



U.S. DEPARTMENT OF
ENERGY

OFFICE OF
**ENVIRONMENTAL
MANAGEMENT**

Department of Energy Owned Spent Nuclear Fuel Integration

Ken Picha

Senior Advisor for Environmental Management

*Nuclear Waste Technical Review Board Meeting
August 24, 2016*

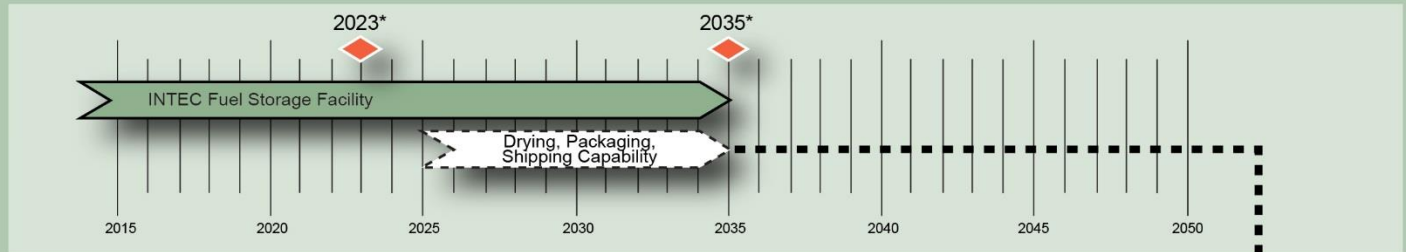


- Spent Nuclear Fuel (SNF) Mission/Vision
- Environmental Management (EM) SNF Overview
 - Hanford
 - Idaho National Laboratory (INL)
 - Savannah River Site (SRS)
- Future Direction
 - Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste
 - SNF Working Group
- Summary/Conclusion

- Safe and secure operations in a cost-effective manner
- Protect human health and the environment
- Work with all stakeholders to comply with legal agreements
- Collaborate with international community to support U.S. non-proliferation objectives
- Achieve SNF management

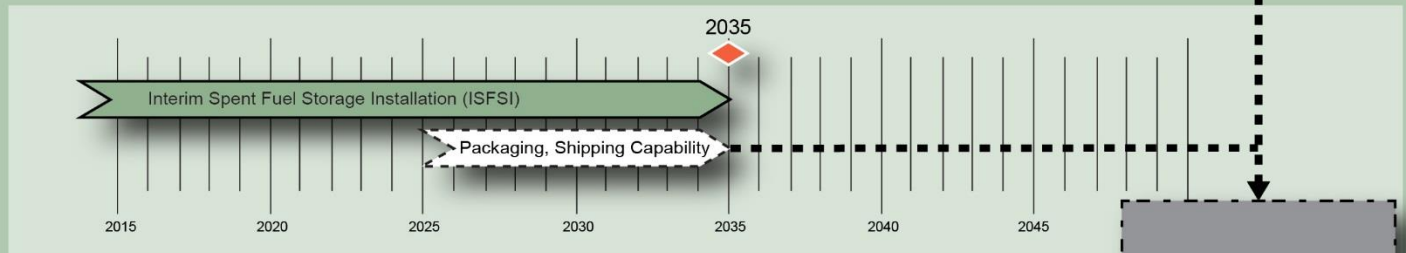
DOE EM Spent Nuclear Fuel Overview

Idaho National Laboratory (~265 MTHM)



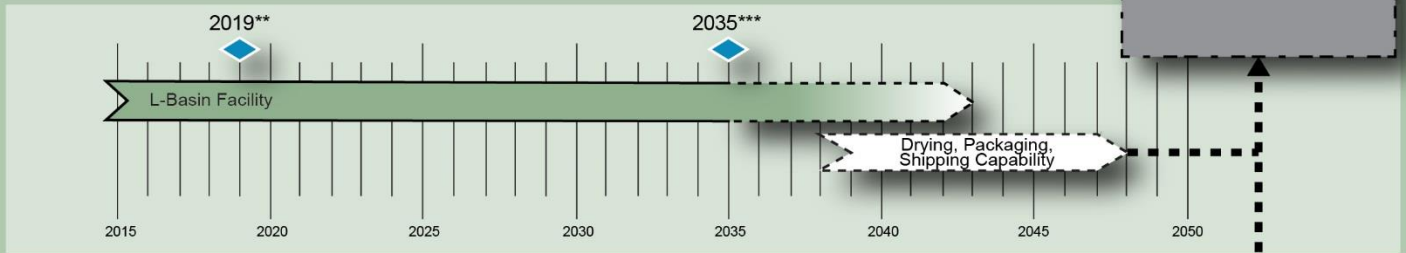
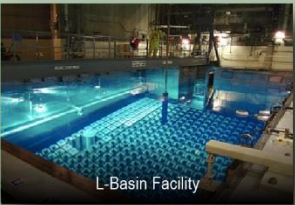
*Settlement Agreement requires dry storage of all SNF by 2023 and removal of all SNF from Idaho by 1/1/2035

