Savannah River Site
Waste Disposition Project

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Waste Disposition Project - Mission

Radioactive Liquid Waste - Tank Waste Stabilization and Disposition

- Disposition 36 million gallons of radioactive liquid waste
- Close 49 underground storage tanks in which the waste now resides

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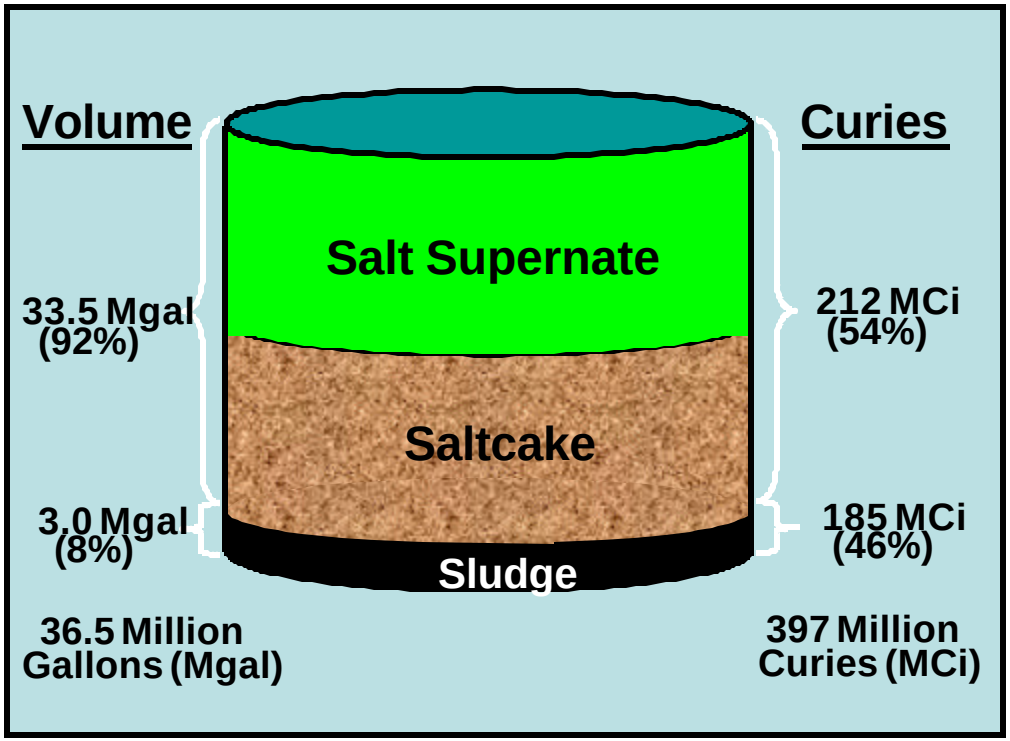
Liquid Waste Background

Facts…

- 2 tanks closed
- 49 tanks remaining to close
  - – aging, carbon steel
  - – 27 compliant, 22 non-compliant
  - – 12 have known leak sites
- Contain half of the radioactivity in the DOE complex
- 1.3 million gallons remaining usable space



