Status of EM's Tank Waste Disposition Programs

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Office of Environmental Management
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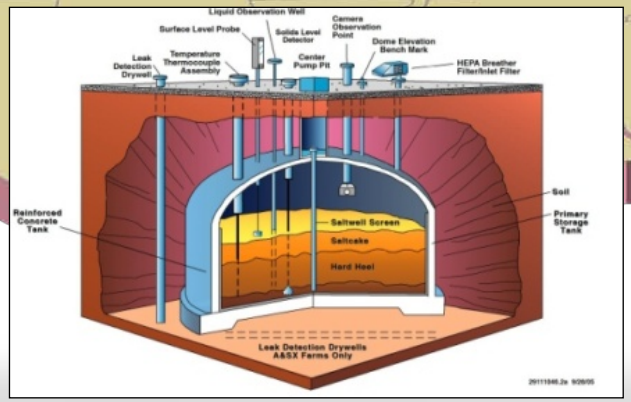
Waste Processing: Treatment and Disposal of Radioactive Waste

Mission: Treat 90 million gallons (340 million liters)
600 million curies of radioactive tank waste (2.22 x 10^{19} becquerels)

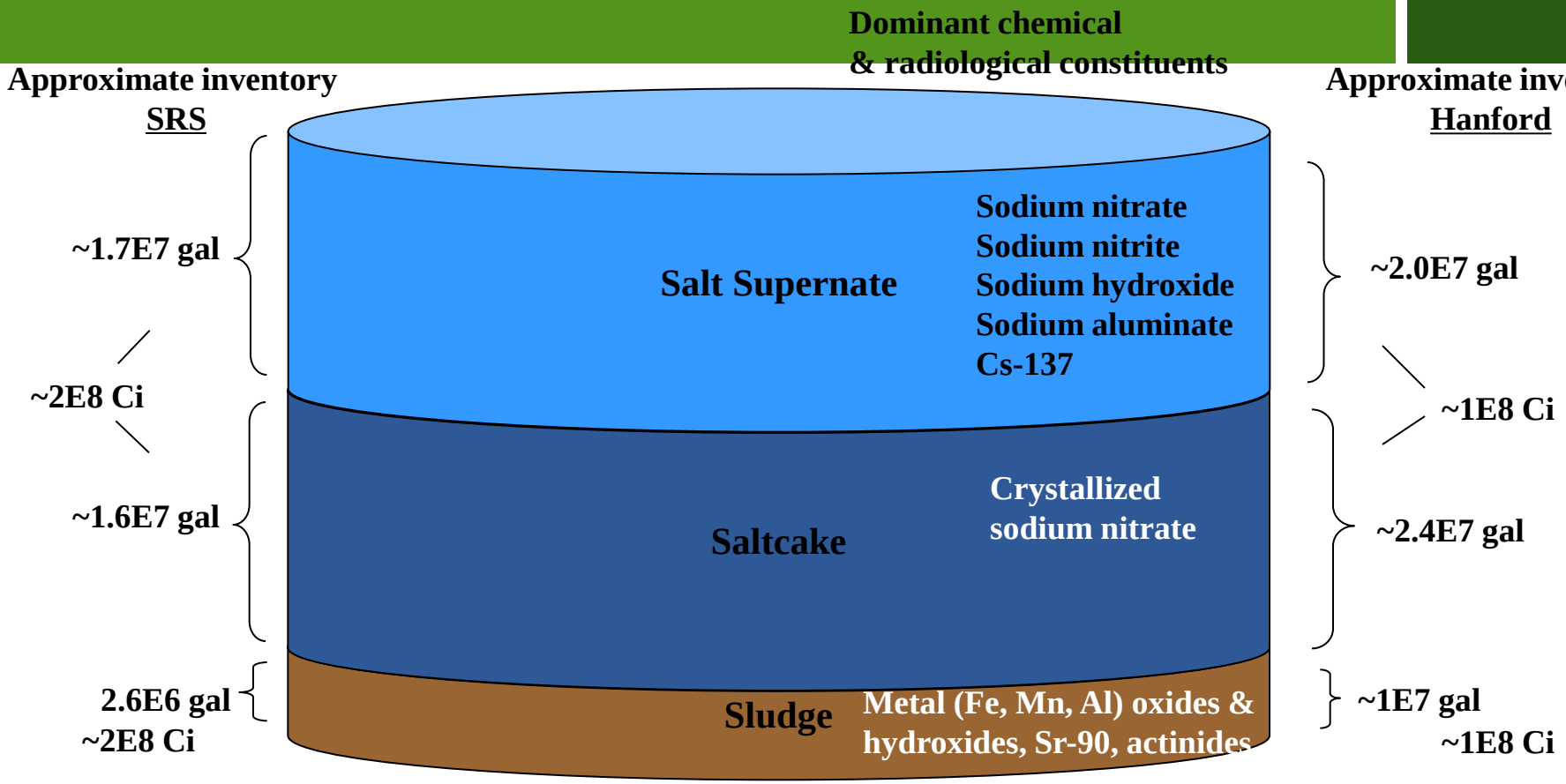
Hanford – 194M curies;
53M gallons
177 Tanks

