



U.S. DEPARTMENT OF **ENERGY**

Tank Waste Strategy Update

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Office of Environmental Management
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EM *Environmental Management*

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Waste Processing: Treatment and Disposal of Radioactive Waste

Mission: Treat 92 million gallons (343 million liters)

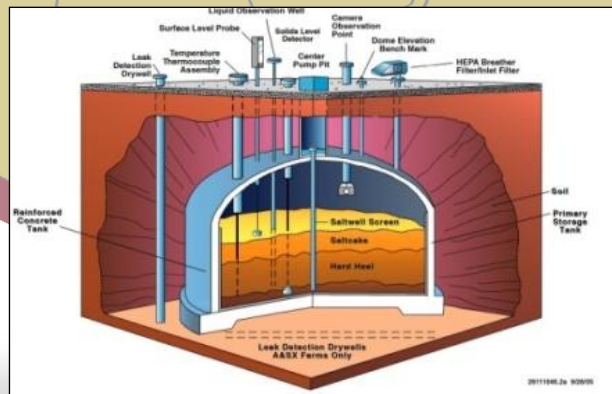
505 million curies of radioactive tank waste (7.39×10^{18} becquerels)

Hanford –
176M curies; 55M gallons
177 Tanks

Idaho –
37M curies, 900K gallons
15 tanks (11 closed)

Savannah River Site – 292M
curies; 37M gallons
51 Tanks (4 closed)

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



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Tank Waste Strategy Overview

- **Treatment and disposal of tank waste is the most technically challenging and expensive component of the EM Cleanup program.**
 - Current estimates indicate it will take 35 years and \$90 billion to complete.
- **The development of new technologies can reduce the schedule and cost by up to one third.**



Tank Waste Strategy Challenges

- The key challenges facing the tank waste program are to reduce technical uncertainties associated with waste treatment, meet compliance commitments and reduce the life-cycle cost of the program:
 - Reduce the technical uncertainty associated with the treatment and disposal of tank waste, in particular at the Waste Treatment Plant;
 - Accelerate treatment and processing schedules;
 - Reduce or eliminate the need for additional large processing facilities;
 - Develop more effective and efficient treatment and processing technologies;
 - Final disposal of High Level Waste; and
 - Maintain core technical competencies at national laboratories and other institutions.



Tank Waste Budget

- EM Budget for FY-2012; \$ 5.65B
- Tank Waste Budget for FY- 2012: \$ 2.12B
 - ORP: \$1.18B
 - SRS: \$ 0.83B
 - ID: \$ 0.11B
- The Budget for Tank Wastes is approximately 37% of the total EM budget.



20 Years of Progress in the Management of Tank Waste

- Stabilized millions of gallons of radioactive tank waste
- Completed 15 tank closures (4 tanks at Savannah River; 7 large and 4 small 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
 - Approximately 3 million gallons of salt waste processed.



20 Years of Progress in the Management of Tank Waste (cont'd.)

- West Valley Demonstration Plant
 - Vitrification facility 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 (2007)
 - Idaho Sodium Bearing Waste Treatment Facility (2007)

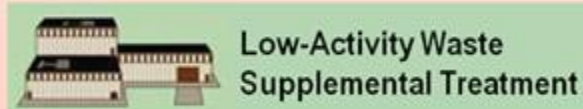
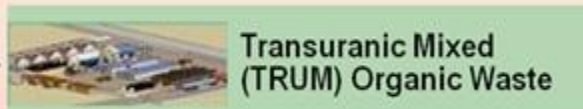


Tank Waste Processing: Hanford

Waste Storage/Retrieval



Processing



Immobilized Low-Activity Waste (ILAW)

Immobilized High-Activity Waste (HLAW)



