Tank Waste Program Reviews

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Tank Waste Program Summary

- Largest portion of Environmental Management (EM) budget
- Longest duration cleanup mission = 35 years
- Greatest technical challenges

Radioactive Tank Waste
$1,933M / 34%

EM’s FY 2014 Budget Request - $5.622 Billion Total
Tank Waste Challenges

- 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.
Reviews Offer Assistance and Perspective

2002  EM Top-to-Bottom Review
2006  External Flowsheet Review Team (EFRT) – Final Report
2006  EFRT – Background Report
2007  Technology Readiness Assessment (TRA)
2007  National Academy of Sciences (NAS)
2009  External Technical Review (ETR)
2009  Construction Project Review (CPR)
2009  NAS – Technology Roadmap
2007  Technology Readiness Assessment (TRA)
2007  National Academy of Sciences (NAS)
2009  External Technical Review (ETR)
2009  Construction Project Review (CPR)
2009  NAS – Technology Roadmap
2010  Integrated Project Team – Vol.1 and 2
2010  CPR May
2010  CPR November
2010  CRESP – Pulse Jet Mixer
2010  Defense Nuclear Facility Safety Board (DNFSB) 2010-2
2010  EM Advisory Board- Tank Waste Subcommittee (EMAB-TWS)
2010  Bechtel Safety Culture Review

2010  Health, Safety & Security Safety Culture Review
2010  NAS Workshop
2011  Government Accountability Office -11-143
2011  DNFSB 2011-1
2011  EM-Technical Expert Group
2011  EMAB- TWS
2011  Secretarial Review of EM Projects
2011  NAS – Waste Forms
2011  CPR
2012  DOE Inspector General
2012  DNFSB Report to Congress
2012  HSS Safety Culture Review
2012  DNFSB - Erosion
2012  Differing Professional Opinion
2013  Secretarial Review of WTP

Bold = External
EMAB – EM TWS Report for Waste Treatment Plant, 9/30/2010

- Charge 1: Verification of Closure of WTP External Flowsheet Review Team Issues
- Charge 2: WTP Technical Design review
- Charge 3: WTP Potential Improvements

EM Response from Dr. Ines Triay, Assistant Secretary for EM, 1/24/2011

- Charge 1: Ten recommendations provided to Contractor for consideration and review with Federal Project Director (FPD) for implementation.
- Charge 2: Five recommendations addressing stronger and more unified “owner” role for DOE implemented through actions by the Deputy Secretary.
- Charge 3: Five recommendations addressing system safety and project accountability also implemented through actions by the Deputy Secretary.

Key Message Received: Need strong DOE owner with single point authority and oversight under a unified baseline
  • Charge 1: Modeling for Life Cycle Analysis
  • Charge 2: Assess Candidate Low-Activity Waste Forms
  • Charge 3: Assess At-Tank or In-Tank Candidate Technologies for Augmenting Planed Waste Pretreatment Capabilities
  • Charge 4: Evaluate Various Melter Technologies
  • Charge 5: Evaluate the Reliability of Waste Delivery Plans
  • Charge 6: Identify Other Tank Waste Vulnerabilities at SRS and Hanford
  • Charge 7: 2020 Vision, Early Startup of One (1) LAW Melter
  • Charge 8: Alternate Retrieval Strategies for the Hanford Waste Tanks

• EM Response from David Huizenga, Acting EM-1, 11/16/2011
  • Recommendations provided to SRS and Hanford for evaluation and implementation, as appropriate.
  • EM considered response as ‘interim’ pending site evaluation and implementation

• EM Follow-up Response from David Huizenga, 6/12/2013
  • Responds to four overarching recommendations and describes broader review
• Tank Waste Corporate Board (TWCB) re-chartered in August 2012
  • Meet semi-annually, rotating between field locations
  • August 2012 – Idaho Falls; March 2013 - Savannah River; October 2013 - Hanford
• Focus for tank waste integration and collaboration
  • DOE and prime contractor representatives from HQ and field sites
  • National Laboratories
  • Invited participants and observers (e.g., Energy Facility Contractors Group, former TWSC members)
• Key Activities
  • Information exchange and Lessons Learned
  • Dialogue on difficult technical and policy issues
  • Charter working groups for further, detailed analysis and evaluation
  • Locus for “Review of Reviews” Evaluation
Many detailed programmatic and technical recommendations forwarded for field consideration (2009 – 2011), but action or status not recorded

Significant program impacts from budget and DOE management changes

Many similar, overlapping, or conflicting recommendations suggest need for comprehensive, integrated resolution

