Presentation to the SRS Citizens Advisory Board

Status of Interim Salt Processing

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Purpose

Provide FY18 update to CAB on Interim Salt Processing, also known as the “Actinide Removal Process (ARP) / Modular Caustic Side Solvent Extraction Unit (MCU)” and progress toward Tank Closure Cesium Removal (TCCR) Technology Demonstration
Agenda

• Acronym List

• Savannah River Site Liquid Waste and Material Flow Path

• ARP/MCU Operational Performance in FY18

• Summary
## Acronyms

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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>ARP</td>
<td>Actinide Removal Process</td>
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<tr>
<td>CSSX</td>
<td>Caustic Side Solvent Extraction</td>
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<tr>
<td>DF</td>
<td>Decontamination Factor</td>
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<tr>
<td>DSS</td>
<td>Decontaminated Salt Solution</td>
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<tr>
<td>DWPF</td>
<td>Defense Waste Processing Facility</td>
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<td>GWSB</td>
<td>Glass Waste Storage Building</td>
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<td>MCU</td>
<td>Modular Caustic Side Solvent Extraction Unit</td>
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<td>MST</td>
<td>MonoSodium Titanate</td>
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<td>NGS</td>
<td>Next Generation Solvent</td>
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<td>SRNL</td>
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<td>SWPF</td>
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<td>TCCR</td>
<td>Tank Closure Cesium Removal</td>
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Salt Waste to be Processed

Inventory values as of 2018-05-31

Volume
- Salt Supernate: 35.2 Million Gallons (Mgal)
  - 16.5 Mgal (47%)
  - 15.9 Mgal (45%)
  - 2.8 Mgal (8%)
- Saltcake: 32.4 Mgal (92%)
- Sludge: 2.8 Mgal (8%)

Curies
- Salt Supernate: 138 MCi (54%)
  - 126 MCi (49%)
- Saltcake: 12 MCi (5%)
- Sludge: 116 MCi (46%)

254 Million Curies (Mci)
Operational Goals
- Radionuclides to glass
- Chemicals to Saltstone
- Tanks cleaned and operationally closed

Legacy Liquid Waste

Salt Processing

Saltstone Disposal Facility

Solid, non-hazardous Waste form (TBD)

Spent Columns

TCCCR (in Testing & Commissioning)

<1% radionuclides remain in tanks

Most radionuclides to glass

<<1% radionuclides to saltstone

51 Tanks
- 8 grouted & operationally closed

Poured 4,166 cans of projected 8,170
61.0 million curies immobilized in glass

21.8 Mgal grout dispositioned containing 470 kCi

43 tanks
35 Mgal
254 MCl

Salt waste

9.7 Mgal treated

Sludge waste

4.2 Mgal treated

DWPF

MCU

ARP

SWPF

Legacy

<1% radionuclides remain in tanks

Most radionuclides to glass

<<1% radionuclides to saltstone

4.2 Mgal treated

Salt waste

9.7 Mgal treated

8 grouted & operationally closed

51 Tanks

4,166 cans of projected 8,170
61.0 million curies immobilized in glass

21.8 Mgal grout dispositioned containing 470 kCi

43 tanks
35 Mgal
254 MCl

Legend:
ARP Actinide Removal Process
BWRE Bulk Waste Removal Efforts
DWPF Defense Waste Processing Facility
MCU Modular Caustic Side Solvent Extraction Unit
TCCR Tank Closure Cesium Removal
SWPF Salt Waste Processing Facility

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TCCR Process Overview

- Control Skid
- Process Enclosure
- Ventilation Skid
- Shielded Ion Exchange Column
- Interim Safe Storage
- Decontaminated Salt Solution
- Process Feed
- Recycle
- Tank 10H
- Tank 11H
Control Skid

Process Enclosure

Ventilation Skid
• **Provide Operational Experience for the Salt Processing Program:**
  – Process Chemistry
  – Equipment Reliability
  – Operational/Maintenance Experience and Lessons Learned
  – Next Generation Solvent implemented into operations in FY14

• **Process Salt Solution for Disposal:**
  – If needed to meet Saltstone acceptance criteria, adsorb actinides/strontium onto MST
  – Clarify feed by filtration in the Actinide Removal Process (ARP)
  – Remove Cesium with the Modular Caustic Side Solvent Extraction Unit (MCU)
  – Send radionuclides to DWPF for inclusion into borosilicate glass
  – Send Decontaminated Salt Solution to Saltstone for low activity waste grout treatment
Historical 2016 Average Decontamination Factor (Cs in/Cs out) for Cs 137
Prior to extended outage for DWPF Melter Replacement (Excludes Start-Ups)

SWPF Design Requirement of 40,000 (99.9975% removal)
Salt Processing Performance

• Detailed process and equipment monitoring is performed during process operations for early detection and resolution of process or equipment problems. This information is used to develop reliability and process improvements for both planned and unplanned outages.

• During the DWPF melter replacement outage, extensive preventive maintenance, corrective maintenance and improvement modifications were performed at MCU to ensure continued reliable operations.

• ARP/MCU will be maintained to operate until the final tie-ins for SWPF operations.

• After suspension of operations for final SWPF tie-ins, ARP/MCU will be maintained in a state of readiness to return to service during the initial 6 months of SWPF operations.
Outage Activities

During the melter replacement outage three Extraction Contactors were pre-emptively replaced based on gathered vibration and performance data, to ensure long term reliability.

- The extraction contactors are the V-10, larger contactors.

- It is within the Extraction Contactor bank where the cesium laden waste is mixed with the solvent and cesium is extracted from the salt waste stream.

Additionally, during the outage, MCU ventilation modifications were implemented to increase the system availability and reduce worker radiological exposure.
ARP/MCU Operations were suspended 1/10/17 due to an unanticipated outage (end of life of the DWPF Melter):

- Reliability and exposure improvements were completed during the unplanned outage period to ensure reliable operations upon restart.

- ~2M gallons of Qualified Salt Feed available for processing.

- On 5/22/18 ARP/MCU successfully resumed operations and has processed more than 137,000 gallons this year-to-date.

- FY18/19 has challenging production goal of 1.4 Mgal in a 10-month production period
The ARP/MCU process continues to provide successful salt processing since start-up in April 2008:

- Supports space management in the tank farms, to enable continued DWPF vitrification operations
- Helps bridge the gap until the Salt Waste Processing Facility starts up
- Provides valuable process, equipment and operational experience for the Salt Processing Program
- Helps reduce the lifecycle of the Salt Processing Program