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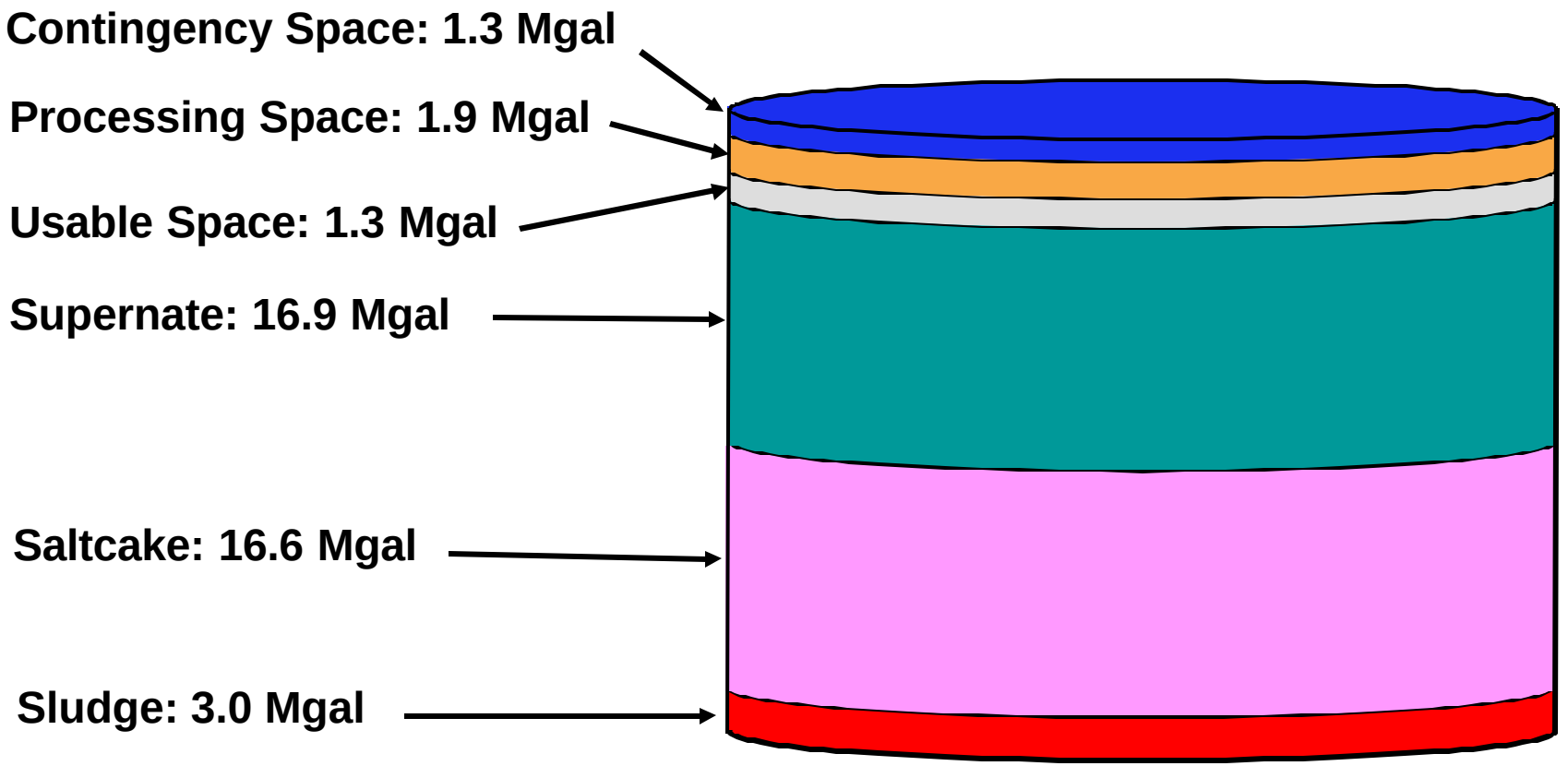
Tank Space



Note: Usable space = Available compliant tank space less processing space and contingency space

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Radioactive Liquid Waste Disposition

"Radioactive waste stored in SRS tanks poses the single greatest environmental risk in the State of South Carolina."

Challenge:

- Safely store, treat and stabilize legacy liquid waste
- Remove waste and close 49 remaining waste tanks

Regulatory Framework

- Federal Facility Agreement (FFA)– Close all non-compliant tanks by Fiscal Year (FY) 2022
- Site Treatment Plan (STP) – remove waste from all tanks by FY 2028
- Tank Closure and waste disposition must meet Section 3116(a) of the Ronald W. Reagan National Defense Authorization Act for FY 2005
- Facilities operated under State-issued permits
- Total radioactivity sent to Saltstone vaults limited to 1.4M Curies

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Liquid Waste Processing Today

Tank Farms
- 2 tanks closed
- 49 remaining

397 MCi (100%)

Interim Salt Processing

DDA

ARP

In Startup

MCU

In Startup

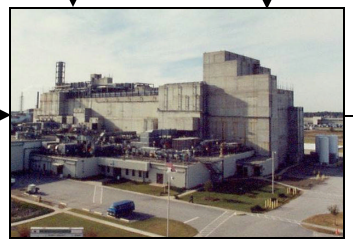
1.2 MCi (0.3%)

High Volume Low Activity Stream

Saltstone

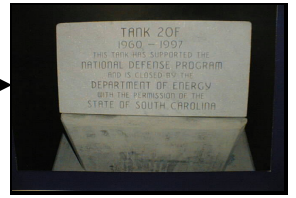
Sludge Processing

DWPF



Low Volume High Activity

Federal Repository



Tank Closure

Legend: DDA: Deliquification, Dissolution & Adjustment Process; MCU: Modular Caustic Side Solvent Extraction Unit; ARP: Actinide Removal Process; SWPF: Salt Waste Processing Facility; DWPF: Defense Waste Processing Facility; Ci: Curie

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Liquid Waste Processing Tomorrow

