Nuclear Energy

Spent Fuel and Waste Science and Technology R&D Campaign (SFWST)

SAND2019-4475PE



Overview of the Spent Fuel and Waste Science and Technology R&D Campaign

Peter Swift
SFSWT R&D National Technical Director
Albuquerque, NM
April 26, 2019

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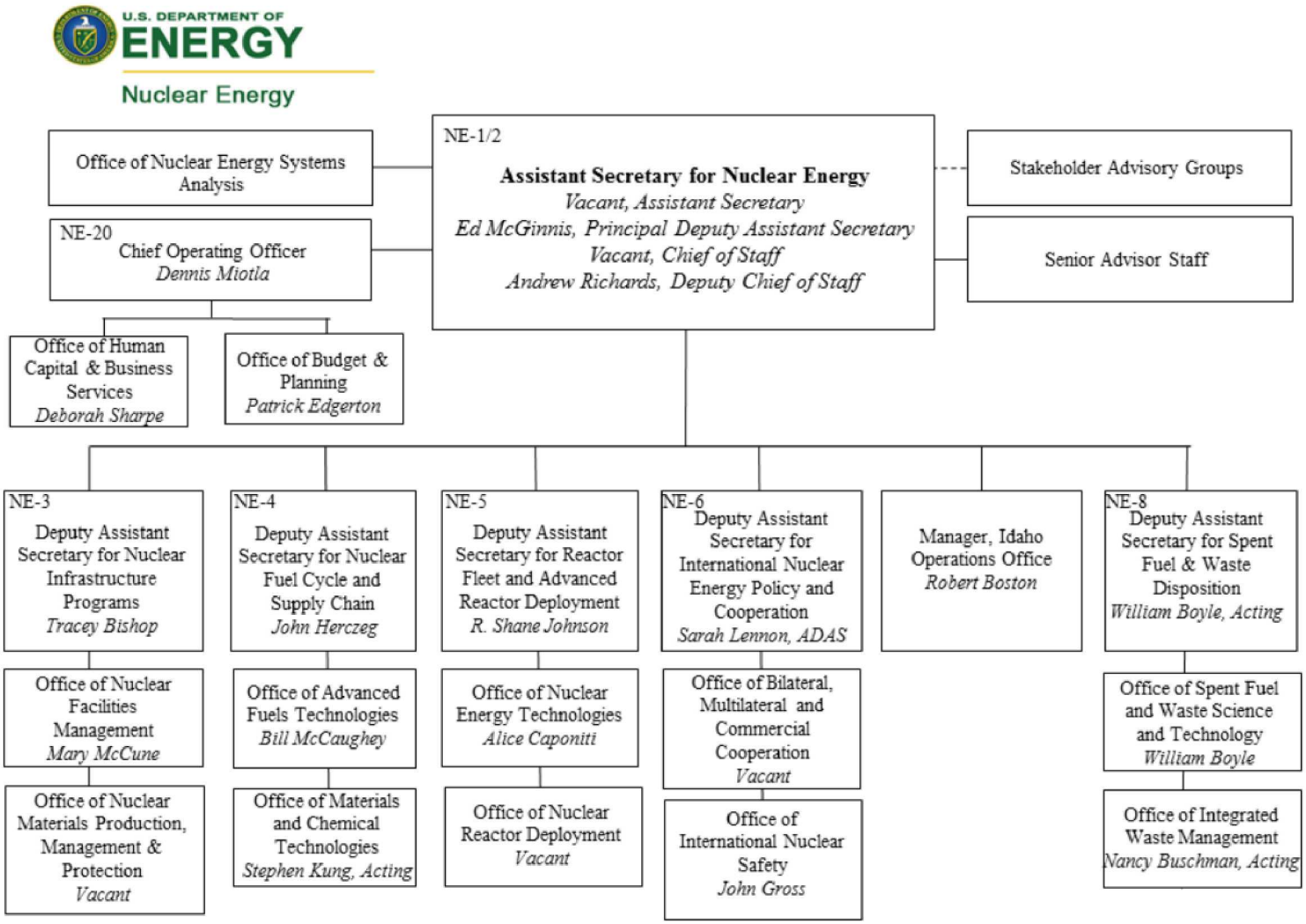
DOE NE Organization

