U.S. DEPARTMENT OF ENERGY

Status of Waste Processing Technology Development

Steve Schneider
Director, Office of Waste Processing

November 16, 2010
EM Waste Processing Technical Exchange

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

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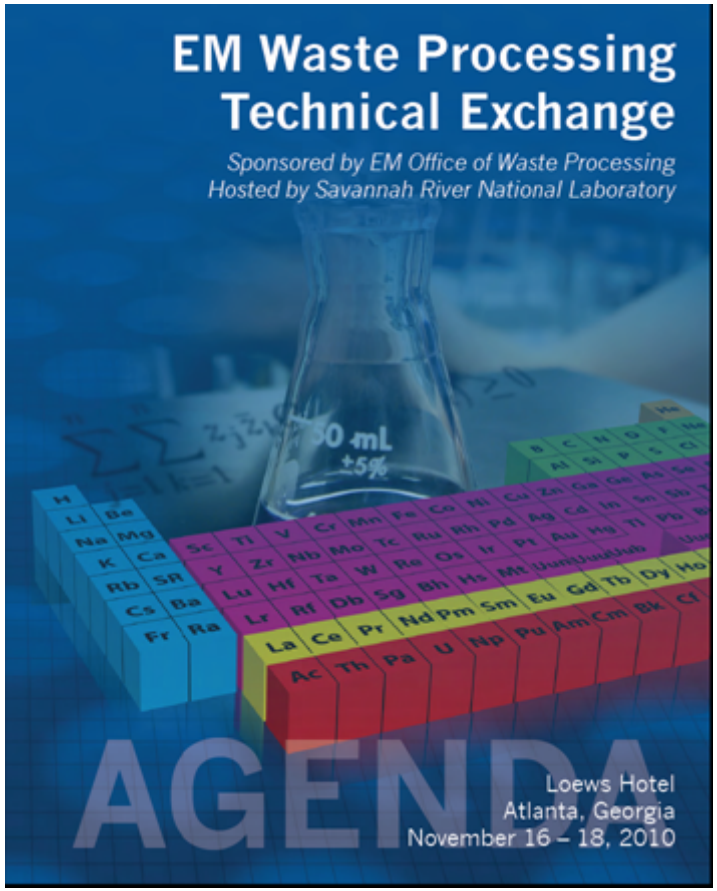
Welcome

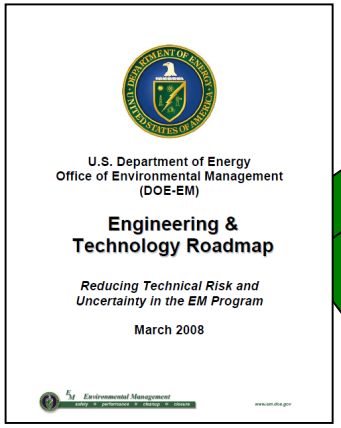


Kick-off Session plus 12 technical sessions

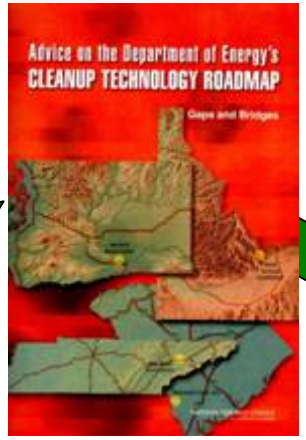
- Waste Retrieval and Closure
- Advanced Unit Operations
- Waste Pretreatment
- Feed Staging, Mixing and Blending
- Increased Waste Loading
- Improved Vitrification and Alternative Waste Forms
- Performance Assessments
- Tank Waste Storage, Inspection and Cleaning
- Posters

We have come a long way!

