Liquid Waste Program
Prime Contractor

U.S. DEPARTMENT OF ENERGY

Savannah River Remediation
AECOM | BECHTEL | CH2M | BWXT

Evaluation and Impacts of Mercury in the SRS Liquid Waste System - Update

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CAB Committee Meeting
New Ellenton, SC
August 9, 2016

SRR-MS-2016-00149

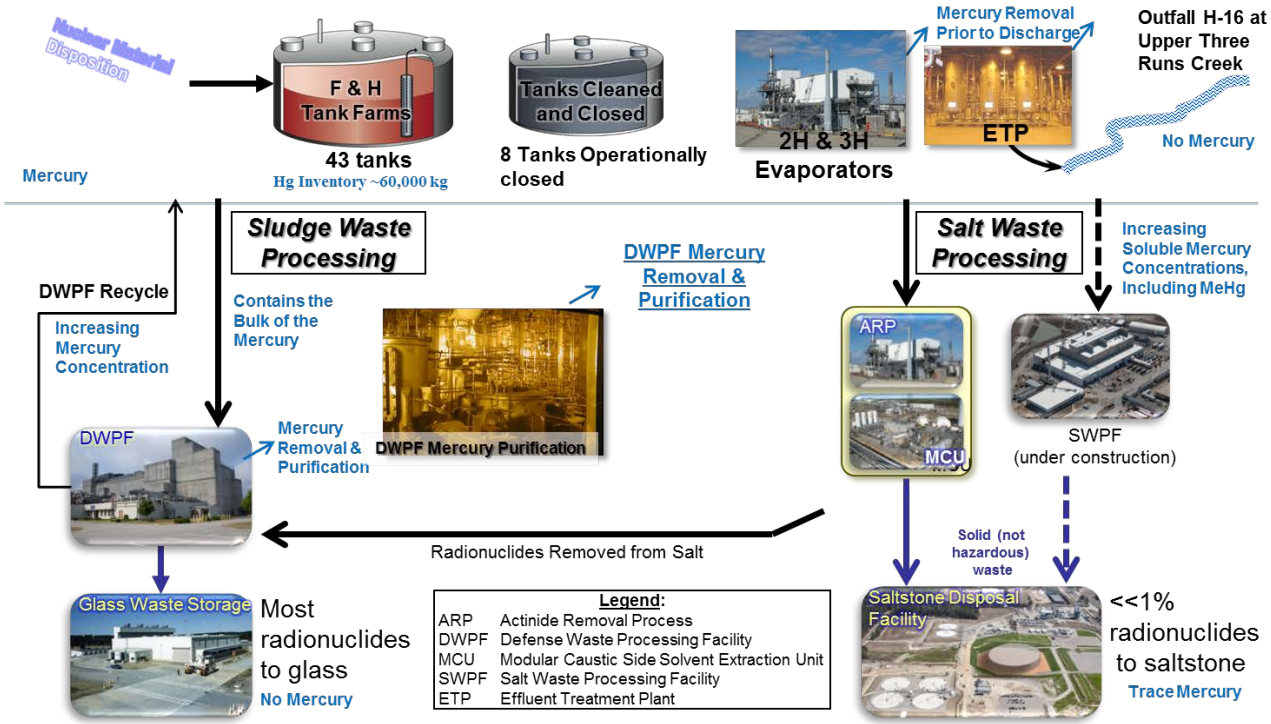
Objective

- Provide an Update on the Progress of the SRS Liquid Waste System Mercury Program
  - Last Update Provided to the Citizen Advisory Board (CAB) in November 2015

Mercury in SRS Liquid Waste (LW) System

- Mercury is present in the LW System and must be removed and dispositioned
- Current and future operations will continue to process waste containing higher levels of mercury from HM-PUREX sludge at H-Tank Farm
- Defense Waste Processing Facility (DWPF) is designed for Mercury removal but this system is not functioning due to chemistry and equipment issues

- Started to observe increased concentrations of organomercury
- Organomercury compounds must be managed throughout the LW system
  - Flammability
  - Mercury retention in saltstone
  - Industrial hygiene and worker protection



Mercury in SRS Liquid Waste System – Initial Items Addressed

- Industrial Hygiene and Worker Protection (Monitoring and Personal Protective Equipment)
  - Worker communications completed
  - Methylmercury permeability testing of latex gloves and other materials completed
  - Precautions, such as 'sniffers', are taken to detect mercury should it be present prior to performing work
- Tank Farm Safety Analysis
  - Compensatory actions implemented, pending minor evaporator modifications
- Saltstone Safety Analysis
  - Safety Analysis changed to address mercury levels that effect worker/facility safety
- Saltstone Performance
  - Toxicity Characteristic Leaching Procedure (TCLP) particle size variability
  - Hazardous waste landfill disposal limit clarified
- Performance Assessment Impact (Tank Closure Grout and Saltstone)
  - Assessment completed and “No Impacts” documented

