U.S. DEPARTMENT OF ENERGY





# *Overview of DOE's Spent Nuclear Fuel & High-Level Waste*

**Frank Marcinowski**

**Office of Environmental Management**

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# Outline

- ✓ **Defense Spent Nuclear Fuel (SNF) and Other Environmental Management (EM) Managed Fuels**
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  - ✓ Inventory and Locations
  - ✓ Path Forward
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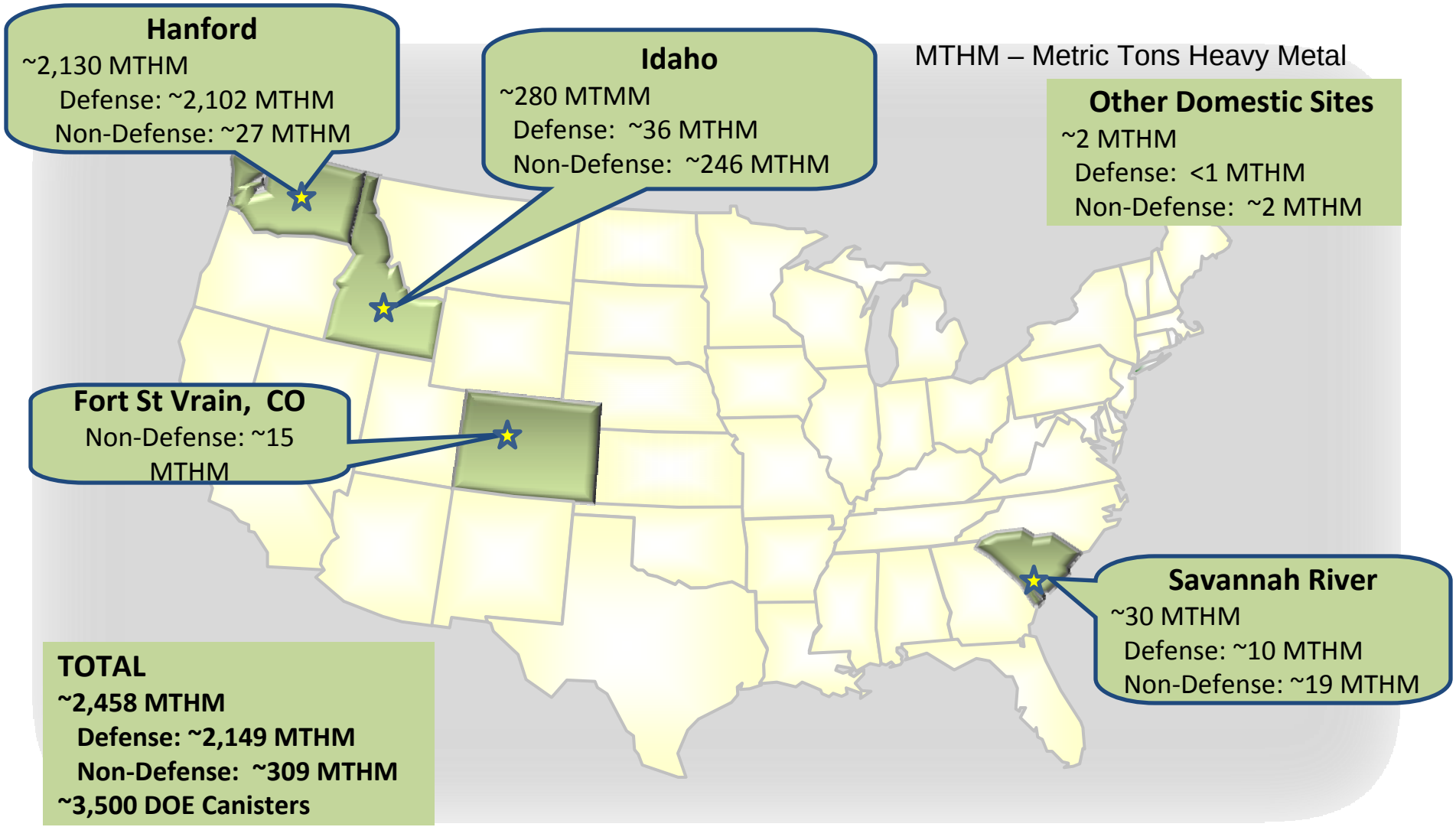
  - ✓ Stakeholder Issues
- ✓ **Other Related Waste**
- ✓ **Summary**