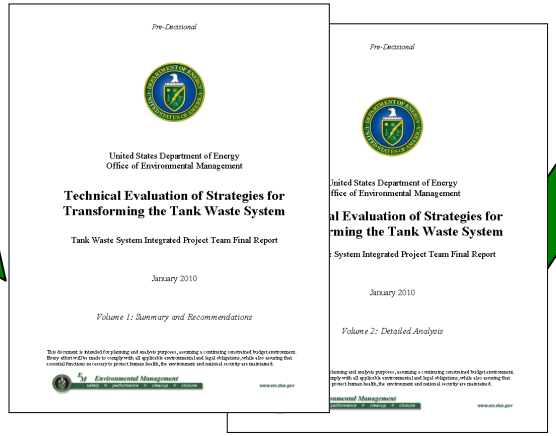
Tank Waste R&D Planning



EM Engineering & Technology Roadmap (2008)



NAS Report – Advice on the DOE Cleanup Technology Roadmap (2009)



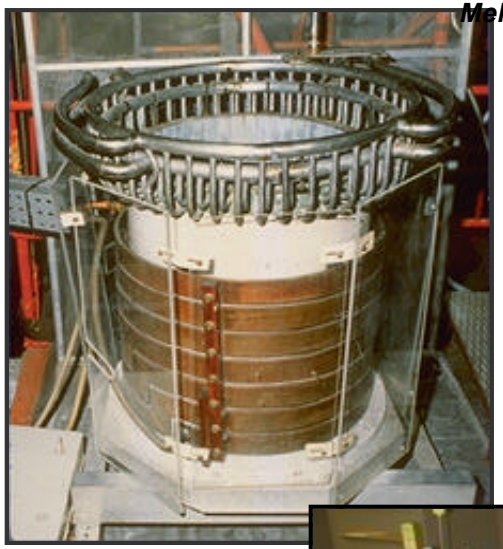
EM Tank Waste IPT Report (2010)

EM Tank Waste R&D Plan (2010)

Transformational Technologies – Reduce Life-Cycle Cost and Schedule

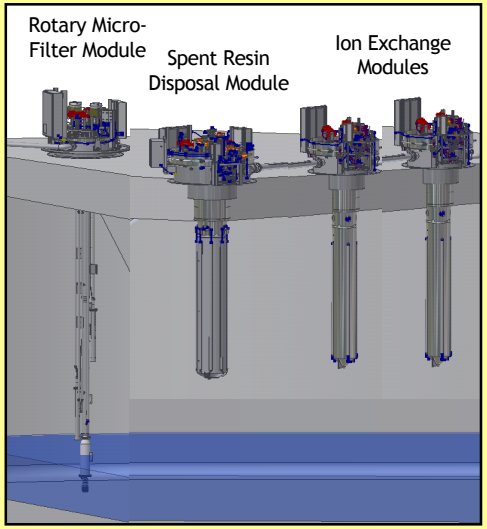
- Deploy At-Tank Processing such as Small Column Ion Exchange to increase processing rate
- Deploy Alternative Treatment process such as Fluidized Bed Steam Reforming to generate new waste form and reduce volume of waste
- Develop Next Generation Melters such as Cold Crucible or Advanced Joule-heated melters to improve waste processing
- Increase Waste Loading to reduce canister production

Cold Crucible Induction Melter



Fluidized Bed Steam Reforming Test Apparatus

Transformational Technologies: At-Tank Processing



Modular Salt Processing: Small Column Ion Exchange (SCIX)

In-tank sorbent column system to expedite salt waste processing

FY10 Completed Tasks

Radiation stability testing on sRF

Evaluated and selected potential non-acid eluants for testing

Spin Tek™ Rotary Microfilter (RMF)

Higher filtration rate system to clarify salt solution or continuously wash sludge

FY10 Completed Tasks

1000-hour endurance test

Began development of improved filter media

Transformational Technologies: Alternative Treatment

Fluidized Bed Steam Reforming (FBSR)

Hanford Tank Waste Sample Shipment for FBSR Tests

Uses superheated steam to convert liquid radioactive wastes to a stable solid

FY10 Completed Tasks

Began evaluation of the monolithic waste form for Hanford LAW

Decontaminated two Hanford samples in preparation for testing

SRNL tested an amended actual SRS DWPF sample emulating future Hanford melter waste

