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

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Citizens Advisory Board Meeting
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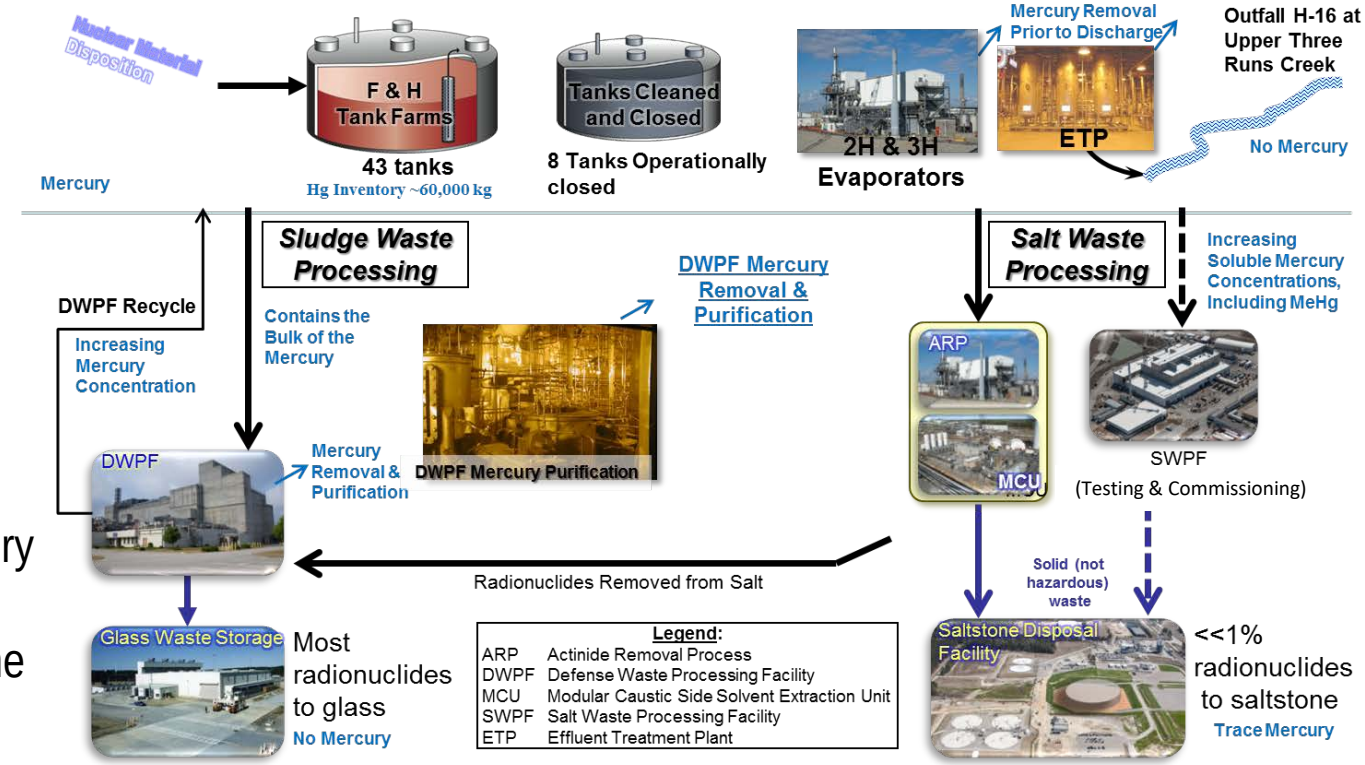
Mercury in SRS Liquid Waste System (LWS) - Background

- Mercury from separations processes is present in the LWS and must be removed & 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 effectively due to chemistry and equipment issues
- Started to observe increased concentrations of organic mercury
- Organic mercury compounds must be managed throughout the LWS
  - Flammability
  - Saltstone mercury retention
  - Industrial hygiene and worker protection



Long Term Mercury Management Plan (Completed in 2016)