Idaho – 37M curies

Savannah River Site –
416M curies; 33M gallons
51 Tanks



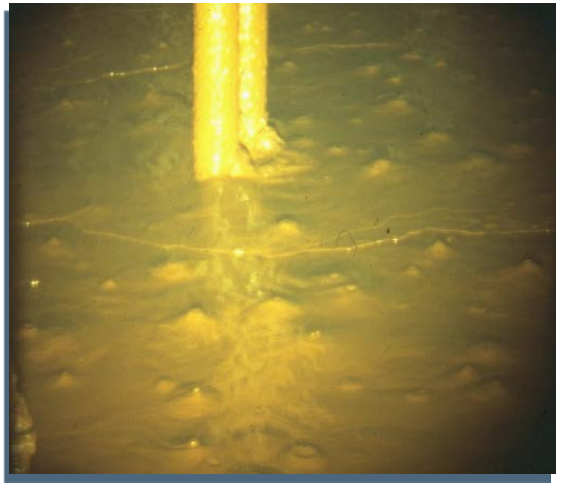
High Activity Waste Tanks



High Activity Waste Tank Interior

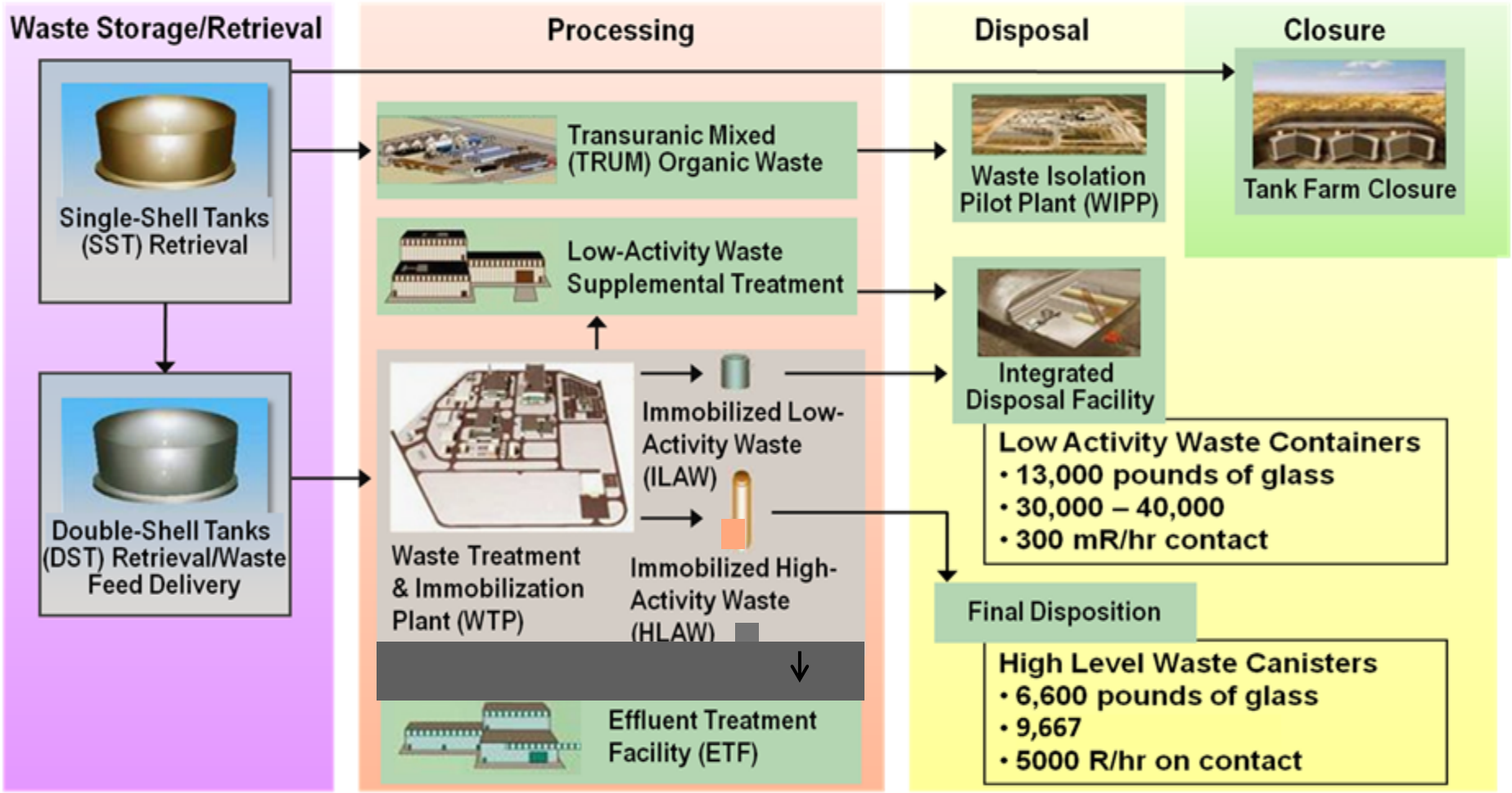
Salt Supernate