Disposal



Low Activity Waste Containers

- 13,000 pounds of glass
- 30,000 – 40,000
- 300 mR/hr contact

Final Disposition

High Level Waste Canisters

- 6,600 pounds of glass
- 9,667
- 5000 R/hr on contact

Closure

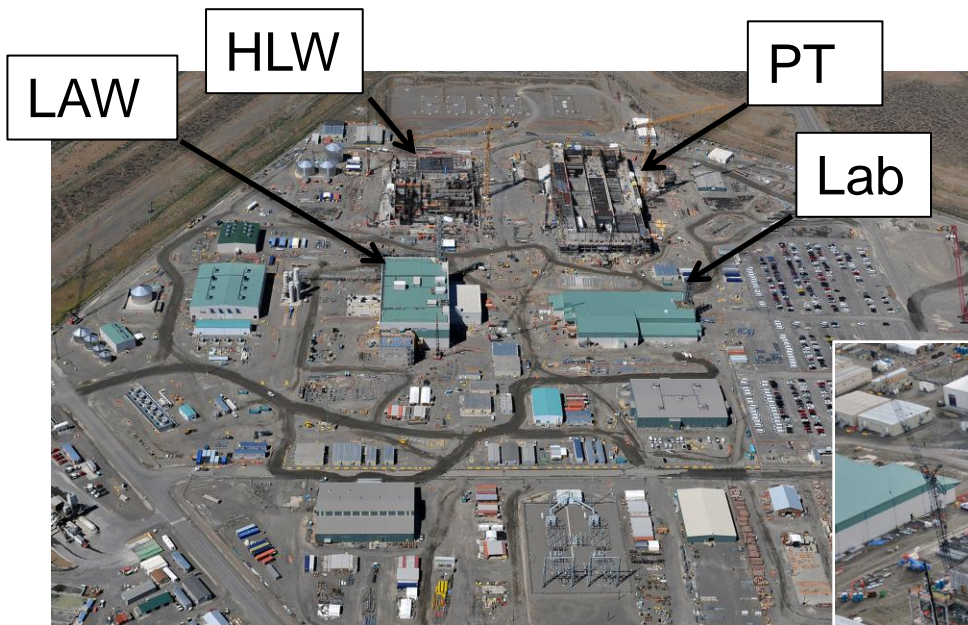


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Waste Treatment and Immobilization Plant Facility in Construction

Hanford Site Waste Treatment and Immobilization Plant



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

- 2,055 tons ductwork
- 946,000 feet electrical raceway
- 4.2 million feet electrical cable



Pretreatment Facility (PT)



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WTP Technical Issue Resolution

➤ Waste Treatment Plant Design Completion Team

- Core Team
 - Leadership and Management

- Technical Teams
 - Full Scale Vessel Testing
 - In-Service Inspection/Redundancy
 - Black Cell Analysis
 - Erosion/Corrosion
 - Tank Farm Pre-treatment Requirements

*Teams are being formed,
preliminary deliverable
schedules will be
available at end of 2012*