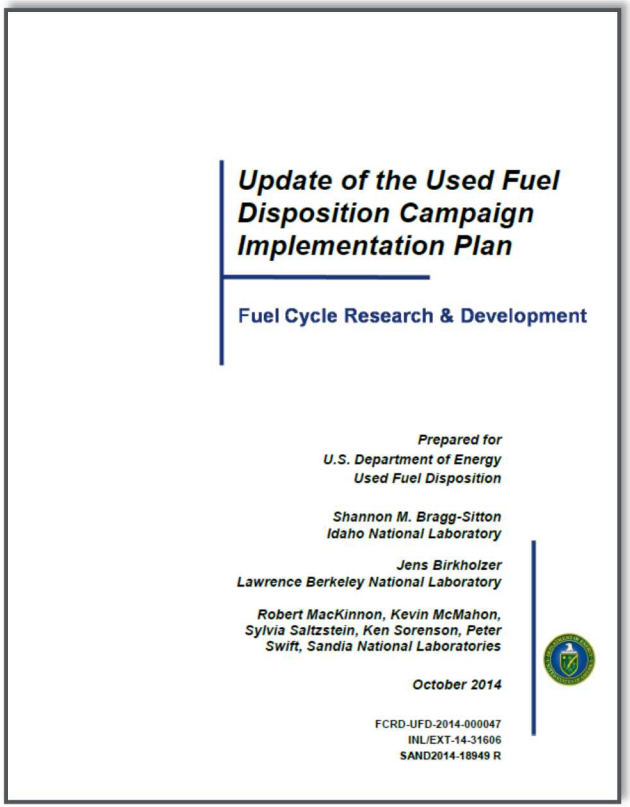


SFWST R&D Mission

The mission of the Spent Fuel and Waste Science and Technology Disposition Campaign is to identify alternatives and conduct scientific research and technology development to enable storage, transportation and disposal of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles.