Saltcake



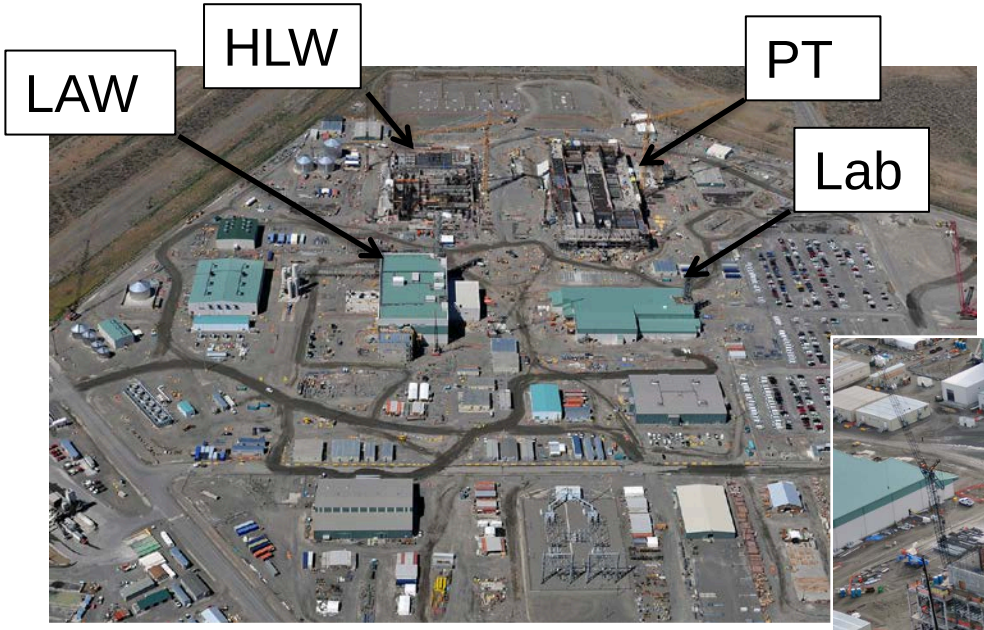
Sludge

Tank Waste Processing: Hanford



Waste Treatment and Immobilization Plant Facility in Construction

Hanford Site Waste Treatment Plant

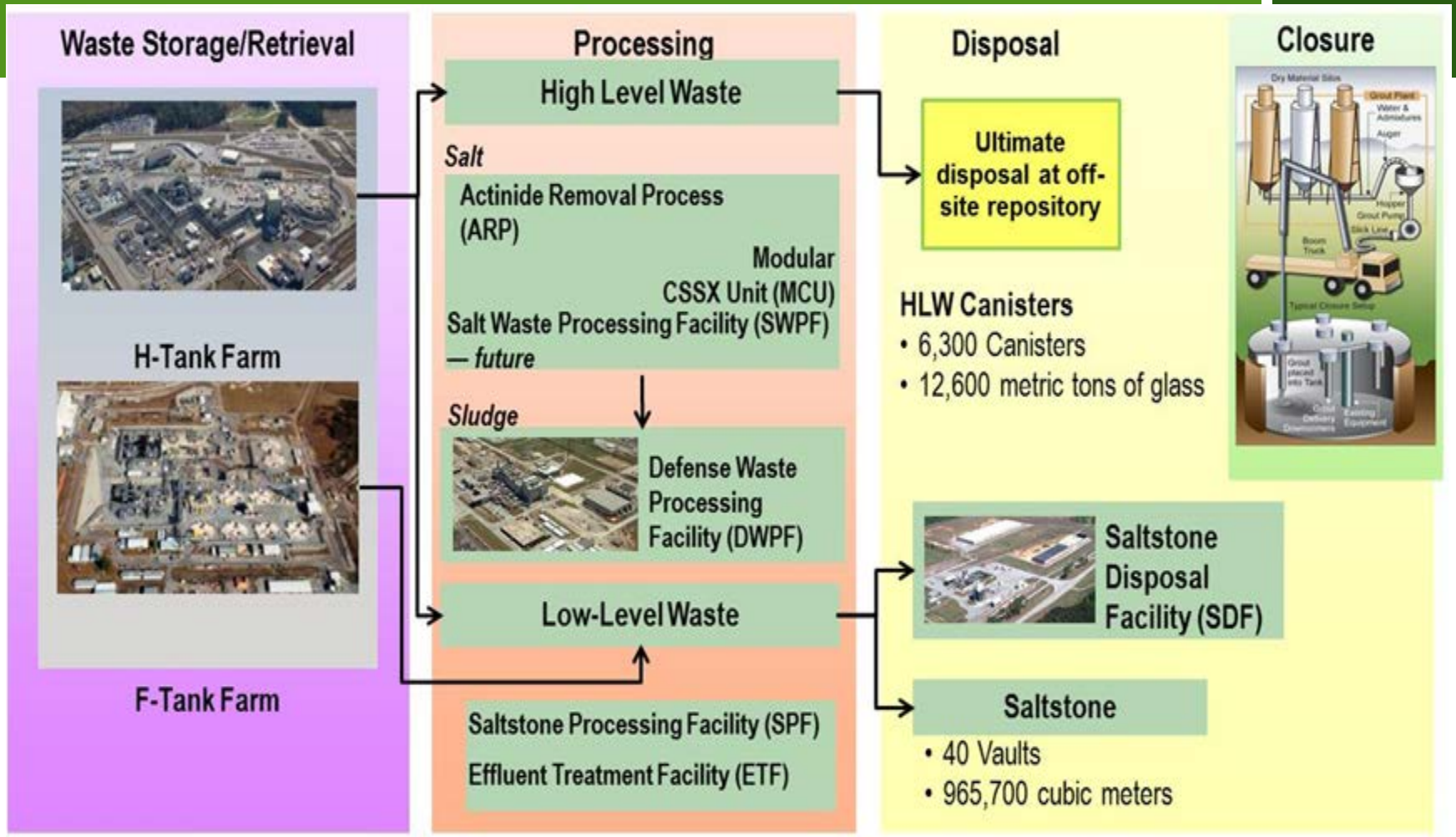