Fort St. Vrain (~15 MTHM)



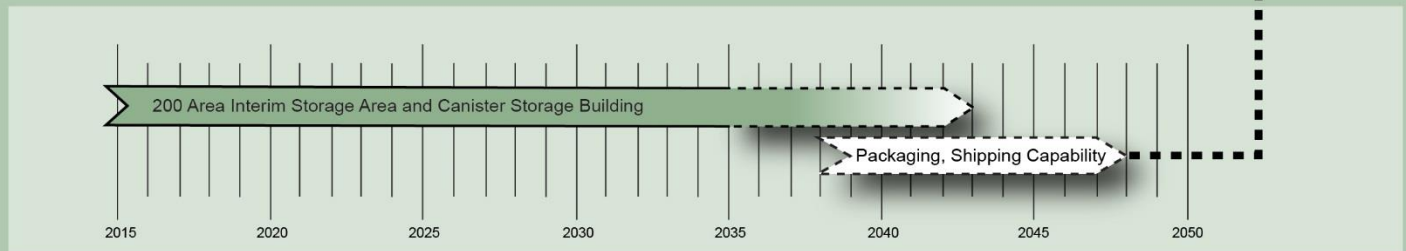
*Settlement Agreement requires removal of all SNF from Colorado by 1/1/2035

Savannah River Site (~30 MTHM)



FRR Program ends 2019 *DRR Program expected to continue through 2035

Hanford Site (~2,130 MTHM)



For illustrative purposes only.

Source of SNF in DOE Inventory

- DOE production reactors (majority of inventory)
- Core debris from the Three-Mile Island Reactor
- Commercial power demonstration projects
 - Shippingport Atomic Power Station, Shippingport, Pennsylvania
 - Peach Bottom Atomic Power Station, Peach Bottom Township, Pennsylvania
 - Fort Saint Vrain Generating Station, Platteville, Colorado
- Foreign Research Reactors (FRR) – 41 countries
- Domestic Research Reactors (DRR)
 - Includes DOE labs, Universities, and other Government agencies

Hanford Site, Washington

- ~ 87% by weight, 14% by volume of DOE inventory
- All SNF has been moved from wet to dry storage
- SNF is safely stored in ~400 Multi-canister Overpacks and other dry casks
- Safely stored awaiting disposition



Dry Cask Storage

Canister Storage Building



- ~12% by weight, 53% by volume of total DOE inventory (includes Ft. St. Vrain)
- Diverse inventory of SNF
 - Includes sodium-bonded, graphite based, and SNF from Three Mile Island (in an Nuclear Regulatory Commission-licensed facility)
- Advanced Test Reactor continues to generate SNF
- Idaho Settlement Agreement
 - SNF in dry storage by 2023
 - SNF out of Idaho by January 1, 2035

INTEC SNF Facilities



Idaho Nuclear Technology and Engineering Center

Fort St. Vrain, Colorado

- Continue to receive FRR (until 2019) and DRR
 - Non-aluminum clad fuel (primarily TRIGA fuel)
 - Currently all shipments into Idaho are suspended until treatment of remaining sodium bearing liquid waste is completed (missed Settlement Agreement milestone)



Cask
Pad

Addressing Idaho SNF Issues

- EM consolidated SNF from 11 storage sites across INL to Idaho Nuclear Technology Engineering Center from 1997 - 2005
- All EM SNF in dry storage as of 2010
- Closed 5 of 6 wet storage pools
- EM working with Navy and NE
 - Removal of EBR II SNF (NE) from wet to dry storage by 2020
 - Move 1,000 ATR (NE) elements from wet to dry storage
 - Remove all Navy fuel from wet (CPP-666) to dry storage by 2018

Wet to Dry Storage at Idaho

SNF Wet Storage Facility	Date Emptied
TRA-660, ARMF/CFRMF Canal*	10/28/1997
CPP-603, Basins*	04/28/2000
TRA-603, MTR Canal & Plug Storage*	09/24/2002
TAN-607, Basin*	09/29/2002
PBF-620, Pool*	09/15/2003
CPP-666, Basins (EM-managed SNF)	06/06/2010