Update of the Used Fuel Disposition Campaign Implementation Plan

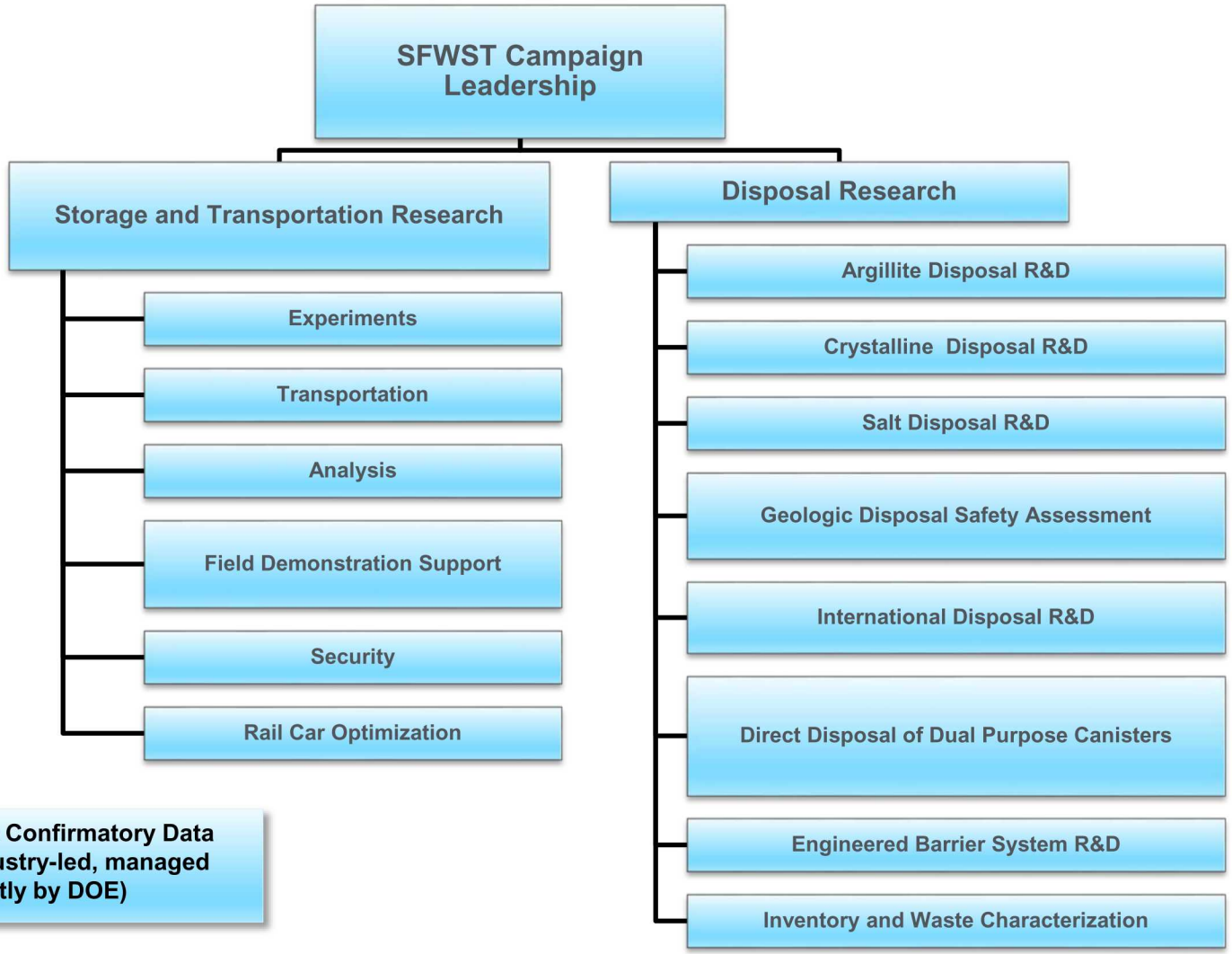
FCRD-UFD-2014-000047, October 2014



Spent Fuel and Waste Science and Technology Campaign

- Managed by the NE Office of Spent Fuel and Waste Science and Technology (SFWST)
- Formerly referred to as the “Used Fuel Disposition” Campaign
- Nine national laboratories support the campaign

FY 18 SFWST R&D Campaign Structure (from PICS NE 1.08.01)



High-burnup Confirmatory Data Project (industry-led, managed directly by DOE)

Campaign Strategic Focus: Storage and Transportation R&D

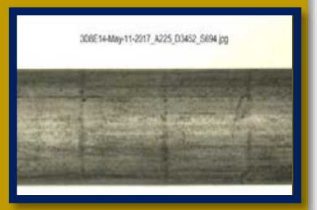
Prepare for extended storage and eventual large-scale transport of spent nuclear fuel and high-level waste

- Support the technical basis for evaluating:
  - Extended storage of spent nuclear fuel
  - Fuel retrievability and transportation after extended storage
  - Transportation of high-burnup spent nuclear fuel

S&T R&D is Driven by the 2017 Internal Gap Analysis & NEI R&D Priorities and Is Enhanced by the Demo Data

We have fuel in hot cells.

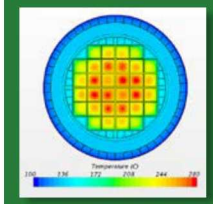
We completed non-destructive tests.



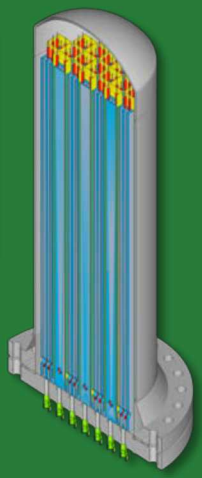
We are starting destructive analysis.

SISTER ROD MECHANICAL TESTING DATA

We have thermal models.