# Current SNF Inventory (2010)



# Types of SNF in DOE Inventory

## Defense

- DOE Production Reactors and Research and Development (R&D) Reactors

## Non-Defense

- Core Debris from the Three-Mile Island Reactor
- Commercial Power Demonstration Projects
  - Shippingport
  - Peach Bottom
  - Fort Saint Vrain
- Domestic Research Reactors (DRR)
- Foreign Research Reactors (FRR)

# State Commitments

- Idaho Settlement Agreement
  - Spent Nuclear Fuel in dry storage by December 31, 2023
  - Spent Nuclear Fuel out of Idaho by January 1, 2035
  - Penalty – Suspension of SNF receipts into Idaho and payment to the State of Idaho $60,000 per day for each day in violation, subject to appropriations
- Colorado Commitment
  - Fort St Vrain Spent Nuclear Fuel out of Colorado by January 1, 2035

# Hanford – Current Status

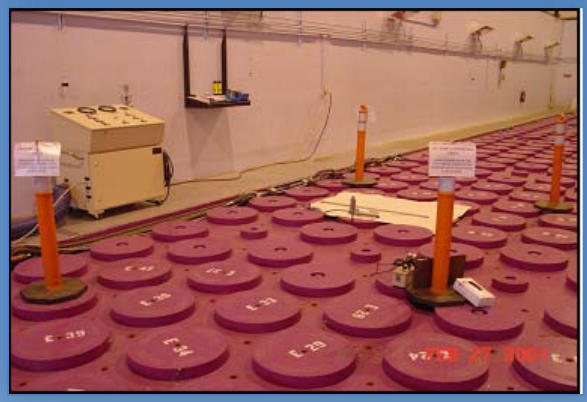
- All SNF has Been Moved From Wet to Dry Storage
- SNF is Stored in ~400 Multi-canister Overpacks and Other Dry Casks

# Idaho National Laboratory – Current Status

- **Diverse Inventory of SNF**
  - Includes both DOE-origin and commercial SNF
- **Diverse Storage Facilities**
  - Numerous dry storage methods
  - Wet storage pool in use
- **Na-Bonded SNF Stored and May Require Treatment**
  - Na-Bonded Fast Flux Test Facility (FFTF) fuel currently being treated; will complete in 2011
- **Continue to Receive Foreign Research Reactor (until 2019) and Domestic Research Reactor Fuel**

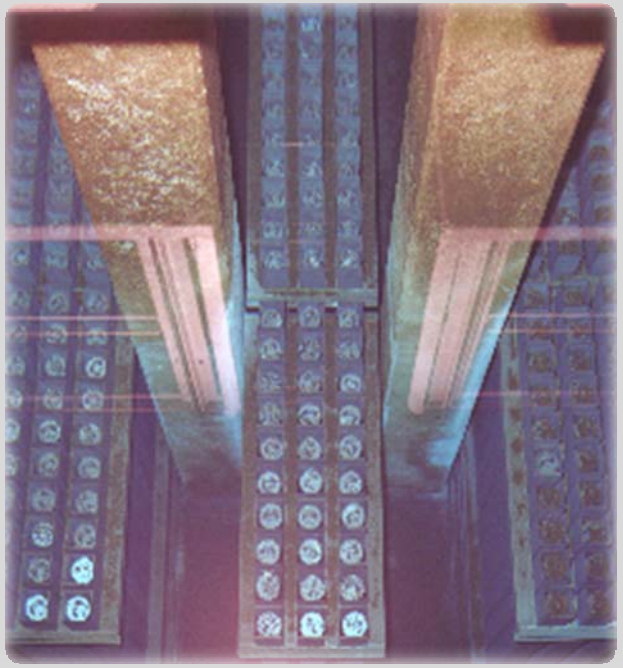
# Fort Saint Vrain – Current Status

- 15 Metric tons Dry Storage Facility managed by DOE
- Nuclear Regulatory Commission (NRC) Licensed Facility
- First Commercial Scale High Temperature Gas Cooled Reactor Plant in the United States



