Savannah River Remediation

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System Plan Revision 19

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Citizens Advisory Board Meeting
Augusta, Georgia

SRS Citizen's Advisory Board

Recommendation No. 15

January 23, 1996

High Level Waste Tank Farm Closure

The Savannah River Site Citizens Advisory Board (SRS CAB) understands that the Department of Energy-Savannah River Operations (DOE-SR) is currently undergoing a re-engineering program for the SRS high-level waste program. A concern of the SRS CAB is the criteria that will determine the final disposition of the high-level waste tanks and piping and header systems for the movement of high-level wastes between the reprocessing canyons, the tanks and the Defense Waste Processing Facility (DWPF). This criteria is yet to be determined; however, closure cannot begin until the criteria has been established (e.g., the allowable amount of waste left in the tanks at closure, disposition of the tanks, and tank systems at closure).

Mindful of this situation, the CAB recommends that:

1. Criteria be established to close the tank farms by the end of FY1996 (September 30, 1996). A strategic closure plan to meet the criteria for the tank farms should also be drafted by the end of FY1996, and updated annually thereafter.
2. The closure criteria and the strategic plan should be reviewed by an independent scientific peer review (ISPR) whenever there are significant changes to the closure criteria .

Agenda

- Liquid Waste System Overview/Status
- Liquid Waste System Plan
- Revision 19 Inputs & Assumptions
- Revision 19 Results
- Summary

SRS Liquid Waste Program

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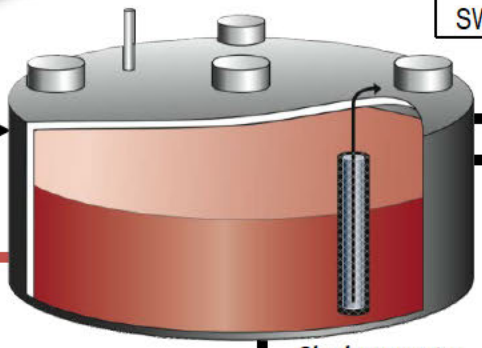
Legend:	
ARP	Actinide Removal Process
BWRE	Bulk Waste Removal Efforts
DWPF	Defense Waste Processing Facility
MCU	Modular Caustic Side Solvent Extraction Unit
SWPF	Salt Waste Processing Facility

Operational Goals
- ✓Radionuclides to glass
- ✓Chemicals to Saltstone
- ✓Tanks closed

Legacy Liquid Waste

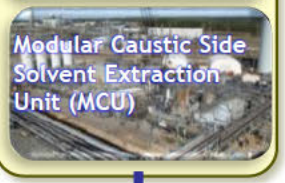
43 tanks, 37 million gallons (Mgal), 280 million curries (MCi)



Salt waste
7.0 million gallons (Mgal) treated

Sludge waste
3.7 million gallons (Mgal) treated

Salt Processing



Salt Waste Processing Facility (under construction)

<1% radionuclides remain in tanks

Radionuclides

Inert chemicals

<<1% radionuclides to saltstone

16 million gallons (Mgal) grout dispositioned containing 414 (kCi)

>99% radionuclides to glass

Poured 3,833 cans of projected 8,582
53 million curies immobilized in glass

51 Tanks
- 6 grouted & closed
- 2 heel removal complete
- 6 Bulk Waste Removal Efforts (BWRE) complete
- 70% empty (old style)
- 14% empty (new style)

SRS Liquid Waste Integration

We do the right thing.

Safe receipt from H-Canyon, treatment, and disposition of SRS liquid waste requires synchronization of several highly interdependent nuclear facilities and chemical operations

System Planning

- Changes to System Plans are driven by:
  - Advances in Technology
  - Change in Sequencing
  - Acceleration Opportunities
  - Funding Adjustments