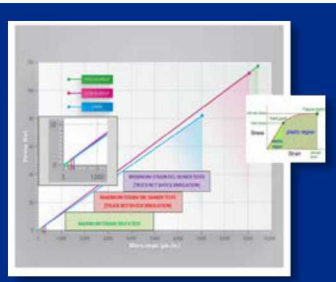
We are getting new thermal data from the Demo.



We will build a test apparatus to identify thermal conservatisms & develop more realistic assumptions.

THERMAL BEHAVIOR

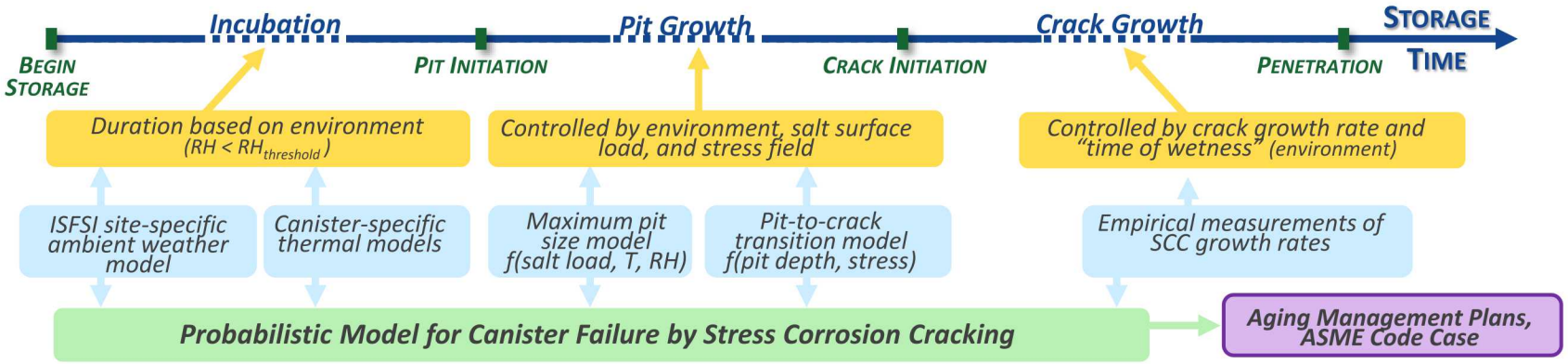
PROVIDES KNOWLEDGE ABOUT SPENT FUEL INTEGRITY WHICH IS COMPARED TO DATA FROM THE TRANSPORTATION TESTS



SPENT FUEL TRIATHLON:
QUANTIFICATION OF NORMAL TRANSPORT SHOCKS & VIBRATIONS

Stress Corrosion Cracking R&D

Evaluate Time Dry Storage Canisters Can Be Safely Stored as a Function of ISFSI Location