# Savannah River Site – Current Status

- SNF is currently in Wet Storage
- Disposition Alternatives for Aluminum-clad SNF Under Consideration
- Current Plan to Receive FRR (until 2019) and DRR



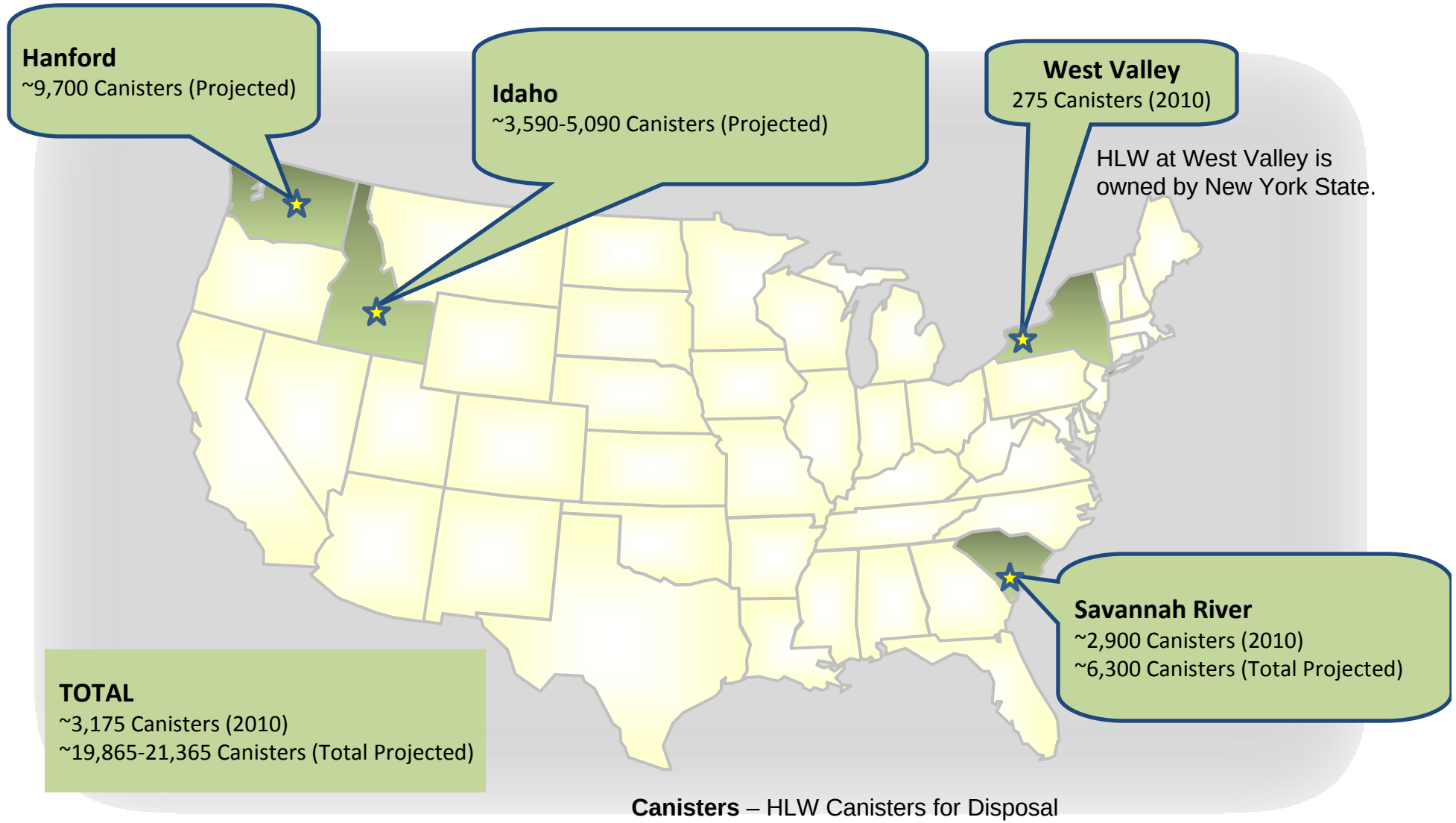
# Status of Foreign Research Reactor/ Domestic Research Reactor Receipts