Empty and close remaining tanks

397 MCi (100%)

High-Capacity Salt Processing

SWPF

0.2 MCi (0.05%)

High Volume Low Activity Stream

Saltstone

Sludge Processing

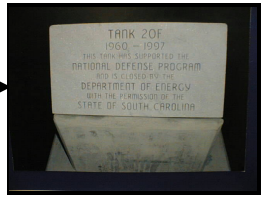
DWPF

395 MCi (> 99%)

Low Volume High Activity

Federal Repository

~0.6M Ci (0.14%)



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DDA

Deliquification, Dissolution, and Adjustment (DDA)

- Remove free supernate
- Drain interstitial liquid
- Store for future processing at Salt Waste Processing Facility

- Dissolve saltcake and transfer of salt solution
- Allow solids to settle

- Transfer to Saltstone feed tank
- Aggregate with other Tank Farm waste to meet processing parameters (if required)

- Initiated processing in 3/2007
- Demonstration batches complete
- Currently processing Tank 41 waste

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Actinide Removal Process

Objective:

Provide near term capability to remove actinides and strontium (Sr-90) from salt waste at a rate of 1.2 million gallons per year

Scope:

- Process to be conducted in two existing modified site facilities (241-96H and 512-S)
- Involves introduction of mono-sodium titanate (MST) into the strike tanks in 241-96H filled with salt solution from Tank 49 followed by filtration of adsorbed actinides and Sr-90

Status:

- Completed integrated runs 11/07
- Operational readiness review complete
- Hot startup in progress

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MCU

Objectives:

- Remove Cesium (Cs-137) from clarified salt waste received from the ARP
- Develop operating experience on a large-scale CSSX process to optimize the startup and initial operations of SWPF

Scope:

- MCU uses the same technology and similar equipment as the SWPF
- MCU will provide Cs-137 removal capability (decontamination factor of ~100) from about 1.2 million gallons of salt waste per year

Status:

- Completed integrated runs 11/07
- Operational readiness complete
- Hot startup in progress

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Tank 48 Recovery

Objectives:

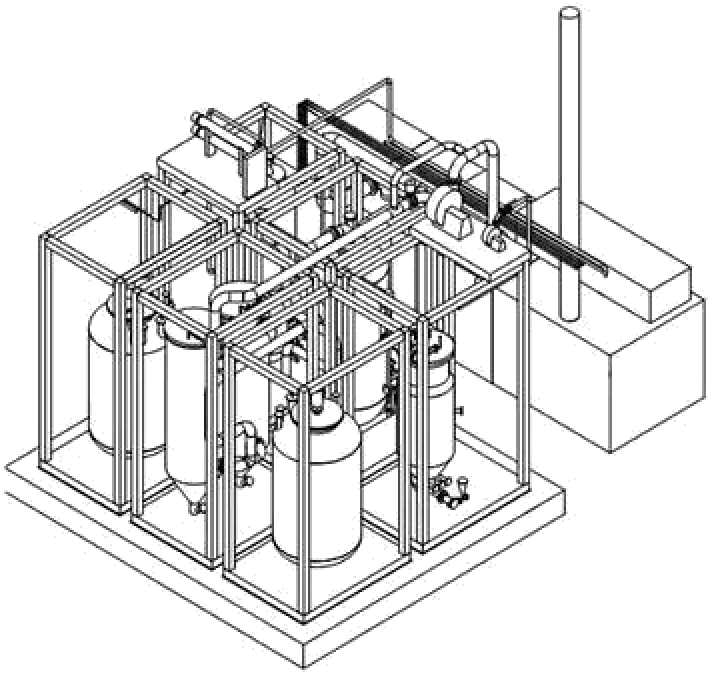
- Treat 240,000 gallons of highly radioactive liquid waste that also contains about 21,800 kg of organic compounds
- Return 1.3 million gallons of vital tank space to Tank Farm service

Scope:

- Tank 48 Treatment Process will provide the capability to treat salt waste and destroy the organics
- Tank 48 will serve as feed tank for SWPF

Status:

- Critical Decision (CD) 1 approved 3/08
- Project completion targeted for 2012 to support SWPF startup



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SWPF

Objective:

Rapidly and efficiently treat salt waste stored in SRS tank farms to remove actinides, Sr-90 and Cs-137

Scope:

- Remove and concentrate Cs-137 and Sr-90/actinides from salt waste and send them to DWPF
- Send decontaminated stream to Saltstone
- Nominal capacity of SWPF ~6.0 Mgal/yr
- Total volume to be processed ~85 Mgal
- Approved TPC - $899M
- Completion date (80% confidence level) – November 2013

Status:

- Baseline and initial procurement/construction approved 9/24/07
- Construction underway