- 257,000 cubic yards concrete
- 34,600 tons structural steel
- 980,000 feet piping

- 2,055 tons ductwork (1.86 million kg)
- 946,000 feet electrical raceway (2.88 km)
- 4.2 million feet electrical cable (1280 km)

Pretreatment Facility (PT)

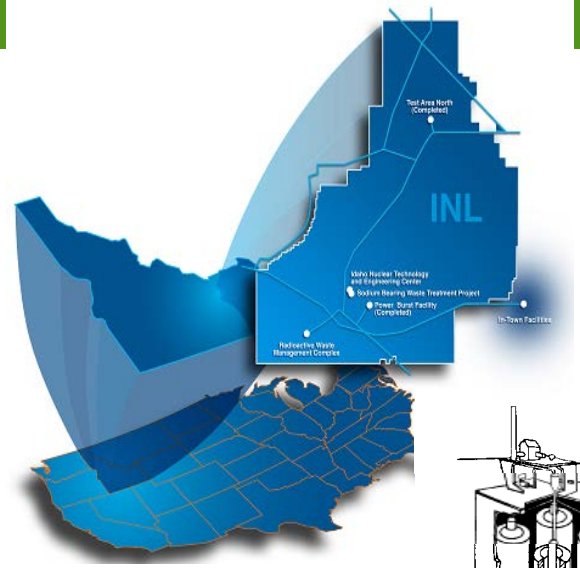
Tank Waste Disposition Process Savannah River



Salt Waste Processing Facility in Construction

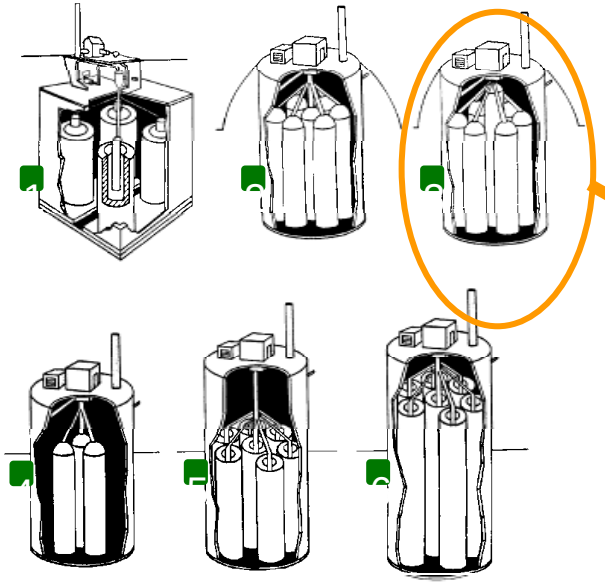
Savannah River Site Salt Waste Processing Facility