- Waste Forms Technology and Performance Final Report, National Academy of Sciences (NAS), 2011
- Better Information Needed on Waste Storage at DOE Sites as a Result of Yucca Mountain Shutdown, GAO, March 2011
- Advice on the Department of Energy’s Cleanup Technology Roadmap – Gaps and Bridges, NAS, 2009
Review of Reviews Approach

- Complete: Develop Process & Tools
- Complete: Load Reviews in Tool
- Complete: Load Proposed Leads, Responses, and Bins
- In-Progress: Field Reviews
  - Initial Draft of Tracking Tool
  - Update Tool
  - Implement Responses and Track Progress
  - Brief EMAB
# Topical Area Groupings

<table>
<thead>
<tr>
<th>Management</th>
<th>Real Waste Testing</th>
<th>Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consult Others</td>
<td>Tank 48 (SRS)</td>
<td>Retrieval</td>
</tr>
<tr>
<td>Risk/Uncertainty/Sensitivity/Health</td>
<td>Analytical Capability</td>
<td>Solubility</td>
</tr>
<tr>
<td>System Plans</td>
<td>At-Tank (Pre-Treatment)</td>
<td>Technetium (Tc)</td>
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<tr>
<td>Regulatory Approach</td>
<td>Cesium (Cs) Removal</td>
<td>Waste Forms</td>
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<tr>
<td>Modeling</td>
<td>Melter / Glass</td>
<td>Gas Retention</td>
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<tr>
<td></td>
<td>Monosodium Titanate (MST)</td>
<td>Heel Removal / Robots</td>
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</table>
Categories for Statusing Recommendations

- Completed / Closed
- Agree - deferred for funding availability
- In-progress
- Not adopted

- On-going
- Recommendation will be used as input to reevaluation of strategy
- Technical Strategy Changed
<table>
<thead>
<tr>
<th>ID</th>
<th>Recommendation</th>
<th>Key Message</th>
<th>Primary Lead</th>
<th>Disposition or Action</th>
<th>Topical Area</th>
<th>Summary Proposed Action</th>
<th>Target Completion Date</th>
<th>Actual Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMATW</td>
<td>2011-04-01&lt;br&gt; 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 EM and the Hanford Tank Farms Program.</td>
<td>Pursue multi-year TD funding&lt;br&gt;EM-20 &lt;br&gt; DOT does not accept the recommendation as written; however EM strives for some flexibility. For example a single control point is being requested for NTE to provide greater flexibility.</td>
<td>EM-20&lt;br&gt; DOT</td>
<td>OI Management - Budget&lt;br&gt;Not adopted</td>
<td>OI Management - 100&lt;br&gt; Recommendation will be used as input to reevaluation of strategy</td>
<td></td>
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<tr>
<td></td>
<td>Standardize life cycle cost analysis&lt;br&gt;EM-20&lt;br&gt; DOT is pursuing this through a proposed initiative by the Tank Waste Corporate Board via preparation of a System Plan Guide.</td>
<td>Standardize life cycle cost evaluation approach for TD&lt;br&gt;EM-20&lt;br&gt; DOT</td>
<td>OI Management - 100&lt;br&gt; Recommendation will be used as input to reevaluation of strategy</td>
<td></td>
<td></td>
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</table>

**Column Header**

- **ID:** A unique identifier for each recommendation to be addressed by the tracking and implementation plan (initial list uses the applicable Report Rec. #)
- **Recommendation:** Verbatim recommendation from a particular report. The first row of a group of similar recommendations identified by color will be a descriptive summary of the group.
- **Key Message:** Summarizes Recommendation
- **Primary Lead:** The office (i.e. EM-20, -21, -23, ORP, and SR) that has responsibility for responding to the recommendation and ensuring actions are completed
- **Disposition or Action:** Detailed status or action already decided or underway
- **Topical Area:** Categorization of recommendation to facilitate resolution and tracking
- **Summary Proposed Action:** Summarizes disposition or action
- **Target Completion Date:** Planned date for resolution of recommendation
- **Actual Completion Date:** Actual date for resolution of recommendation
### Preliminary Action Summary *