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DWPF Vitrification

Objective:

Process (vitrify) HLW from SRS tank farms into a stable waste form ready for disposal in the Federal Repository

Scope:

- Design started in 1977
- Construction began 1983
- Radioactive operations began March 1996
- Sludge feed currently being processed from old style tanks to meet regulatory commitments

Status:

- Poured over 2,480 canisters to date
- Continuing to optimize process performance

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Saltstone Facility

Objective:

Process low activity salt stream into grout for disposition in vaults

Scope:

- Aqueous waste mixed with flyash, slag and cement
- Poured in concrete vaults to solidify
- Engineered disposal facility
- Low water permeability
- Excellent non-leaching qualities
- Non-hazardous product

Status:

- Modifications completed 10/07
- Currently processing DDA waste
- Continuing to enhance process

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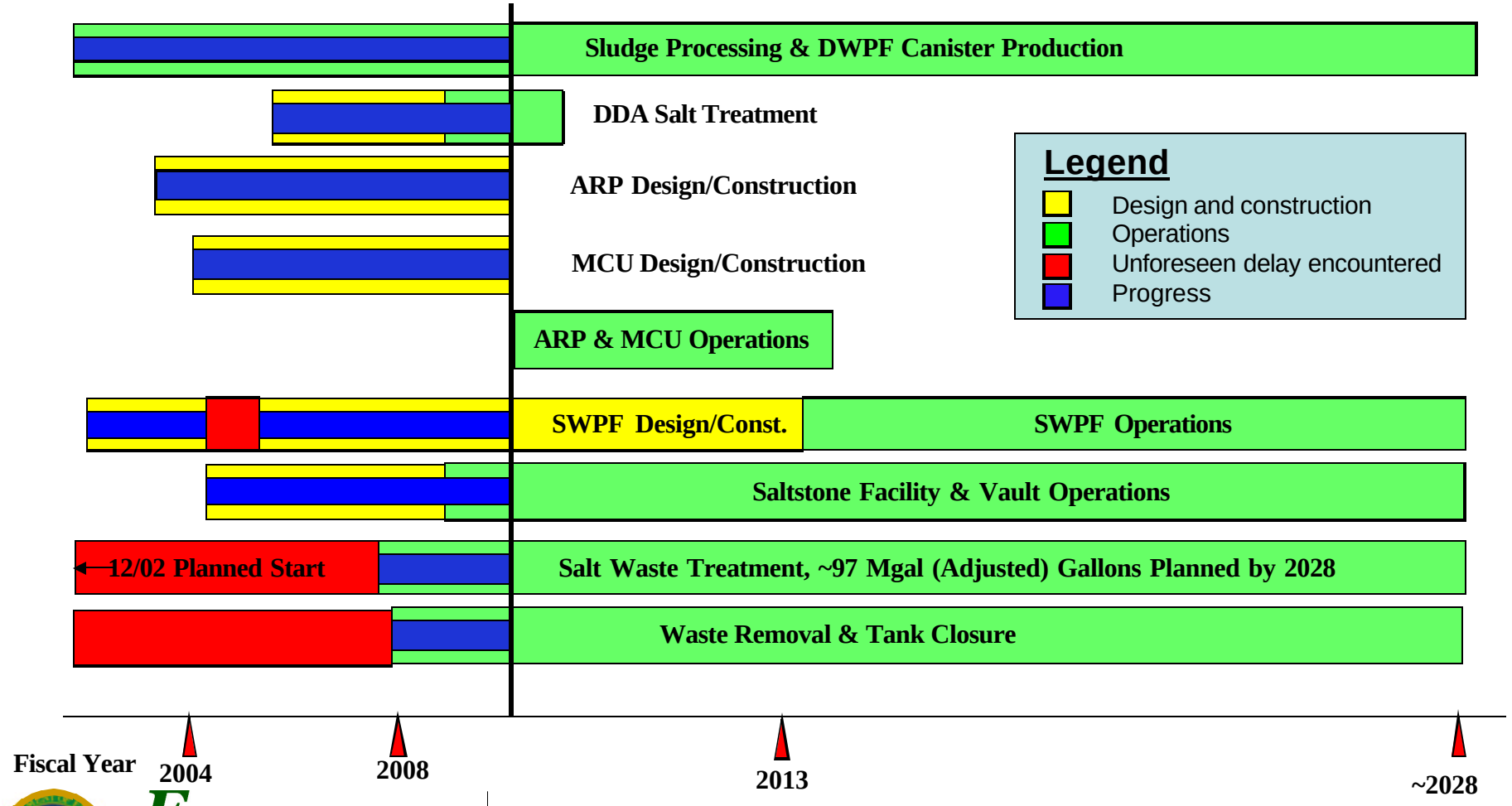
Liquid Waste Project Schedule