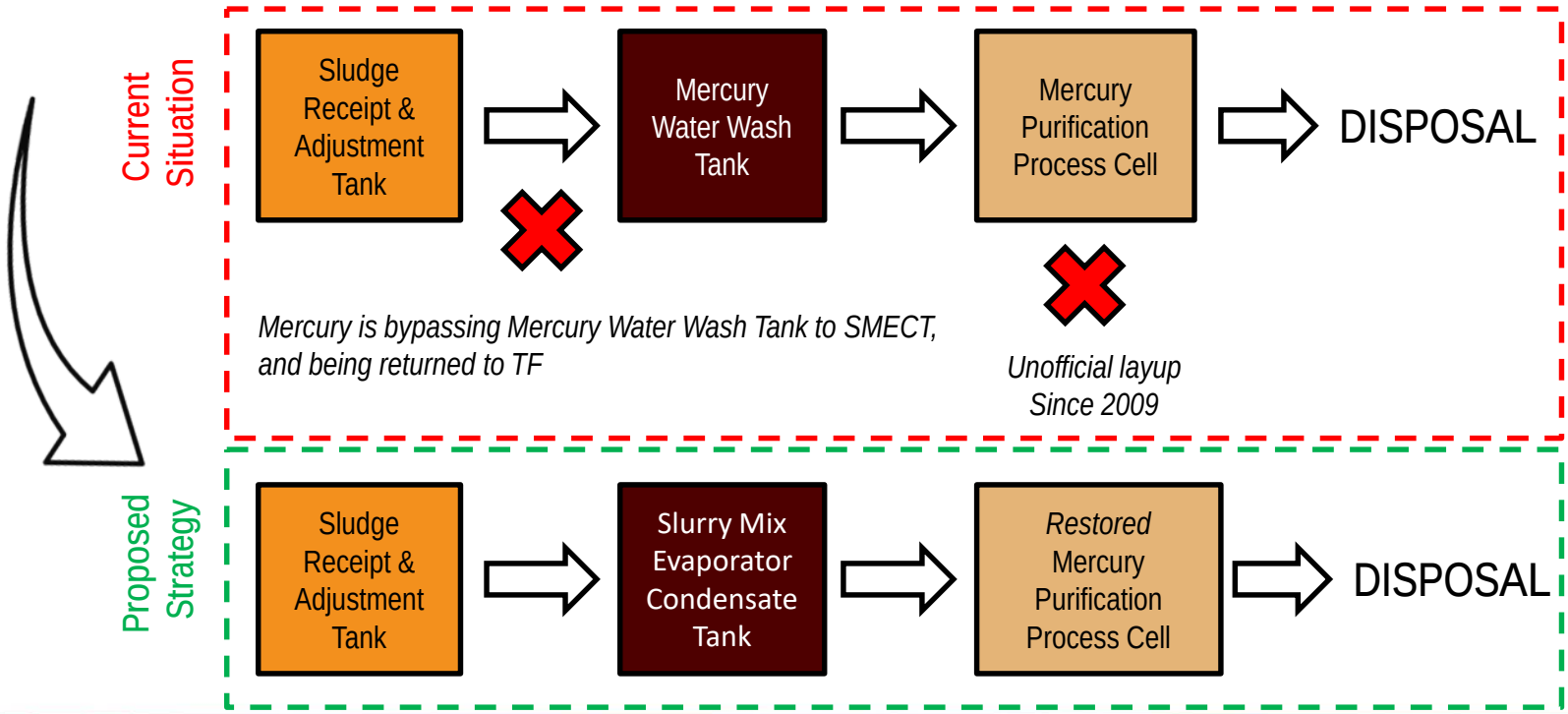
Task: Conduct *an integrated, system-wide evaluation of mercury* behavior in the LWS; *develop a long-term action plan* to address overall mercury management and removal

- 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 (approved – actions underway)
- Established:
  - Mercury Expert Advisory Panel
  - AECOM Mercury Issue Coordination Team to integrate mercury related efforts between SRS and Oak Ridge
- Integrated with:
  - EM-1 Mercury Technology Challenges Team

Long Term Mercury Management Actions

- DWPF Mercury Removal – System Engineering Evaluation Recommendations
  1. *Raise pH in Slurry Mix Evaporator Condensate Tank (SMECT) to collect additional Mercury (complete)*
  2. *Reestablish/repair Mercury Purification Process Cell operation (ongoing)*
- Facility Implementation - Initial Operations Revised to 2019
  - Design work complete / jumpers fabricated
  - Physical mods / install coordinated adjacent canyon outage work

