**The Secretary of Energy**
**Washington, DC 20585**

November 24, 2010

The Honorable Peter Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

Enclosed is the Department of Energy's (DOE) revised Implementation Plan (IP), which addresses the remaining open commitments for Defense Nuclear Facilities Safety Board (Board) Recommendation 2001-1, *High-Level Waste Management at the Savannah River Site (SRS)*. This revision reflects the changes you requested in your letter dated May 27, 2010.

The remaining open commitments for Recommendation 2001-1 relate to projects for the startup of the Salt Waste Processing Facility; the return of Tank 48 to tank farm service; and the return of Tank 50 to higher curie tank-farm service. The enclosed IP revision — Revision 6 — describes the remaining open commitments and updates each commitment's milestones based on DOE-approved schedules for the project. Revision 6 also includes additional interim milestones (one per year) toward completion of each commitment, as suggested by the Board.

If you have any further questions, please contact me or Dr. Inés R. Triay, Assistant Secretary for Environmental Management, at (202) 586-7709.

Sincerely,

Steven Chu

Enclosure

# DEPARTMENT OF ENERGY REVISED PLAN CONCERNING SAVANNAH RIVER SITE'S HIGH LEVEL WASTE MANAGEMENT STRATEGY

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 2001-1 IMPLEMENTATION PLAN

## REVISION 6

## October 2010

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## 1. Executive Summary

On March 23, 2001, the Defense Nuclear Facilities Safety Board (Board) issued Recommendation 2001-1, High-Level Waste (HLW) Management at the Savannah River Site (SRS). The recommendation addressed the need for the Department of Energy (DOE) to ensure that the margin of safety and amount of tank space in the SRS HLW system is sufficiently maintained to enable timely stabilization of nuclear materials at SRS.

The DOE accepted this recommendation and found that the Board recommendation appropriately highlighted the need to vigorously address the significant management challenges that SRS faces in accomplishing the strategic mission of waste disposition. Beginning with the initial DOE acceptance of the recommendation and the subsequent Implementation Plan (IP) provided to the Board on May 18, 2001, numerous commitments have been developed and completed to adequately manage the margin of tank space to ensure efficient tank waste disposition. The IP has matured along with the SRS liquid waste system and has realized numerous accomplishments through its revisions. This revision to the IP summarizes the completed actions, and provides interim milestones and deliverables to remaining commitments.

The most recent May 27, 2010, Board letter suggested interim milestones and deliverables for the two commitments regarding Recommendation 2001-1should include annual commitments and suggested addition of a milestone for returning Tank 50 to higher curie service. DOE provides these new commitments below:

### 1. Startup the Salt Waste Processing Facility (SWPF):

| Commitment | | Due Date | Deliverable |
|---|---|---|---|
| 2.14 | Begin SWPF Radioactive Operations | December 2015 | DOE certification of SWPF radioactive operations. Certification will document radioactive material has been introduced for processing into SWPF. |
| 2.14.1 | Complete Delivery of ASME Vessels | December 2011 | DOE certification of completed delivery of ASME vessels. |
| 2.14.2 | Complete Dark Cells at Deck 139 ft. Level | May 2012 | DOE certification of completion of dark cells at the Deck 139 ft level. |
| 2.14.3 | Complete Roof at 154 ft. Level | July 2013 | DOE certification of completed roof at 154 ft level. |
| 2.14.4 | Begin Cold Commissioning | October 2014 | DOE certification of initiation of cold commissioning. |

## 2. Return Tank 48 to Tank Farm Service

| | Commitment | Due Date | Deliverable |
|---|---|---|---|
| 3.9.1 | Complete 35% Design of Tank 48 Treatment Project | December 2010 | DOE certification of 35% design completion. Certification will be by design review of the completed set of technical documents, consistent with SRS Manual E7-1 Procedure DE-DP-306 "Engineering Deliverables List" for Preliminary Design. |
| 3.9.2 | Authorize procurements of Fluidized Bed Steam Reformer (FBSR) Auger/grinder | December 2011 | DOE approved critical decision document in accordance with DOE-O 413.3A authorizing procurement of FBSR auger/grinder . |
| 3.9.3 | Complete 90% Design of Tank 48 Treatment Project | December 2012 | DOE certification of 90% design completion. Certification will be by design review of the completed set of technical documents, consistent with SRS Manual E7-1 Procedure DE-DP-306 "Engineering Deliverables List" for Detailed Design. |
| 3.9.4 | Receive FBSR Major Module Skids at SRS | June 2013 | DOE certification of FBSR major module receipt at SRS. |
| 3.9.5 | Begin Tank 48 FBSR Radioactive Operations | December 2014 | DOE certification of Tank 48 FBSR radioactive operations. Certification will document Tank 48 radioactive material has been introduced for processing into 241-96H. |
| 3.9.6 | Process 25,000 Gallons of Tank 48 Materials | May 2015 | DOE certification documenting completion of processing of 25,000 gallons of Tank 48 material through the FBSR. |
| 3.9.7 | Return Tank 48 to Waste Service | December 2016 | DOE approved DSA that allows waste transfers into Tank 48. |