Office of River Protection

WTP Technical Issue Resolution

➤ River Protection Project Mission Definition Resolution Team

- Evaluation of RPP Mission Alternatives

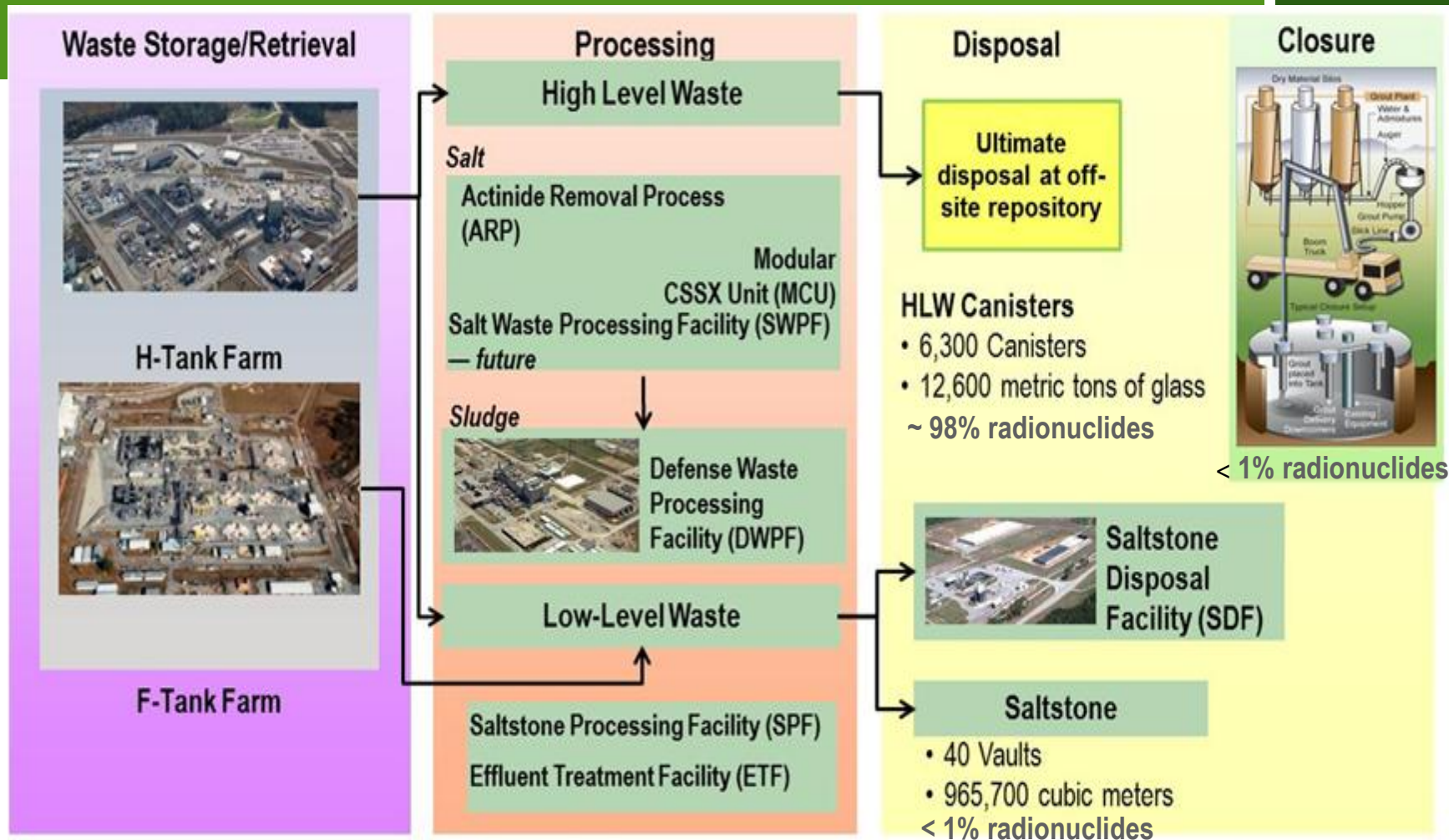
- Subordinate Technical Teams

- Select Supplemental Treatment LAW Waste Form and Secondary Waste Form
- Evaluate System Changes for IHLW Waste Form Production and Disposal
- Assess Alternative RPP Mission Strategies
 - ✓ Separate LAW Operation
 - ✓ Separate HLW Operation
 - ✓ TRU Waste Packaging

Teams are being formed, preliminary deliverable schedules will be available at end of 2012



Tank Waste Disposition Process Savannah River



Salt Waste Processing Facility in Construction

Savannah River Site Salt Waste Processing Facility



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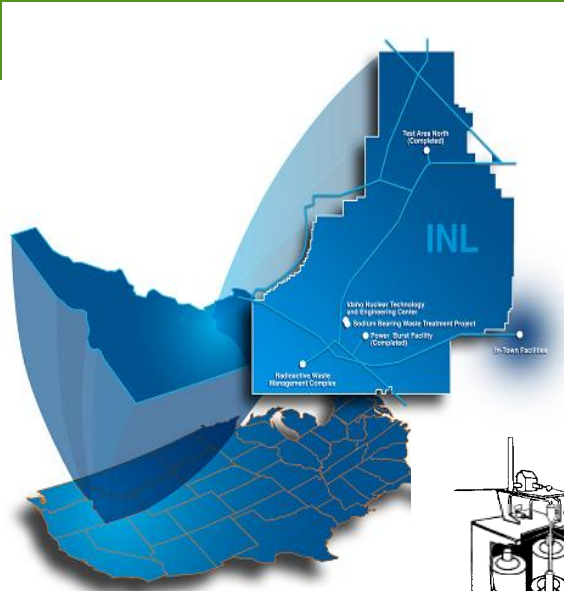
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Savannah River Site Technology Activities

- SCIX is an in-tank supplemental salt waste processing technology that can augment SWPF capability by up to 2.5M gallons per year.
- Deployment of Next Generation Solvent in ARP/MCU to ramp-up production
- Improvements to glass loading, melter throughput, saltstone improvements