Modification Design & Fabrication Complete

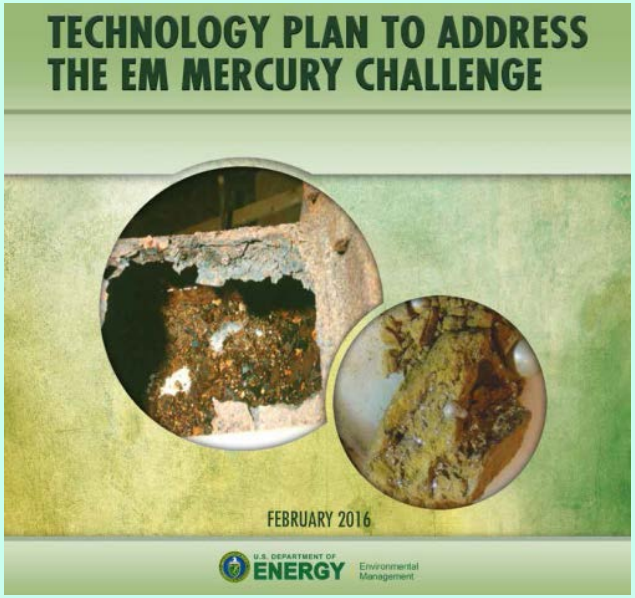


Long Term Mercury Management Actions

- Alternate Liquid Waste Mercury Removal – Systems Engineering Evaluation Recommendations
  1. *Removal of ionic mercury via reductant with a chemical additive to the 2H Evaporator system to enhance current mercury removal (Scoping Studies Complete)*
  2. *Pursue removal of organic mercury via photoreaction (Tank 50) in parallel with enhanced retention of mercury in saltstone (Scoping Studies Complete – FIU Collaborating on Future Testing)*
  3. *Develop methods to measure mercury in sludge (Real Waste Sludge Measurements Complete)*

- All Recommendations Involve Varying Levels of Technology Development, Deployment, and Maturation
- Additional, SRNL to establish capability to measure Methylmercury in Radioactive Samples

Input



FY16, FY17, FY18 - Funding for DOE-EM for Alternate Mercury Removal Technology Allocation; Task Performance coordinated by Savannah River National Laboratory (SRNL)

Mercury in SRS LWS – Progress

- Industrial Hygiene and Worker Protection (Monitoring and Personal Protective Equipment)
  - Extensive Vapor Monitoring precautions, such as 'sniffers', are taken to detect mercury should it be present prior to performing work
  - IH Controls based on Worst Case Mercury Vapor Compound (Dimethyl Mercury)
    - *Worst case Mercury Vapor Compound now accounts for < 0.10 % of the Mercury Vapors*
  - Increased Engineered Features to Limit Vapor Potential
    - *90% of ETP Modifications Complete*
- SRNL Effort to Establish on-site Analysis for Organic Mercury Completed
  - Eliminates need to ship samples off-site, increases turnaround time and accuracy
- DWPF Modifications for Mercury Removal Staged for Implementation
  - Mercury Pump Repairs Ongoing
  - Outage Scheduled in Coordination with Adjacent Equipment Replacement
- Alternate Mercury Technology Efforts Progressing
  - Scoping / Feasibility Studies now Complete for all initiatives
  - University Expertise Engaged
  - DOE-EM Mercury Technology Plan Update in Progress

Summary

- Mercury is pervasive throughout the LWS
- Represents both a current and a long-term challenge to Liquid Waste processing
- DWPF Mercury Removal System is a key technology challenge
  - Modification design changes & fabrication are complete
  - Installation coordinated with adjacent equipment replacement
- Technology initiatives for removal of mercury from the LWS (other than DWPF) are progressing
- Ongoing actions
  - Facility modifications
  - Technology development

Acronyms

ARP – Actinide Removal Process

DWPF – Defense Waste Processing Facility

EM – DOE Environmental Management

ETP – Effluent Treatment Facility

HM-PUREX – H-Canyon Modified – Plutonium Uranium Reduction Extraction

LWS – Liquid Waste System

MCU – Modular Caustic Side Solvent Extraction Unit

SMECT – Slurry Mix Evaporator Condensate Tank

SRNL – Savannah River National Laboratory

SWPF – Salt Waste Processing Facility

TCLP – Toxicity Characteristic Leaching Procedure