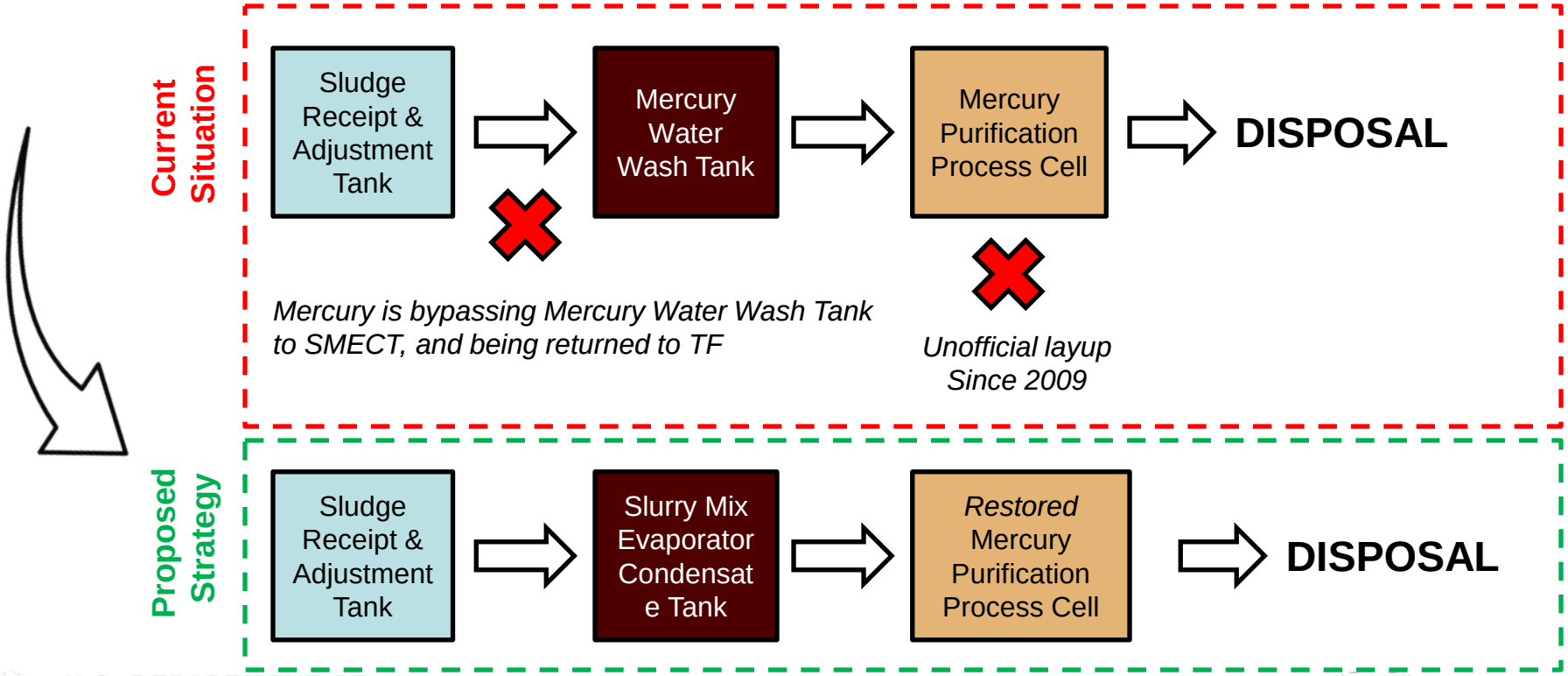
Long Term Mercury Management Plan

Task: Conduct ***an integrated, system-wide evaluation of mercury*** behavior in the Liquid Waste system; ***develop long-term action plan*** to address overall mercury management and removal

- Two Phase Assessment Approach:
  - Phase 1: Review Liquid Waste inventory and chemical processing behavior
    - ✓System-by-system review
    - ✓Gap analyses
  - Phase 2: Integrated Assessment
    - ✓ Extensive Sampling and Mercury Speciation Effort
    - ✓ DWPF Mercury Removal Systems Engineering Evaluation
    - ✓ Alternate Liquid Waste Mercury Removal Systems Engineering Evaluation
    - ✓ Overall Systems Reviews
      - ✓ DWPF
      - ✓ Salt processing
      - ✓ Evaporators
    - ✓ Comprehensive Action Plan (nearing completion)
- Established:
  - ✓Mercury Expert Advisory Panel (ongoing)
  - ✓AECOM Mercury Issue Coordination Team to integrate mercury related efforts between SRS and Oak Ridge (UCOR) (ongoing)
- Integrated with:
  - ✓EM-1 Mercury Technology Challenges Team (ongoing)