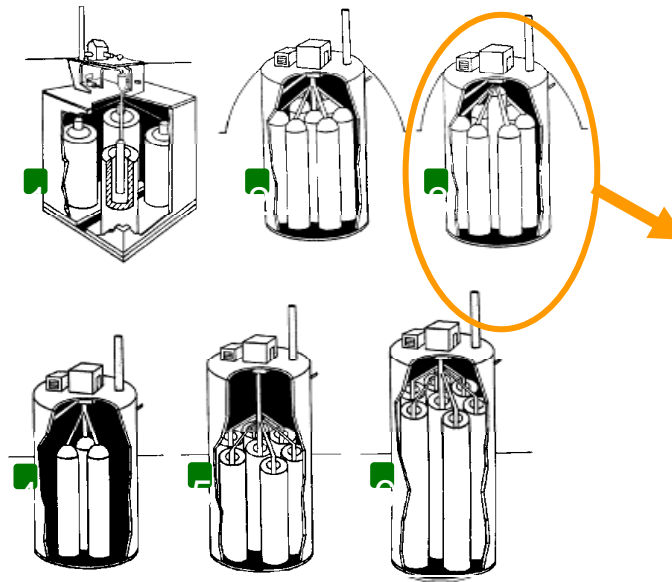


Tank Waste Processing: Idaho



Idaho National Laboratory (Three Waste Streams):

- Calcine (granular solid) 4,400 m³ in 7 bin sets
- Sodium Bearing Waste (SBW) – 900,000 gal



Sodium Bearing Waste Treatment Facility in Startup

- Recovery plan in place from June 2012 offgas event
- Expect Resumption of startup in Spring 2013
- Approximately one year operation to treat remaining 900,000 gallons of liquid sodium-bearing waste

Idaho National Laboratory Sodium Bearing Waste Treatment Facility



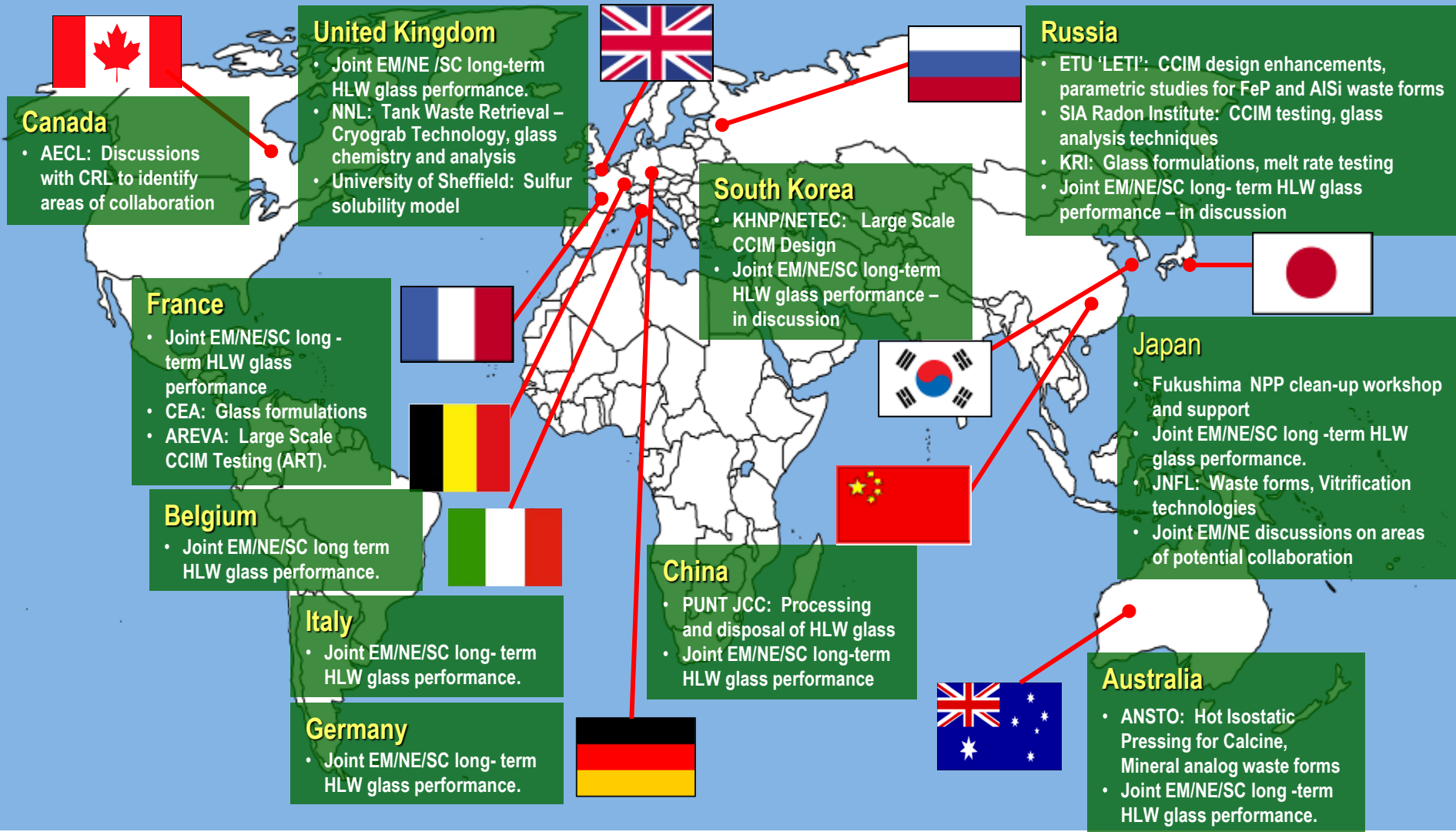
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EM International Waste Processing Collaborations



