

8.14C PBS SR-0014C/14X Liquid Tank Waste Stabilization and Disposition-2035/Storage Operations Awaiting Geologic Repository

8.14C.1 Background

The Savannah River Site (SRS) is a Department of Energy (DOE) site that has produced nuclear materials for national defense, research, and medical programs since it became operational in 1951. As a by-product of this production, there are approximately 36 million gallons of liquid, high-level radioactive waste stored on an interim basis in 49 underground waste storage tanks as of the beginning of April 2004. Continued, long-term storage of these liquid, high-level wastes in underground tanks poses an environmental risk (12 of the SRS tanks have a waste leakage history). Since FY 1996, the High Level Waste (HLW) Program at SRS has been removing waste from tanks, pre-treating it, vitrifying it, and pouring the vitrified waste into canisters for long-term storage and disposal. From FY 1996 to the end of April 2004, over 1,575 canisters of waste have been vitrified. The canisters vitrified to date have contained sludge waste.

8.14C.2 End State

Completion of this PBS scope will result in the treatment and permanent disposal of the liquid radioactive waste currently stored at the SRS as well as radioactive waste from planned nuclear materials stabilization activities by FY 2019. It will also result in the operational closure of the remaining 49 underground storage tanks by FY 2020 (2 of the original 51 tanks have already been closed in place using grout in FY 1998) and the deactivation of the major facilities and equipment that comprise the HLW System. Once facilities are deactivated, these facilities will be maintained in a minimal surveillance and maintenance condition until transferred to PBS SR-0040 for decommissioning.

8.14C.3 Scope and Description

The scope of this project is the permanent disposal of 36 million gal of HLW stored in 49 underground storage tanks, as well as future waste from planned nuclear materials stabilization activities. It includes the management of waste in the F and H Tank Farms through transfers, evaporation, and storage to effectively manage tank space. The HLW fraction of the removed waste will be processed into borosilicate glass canisters at the Defense Waste Processing Facility (DWPF) and temporarily stored onsite in a Glass Waste Storage Building (GWSB) until Yucca Mountain is available. A second Glass Waste Storage Building is being designed and constructed because the first facility is nearing capacity. The scope of this project also includes the design, construction and operation of a Canister Shipping Facility to support shipments to Yucca Mountain.

This PBS includes the design, construction, and operation of the Salt Waste Processing Facility (SWPF) to pre-treat salt waste, resulting in the highly radioactive

fraction being sent to DWPF for vitrification. Some existing facilities at SRS will also be used to treat salt waste and prepare it for disposal. The low-level fraction will go to the Saltstone Facility, which treats and permanently disposes of low-level waste by stabilizing it in a solid, cement-based form.

An acid side evaporator is to be designed and constructed to treat the recycle from DWPF. It will reduce the influents to the tank farm by as much as 2,700,000 gal/yr during peak DWPF operations when both sludge and salts are being vitrified. It is also necessary during the final vitrification activities since recycle will be unable to be returned to the tank farms as the waste is removed from the last tanks and the tanks are closed.

Deactivation of HLW facilities and tanks is included in this project. All HLW tanks in H and F Tank Farms will be operationally closed (removed from service and filled with grout). The 1H, 1F, 2H, 2F, and 3H Evaporators and contaminated waste transfer systems will be closed by isolating utilities and filling with grout, as appropriate. Above ground support systems that present a significant hazard (such as cooling towers) will be removed. Also, all non-permanent office facilities (trailers) will be removed. The DWPF and SWPF will be deactivated by isolating utilities and filling the canyon cells with grout. In addition, the Failed Equipment Storage Vaults will be deactivated by isolating utilities and filling with grout, as appropriate. Both GWSB I and II will be deinventoried and deactivated.

8.14C.4 Responsibilities

In addition to the overall responsibilities identified in Section 4.3, PBS specific responsibilities are summarized as follows.

