U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

Department of Energy
High-Level Waste Integration

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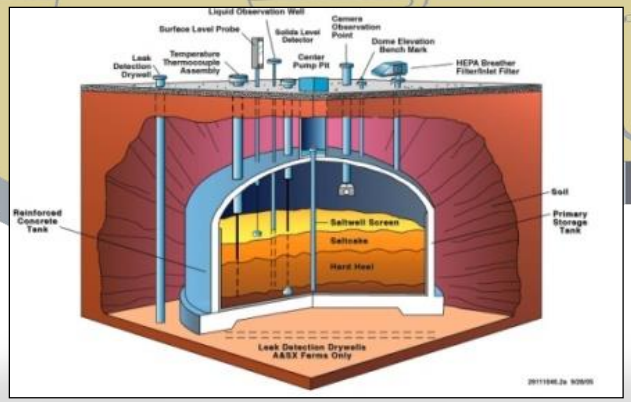
Waste Processing: Treatment and Disposal of Radioactive Waste: Treat ~90 million gallons/500 million curies

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

Idaho
–15 tanks (11 closed);
–37M curies
–900K gallons, 4,400m^3 calcine

Savannah River Site
–51 Tanks (8 closed)
–37M gallons
–292M curies;
–~4,100 canisters (2016); ~8,000 (total projected)

West Valley Demonstration Project
–4 tanks
– ~ 25M curies
– 275 canisters



DOE Tank Waste Management Strategy

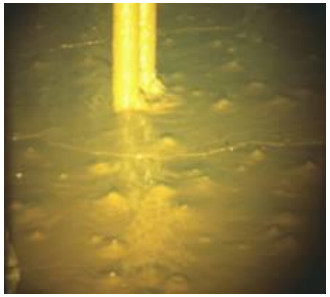
- Safely store waste in form of liquids, sludges, saltcake and calcine
- Retrieve waste for purposes of pretreatment, treatment, and disposal
- Pretreat alkaline waste (SRS, Hanford and WVDP), typically through a separations process to separate waste into:
  - Low-activity waste stream treated and disposed 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 Tank Waste Program Strategy

- The Tank Waste Program Strategy consists of:
- Safely storing:
  - over 90 million gallons of radioactive liquid waste at the SRS, Idaho and Hanford
  - 4,400 m3 of radioactive calcine at Idaho
  - 4,100 HLW canisters at SRS and 275 canisters at West Valley
- Constructing and operating major nuclear facilities to treat and disposition the tanks waste; and
- Emptying, cleaning and closing waste tanks.