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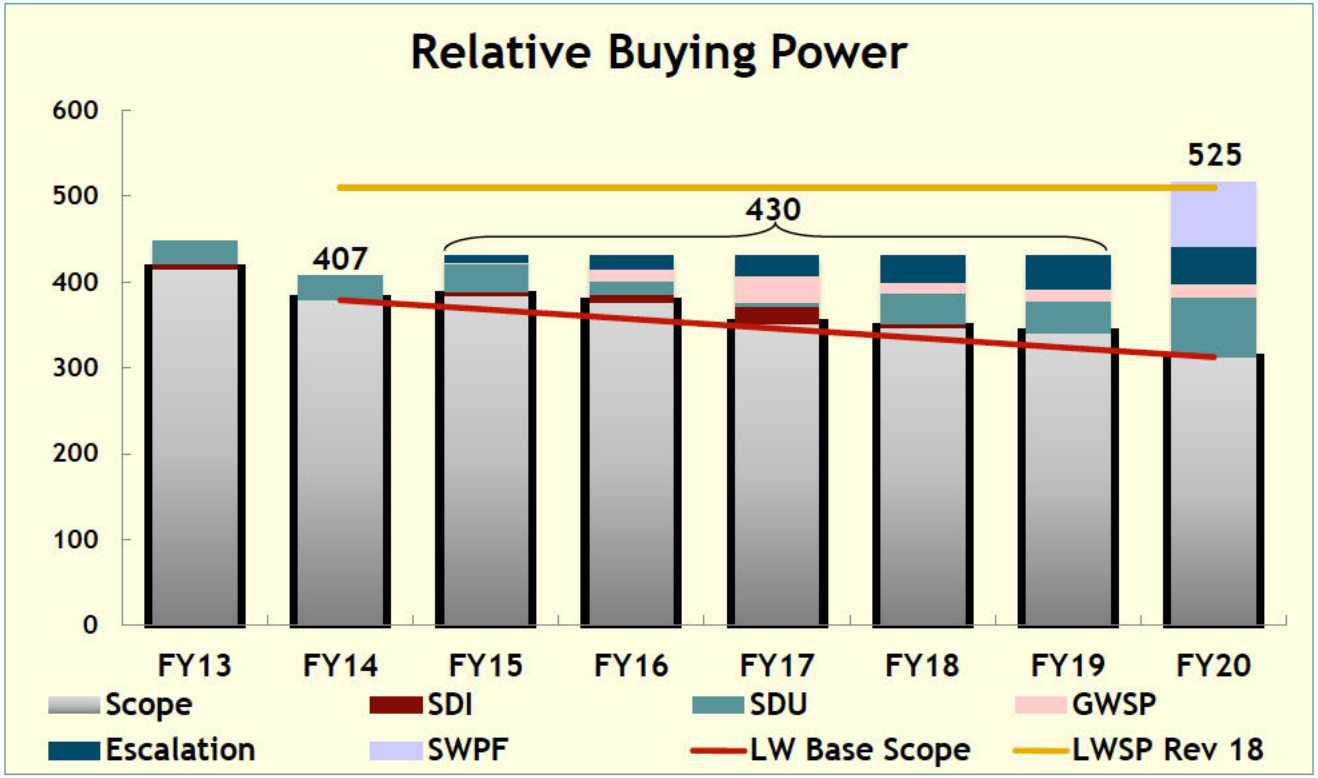
- August 2013 inputs and assumptions (modified April 2014 & May 2014) for Revision 19 of the Liquid Waste System Plan:
  - $407.1M new Budget Authority (BA) to the LW contractor in fiscal year 2014
  - $430M/yr (constant dollar funding) to the Liquid Waste contractor fiscal year 2015–fiscal year 2019
    - Includes Line Item funding, including assigned contingency, for Saltstone Disposal Units beginning with Saltstone Disposal Unit-7
    - Includes Glass Waste Storage Project Line Item beginning in fiscal year 2015
  - $525 M (in fiscal year 2020 and escalated thereafter) per year until the end of the program.
    - Includes $80M/yr (in fiscal year 2020 and escalated thereafter) for operation of Salt Waste Processing Facility.

System Plan Revision 19



- Using these inputs, two significant impacts of the lower funding levels are realized:
  - Salt Waste Processing Facility is not supported at its rated capacity upon startup
  - After grouting Tanks 5, 6, 12, & 16 no tanks are grouted until 2024

System Plan Revision 19 Specific Results

- Salt Waste Processing Facility operations not supported at rated capacity
  - Sufficient salt batch blend tanks not available at Salt Waste Processing Facility startup
  - Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit operations limited due to funding and Saltstone Disposal Unit space
  - Funding for Defense Waste Processing Facility enhancements not available until fiscal year 2020 with completion in 2022
  - Enhanced Low Activity Waste Disposal II enhancements and increased staffing at Saltstone not funded until fiscal year 2024
  - Inability to afford sludge waste removal at a pace sufficient to support desired canister and salt throughput
  - Limited canister storage locations prior to completion of the Glass Waste Storage Project