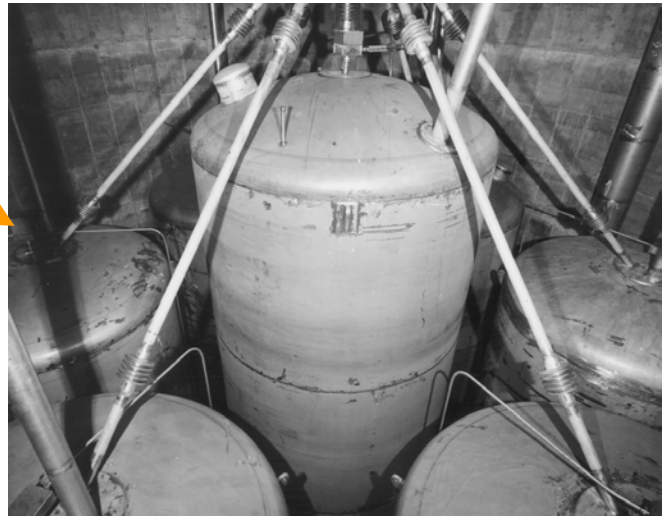
Tank Waste Processing: Idaho



Idaho National Laboratory (Three Waste Streams):

- Calcine (granular solid) 4,400 m^3 in 7 bin sets
- Sodium Bearing Waste (SBW) – 900,000 gal
- Ceramic/metallic waste (NE)





Sodium Bearing Waste Treatment Facility in Construction

Idaho National Laboratory

Sodium Bearing Waste Treatment Facility

20 Years of Progress in the Management of Tank Waste

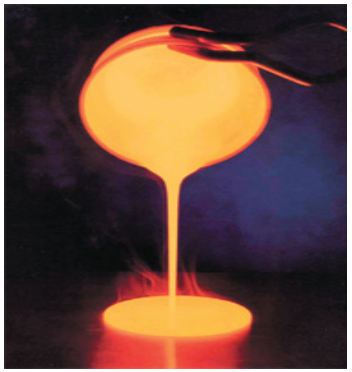
- Stabilized millions of gallons of radioactive tank waste
- Completed 9 tank closures (2 tanks at Savannah River; 7 tanks at Idaho
- Completed 16 tank retrievals
- Savannah River Site Tank Waste Processing
  - Defense Waste Processing Facility operational in 1996
    - Over 3,500 canisters produced
  - Salt processing facilities operational in 2008
    - Over 5 million gallons of salt waste processed.
- West Valley Demonstration Plant
  - Operational in 1996
  - Produced 275 canisters of vitrified high level waste
  - Completed processing in 2002
- Began Construction on three additional tank waste processing facilities
  - Hanford Waste Treatment and Immobilization Plant (2003)
  - Savannah River Salt Waste Processing Facility (2005)
  - Idaho Sodium Bearing Waste Treatment Facility (2007)

Technology Development and Deployment (TDD)

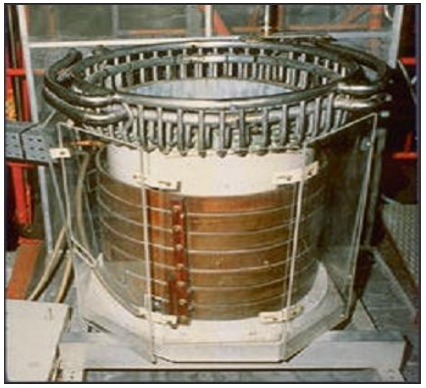
Activities:

- Develop and deploy at-tank processing.
- Increase waste loading in glass to reduce canister production.
- Develop next-generation melters to improve processing.
- Develop & deploy alternative treatment and separations processes.
- Develop alternative waste forms.
- Develop technologies for accelerated tank waste retrieval and tank closure.

The key to maintaining progress in EM's tank waste management is the continuation of an effective Technology Development and Deployment (TDD) Program which can significantly reduce tank waste treatment and disposal life-cycle costs.



