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Discussion Topics

• Overview of DOE-EM.

• Office of Nuclear Energy and Office of Environmental Management collaboration.


• Impact of delay in the opening of a geologic repository—continued storage and DOE agreements with States and other agencies.
EM Has Significantly Reduced Risks to the Environment and Public

Completed cleanup on 90 of 107 former nuclear weapons and research sites

Immobilized over 5 million gallons of radioactive liquid tank waste (enough to fill over seven Olympic-sized swimming pools)

Packaged 100% of EM’s plutonium inventories for storage and permanent disposition (over 5,000 containers)

Former plutonium storage vaults
Waste Processing: Treatment and Disposal of Radioactive Waste: Treat 92 million gallons/505 million curies

**Hanford**
- 177 Tanks
- 176M curies
- 55M gallons
- ~9,700 canisters (projected)

**Idaho**
- 15 tanks (11 closed);
- 37M curies
- 900K gallons
- ~3,590-5,090 canisters (projected)

**Savannah River Site**
- 51 Tanks (4 closed)
- 37M gallons
- 292M curies;
- ~3,600 canisters (2013); ~7,580 (total projected)

**West Valley Demonstration Project**
- 4 tanks
- ~25M curies
- 275 canisters
• Safely store waste in form of liquids, sludges, saltcake and calcine
• Retrieve waste for purposes of pretreatment, treatment, and disposal
• Pretreat alkaline waste (SRS, Hanford and WVDP), typically through a separations process to separate waste into:
  • Low-activity waste stream treated and disposed as low-level waste (LLW) onsite [except offsite disposal at WVDP] (most of volume);
  • High-activity waste stream treated and disposed as high-level waste (HLW) at a geologic repository (most of activity);
• Treat high-activity alkaline waste (SRS, Hanford and WVDP) using vitrification
• Retrieve, treat and dispose remaining acidic liquid wastes at INL for disposal in a geologic repository.
• Retrieve and dispose calcine (INL) directly in its existing form or following alternative preparations for disposal.
• Stabilize tank waste residues intended for in-place closure.
The Radioactive Liquid Waste Challenge: How EM is Making Progress Today

Integrated Waste Treatment Unit – Idaho Falls, ID
- Construction completed in 2012
- Will treat Idaho’s inventory of liquid tank waste – approximately 900,000 gallons

Defense Waste Processing Facility – Aiken, SC
- Began operations in 1996
- Largest operating radioactive waste glassification plant in the world
- Converts waste to solid glass form suitable for long-term storage and disposal
Overview: DOE Radioactive Waste Authorities

- Atomic Energy Act of 1954
  - DOE Order 435.1 Radioactive Waste Management
    - Low Level Waste
    - High Level Waste
    - Transuranic Waste
- Energy Reorganization Act of 1974
- Department of Energy Organization Act (1977)
- Uranium Mill Tailings and Radiation Control Act of 1978

- West Valley Demonstration Project Act of 1980
- Missions are further defined in:
  - Energy Policy Act of 2005
## Current Tank Inventories

- **SRS**
  - 37 million gallons
  - 292 million curies
- **Hanford**
  - 55 million gallons
  - 176 million curies
- **Idaho**
  - 900,000 gallons
  - 37 million curies
- **Other Wastes**
  - Cesium/Strontium Capsules at Hanford
    - 1900 capsules

## Treated HLW (existing)

- **SRS**
  - 3,600 vitrified canisters
  - 50 million curies
- **West Valley**
  - 275 canisters in 25 million curies
- **Idaho**
  - 37 million curies
  - 4,400 m$^3$ in 7 bin sets

## Treated LAW (Projected totals)

- **SRS**
  - <1 million curies
  - ~700,000 m$^3$
- **Hanford**
  - 10 million curies
  - ~160,000 m$^3$
- **WVDP (complete)**
  - <500,000 curies
  - ~5,400 m$^3$
Hanford Tank Waste

Evaporator → Water Vapor → Effluent Treatment Facility → Treated Water

Alternative Technology LAW Treatment Facility

LAW → Effluent Treatment Facility

LLW → Integrated Disposal Facility

Note: Facilities shown in dashed lines are not yet constructed

Tank Farms (149 Single-Shell and 28 Double-Shell Tanks)