- FRR Program Supports U.S. Non-proliferation Policy
  - Over 9,200 assemblies from 29 countries received (as of March 2010)
  - Aluminum-clad at Savannah River Site; non-Aluminum-clad at Idaho National Laboratory
  - Current plans are to receive FRR until 2019
- DRR Program Accepts Spent Fuel from U.S. Universities and Other Government Research Reactors

# DOE Spent Nuclear Fuel Summary

| DOE Spent Nuclear Fuel inventory | |
|---|---|
| <u>Defense SNF</u> | |
| Savannah River Site | 10 MTHM |
| Hanford | 2,102 MTHM |
| Idaho National Lab | 36 MTHM |
| Other | < 1 MTHM |
| Subtotal | 2,149 MTHM |
| <u>Non-Defense SNF</u> | |
| Savannah River Site | 19 MTHM |
| Hanford | 27 MTHM |
| Idaho National Lab | 246 MTHM |
| Other | 17 MTHM |
| Subtotal | 309 MTHM |
| **Total** | 2,458 MTHM |

# 2010 DOE HLW Inventory




**Canisters** – HLW Canisters for Disposal

# Inventory and Location

## Savannah River Site

- About 2,900 canisters produced (of 6,300 planned)
- Storage in 2 near surface modular structures (a 3rd is planned)
- About 200 canisters produced per year (expect to accelerate with new technology)
- 31 million of the 37 million gallons of tank waste remain to be treated (51 tanks; 2 closed)