This PBS falls under the responsibility of the DOE-SR Assistant Manager for Waste Disposition Project. In accordance with DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets, a Federal Project Director (FPD) has been identified to manage this PBS and will be approved by EM-1. Subproject FPDs have been identified for the scope under this PBS, the High Level Waste System and the Salt Processing Program. The FPDs use an Integrated Project Team (IPT) approach to manage the PBS. The IPTs are comprised of personnel from a wide variety of disciplines to ensure the work is managed safely and effectively.

The performance of the majority of the work scope for this PBS is the responsibility of the management and operating (M&O) contractor under the oversight of the DOE FPD. Currently, the M&O contractor is Westinghouse Savannah River Company (WSRC). Within WSRC, responsibility resides with the Closure Business Unit area project managers for the Liquid Waste Disposition Project and the Waste Solidification Area Project.

Portions of the work scope under this PBS are performed under separate contracts directly managed by DOE. Separate contracts have been awarded for both the design and construction of the GWSB II. An engineering, procurement, and construction (EPC) contract has been awarded for the design, construction, and 1-yr operation of the SWPF.

8.14C.5 Schedule

The HLW tank farms and the ETP will continue to operate through FY 2019, with the F Tank Farm completing operations by FY 2015. Sludge and salt waste removal from the HLW tanks will continue through FY 2018. Vitrification of HLW and production of HLW canisters will continue through FY 2019. PBS SR-0014X, Storage Operations Awaiting Geologic Repository, will commence in FY 2010 and continue through FY 2020 with the completion of canister shipments to Yucca Mountain.

The following schedule is based on the specified assumptions in Section 8.14C.7.

8.14C.6 Resources

The cost profile for this PBS for FY 2004 – FY 2025 is TBD.

The previous lifecycle baseline assumed treatment and disposal of radioactive salt waste would commence in FY 2003. However, issues created by the waste incidental to reprocessing (WIR) lawsuit prevented salt processing from proceeding. The 2004 PMP proposes a revised plan for salt processing that can be accomplished by FY 2019. The successful use of alternative technology for bulk waste removal from the HLW tanks, known as “Waste on Wheels (WOW),” and the cost efficiencies have been incorporated. Support of the initiative to minimize non-HLW inputs has been added, including the addition of an evaporator to reduce the volume of DWPF recycle to the tank farms. The construction and operation of a CSSX Modular Unit prior to SWPF becoming operational has also been added. The SWPF line item and associated operational costs have been revised based upon the latest conceptual design, and a more recent estimate resulting in a substantial reduction in baseline cost.

Government Furnished Services and Items

The following Government Furnished Service and Item has been identified to support this project:

- § Resolution of the waste incidental to reprocessing issue by October 2005.

Technology Needs

The critical path for SRS cleanup is High Level Waste (HLW) processing in Defense Waste Processing Facility (DWPF). These tasks can shorten this critical path. In addition to the aforementioned resource requirements, the following technology needs have been identified in support of accelerated cleanup:

- § Increase throughput and reduce total number of HLW canisters to significantly reduce costs and accelerate the project. Includes increasing waste loading per can, melt-rate improvements, melter improvements, and facility optimization to reduce bottlenecks. Optimize melter glass loading.

Benefit: Reduced costs/acceleration of treatment and enable completion of cleanup before FY 2025