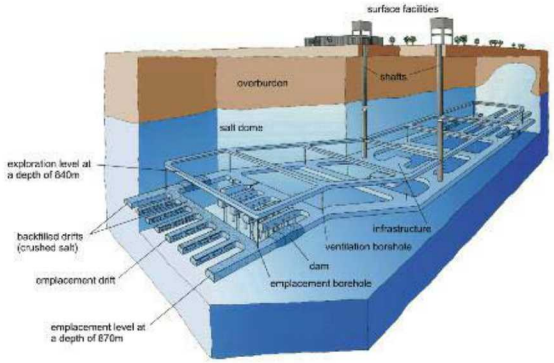


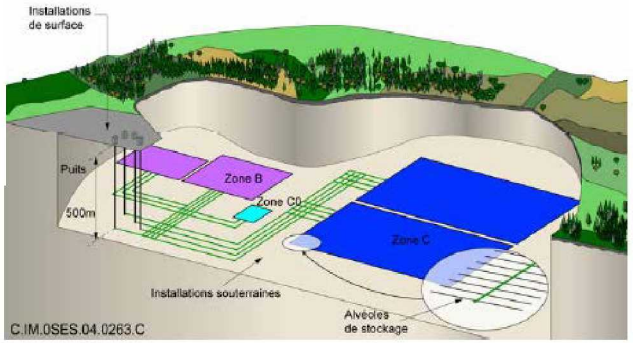
CURRENT AND FUTURE WORK IN EACH OF THE ABOVE AREAS

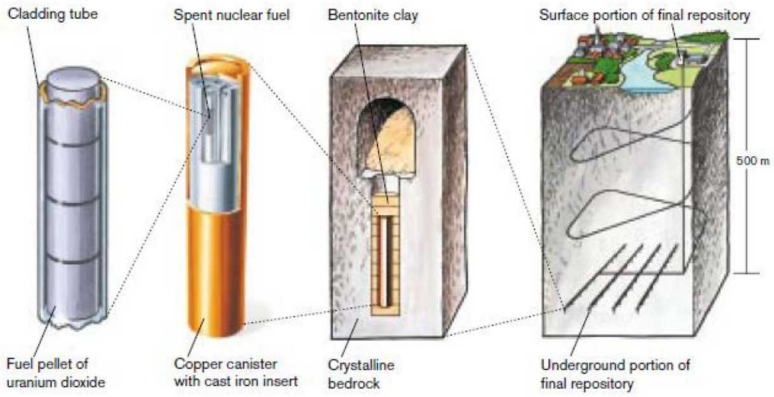
- *SNL — Surface environment, brine stability*
- *SNL/Ohio State Univ. — Pitting initiation/growth, pit-to-crack transition*
- *CO School of Mines (CSM)/SNL — Pitting initiation/growth (effect of stress)*
- *SNL/LANL — mockup pitting/cracking*
- *CSM — Pit-to-crack transition (modeling)*
- *NC State U (SNL) — SCC growth rates*
- *Ohio State Univ. (SNL) — SCC growth rates*
- *SRNL — SCC growth rates*

Campaign Strategic Focus: Disposal R&D

- Provide a sound technical basis for multiple viable disposal options in the US
- Increase confidence in the robustness of generic disposal concepts
- Develop the science and engineering tools needed to support disposal concept implementation

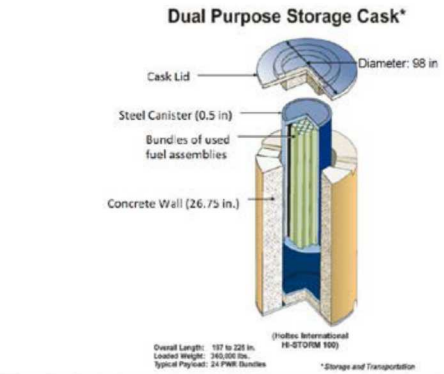




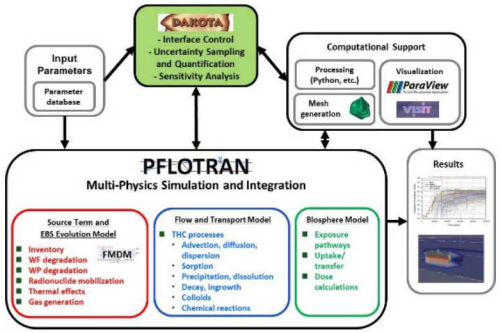


Emphasis for FY19 Disposal R&D

- Options for Dual Purpose Canisters
  - Continue analysis of potential for postclosure criticality
    - Conduct postclosure criticality consequence analysis
    - Analyses of DPC fillers for criticality control
    - Modeling of DPC postclosure performance including fillers
    - Design enhancement options for existing and future DPCs
  - Geotechnical considerations for postclosure performance
- Geological Disposal Safety Assessment (GDSA)
  - High performance computing of system performance (PFLOTRAN)
  - Uncertainty Quantification and Sensitivity Analysis tools
  - Performance assessment inventory of DOE-managed wastes
- Enhanced R&D and International Collaborations to support disposal concepts in multiple geologic media
  - Heated borehole field test in salt at WIPP
  - Experimental and modeling activities in salt, argillite, and crystalline rock



Example of a dual-purpose canister inside a storage overpack (cask) (modified from Easton 2011).



Questions?