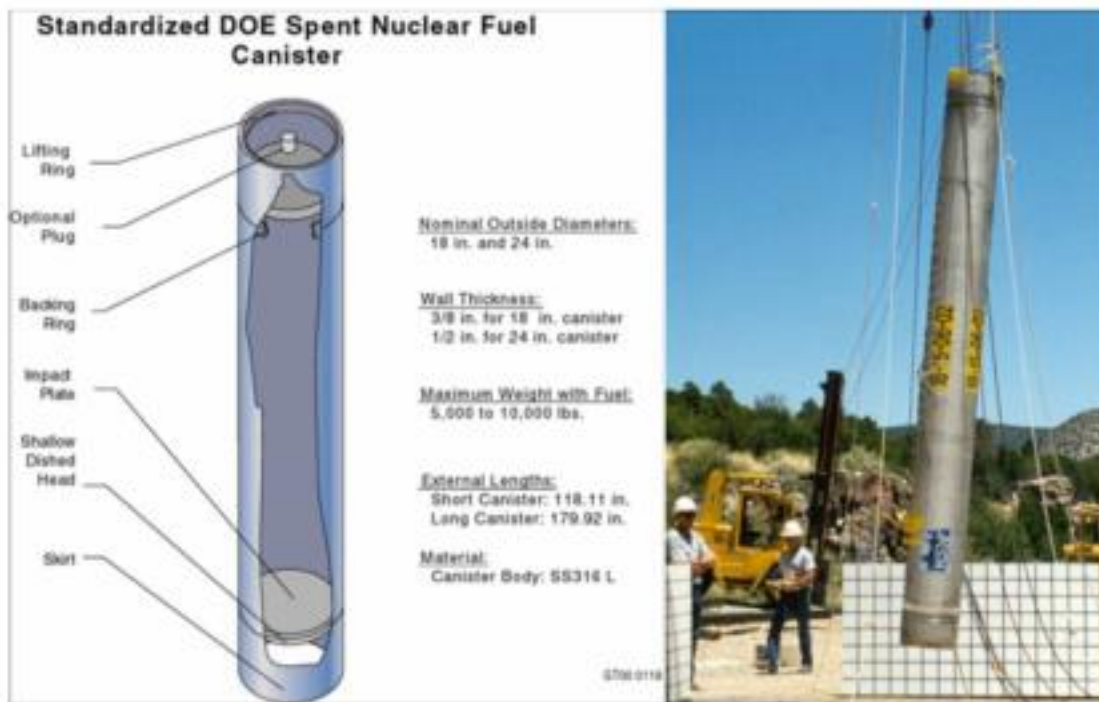
(* Closed)

Making SNF 'Road Ready' at Idaho

- Under the Idaho Settlement Agreement, DOE is required to remove all SNF from Idaho by Jan. 1, 2035
- DOE is performing initial planning to make the SNF stored at INL 'road ready' to meet the Settlement Agreement milestone
- Plans include packaging variety of DOE-managed SNF into standardized canisters for future management

Making SNF 'Road Ready' at Idaho

Standardized DOE SNF Canister

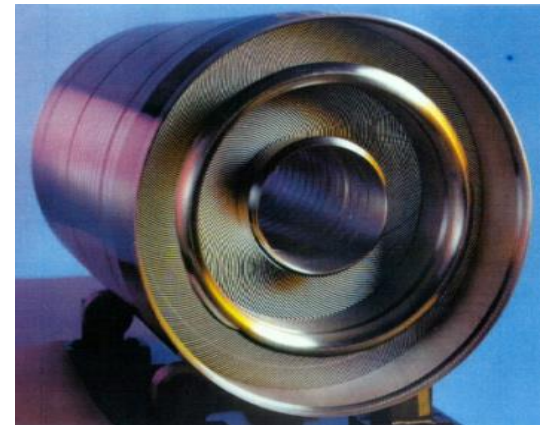


Savannah River Site, South Carolina

- ~1% by weight, 31% by volume of DOE inventory
- All SNF in wet storage (L-Basin)
 - Implementing Augmented Monitoring & Condition Assessment Program in addition to existing maintenance activities
- Continue to receive FRR (until 2019) and DRR
 - Aluminum-clad SNF only
 - Includes High Flux Isotope Reactor (HFIR) Fuel – temporarily suspended due to storage capacity