Development timeframe: FY 2004 – FY 2006

- § Address impact of changing feed streams from canyon disposals and salt processing on DWPF process and throughput.
Benefit: Maintain increased throughput in DWPF
Development timeframe: FY 2004 – FY 2006
- § Characterize material for the next two sludge batches.
Benefit: Improves flowsheet development and supports melt rate and melter improvement initiatives above.
Development timeframe: FY 2005 – FY 2006
- § Provide accelerated parallel paths for saltcake and supernate treatment to minimize costs. Technology areas include saltcake sampling and characterization, dissolution and retrieval, faster filtration, cesium and actinide removal, on-line analytical capabilities, cost-effective treatment of TPB contaminated streams and disposal options for minimally treated salt waste, i.e., alternative waste removal technology (techniques to remove salt waste from HLW storage tanks).
Benefit: Reduces costs/reduces wastes/reduces exposures
Development timeframe: FY 2006
- § Provide second generation salt feed preparation (multiple treatment options).
Benefit: Allows continued operation of DWPF/reduces volume in the tanks
Development timeframe: Prior to FY 2005
- § Improve disposition planning for salt solutions by the ability to predict transuranic element solubility and hence whether salt waste can be disposed of directly to Saltstone or require treatment.
Benefit: More cost effective and faster disposition of salt waste
Development timeframe: Prior to FY 2005
- § Accelerate saltcake and sludge waste removal in unobstructed and obstructed tanks, and tank annuli. Improve leak detection/mitigation and develop better technologies for tank farm water management, including the provision of:
 - § alternative processing and/or concentration methods for DWPF aqueous recycle streams
 - § alternative processing methods for other non-HLW streams (e.g., unirradiated fuels).Benefit: Reduces costs/reduces volume of recycle and other wastes returned to tank farms/reduces the silicon content being sent to tank farm (evaporator buildup issue) (without solutions: loss of storage capacity at tank farm or extended outage of tank evaporators could eventually halt DWPF operations)
Development timeframe: FY 2004 – FY 2006
- § Improve bulk waste removal with more efficient mixing and chemical cleaning to minimize residual waste (Tank heel removal/closure technology).
Benefit: Enables closure/reduces costs/reduces exposures
Development timeframe: FY 2003 – FY 2006

8.14C.7 Key Assumptions, Agreements, Alternatives, Trade-offs, and Risk Management

Key Assumptions

The following key assumptions have been used as the basis for the lifecycle cost and schedule development:

- § Defense Waste Processing Facility (DWPF) will continue to produce canisters at an average rate of 230 canisters/yr (250 canisters/yr through FY 2008) with increased waste loading (equivalent of 280 canisters)
- § Successful implementation of WOW, an innovative technical alternative to the HLW Removal Baseline for bulk waste removal of sludge from the HLW tanks
- § The new Canister Shipping Facility will be designed, constructed, and online to support shipments beginning in 2010
- § The Federal Repository at Yucca Mountain will be available to start receiving DWPF canisters by 2010
- § Final shipment of DWPF canisters will occur by 2020
- § Full funding will be available in October 2004 for the HLW Program. The WIR issue will be fully resolved by January 2005, and resulting salt disposition operations and tank closures will commence by October 2005
- § Salt Waste Processing Facility (SWPF) will be online by February 2009. Throughput will be maximized for salt treatment such that sludge and salt programs end simultaneously.
- § A solvent extraction pilot will be online in mid-FY 2006 with approximately 1 million gal/yr capacity. Actinide processing capability will be installed in 241-96H such that approximately 1 million gal/yr processing capability exists in combination with 512-S by October 2006. The purpose of these facilities is to prove SWPF technology and engineering and provide tank space needed for SWPF feed for startup in February 2009.
- § Modifications for Saltstone processing for 0.5 Ci/gal feed will be designed in FY 2004 and will be online by October 1, 2005.
- § Sufficient new Saltstone vault capacity will be designed in FY 2004 and will be available to support receipt of feed from 0.5 Ci/gal processing from Saltstone by October 1, 2005.
- § Tank closure activities will proceed, but no tank will be grouted until resolution of the WIR lawsuit. Tanks 18 and 19 are planned for closure by June 30, 2007 and March 30, 2007, respectively.
- § The Glass Waste Storage Building II will be available by June 2006 for additional canister storage.