## 3. Return Tank 50 to Higher Curie Tank Farm Service

| Commitment | | Due Date | Deliverables |
|---|---|---|---|
| 3.13.1 | Award Effluent Treatment Project (ETP) and Saltstone Procurements | June 2011 | DOE certification of Effluent Treatment Project (ETP) procurement award. |
| 3.13.2 | Complete Modular Caustic Side Solvent Extraction Unit (MCU) Decontaminated Salt Solution (DSS) Tie-in Design | December 2011 | DOE certification of completed Modular Caustic Side Solvent Extraction Unit (MCU). Decontaminated Salt Solution (DSS) Tie-in Design. Certification will be by document review of the Design Change Package (DCP). |
| 3.13.3 | Complete Tank 50 Return to Service (RTS) | December 2012 | DOE certification of Tank 50 available to receive higher curie material via transfer line modifications. Certification will be through verification of DCPs in SRS Document Control and completed work packages signed off by Maintenance and/or Construction. |

In addition to these specific commitments, an additional commitment regarding the management of the DWPF recycle stream, the largest influent to the tank farms is as follows:

| | | | |
|---|---|---|---|
| 3.12 | Reduce DWPF recycle by 1.25 Mgal/year | December 2013 | DOE certification of total reduction in recycle volume transferred to the Tank Farms. Certification will be through review of facility documentation (for example, log entries) that demonstrates 1.25 Mgal per year annualized reduction capability. |

The Principal Deputy Assistant Secretary (EM-2) is the Responsible Manager for this IP. EM-2 is responsible for ensuring that all associated planning, response, and implementation activities are performed consistent with requirements and guidance provided in Interface with the Board (DOE M 140.1-1B). The Manager of the Savannah River Operations Office is the point of contact responsible for the site-specific actions of this recommendation.

## 2. Introduction

The Board issued Recommendation 2001-1, HLW Management at the SRS, on March 23, 2001, addressing the need for the DOE to ensure sufficient waste tank space margin at the SRS to enable timely stabilization of tank waste. The Board recommended the following:

1) Initiate actions to remove transferable HLW liquid from Tank 6 to a level below all known leak sites.

2) Reassess the schedule and priority for selecting a technology for a salt processing capability, and vigorously accelerate the schedule leading to operation of a salt processing facility

3) Develop and implement an integrated plan for HLW tank space management that emphasizes continued safe operation of the Tank Farms throughout its lifecycle. The plan should include enough margin to accommodate contingencies and reduce overall programmatic risk. The plan should also restore operating margin to the Tank Farms by including action to:

    (a) Reduce or eliminate the DWPF recycle stream;

    (b) Recover former In-Tank Precipitation (ITP) tanks for Tank Farm operations;

    (c) Assess the desirability of adding an additional HLW evaporator to support Tank Farm operations;

    (d) Assess the feasibility of constructing new HLW tanks; and

    (e) Resolve waste compatibility and equipment degradation problems to allow for unconstrained operation of three existing evaporators.

4) Reassess contractor incentives to ensure that near-term production at DWPF is not overemphasized at the expense of safety margin in the tank farms.

A series of IP revisions, beginning with the initial DOE acceptance of the recommendation as addressed in the IP provided to the Board on May 18, 2001, has resulted in the development and completion of numerous commitments that have augmented the margin of tank space to ensure efficient tank waste disposition. The commitments, their completion, and resolution of the remaining commitments are presented in this revision of the IP.

A May 27, 2010, Board letter suggested annual interim commitments for two commitments and addition of a commitment for Tank 50 regarding Recommendation 2001-1:

1. Startup the Salt Waste Processing Facility;

2. Return Tank 48 to Tank Farm service; and

3. Return to Tank 50 to Tank Farm Service.

This revision to the IP summarizes the completed actions, and provides interim commitments with associated milestone dates to these remaining commitments. This IP has matured along with the SRS liquid waste system and has realized numerous accomplishments through its revisions. A summary of the commitments through each of the revisions, commitment completion/resolution, and the proposed new commitments are presented herein.