1900 Sr/Cs capsules

1.7 M Curies ~1,900 m³

TRU Processing

Low Cesium-137, liquid/solid separations only

TRU

WTP = Waste Treatment Plant

LAW & HAW

Treated Water

WIPPP

0.3M Curies CH-TRU ~5,000 m³

180 M Curies ~5,700 m³

Geologic Repository

LAW = Low-Activity Radioactive Waste

HAW = High-Activity Radioactive Waste

LLW = Low-Level Radioactive Waste

HLW = High-Level Radioactive Waste

CSB = Canister Storage Building

SNF = Spent Nuclear Fuel

TRU = Transuranic

CSB #1

Other CSBs
**Current SNF Inventory (2013)**

- **Hanford, CO**
  - Total: ~2,130 MTHM
  - Defense: ~2,102 MTHM
  - Non-Defense: ~27 MTHM

- **Idaho**
  - Total: ~280 MTMM
  - Defense: ~36 MTHM
  - Non-Defense: ~246 MTHM

- **Savannah River**
  - Total: ~3 MTHM
  - Defense: ~10 MTHM
  - Non-Defense: ~19 MTHM

- **Other Domestic Sites**
  - Total: ~2 MTHM
  - Defense: <1 MTHM
  - Non-Defense: ~2 MTHM

- **Fort St Vrain, CO**
  - Non-Defense: ~15 MTHM

- **TOTAL**
  - ~2,458 MTHM
  - Defense: ~2,149 MTHM
  - Non-Defense: ~309 MTHM
  - ~3,500 DOE Canisters

**MTHM – Metric Tons Heavy Metal**
NE-EM Collaboration

• Jointly sponsored March 2012 workshop that created the Salt R&D Study Plan
  – NE funded science-based scope of work: laboratory and modeling
  – EM supported mining of underground research laboratory

• Held follow-on technical workshop in March 2013
  – Focus on identifying additional R&D, modeling and field activities for a generic salt repository
  – Draft integrated path forward available late April 2013

• NE and EM will continue to meet regularly and coordinate activities
• EM is supporting NE’s disposal-related research and development (R&D) work, including:

  – Support the feasibility of a generic salt repository, in accordance with a consent-based, step-wise approach that is informed by sound science and an adequate regulatory framework.

  – Demonstration of effectiveness of salt as a repository for heat-generating radioactive waste.

  – Review of past studies and data related to potential disposal of heat-generating wastes in salt.

  – New coupled models (thermo, mechanical, hydro).

  – Mining access drifts and install infrastructure using existing resources, to prepare for planned heater test which can inform future disposition plans.
Impact of delay in a geologic repository

- 2012 Department’s Environmental Liability Report:
  - A 20-year delay in the opening of a geologic repository may result in a $1.1 billion liability (in constant 2012 dollars).
  - Includes additional costs above current baselined estimates to safely store HLW and SNF at four DOE sites (Idaho National Laboratory, Hanford, Savannah River Site, and the West Valley Demonstration Project).

- EM continues safe management/storage of HLW and SNF.
  - *DOE’s Strategy for Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste* (January 2013) estimates a repository in 2048

- Continue to develop improved techniques to reduce treatment costs and schedules.
Impact of Repository Delay on Agreements

- Agreements with States in forms of Site Treatment Plans (SRS), Federal Facility Agreements (SRS), Hanford Federal Facility Agreement and Consent Order (Hanford), Consent Decrees (Hanford), Settlement Agreement (Idaho)

- These agreements primarily are directed at activities such as:
  - Tank waste retrieval/tank cease use dates
  - Tank waste cease use dates
  - Tank waste pretreatment/treatment facility construction completion dates
  - Tank waste treatment completion dates
  - Tank closure dates

- DOE is continuing to review the impacts on agreements with the States and regulators.

- DOE will work with the States and regulators to evaluate options necessary to meet DOE’s commitments.
Additional detail on EM site inventories & plans
• 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

• Continue to Receive Foreign Research Reactor (until 2019) and Domestic Research Reactor Fuel
Fort St. Vrain SNF - 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
• FRR Reactor Program Supports U.S. Non-proliferation Policy
  • Over 9,500 assemblies from 32 countries received (as of March 2013)
  • 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