Agreements

The following agreements are drivers for this project:

- § The *Federal Facility Agreement (FFA)* is a binding agreement between DOE, the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The *FFA* requires that the 22 non-compliant tanks (tanks lacking full secondary containment) be emptied and closed on an approved tank-by-tank schedule
- § SRS Site Treatment Plan (STP) is an annual plan required and approved by SCDHEC. The STP governs the treatment of liquid HLW and establishes a schedule for treating and disposing of mixed waste and identifies the DWPF as the best demonstrated treatment technology for liquid HLW. STP requires that

the processing of all high-level waste (both existing and future) be completed by FY 2028.

Alternatives, Trade-offs, and Risk Management

HLW processes and systems must be fully integrated to efficiently execute missions. The system complexity requires many aspects of the program to interact such that appropriate prioritization occurs and mission interference is minimized. The following project risks in achieving the PBS objectives have been identified:

- § Tank Farm Useable Storage (compliant tank) Space – Without some salt disposition success, Type III tank space will continue to be a major concern until the startup of the SWPF. Preparation of feed and receipt of residues from DWPF requires usable working tank space. Pursuit of additional space management initiatives, includes continued evaporation of liquid waste, returning Tank 48 to HLW storage service, and reduction of non-HLW inputs to the Tank Farms
- § Uncertainties in Tank Space Assumptions – The Tank Farm space management strategy is based on a set of key assumptions involving canister production rates, influent stream volumes, Tank Farm evaporator performance, viability of Type III Tanks, space-gain initiative implementation, and acid evaporator for DWPF to recycle. Significant changes in any of these key assumptions could impact the ability to successfully support planned processing commitments caused by a lack of Tank Farm waste storage space
- § Tank Closure – Cost and schedule will be drastically impacted if exhuming tanks becomes a requirement
- § Waste Incidental to Reprocessing Lawsuit – Delay beyond October 2005 in the resolution of uncertainties resulting from the lawsuit will impact cost and schedule
- § Salt Processing – Processing and disposition of salt waste and pursuing operational closure of tanks cannot proceed until DOE resolves the Idaho Court ruling impact on use of the WIR process. Both a legislative action and a court appeal are in progress
- § SWPF – Success of the salt processing strategy is based upon SWPF becoming operational in FY 2009 and throughput being maximized for salt treatment consistent with completion of HLW sludge vitrification
- § Canister Storage – DWPF canister production schedule will be extended if additional storage locations, provided as a Government Furnished Services and Items (GFSI), are not available. Additional storage locations will need to be provided so as not to interrupt production
- § Failed Equipment Storage Vaults (FESV) and DWPF Melter Disposal – The schedule will be extended and costs increased for the deactivation of the FESV and melter disposal if the melters cannot be shipped intact, i.e., they require major cutting operations and dismantling prior to shipment to Yucca Mountain
- § Age of the HLW Facilities – The HLW System Plan includes provision for normal maintenance and specific long-duration equipment replacement activities, such as the DWPF melter. However, unforeseen equipment failures, such as a major tank leak or transfer line failure or evaporator failure, could have a significant impact on the operation of the HLW System
- § Yucca Mountain – An integrated canister acceptance schedule has been developed for receipt at Yucca Mountain. This schedule assumes 205 canisters/yr from SRS to be shipped to Yucca Mountain starting in FY 2010. To meet the *PMP* target of 2020 for all canisters shipped, the rate must be increased to 500 canisters/yr starting in FY 2010. The site's lifecycle baseline schedule and cost will be increased if Yucca Mountain is not ready by

- FY 2010, the Canister Shipping Facility is not available, or the assumed yearly canister shipment rates are not achieved
- § CSSX Modular Unit – Although technical risks are considered minimal, there is potential for delay in the FY 2006 operational date for the CSSX Modular Unit due to the aggressive nature of the schedule

8.14C.8 Performance Monitoring and Evaluation

8.14C.8.1 HQ Monitoring and Evaluation

Monitoring of this PBS at the HQ level is completed primarily through use of the Integrated Planning, Accountability, and Budget System (IPABS) system. Actual cost, schedule, and performance data are collected for each PBS and compared to the established baseline. All elements of the lifecycle baseline are under EM-HQ configuration control. Performance data include the Gold Metrics and the Budget Milestones. Progress toward these measures and any proposed changes to them are provided as follows.

