



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

Presented by: Richard E. Edwards

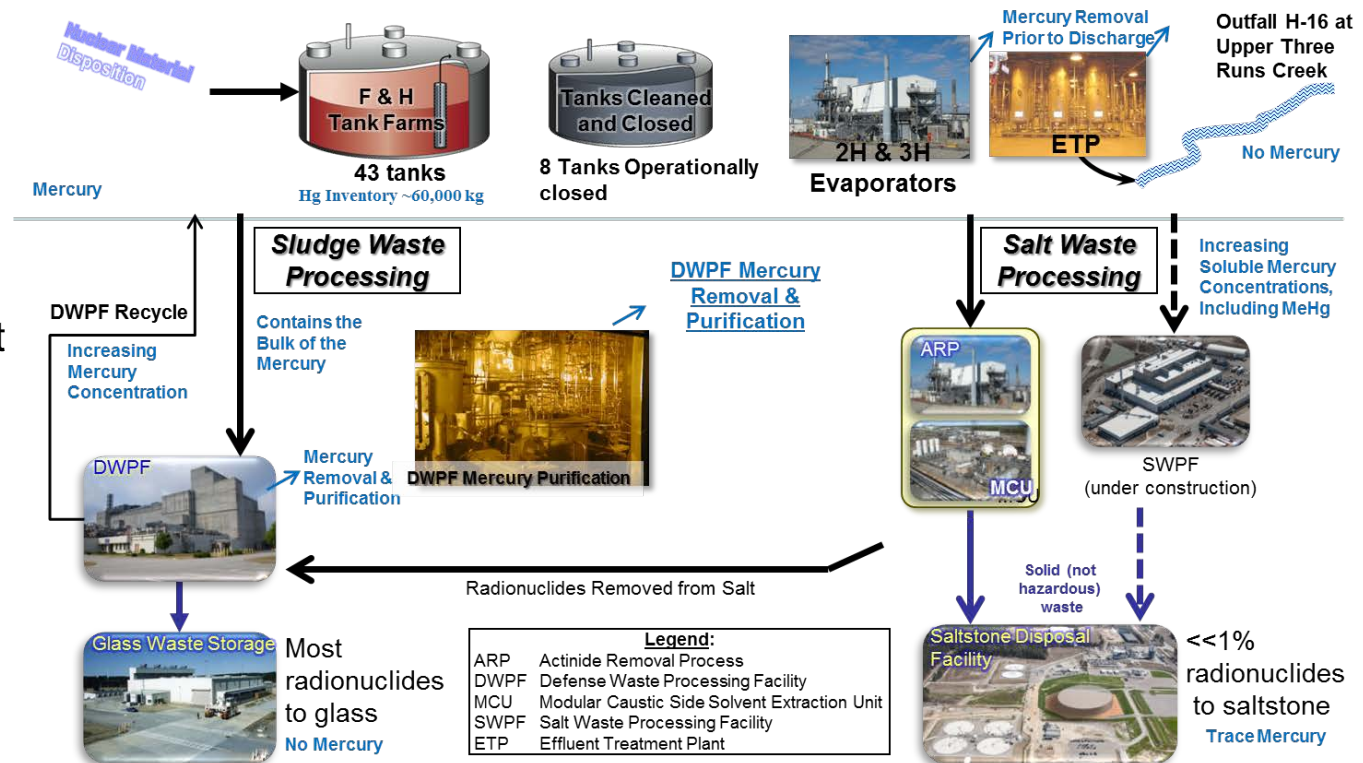
Citizens Advisory Board Meeting
Augusta, GA
September 27, 2016

SRR-MS-2016-00193

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 organic mercury
- Organic Mercury compounds must be managed throughout the LW system
 - Flammability
 - Saltstone Mercury retention
 - 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**
 - Safety Analysis changed, 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