## 3. Recommendation Resolution

The Board's sub-recommendations and the specific actions to address each are discussed below. Each section discusses the remaining open commitments with clearly defined deliverables, milestone dates, and includes yearly commitments for the SWPF project, Tank 48 Treatment Project, and recovery of Tank 50.

### 3.1. Sub-recommendation 1: Initiate actions to remove transferable HLW liquid from Tank 6 to a level below all known leak sites.

This sub-recommendation was specifically tied to a leak resultant from a low-activity waste transfer in January 2001 into Tank 6, an old-style Type I tank essentially empty since 1973. Alarms were received in the control room indicating liquid in the annulus and subsequent visual inspections and sampling confirmed radioactive liquid waste in the annulus. Detailed inspections using a remote crawler and video camera identified numerous leak sites attributed to known stress corrosion mechanisms in the Type I tanks. Consequently, the level of waste in Tank 6 was lowered below the lowest known leak site by May 30, 2001.

DOE continues to maintain the Type I/II old-style tanks leak free by not allowing routine transfers except for: (1) waste removal activities; (2) waste processing activities; and (3) storage of low-activity, aluminum-rich supernate separated from sludge waste for feed to DWPF. Typical additions include liquid needed to:

- slurry/mix sludge
- facilitate transfer of waste from tank
- prevent drying of sludge
- remove heels
- flush or clean equipment/tank structures
- control corrosion

Typical waste transfers include movement of waste or residual heels from one old-style tank into another old-style tank when those tanks are part of the transfer path to a waste processing unit. For example, waste from Tanks 5 and 6 was transferred to Tank 7 before being transferred to Extended Sludge Processing (ESP) due to the existing transfer piping arrangements. Similarly, Tank 13 in H Tank Farm will be used as the staging and transfer path for waste and residual heel removal for H Area tanks due to its existing piping arrangements. Another waste transfer example was the use of existing Tank 7 supernate to suspend the Tank 5 sludge. This allowed for the beneficial re-use of liquids needed to slurry/mix the sludge from Tank 5 without creating additional "new" waste volumes. Tanks 5 and 6 have subsequently progressed to final heel removal in preparation for operational closure.

Additionally, during sludge batch preparation, aluminum is dissolved from sludge that has been removed from old-style tanks to lessen the number of canisters made at DWPF. This aluminum-rich liquid is temporarily stored in selected Type I and Type II style tanks with sound structural integrity until it can be processed through SWPF as part of the salt solution feed stream. Tank 11 and Tank 8 are currently used for this purpose. These tanks continue to be part of a comprehensive structural integrity program including corrosion control, leak detection, and in-service inspection.

**Commitments**

All commitments related to this sub-recommendation have been successfully completed as shown in Table 1.

**Table 1: Summary of Closed Commitments Related to Sub-recommendation 1**

| Commitment | | Completion Date |
|---|---|---|
| 1.1 | Pump Tank 6 to Below the Lowest Known Leak Site | 5/2001 |
| 1.2 | Pump Tank 5 to below the Lowest Known Leak Site | 7/2001 |
| 1.3 | Revise HLW Tank Inspection Program | 4/2002 |

### 3.2. Sub-recommendation 2: Reassess the schedule and priority for selecting a technology for a salt processing capability, and vigorously accelerate the schedule leading to operation of a salt processing facility.

The system plan initially consisted of two waste pretreatment processes - sludge preparation via the ESP and salt preparation via ITP. However, due to initial startup issues with the ITP process, DWPF began operations processing sludge only, and in 1998, ITP startup activities were suspended due to concerns in meeting safety and production objectives. An extensive evaluation of alternative processing options was subsequently performed resulting in the selection of a solvent extraction based process for cesium removal from the tank waste. A contract has been established to build and operate the SWPF based on this solvent extraction process and the project is currently in the construction stage. While it is recognized that the bulk of the salt wastes will be processed through the SWPF, the DOE has aggressively pursued a multi-phased approach to interim salt disposition.

The first phase of salt disposition was deliquification, dissolution, and adjustment (DDA) to sustain tank closure activities, sludge disposition activities in DWPF, and to minimize continued limited use of old-style tanks. Approximately 2.8 million gallons of dissolved salt solution from Tank 41 and associated adjustment streams were dispositioned through the DDA process. Concurrently, the DOE prepared the Saltstone Facility to safely and efficiently process the low activity salt solutions through modifications, primarily related to operating personnel safety, to handle higher activity levels than the original design basis of the Saltstone Facility. The modifications included increased equipment shielding, improvements to equipment reliability, reduced hands-on maintenance, and modifications to effectively deal with process upsets.