Gold Metrics

Liquid Waste in inventory eliminated (thousand gal)

Year	Current Baseline	Proposed
Pre FY04	700	0
FY 2004	1,300	0
FY 2005	1,900	0
FY 2006	1,800	0
FY 2007	1,900	0
FY 2008	1,900	0
FY 2009	1,900	0
FY 2010	2,170	3,310
FY 2011	2,170	3,310
FY 2012	2,170	3,310
FY 2013	2,170	3,310
FY 2014	2,170	3,310
FY 2015	2,170	3,310
FY 2016	2,170	3,310
FY 2017	2,170	3,310
FY 2018	2,170	3,310
FY 2019	2,170	3,310
FY 2020	0	0
FY 2021	0	0
FY 2022	0	0
FY 2023	0	0
FY 2024	0	0
FY 2025	0	0
Lifecycle Total	33,100	33,100

Basis for change: Revised/proposed metrics based upon revised HLW System Plan will be available later, as appropriate.

HLW packaged for final disposition (Canisters)

Year	Current Baseline	Proposed
Pre FY04	1,467	1,467
FY 2004	250	250
FY 2005	250	250
FY 2006	250	250
FY 2007	250	250
FY 2008	250	250
FY 2009	230	230
FY 2010	230	230
FY 2011	230	230
FY 2012	230	230
FY 2013	230	230
FY 2014	230	230
FY 2015	230	230
FY 2016	230	230
FY 2017	230	230
FY 2018	230	230
FY 2019	43	43
FY 2020		
FY 2021		
FY 2022		
FY 2023		
FY 2024		
FY 2025		
Lifecycle Total	5,060	5,060

Basis for change: No change required at this time.

Liquid waste tanks closed (Tanks)

Year	Current Baseline	Proposed
Pre FY04	2	2
FY 2004	2	0
FY 2005	0	0
FY 2006	0	2
FY 2007	0	2
FY 2008	3	2
FY 2009	1	2
FY 2010	4	2
FY 2011	0	2
FY 2012	2	3
FY 2013	10	3
FY 2014	2	4

FY 2015	8	4
FY 2016	1	4
FY 2017	3	4
FY 2018	4	5
FY 2019	6	5
FY 2020	3	5
FY 2021		
FY 2022		
FY 2023		
FY 2024		
FY 2025		
Lifecycle Total	51	51

Basis for change: Revised HLW System Plan

Budget Milestones

Milestone	Proposed	Current
Commence operations of the CSSX Modular Unit	5/30/2006	
Close Tank 19	3/30/2007	
Close Tank 18	6/30/2007	
Commence operations of the SWPF	2/27/2009	
Complete operations of CSSX Modular Unit	2/28/2009	
Begin PBS SR-0014X. Storage Operations Awaiting Geologic Repository	9/30/2010	
Complete operations of F Tank Farm	9/30/2015	
Complete sludge and salt removal from HLW Tanks	9/30/2018	
Complete operations of H Tank Farm	9/30/2019	
Complete operations of Effluent Treatment Project	9/30/2019	
Complete operations of the SWPF	9/30/2019	
Complete DWPF Operations	9/30/2019	
Complete Shipment of DWPF Canisters	9/30/2020	
Complete treatment and disposal at Saltstone	9/30/2020	
Complete deactivation and operational closure of the HLW Tanks.	9/30/2020	
PBS SR-0014X Project Complete	9/30/2020	
Complete deactivation of remaining major HLW facilities and equipment	9/30/2021	
PBS SR-0014C Project Complete	9/30/2021	

Basis for change: Revised HLW System Plan

8.14C.8.2 Site Monitoring and Evaluation

Refer to Section 4.3 for a description of the site’s performance monitoring and evaluation process.