- Comparison of Salt Waste Processing Facility capability versus predicted throughput modeling shows a cumulative difference of over 18 million gallons between fiscal year 2019 and fiscal year 2024, representing an additional two years to the Liquid Waste lifecycle

Fiscal Year	SWPF Capacity	Rev 19	Delta
FY19	4.625 Mgal	4 Mgal	-0.625 Mgal
FY20	7.2 Mgal	3 Mgal	-4.2 Mgal
FY21	7.2 Mgal	3 Mgal	-4.2 Mgal
FY22	9 Mgal	6 Mgal	-3 Mgal
FY23	9 Mgal	6 Mgal	-3 Mgal
FY24	9 Mgal	6 Mgal	-3 Mgal
Total	46.025 Mgal	28 Mgal	-18.025 Mgal

System Plan Revision 19 Specific Results (Continued)

- Tank Closure Activities
  - Grouting of Tanks 5 and 6 completed in fiscal year 2014
  - Grouting of Tanks 16 and 12 to be complete in fiscal year 2016 (Federal Facilities Agreement date: fiscal year 2015)
  - Given the Revision 19 inputs, next tank grouting occurs in 2024

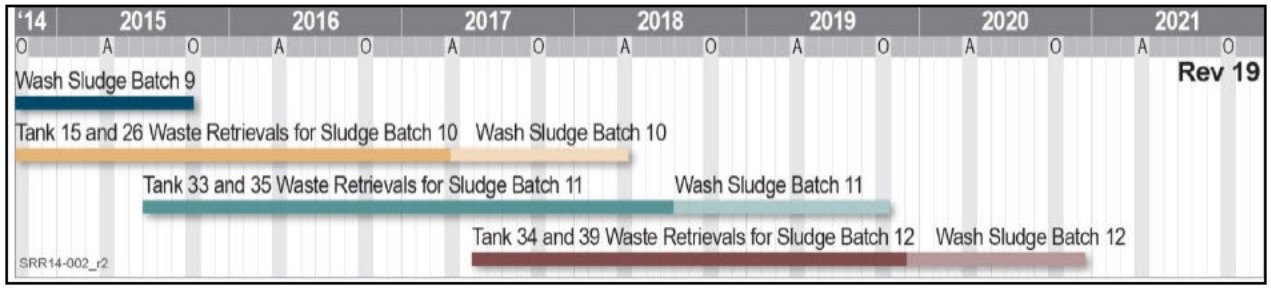
- Interim Salt Processing
  - Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit operations provide tank space for preparation of sludge batches for Defense Waste Processing Facility, support of waste receipts from H-Canyon, progress towards closure of old-style tanks, and support of Salt Waste Processing Facility upon startup in 2018.
  - Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit will utilize Next Generation Solvent
  - Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit throughput is determined by:
    - Operator staffing levels at Saltstone & Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit
    - Availability of Saltstone Disposal Unit space
    - Availability of canister storage
    - Funding to perform sludge waste retrievals
  - Salt processing at Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit will continue until 6 months prior to Salt Waste Processing Facility startup then shutdown for transfer line modifications to tie SWPF in to the Liquid Waste System

Fiscal Year	ARP/MCU Production Forecast (kgal)
FY14	800
FY15	1,500
FY16	1,200
FY17	2,000
FY18	1,000

System Plan Revision 19 Specific Results (Continued)

- Sludge Processing
  - Defense Waste Processing Facility canister production synchronized with Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit production.
  - Glass Waste Storage Building 2 had 822 available canister storage locations at start of fiscal year 2014
  - Limited storage capacity in Glass Waste Storage Building 2, and expected timing of the Glass Waste Storage Project line item, limits Defense Waste Processing Facility operation until fiscal year 2019.
  - Bulk sludge waste retrievals and sludge batch washing and qualification are limited to just-in-time supply

Fiscal Year	Expected Canister Production
FY14	125
FY15	155
FY16	135
FY17	170
FY18	160
FY19	275
FY20	275
FY21	275
FY22	275
FY23	275



System Plan Revision 19 Specific Results (Continued)