Tank Waste Corporate Board for Integration of Tank Waste Activities

➤ Why a Tank Waste Corporate Board?

- Previous Tank Waste Boards since early 1990's had mixed success
- Most recent Board had lapsed since October 2010
- Viewed as cornerstone to re-energize EM focus on integration and collaborative solutions

➤ How did we get the Board started again?

- First meeting in August 2012 at Idaho Falls included 40 attendees from:
 - DOE and prime contractor representatives from HQ and field sites,
 - National Laboratories, and
 - Invited guests from the Energy Facility Contractors Group (EFCOG)
- Prepared and approved an updated Charter
- Opened a productive and collegial dialogue



Tank Waste Corporate Board for Integration of Tank Waste Activities

➤ Achievements

- Broad interest and engagement across the ‘Tank Waste community’
- Information exchange on key topics:
 - Laboratory Role in Tank Waste Management and Multi-Site System Approach
 - Technetium Technology and Next Generation Vitrification
 - Lessons Learned from Sodium-Bearing Waste project
- Tank Waste Corporate Board chartered groups for further study:
 - *Tank Closure Working Group* - coordination on tank closures.
 - *Tank Waste Performance Measures Working Group* - improved tank waste PMs

➤ Next Steps

- Continued engagement on key tank waste issues
- Next meeting near Savannah River in March/April 2013



Summary of EMAB Recommendations:

Recommendation	Response
Support sequential WTP commissioning to include early LAW. (2011-07-C/D/E)	The WTP project is currently being reviewed and rebaselined in connection with Secretarial review.
Support management realignment and integration between the Tank Farms and WTP. (2011-07-A)	The EM program has been reorganized to provide Mission Unit support to improve field alignment.
Implement and deploy a general planning model suited for uncertainty analysis, operator-based sensitivity analysis, and optimization of retrieval, blending, and processing. (2011-01-C2/A2/A3)	Model development by MITRE for SR waste treatment is providing initial basis to address this recommendation.
Evaluate failure of 242-A evaporator. (2011-05-B)	Evaporator has been updated/evaluation completed.
Develop risk strategy for waste delivery. (2011-05-D)	This recommendation will be deferred until the WTP project review and rebaselining are completed.
Analyze alternatives for LAW. (2011-05-F)	EM-21 and ORP are funding research in advanced waste formulations to address this recommendation.
Work with regulators to develop options to provide flexibility and improve permitting. (2011-02-C/D, 2011-05-A, 2011-07-F)	EM-23 and ORP are coordinating closely with the State of Washington regulators.