<table>
<thead>
<tr>
<th>Summary Proposed Action</th>
<th>EMAB-TW Count</th>
<th>TEG Count</th>
<th>NAS-GAPs Count</th>
<th>NAS-Waste Count</th>
<th>GAO Count</th>
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<tbody>
<tr>
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<td>3</td>
<td>1</td>
<td>3</td>
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<td>0</td>
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<tr>
<td>Not adopted</td>
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<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>8</td>
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<tr>
<td>On-going</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Recommendation will be used as input to reevaluation of strategy</td>
<td>23</td>
<td>39</td>
<td>14</td>
<td>6</td>
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<td>82</td>
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<tr>
<td>Technical Strategy Changed</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>SubTotal Rec's from Review</strong></td>
<td><strong>47</strong></td>
<td><strong>95</strong></td>
<td><strong>23</strong></td>
<td><strong>10</strong></td>
<td><strong>5</strong></td>
<td><strong>180</strong></td>
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* - Will be updated upon completion of field input
• Savannah River response examples
  • Through system planning, need for Tank 48 has been revised due to success with Actinide Removal Process / Modular Caustic Side Solvent Extraction Unit (EMAB-TWS-2011-05-E)
  • An options analysis for Small Column Ion Exchange (SCIX) treatment was completed and documented (EMAB-TWS-2011-06-B)
  • An External Technical Review (ETR) was completed in September 2011 to complete the technical evaluation for SCIX (EMAB-TWS-2011-03-E)

• Hanford response examples
  • Revised Waste Acceptance Product Specifications has been issued to use as a basis for waste acceptance criteria (EMAB-TWS-2011-05-C)
  • Majority of technical and programmatic recommendations are being evaluated as part of Secretarial Review of WTP (following slides)

• Headquarters response examples
  • Guidance and standard approaches for DOE O 413.3B (EMAB-TWS-2011-01-D)
  • Model developed by MITRE for SR tank farms (EMAB-TWS-2011-01-C2)
• Almost exclusive focus on Hanford Tank Waste issues
  • **2012 DOE Inspector General (IG):** The Department of Energy’s $12.2 Billion Waste Treatment and Immobilization Plant – Quality Assurance Issues – Black Cell Vessels
  • **2012 DNFSB Report to Congress:** Status of Significant Unresolved Issues with the Department of Energy’s Design and Construction Projects
  • **2012 HSS Safety Culture Review:** Independent Oversight Assessment of Nuclear Safety Culture and Management of Nuclear Safety Concerns at the Hanford Site Waste Treatment and Immobilization Plant (WTP)
  • **2012 DNFSB Erosion Issue:** Review by DNFSB staff regarding wear (erosion and corrosion) allowances used for the design of piping, vessels, and pulse jet mixer (PJM) nozzles at the WTP
  • **2012 Differing Professional Opinion:** “Differing Profession Opinion Panel Report - Unknown Viability of Black Cells and Piping at the Waste Treatment and Immobilization Plant at Hanford”

• Secretary of Energy Review provides major focus and emphasis
• Design Completion Team was chartered to resolve the technical issues
  • Five topical areas identified (refer to next slide)
  • Subordinate technical teams formed
• Modeling (computational fluid dynamics) and scaling presented too many uncertainties to assess pulse jet mixing performance
  • Use full scale testing with actual vessels using relevant simulants
  • PNNL and SRNL tasked to develop the test plans, develop the simulants, and provide technical oversight of the testing
• Over-conservatism delaying completion of design (analysis paralysis)
  • Utilizing probabilistic (quantitative) risk assessments to inform design parameters and nuclear safety controls
• Diverse tank waste characteristics driving very broad WTP feed acceptance criteria
  • “Precondition” tank waste prior to delivery to WTP
WTP Design Completion Team

CORE TEAM
Design Completion

S1 Team

TECHNICAL TEAM
Tank Waste Pre-Treatment Requirements and Facilities

TECHNICAL TEAM
Full Scale Vessel Testing

TECHNICAL TEAM
In-Service Inspection and Design Redundancy

TECHNICAL TEAM
Black Cell and Vessel Analysis

TECHNICAL TEAM
Erosion and Corrosion
• A systematic approach has been developed to provide tracking of external reviews through the Tank Waste Corporate Board

• A focused effort has been initiated to resolve long-standing, complex technical issues that have stalled WTP design completion

• We are exploring alternative strategies and technical approaches for the tank waste disposition mission
Supplemental Information
• EM Budget for FY-2013 = $ 5.29 B (after sequestration)
• Tank Waste Budget for FY- 2013 = $ 1.89 B
  • ORP: $1.09 B
  • SRS: $0.67 B
  • ID: $0.11 B
• Budget for Tank Wastes is approximately 36% of the total EM budget.
• Technology Development Budget
  • FY12 = $1.8M
  • FY13 = $3.2M
• A robust tank waste technology development program requires funding of $20 to $30M per year if significant life-cycle cost reductions and schedule reductions are to be realized.