Salt Supernate

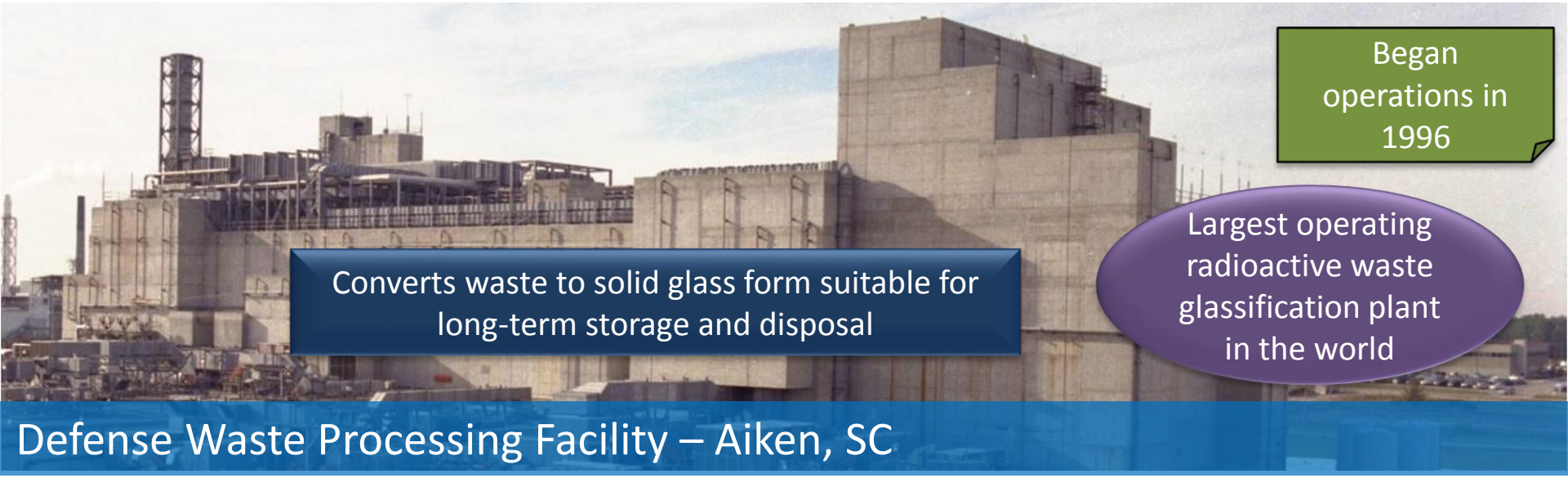
Saltcake



Sludge

Safely Stored Canisters

The Radioactive Liquid Waste Challenge: How EM is Making Progress Today



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

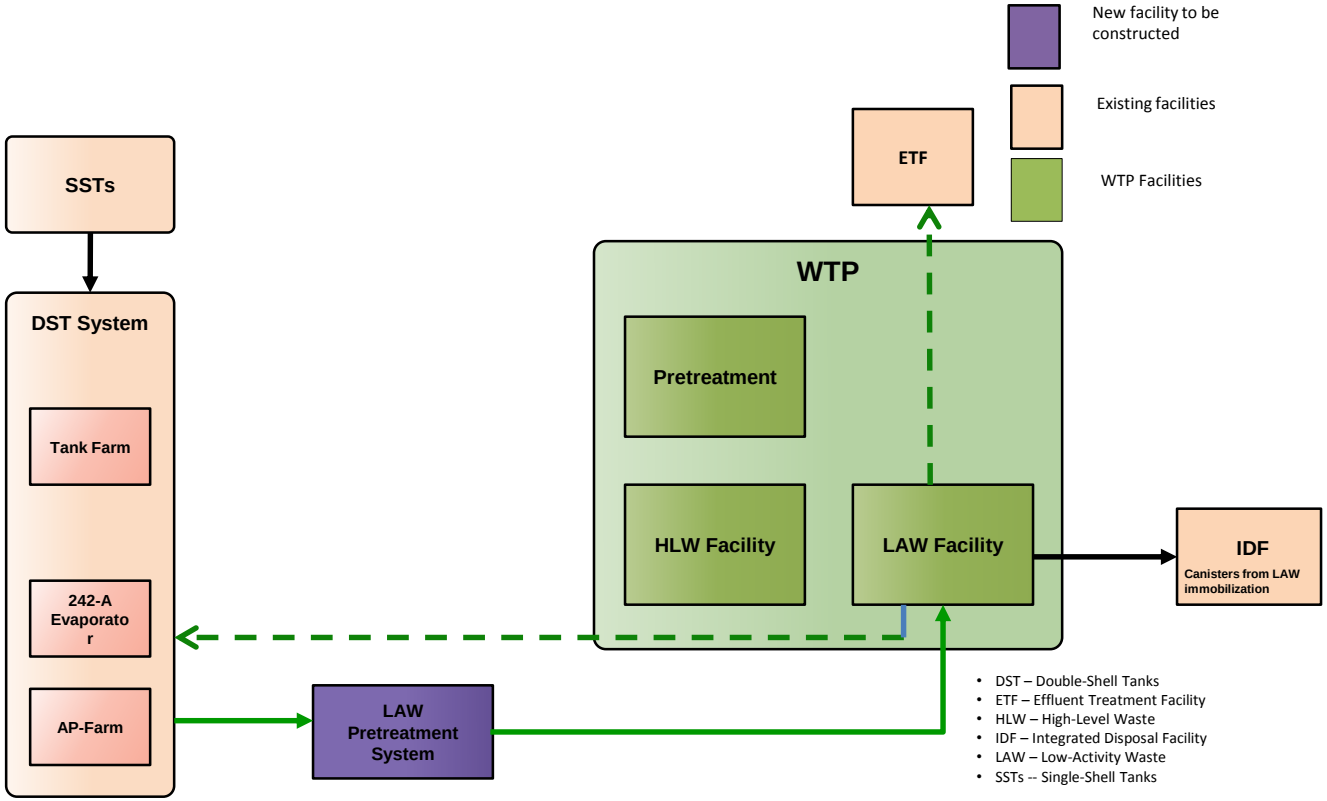
Defense Waste Processing Facility – Aiken, SC