- Saltstone Disposal Unit Construction
  - Saltstone Disposal Unit required to support grout production and salt treatment at either Actinide Removal Process/Modular Caustic-Side Solvent Extraction Unit or Salt Waste Processing Facility
  - Without available Saltstone Disposal Unit space, Salt treatment cannot occur
  - Saltstone Disposal Unit construction costs have significant impact to overall funding profile
  - Saltstone Disposal Unit must be available as follows to prevent impacting planned salt processing:

Saltstone Disposal Unit	Need Date
Saltstone Disposal Unit 6	May 2017
Saltstone Disposal Unit 7	October 2021
Saltstone Disposal Unit 8	December 2023
Saltstone Disposal Unit 9	September 2025

Revision 19 Results

Parameter	Revision 18	Revision 19
Final Type I, II, and IV tanks Bulk Waste Removal Efforts complete	2023	2028
Final Type I, II, and IV tanks complete operational closure	2028	2032
Complete bulk sludge treatment	2026	2030
Complete bulk salt treatment	2028	2033
Complete heel treatment	2032	2039
Small Column Ion Exchange for supplemental salt waste treatment	Yes	No
Next generation extractant for increased Salt Waste Processing Facility throughput	Yes	Yes
Maximum canister waste loading	40 wt%	40 wt%
Nominal annual canister throughput rate	275	275
Total number of cesium-only canisters produced	0	0
Radionuclides (curies) dispositioned in Saltstone Disposal Facility within Liquid Waste Strategy	Yes	Yes

Alternative Case

- Maximize salt treatment by supporting Salt Waste Processing Facility at rated capacity

Maximize Salt Waste Processing Facility Throughput

- Scope
  - Defense Waste Processing Facility Enhancements, Enhanced Low Activity Waste Disposal Phase II, Saltstone Production Facility @ 24/7, Accelerate Sludge Bulk Waste Removal Efforts
  - Enhance Actinide Removal Process /Modular Caustic-Side Solvent Extraction Unit production
  - Accelerate Saltstone Disposal Unit Construction
  - Increase Glass Waste Storage Building #1 capacity
- Results

Fiscal Year	Rev 19 ARP/MCU	Alt Case ARP/MCU	Rev 19 SWPF	Alt Case SWPF
FY14	800	800		
FY15	1,500	1,500		
FY16	1,200	1,200		
FY17	2,000	4,700		
FY18	1,000	2,350		
FY19			4,000	4,625
FY20			3,000	7,200
FY21			3,000	7,200
FY22			6,000	9,000
FY23			6,000	9,000
FY24			6,000	9,000
Total	**6,500**	**10,550**	**28,000**	**46,025**

Parameter	Rev 19	Alt Case
Final Type I, II, & IV tanks Bulk Waste Removal Efforts complete	2028	2027
Final Type I, II, & IV tanks grout complete	2032	2031
Complete bulk sludge treatment	2030	2028
Complete bulk salt treatment	2033	2031
Complete heel treatment	2039	2037
Small Column Ion Exchange for supplemental salt waste treatment	No	No

Revision 19 Addendum

- Currently under development - Due August 15, 2014
- While maintaining risk reduction, emphasize removing waste from old-style tanks and providing enhanced capability for feeding Salt Waste Processing Facility

Summary

Lessons Learned from Revision 19 modeling:

- Importance of Salt Waste Processing Facility in lifecycle planning
- Importance of near term salt processing
- Need for Salt Waste Processing Facility support projects
- Need/Importance of Saltstone Disposal Units

Acronyms

ARP	**Actinide Removal Process**
BWRE	**Bulk Waste Removal Efforts**
DOE	**Department of Energy**
DOE-EM	**Department of Energy – Environmental Management**
DWPF	**Defense Waste Processing Facility**
ELAWD	**Enhanced Low Activity Waste Disposal**
FFA	**Federal Facilities Agreement**
FY	**Fiscal Year (October 1st – September 30th)**
GWSP	**Glass Waste Storage Project**
GWSB	**Glass Waste Storage Building**
LWSP	**Liquid Waste System Plan**
MCi	**Million Curies**
MCU	**Modular Caustic-side Solvent Extraction Unit**
Mgal	**Million Gallons**
NGS	**Next Generation Solvent**
SCIX	**Small Column Ion Exchange**
SDI	**Salt Disposition Integration**
SDU	**Saltstone Disposal Unit**
SPF	**Saltstone Production Facility**
SRR	**Savannah River Remediation, LLC**
STP	**Site Treatment Plan**
SWPF	**Salt Waste Processing Facility**