The next phase of interim salt disposition was the startup and operation of the Actinide Removal Process (ARP) and MCU, which utilizes the same technology as the SWPF. Resolution of legal challenges in August 2007 to a South Carolina modified permit needed to dispose of treated salt waste in the Saltstone Facility allowed ARP/MCU radioactive operations in May 2008. The resolutions consisted of: (1) limiting DDA material to waste contained in Tank 41 as of June 9, 2003; and (2) processing additional waste with ARP/MCU that was originally planned to be processed with DDA alone. The ARP/MCU has processed approximately 850,000 gallons of salt solution to-date with 142,000 gallons in salt batch 1 and 740,000 gallons in salt batch 2. Enhancements and improvements in ARP/MCU process chemistry, process efficiency, and overall attainment/throughput resulted in improved processing rates between salt batches. In addition, the ARP/MCU process has exceeded expectations for decontamination factor requirements for Cesium 137. Finally, the ARP/MCU process continues to provide valuable operational experience to the SWPF, which is the only remaining open commitment to this sub-recommendation.

Commitments

The series of commitments completed regarding Sub-recommendation 2 is shown in Table 2. The startup of SWPF is the only remaining open commitment.

**Table 2: Summary of Commitments Regarding Sub-recommendation 2**

| Commitment | | Completion Date |
|---|---|---|
| 2.1 | Identify a Preferred Technology | 6/2001 |
| 2.2 | Issue Record of Decision | 10/2001 |
| 2.3 | Brief the Board on the Preferred Salt Processing Technology and Schedule | 6/2001 |
| 2.4 | Issue Request for Proposal (RFP) for up to two Engineering, Procurement and Construction (EPC) Contractor(s) | 11/2001 |
| 2.5 | Issue report on HLW Tank Farm Schedule Sensitivity Analysis. | 4/2002 |
| 2.6 | Develop and Submit Commitments Related to Implementation of the Revised Salt Processing Program | 4/2002 |
| 2.7 | Award EPC Contracts as a Demonstration of Progress Towards Acquisition of Salt Waste Processing Capability | 6/2002 |
| 2.8 | Complete Conceptual Design of a Salt Waste Processing Facility | 1/2004 |
| 2.9 | Demonstrate the Viability of the Disposition of Low Curie Salt Directly to the Saltstone Facility 90 Days After Issuance of the Low Activity Saltstone Facility Disposal Permit. | 2/2008 |
| 2.10 | Demonstrate the Viability of the Actinide Removal Process | 5/2008 |
| 2.11 | Prepare a Report that Evaluates the Success of Low Curie Salt Processing and Projects Future Processing Activities for Low Curie Saltcake | 8/2003 |
| 2.12 | Prepare a Programmatic Risk Assessment with Mitigations Strategies for the Salt Processing Program | 8/2003 |
| 2.13 | Begin MCU Radioactive Operations | 5/2008 |
| **2.14** | **Begin SWPF Radioactive Operations.**<br>**Replaced with Commitments Below in Table 3** | **OPEN**<br>**Described in Section 3.2.1** |

### 3.2.1. Begin SWPF Radioactive Operations

DOE recognizes the importance of SWPF, the only remaining commitment to this sub-recommendation, to the long-term completion of its mission. DOE has assigned dedicated resources to manage the design, construction, and initial operation of this facility in conformance with DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets,* and has utilized an Engineering, Procurement, and Construction (EPC) contractor outside of the traditional Management and Operating (M&O) contract strategy for the SWPF. The July 2006 Revision 4 to the IP preceded establishment of the project baseline at Critical Decision 2 (CD-2), Approve Performance Baseline, in September 2007 and approval of the Critical Decision 3 (CD-3), Approve Start of Construction, milestone in January 2009. This document, Revision 6, adjusts the commitment date for startup of this facility. The approval memorandum for CD-3, Approve Start of Construction, established a new approved baseline for CD-4, Approve Start of Operations or Project Completion, of October 2015. In accordance with the approved project baseline at CD-3, both early and late finish dates were established. The early finish dates are at a less than 50 percent confidence level and the late finish dates are based on the realization of established project risks and are at an 80 percent confidence level. In the development of the project risk plan, 126 weeks of schedule contingency were identified to reach the 80% confidence level. Given the progress to date and mitigative actions by the project, CD-4, Approve Start of Operations is currently scheduled between August 2013 (early finish) and October 2015 (late finish). The subsequent introduction of radioactive material for processing in SWPF (i.e., begin SWPF radioactive operations) is forecast for December 2015.