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Summary of EMAB Recommendations:

(Continued)

Recommendation	Response
Conduct additional RMF testing with a range of actual Hanford tank waste samples. (2011-03-I)	The experimental program utilizes both actual waste samples as well as simulants.
Evaluate options, e.g. steam reforming, for Tank 48H processing. (2011-05-E/B)	The SRS Liquid Waste Stem Plan is currently being revised to include alternatives that do not use Tank 48H.
Conduct full scale SCIX testing. (2011-03-D)	The SCIX system at SRS had be deferred because of a funding shortfall. It is anticipated that the project will be restarted in the future.
Evaluate alternatives to sRF ion exchange resin. (2011-03-F1/F2)	EM-21 is funding a TDD project in next generation cesium solvent which addresses this recommendation.
Evaluate Cross Flow Filtration (CFF) for supernate. (2011-03-G)	Deferred due to lack of funding.
Near-term technological development focus on JHM. If an alternative melter technology is needed, develop CCIM . (2011-04-C)	EM-21 is funding research in advanced glass melters as well as advanced glass formulations that address this recommendation.
Difficulty in capturing volatile contaminants (e.g., Tc-99) in LAW glass should be considered in alternative treatment processes and waste forms WTP. (2011-02-A)	EM-21 and ORP are funding research in advanced waste formulations to address this recommendation.



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Summary of EMAB Recommendations:

(Continued)

Recommendation	Response
Conduct full scale SCIX testing.	The SCIX system at SRS had be deferred because of a funding shortfall. It is anticipated that the project will be restarted in the future.
Conduct additional RMF testing with a range of actual Hanford tank waste samples.	The experimental program utilizes both actual waste samples as well as simulants. The focus is on SRS first.
Evaluate options, e.g. steam reforming, for Tank 48H processing.	The SRS Liquid Waste Stem Plan is currently being revised to include alternatives that do not use Tank 48H.
Evaluate alternatives to sRF ion exchange resin.	EM-21 is funding a TDD project in next generation cesium solvent which addresses this recommendation.
Evaluate Cross Flow Filtration (CFF) for supernate at Hanford.	Deferred due to lack of funding.
Near-term technological development focus on JHM. If an alternative melter technology is needed, develop CCIM .	EM-21 is funding research in advanced glass melters as well as advanced glass formulations that address this recommendation.
The difficulty in capturing volatile contaminants (e.g., Tc-99) in LAW glass should be considered in alternative treatment processes and waste forms for Hanford.	Alternative treatment and Tc studies are being evaluated as part of the Secretarial review.



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EMAB Overarching Recommendations

Recommendation	Response
It is recommended that DOE seek (with Office of Management and Budget support) multi-year appropriations with no control points from Congress (versus year-to-year funding with control points) for mission-critical projects for both SRS and the Hanford Tank Farms Program.	DOE does not accept recommendation as written; however, EM strives for some flexibility. For example in requesting a single control point for the WTP project to provide greatest flexibility.
It is recommended that DOE seek to standardize life cycle cost evaluations system-wide when evaluating alternatives for technology and/ treatment system capital projects, regardless of expenditure level.	EM is pursuing this through a proposed initiative by Tank Waste Corporate Board via preparation of System Plan Guide
It is recommended that DOE proceed with a preliminary design funding request for execution of Vision 2020 to allow a single LAW melter to operate significantly earlier than in the baseline; on or about 2016.	This approach is being evaluated as part of response to Secretary's initiative.
EM-TWS recommends that DOE-SRS and ORP be extra vigilant in applying resources to additional project developments to the detriment of mission-critical system construction and operations (i.e., SWPF and WTP).	Part of evaluation to feed LAW first noted above, via a Business Case analysis.



Conclusions

- The integration of EM's Tank Waste programs is ongoing:
 - Tank Waste Corporate Board
 - Building on SRS successes – sludge preparation, salt preparation (ARP/MCU)
 - Technology development - Small Column Ion Exchange

- EM will be dispositioning recommendations as part of an integrated strategy.

- The Tank Waste Corporate Board will have a key role in formulating and promulgating the tank waste integrated strategy.

- Sharing of system planning and risk management tools will result in efficient and consistent systems plans at all tank waste sites.

- R&D directed to tank waste processing and waste forms may potentially yield significant cost savings.



Backup

Tank Waste Strategy Update



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 and ORP.
- 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)
 - Secretary Team Review of WTP Black Cells



High Activity Waste Tanks