Long Term Mercury Management

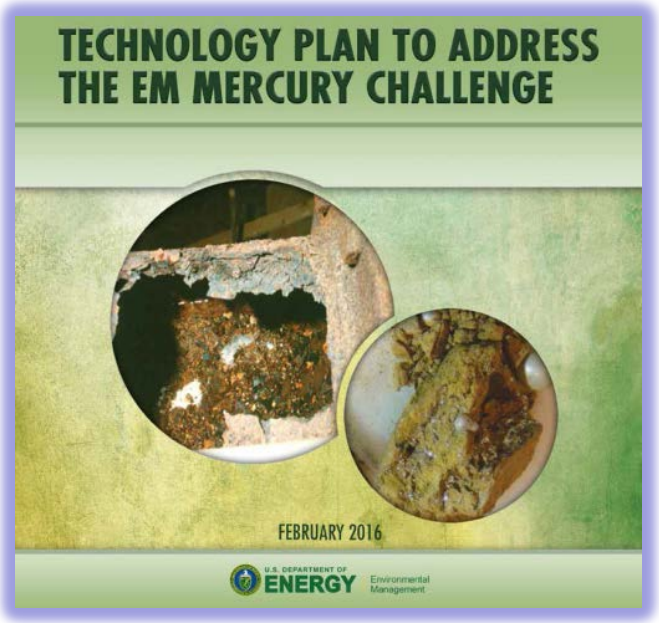
- DWPF Mercury Removal – System Engineering Evaluation Recommendations
  1. *Raise pH in Slurry Mix Evaporator Condensate Tank (SMECT) to collect additional Mercury*
  2. *Reestablish/repair Mercury Purification Process Cell operation*
- Facility Implementation Plans Ongoing – Initial Operations Targeted for Mid 2017



Long Term Mercury Management

- Alternate Liquid Waste Mercury Removal – Systems Engineering Evaluation Recommendations
  1. *Removal of ionic Mercury via reductant with a chemical additive to the evaporator (2H) system to enhance current mercury removal*
  2. *Pursue removal of organic mercury via photoreaction (Tank 50) in parallel with enhanced retention of mercury in saltstone*
  3. *Develop methods to measure mercury in sludge*
  4. *Target process vessels for mechanical removal of Mercury (opportunistic)*

Input



- All Recommendations Involve Varying Levels of Technology Development, Deployment, and Maturation

FY16 - $615K in Funding for DOE-EM for Alternate Mercury Removal Technology Allocation

Long Term Mercury Management – Remaining Activities

- Complete Mercury Expert Advisory Panel Review
- Issue Long Term Mercury Management Plan
  - Plant operations
  - Technology development
  - Process monitoring

Examples of Long-Term Actions

Category	Facility	Status	Scope	Performing Organization
Plant Operations	DWPF	Initiated	Raise pH in Slurry Mix Evaporator Condensate Tank (SMECT) to collect additional Mercury	SRR – DWPF
	DWPF	Initiated	Reestablish Hg Removal System and associated jumpers to remove mercury from SMECT and/or MWWT	SRR – DWPF
	DWPF	Future Outage scope	Gain operational mercury removal efficiencies e.g. flush/clean condensers and scrubber baskets	SRR-DWPF
Technology Development	TF	Funded (EM, 2 yr.)	Removal of ionic mercury via reductant with a chemical additive to the evaporator (2H) system to enhance current mercury removal	SRNL
	TF	Funded (EM, 2 yr.)	Removal of organic mercury via photoreaction (Tank 50)	SRNL
	TF	Funded (EM, 1 yr.)	Develop methods to determine speciation of mercury in sludge	SRNL
Process Monitoring	DWPF	Continue	Monitor mercury analysis of sludge batches after concentration	SRR – DWPF
	TF	Continue	Monitor mercury collection from Evaporator System	SRR-TF
	SS	Continue	Monitor mercury speciation of Tank 50 quarterly samples	SRR – Saltstone
	TF	Continue	Monitor mercury in salt batch qualification samples	SRR – TF
	SHT	Continue	Monitor mercury in monthly MCU solvent sample	SRR – MCU
	All	Initiated	Develop in-house capability to measure organomercury.	SRNL
	All	Initiated	Run certified laboratory to laboratory comparison on Hg TCLP results for variability	SRR/SRNL

Summary

- Mercury is Pervasive Throughout the Liquid Waste System
- Represents Both a Current and a Long-Term Challenge to Liquid Waste Processing
- DWPF Mercury Removal System is a Key Technology Challenge
- Began Several Technology Initiatives for Removal of Mercury from the Liquid Waste System (Other than DWPF)
- Long-Term Action Plan being finalized (August 2016)
- Long-Term Actions may Require Significant
  - Process Adjustments
  - Facility Modifications
  - Technology Development