# Inventory and Location (Continued)

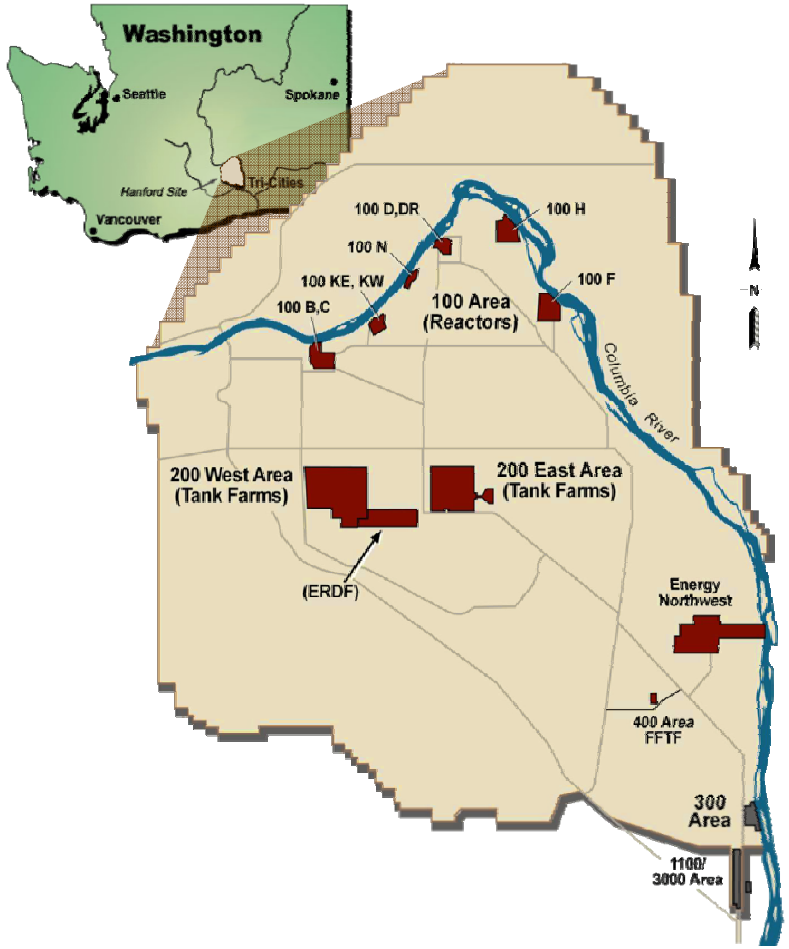

Idaho National Laboratory

- Three waste streams:
  - 4,400 $m^3$ of calcine (a granular solid) stored in 7 bin sets (43 bins)
    - To be converted to monolithic solid by hot isostatic pressing; projected to produce 2,900- 4,400 canisters
  - Sodium Bearing Waste (SBW) – 900,000 gallons stored in four tanks
    - To be treated by steam reforming – about 590 ten-foot canisters of granular powder will be produced
    - 7 of 11 tanks closed
- Ceramic/metallic waste produced by treatment of sodium-bonded fuel (NE-managed project) – 100 canisters projected

# Inventory and Location (Continued)

## Hanford

- 53 million gallons of liquid waste (177 tanks, 6 emptied) awaiting treatment in Waste Treatment Plant (WTP)
- 9,700 canisters projected; about 400+ per year planned
- ~1,900 cesium/strontium capsules in wet storage



# Inventory and Location (Continued)

**Non-DOE High Level Waste**

- West Valley
  - 275 canisters of EM managed commercial-origin HLW stored in hot cell (dry cask storage planned)

# Path Forward

- Savannah River Site and Hanford – Vitrify/Immobilize Tank Waste
  - Store canisters of treated waste on-site
- Idaho National Laboratory – Treat HLW Calcine by Hot Isostatic Pressing to Form a Monolithic Solid; Treat Sodium Bearing Waste (SBW) by Steam Reforming
  - Store canisters of treated calcine and SBW on-site
- Develop Improved Treatment Methods to Reduce Costs and Schedules
- Continue Safe Canister Storage (about 22,000) On-Site
  - Storage designed for 100 years

# State Commitments

## Idaho Settlement Agreement

- Settlement Agreement between the State of Idaho, DOE, and the Department of the Navy
  - HLW Calcine must be ready for transport out of Idaho by December 31, 2035
  - Penalty: suspension of SNF receipt into Idaho, subject to appropriations

# Stakeholder Issues

- Uphold State Commitments – Concern that Waste May be Stored On-Site Indefinitely
  - Hanford TPA
  - Idaho Settlement Agreement
  - South Carolina Federal Facility Agreement
- Maintain Institutional Controls, Develop Technical Basis for Extended Storage and Assess Environmental Impacts

# DOE High Level Waste Summary

| DOE High Level Waste Inventory Summary | | |
|---|---|---|
| Location | Existing Canisters | Total Projected Canisters |
| <u>Defense HLW</u> | | |
| Savannah River Site | 2,900 | ~6300 |
| Hanford | 0 | ~9700 |
| Idaho National Lab | 0 | ~3,590-5,090 |
| Subtotal | 2,900 | ~19,590-21,090 |
| <u>Non-Defense HLW</u> | | |
| West Valley | 275 | 275 |
| **Total** | 3,175 | ~19,865-21,365 |

# Related Waste Issues

## Greater Than Class C (GTCC) Waste

- **Consists of:**
  - Activated metals from decommissioning nuclear power plants
  - Radioactive sealed sources and other media from licensees
  - Non-defense transuranic waste (TRU)
- **Scope:**
  - 1,100 $m^3$ currently exists in storage
  - 4,200 $m^3$ to be generated by existing facilities (future plant decommissioning)
  - 6,400 $m^3$ may be generated by proposed facilities or projects
- **DOE has statutory responsibility to provide disposal for GTCC LLW**
  - GTCC has no current disposal path, but DOE is in process of developing environmental impact statement evaluating disposal alternatives

# Summary

- Continue Safe Management/Storage of HLW and SNF
- No Significant Near-Term Technical or Safety Impacts for 50+ Years
- Continue to Develop Improved Techniques to Reduce Treatment Costs and Schedules
- Potential Compliance Issues with Affected States Without Disposal Path for Defense Wastes