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Current Challenges - Storage

- **Safely operating aging SRS Tank Farms**
  - Decaying infrastructure and forced outages
  - Strategy: Use system health analysis to identify vulnerabilities and restore selected infrastructure spares via small projects
- **Creating sufficient space to support SWPF**
  - Successful execution of interim processing essential
  - Preparing qualified feed consumes space in the near term due to salt dissolution and sodium adjustment
  - Strategy: Recover Tank 48 and optimize existing infrastructure to recover Tank 50 to high level waste service

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Current Challenges - Retrieval

- Federal Facilities Agreement
  - Technology uncertainties and Section 3116 process create risk to 2022 completion date for closure of non-compliant tanks
  - Strategy: Develop and deploy new tank cleaning technologies to accelerate preparation of tanks for closure
  - Strategy: Limit Waste Determination submittals to one per Tank Farm

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Current Challenges - Treatment

- **Site Treatment Plan**
  - Current estimates of sludge mass and salt processing capability create risk to 2028 date for completion of waste removal and treatment
  - Strategy: Timely start of SWPF
  - Strategy: Implementation of sludge mass reduction technologies
  - Strategy: Employ new melter technologies to increase waste loading and throughput
  - Strategy: Potentially augment salt processing through alternative treatment technologies
    - Evaluate small column ion exchange
    - Improve effectiveness of ARP/MCU and operate longer

Current Challenges – Tank Closure

- SR inexperience with public review of performance assessments (PA)
  - HQ support needed to educate stakeholders
- Limited data available to support waste removal to maximum extent practical
- Improved physical property data needed to support waste removal and PA's

Technology - Ongoing Site Initiatives

- **Tank 48 Recovery Project**
  - Fluidized Bed Steam Reforming
  - Wet Air Oxidation (risk mitigation)
- **Sludge Mass Reduction**
  - Low temperature leaching in Tank 51 reduced aluminum in Sludge Batch 5
- **Sludge Waste Processing**
  - Increased Waste loading in glass and increased melt rate
- **Sludge Heel Removal**
  - Mechanical Cleaning in Tanks 18, 19
  - Chemical Cleaning in Tanks 5, 6


TMR Sand Mantis

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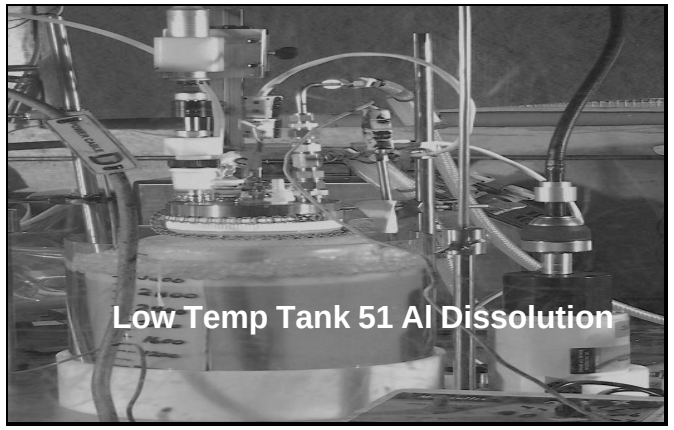
Technology - Needs

- **Waste processing**
  - Increased glass waste loading and melt rate
  - Accelerated sludge batch preparation
  - Vitrification rate increase by melter technologies
- **Augment salt processing**
  - Small Column Ion Exchange
  - ARP/MCU enhancements and life extension
- **Sludge Heel Removal**
  - Develop and deploy Enhanced Chemical Cleaning, to reduce downstream oxalic acid impacts at DWPF
- **Closure**
  - Develop physical property data to support PA's for tank farms and Saltstone, including improved tank closure grouts



Shielded Cells Testing with Actual Waste

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Issues

- **Technical**
  - Scarce expert resources to perform performance assessments
  - Develop physical property data to support PA's for tank farms and Saltstone, including improved tank closure grouts
- **Regulatory**
  - A revision process for the WD is needed to allow deployment of new technologies not included in the current WD

Summary

- **Liquid waste processing strategy in place**
  - Sludge and interim salt treatment underway
  - SWPF under construction
- **Many challenges remain**
  - Tank 48 and 50 recovery
  - Sludge mass reduction
  - Enhanced DWPF throughput
  - Augmentation of existing salt processing
- **Ongoing collaborations and investment in new technology are essential to success**

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