Advanced Glass Formulations



Cold Crucible Induction Melter

The EM FY 2012 Tank Waste TDD program:

- Cold Crucible Induction Melter, to include some glass development.
  - Leverages work at Idaho sponsored by NE
- The Cementitious Barriers Partnership (CBP)
  - Additional EM funds directed to CRESP for this task
- The Joint EM-NE-International Evaluation of Long-Term Behavior of Glass High-Level Waste Form
  - Additional funding from NE and international partners
- Sulfate Removal
- Next Generation Cesium Solvent

System Planning

- System Plans provide programmatic assumptions, e.g. funding, regulatory conditions, and technical assumptions, e.g. models, technology development, that are the basis for completing tank waste missions at Hanford and the Savannah River Site.
- SRS Liquid Waste System Plan, Rev. 16
  - Regulatory milestones for old-style tank (single-shell) closure by 2022.
  - System planning forecasts completion of liquid waste treatment at SRS by ~2026.
- ORP Tank Waste System Plan, Rev. 6 (Baseline Case)
  - WTP Start-up in 2019
  - Completion of Program in 2047
- The review of plans is under consideration because the Department desires integrated, efficient and consistent systems plans at all tank waste sites.

The Tank Waste program has been reviewed by:

- The Environmental Management Advisory Board (EMAB) Tank Waste Subcommittee
- Technical Expert Group (TEG) EM Tank Waste Strategy Review
  - Research and Development Plan
  - Technical Planning, Integration and Risk Management
  - Waste Retrieval and Tank Closure
  - Alternative Waste Treatment
  - Improved Vitrification Capacity and Increased Waste Loading
- Defense Nuclear Facilities Safety Board Recommendation on Tank Waste Management at SRS
- Construction Project Reviews
  - Salt Waste Processing Facility (4 reviews – last October 2011)
  - WTP (5 reviews – last August 2011)
  - Specific set of Recommendations for each facility from each review
- Technical reviews of at-tank technologies
  - External Technical Review of Small-Column Ion Exchange (Feb 2011)
  - Technology Readiness Assessment of SCIX (Completing)

EMAB Tank Waste Subcommittee

- Tank Waste Subcommittee originally chartered, in response to Secretary request to perform technical review of Waste Treatment and Immobilization Plant (WTP) in May 2010. Three tasks:
  - Verification of closure of WTP External Flowsheet Review Team (EFRT) issues.
  - WTP Technical Design Review
  - WTP potential improvements

- Report completed and briefed to DOE in September 2010

- Follow-on scope for TWS identified immediately after briefing to DOE and finalization of Technical Expert Group work scope:
  - Modeling for life-cycle analysis
  - Assess candidate low-activity waste forms
  - Assess at-tank or in-tank candidate technologies for augmenting waste pretreatment capabilities
  - Evaluate various melter technologies
  - Evaluate waste delivery plans
  - Identify other tank waste vulnerabilities at SRS and Hanford

EMAB Tank Waste Subcommittee Recommendations

- Overarching recommendations – 4
- Recommendations on Modeling for Life-Cycle Cost - 8 (2 with sub-recommendations)
- Recommendations for Candidate Low-Activity Waste Forms – 4
- Recommendations for At-Tank or In-Tank Candidate Technologies for Augmenting Planned Pretreatment Capabilities - 9 (1 with sub-recommendations)
- Recommendations for Melter Technologies – 3
- Recommendations for Reliability of Waste Delivery Plans – 6
- Recommendations related to Other Tank Waste Vulnerabilities – 3
- Recommendations for 2020 Vision, Early Startup of One LAW Melter at Hanford - 6

Status of TWS 2011 Recommendations

- EM-HQ, DOE-SR, ORP and their respective contractors are evaluating recommendations

- Majority of recommendations are being addressed in concert with ongoing activities, such as:
  - Enhancements to system plans and life-cycle models
  - Responses to Construction Project Review recommendations
  - Technology maturity plans that will evolve from TRAs, e.g., SCIX
  - Implementation plan to Defense Nuclear Facilities Safety Board recommendation on Large-Scale Integrated Testing for mixing in WTP
  - Evaluation of TEG recommendations

Conclusions

- **EM's Tank waste Programs have received multiple reviews.**
- **EM is currently evaluating the recommendations and deciding how to proceed.**
- **R&D directed to tank waste processing may potentially yield significant cost savings.**