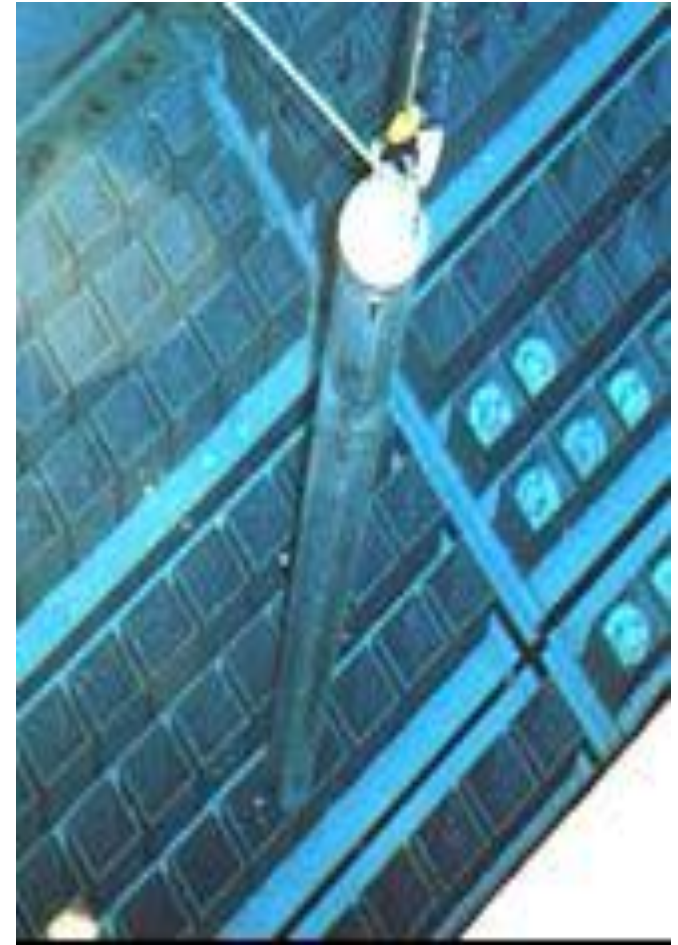


Wet storage at L- Basin



HFIR Fuel (Office of Science)

- In March 2013, DOE decided to process limited quantity of aluminum-clad fuel (including HFIR) & target residues
 - Generates extra storage capacity (especially for HFIR fuel)
 - Economic benefits (converts separated HEU to LEU for commercial use with proceeds back to Federal Government)
 - Non-proliferation benefits



Typical Material Test Reactor Fuel

Foreign Research Reactor Spent Fuel Acceptance Program

- Supports the U.S. non-proliferation policy under global threat reduction initiative
- Program initiated in 1996 w/41 countries
- ~ 9,800 SNF Assemblies Received
- Aluminum-clad fuel to SRS (majority of shipments)
- Non-aluminum-clad fuel to INL (primarily TRIGA fuel)
- Program ends in 2019
 - SNF shipments expected in the next 3 years from Canada, Japan, Finland, Australia, etc.

- The mission of the United States DRR Infrastructure Program (RRI) is to provide fresh nuclear reactor fuel to U.S. Universities at no, or low, cost to the university.
- The title of the fuel remains with the United States government and when universities are finished with the fuel, it is returned to DOE (at DOE/INL or DOE/SRS)
- The Program is funded and managed by the Office of Nuclear Energy
- Supports 24 U.S. Universities

Future Direction

- Administration's *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*, January 2013, endorsed the key principles of the Blue Ribbon Commission's recommendations
 - Pilot-scale interim storage facility
 - Consolidated interim storage facility
 - Geologic repository
- Legislation needed for full implementation
- DOE's *Report on Separate Disposal of Defense High-Level Radioactive Waste*, March 2015
 - Strong basis exists to find that a Defense HLW Repository is required
 - Would provide valuable experience to reduce the cost and time for a future repository

- DOE complex-wide coordination of SNF issues by establishing an internal DOE working group in 2014
 - Collaboration between
 - Office of Environmental Management
 - Office of Science, Nuclear Energy, Naval Reactors, and NNSA (Materials, Management, and Minimization)
 - DOE field sites that manage DOE SNF

- SNF working group objectives include:
 - Develop complex-wide strategies for storage, retrieval, packaging, transportation, technology development, processing, and/or disposal
 - Integrate and leverage DOE SNF management and disposition activities across the complex
 - Support DOE efforts to develop waste acceptance criteria for a future repository
 - Support non-proliferation goals
 - Re-establish National SNF Program and maintain updated complex-wide database of DOE's SNF
- Working Group has met 4 times since the initial meeting in 2014
- Facilitate cooperative issue resolution throughout DOE

Summary/Conclusion

- EM is safely and effectively managing the legacy SNF with minimal impacts to DOE on near-term SNF management
 - Processing limited amount of spent fuel (at Savannah River Site and Idaho)
 - EM has realized significant benefits by consolidating SNF storage from multiple sites across INL to INTEC
 - EM has made significant progress in transferring SNF from wet to dry storage
- SNF Working Group is an effective means for enhancing integration of SNF programs across the complex

Questions