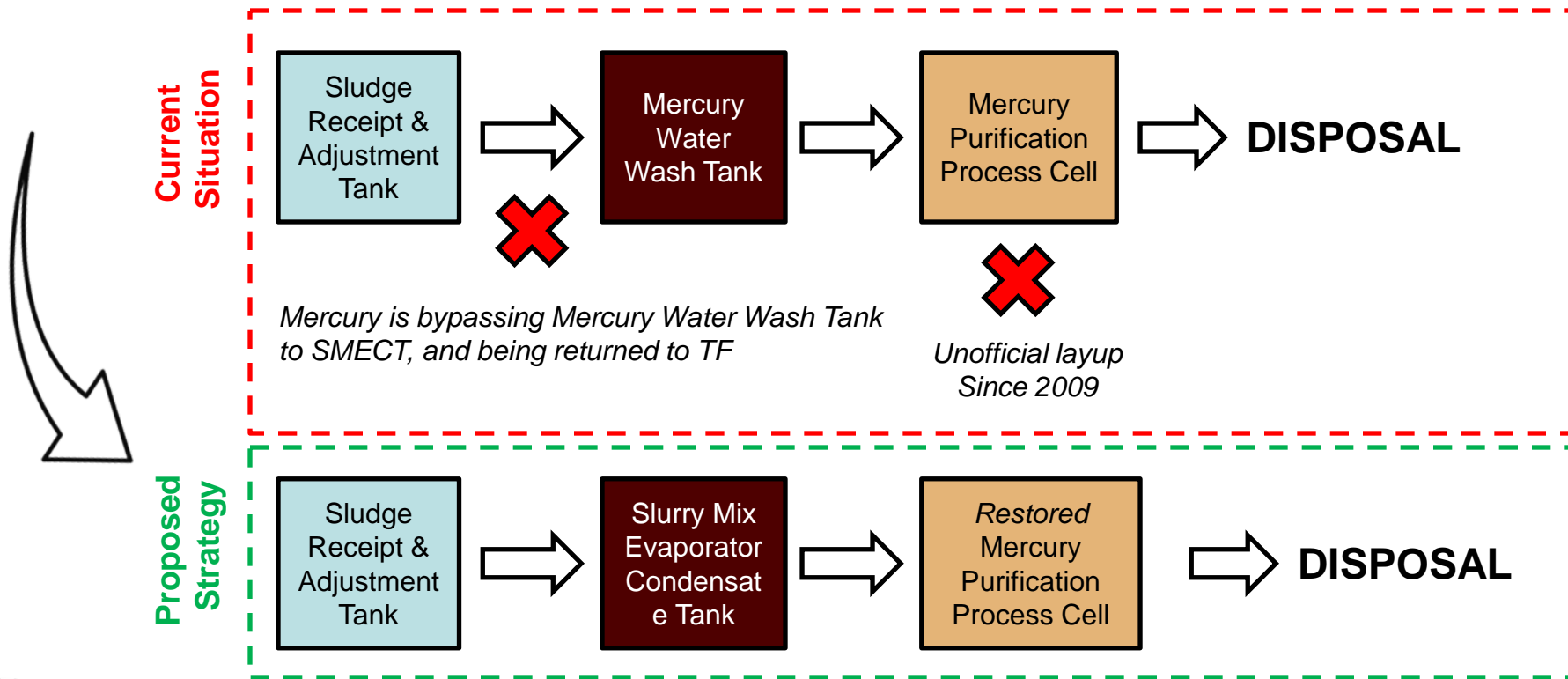
Task: Conduct ***an integrated, system-wide evaluation of mercury*** behavior in the Liquid Waste system; ***develop long-term action plan*** to address overall mercury management and removal

- 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 (approved - pending final review/transmittal)
- 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)



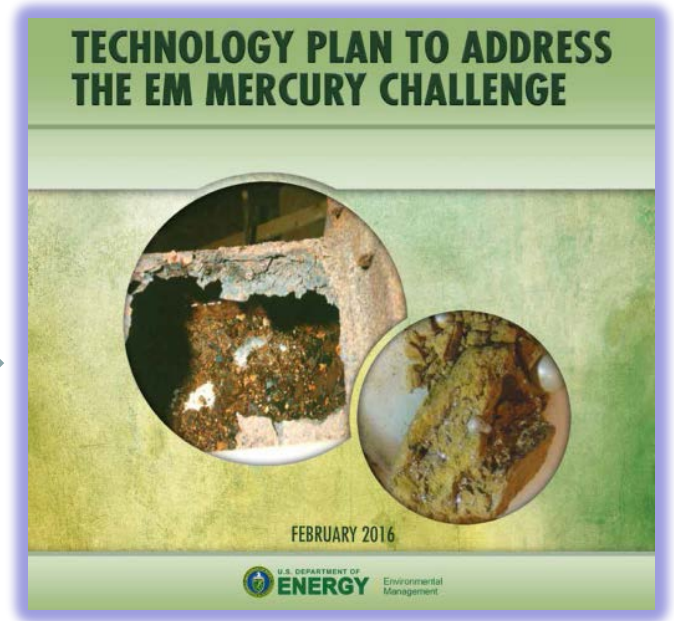
Long Term Mercury Management

- 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 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)*
- **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

- Completed Mercury Expert Advisory Panel Review
- Issued 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)	Removal of ionic mercury via reductant with a chemical additive to the evaporator (2H) system to enhance current mercury removal	SRNL
	TF	Funded (EM)	Removal of organic mercury via photoreaction (Tank 50)	SRNL
	TF	Funded (EM)	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 speciation results	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 Approved
- Long-Term Actions Require
 - Process Adjustments
 - Facility Modifications
 - Technology Development