Undergoing Commissioning for Start-up

Will treat Idaho's inventory of liquid tank waste – approximately 900,000 gallons

Integrated Waste Treatment Unit – Idaho Falls, ID

Hanford Direct Feed Low Activity Waste Approach



SRS Liquid Waste System

Legend:

ARP	Actinide Removal Process
DWPF	Defense Waste Processing Facility
MCU	Modular Caustic Side Solvent Extraction Unit
SWPF	Salt Waste Processing Facility

H-Canyon Receipts

Currently receive ~150 kgal/yr

38 Mgal, 270 million curies

Salt Waste

7.3 Mgal treated

Recycle

Sludge Waste

3.8 Mgal treated

ARP

MCU

SWPF

(Construction completed, Undergoing commissioning)

DWPF

Radionuclides

Tanks Cleaned and Closed

Inert chemicals

Glass Waste Storage

Saltstone Disposal Facility

<1% radionuclides remain in tanks

51 Tanks

- *8 operationally closed*
- *4 bulk waste removed*
- *old style – 35% of space used*
- *new style – 81% of space used*

>98% radionuclides to glass

Projected 8,170, ~4150 to date with 55 million curies immobilized in glass

<1% radionuclides to saltstone

16 Mgal grout dispositioned containing 0.4 million curies

NWTRB Briefing: Tank Waste Overview, Aug. 2016

West Valley Demonstration Project

In September 2002 DOE completed solidification of ~600,000 gallons of HLW that had been generated by the nation's only operating commercial nuclear fuel reprocessing plant located near West Valley, New York

- The HLW sludge was vitrified and resulted in ~600 tons of glass; 24 million curies; 275 canisters
- The canisters of vitrified HLW were placed in storage in a shielded cell within the Main Plant Process Building, to await transport to a federal repository

HLW Canisters

275 stainless steel canisters of vitrified HLW

- 10' tall, 2' diameter
- 2,665 R/hr average dose rate
- 1,100 – 7,460 R/hr range
- 5000 lbs average weight
- 90% average fill height

3 canisters of decontamination wastes

West Valley Demonstration Project

Technical Approach

- Canisters decontaminated in place in the storage racks
- 5 canisters loaded into an overpack within a shielded cask
- Overpack lid remotely welded
- Cask lid secured and cask transported to the High Level Waste (HLW) Cask Storage Pad

Loaded Overpack in Cask

Eventual transfer of overpack for shipping

SRS Canisters

- Canisters:
  - 10’ tall, 2’ diameter (longer neck than WVDP)
  - 304L stainless steel
- HLW canisters are currently stored in Glass Storage Buildings 1 and 2 in concrete reinforced vaults
  - GSB-1 currently stores 2,254 canisters
  - GSB-2 currently has capacity for 2,340 canisters
  - To increase storage capacity, SRS will “double-stack” canisters in GSB-1 thus increasing GSB-1 storage capacity by 2,254 for a total capacity of 6,848 canisters
  - This mitigates the need for additional storage until FY 2026.

Treated Idaho Sodium Bearing Waste

- Treated sodium bearing waste would be loaded into canisters and then the canisters stored in concrete vaults:
  - Canisters are 10’ tall, 26 inches in diameter
  - 304L stainless steel
- 16 canisters per vault

WTP Canister design

- High-Level Waste canisters
  - 15-foot long, 2-foot diameter
  - 304L stainless steel
- Low-Activity Waste canisters
  - 7-foot long, 4-foot in diameter
  - 304L stainless steel

High Level Waste Integration

- Contractor
  - Leadership transfer between Hanford and SRS tank waste contracts (same lead contractor) to promote integration
  - Technology integration – separations processes, tank integrity, tank retrievals
- DOE Federal
  - Temporary assignments:
    - Participation of construction project personnel from one site as reviewers on project peer reviews at other sites
    - Temporary rotations of staff from one site to another to augment startup and commissioning and share lessons learned
  - Tank Waste Corporate Board:
    - Managers with tank waste responsibilities at Headquarters and the field (SRS, Hanford, Idaho, West Valley Demonstration Project)
    - Key issues:
      - Tank waste infrastructure commonalities
      - Tanks waste technology development
      - Commissioning of tank waste projects
      - Disposition of tank waste