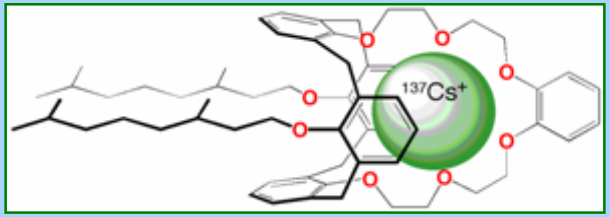
Next-Generation Cesium Solvent

New solvent for Caustic-side Solvent Extraction process at SRS to enhance removal of cesium

FY10 Completed Tasks

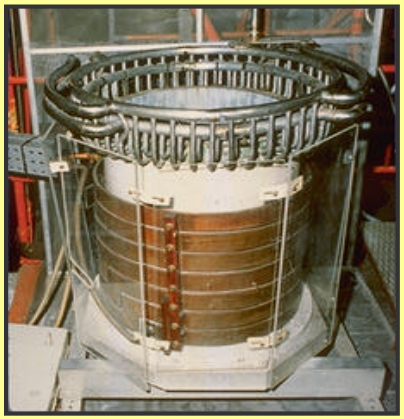
ORNL and SRNL delivered the solvent chemistry formulation

- New, more soluble calixarene extractant called MaxCalix.
- Stripping using dilute boric acid solution



MaxCalix with Captured Cesium Ion

Transformational Technologies: Next Generation Melters and Waste Loading



Cold Crucible Induction Melter

Next Generation Melters

Develop next-generation melters to dramatically increase waste loading

FY10 Tasks Completed

EM Next Generation Melter Technology Workshop

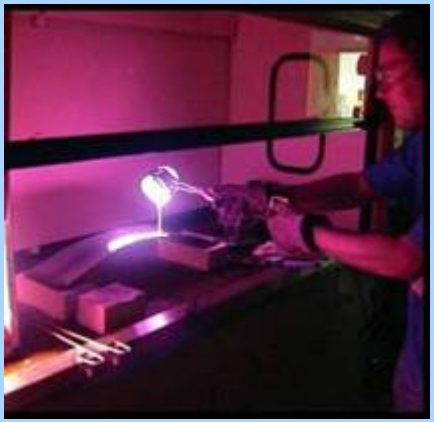
Increased Waste Loading: Advanced Silicate Glasses

Develop methods to increase the amount of waste in glass - reducing waste volume and costs

FY10 Tasks Completed

Completed initial glass models

Demonstrated that increasing the temperature difference between liquidus and melter may achieve a significant increase in waste loading



High Temperature Glass Pour

Looking Ahead

- **2011- 2013**
  - FBSR waste form qualification preliminary and final results
  - Deploy SCIX / RMF at SRS
  - Select next generation melter for engineering development
- **2014 – 2016**
  - Complete R&D for SCIX/RMF at Hanford
  - Select next generation melter for deployment

Plans or schedules discussed at this Technical Exchange do not imply that decisions to implement have been finalized by the Department. All technology selection decisions will be evaluated for safety and compliance with environmental and legal obligations prior to deployment.

Program Challenges

- Providing timely answers on whether technologies will meet site needs and deadlines
- Integrating labs, contractors, vendors and universities
- Maintaining a balanced portfolio of near-term and long-term investments
- Balancing many needs with available budgets

How do we get there?

- **Detailed task plans**
- **Technical reports**
- **Tests with real waste**
- **Program performance reviews**
  - Monthly at the program level
  - Quarterly across EM R&D Program
- **Technical reviews**
  - Peer reviews and External Technical Reviews
  - Reviews by groups outside EM i.e., EM Technical Expert Group, National Academy of Sciences

Goal for Future

The Tank Waste Times

one dollar | ESTABLISHED 1989 | November 16, 2020

DOE Tank Waste Technologies Saves Taxpayers Billions

Reduces Waste Processing and Tank Closure Cost by 1/3

The Department of Energy today announced the results of its decade-long strategy to transform the tank waste system….

The results to date are schedule reduction of seven years and cost savings of $19 billion from the baseline projected in 2010.

Closing

- Enjoy the remainder of the sessions
- Questions

U.S. DEPARTMENT OF ENERGY

For More Information Please Contact:

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Environmental Management
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