A summary of the open SWPF commitments is given in Table 3.

**Table 3: Open Commitments Regarding Sub-recommendation 2: SWPF**

| Commitment | | Completion Date |
|---|---|---|
| 2.14 | Begin SWPF Radioactive Operations | December 2015 |
| 2.14.1 | Complete Delivery of ASME Vessels | April 2011 |
| 2.14.2 | Complete Dark Cells at Deck 139 ft. Level | May 2012 |
| 2.14.3 | Complete Roof at 154 ft. Level | July 2013 |
| 2.14.4 | Begin Cold Commissioning | October 2014 |

Justification

The original commitment date provided in January 2006 (IP Revision 3) and July 2006 (IP Revision 4) preceded establishment of the SWPF CD-2 project baseline in September 2007 in conformance with DOE Order 413.3A. Per the approval memorandum for the CD-3, Approve Start of Construction, the new approved baseline for CD-4, Approve Start of Operations or Project Completion, is October 2015, which includes 126 weeks of schedule contingency. The subsequent introduction of radioactive material for processing in SWPF (start of radioactive operations) is forecast for December 2015.

The Assistant Secretary for Environmental Management has initiated several practices to provide additional confidence in the ability to meet construction project milestones for all its major construction projects. These include:

- Establishment of a process to perform periodic independent Construction Project Reviews. It is expected that these reviews will be performed under the leadership of senior EM Headquarters staff, approximately every six months, and will serve as a mechanism by which potential issues that could jeopardize project cost and schedule baselines can be identified in a timely manner so that necessary corrective actions or resources can be applied to address the issues.

- Performance of rigorous quality assurance audits to identify potential issues with project design, procurement, and construction. Over the last two years EM has performed over 20 such audits and reviews.

<u>Compensatory Measures</u>

The DOE is considering further interim supplemental salt processing initiatives prior to the startup of SWPF to accelerate the life-cycle completion of tank closure at the SRS. The strategies through technology deployments are:

- Life extension and process enhancement of the ARP/MCU process including demonstration of the next-generation solvent for potential use in SWPF.
- Design, fabrication, and operation of small column ion exchange (SCIX).
- Productivity enhancements at the Saltstone Facility.

The deployment of these technologies can significantly reduce the life-cycle of the SRS and accommodate startup of SWPF within the range expected.

### 3.3. Sub-recommendation 3. Develop and implement an integrated plan for HLW tank space management that emphasizes continued safe operation of the Tank Farms throughout its life cycle.

The liquid waste system is a highly integrated operation that involves safely storing, removing, treating, dispositioning low-level waste in the Saltstone Facility, vitrifying the higher activity waste through DWPF, and storing the vitrified waste until permanent disposition. The Liquid Waste System Plan documents the operating strategy of the integrated liquid waste system and recognizes the success of the interim salt processing programs (DDA, ARP/MCU) to accelerate salt removal and tank space management initiatives. In addition, the 2H Evaporator system has experienced excellent performance, due in part to the ability to deliquor the evaporator system into space made available by the interim salt disposition programs. These successes have allowed consideration of accelerated closure of the old-style tanks.

The Tank Farm space management strategy is based on a set of key assumptions involving projections of DWPF canister production rates, influent stream volumes, Tank Farm evaporator performance, and space gain initiative implementation. The processing of salt and sludge utilizes new-style tank space to process waste in old-style tanks, and therefore new-style tank space will only become available once all waste in old-style tanks is processed. Sludge processing through the DWPF removes the highest risk material from the old-style tanks. However, for every 1.0 gallon of sludge processed, 1.3 gallons of salt waste is formed due to sludge washing and DWPF processing operations to return the resulting low hazard salt waste to the tank farm. Similarly, salt processing typically requires the use of 4 gallons of tank space per gallon of salt waste processed. Given these parameters, the “key to reducing the overall risk is processing high-level waste as expeditiously as possible and managing the total tank space efficiently”, as recognized by the Board letter dated January 7, 2010.

Figure 1 indicates the actual useable tank space and the forecasted tank space. This available tank space is a result of efficiently managing the unit operations which produce or consume space. The useable tank space is calculated using liquid level and the fill limit based on the high liquid level conductivity probe setpoint. Some of the variance between actual and forecast is based on changes to the fill limits. Some of the variance relates to normal changes in tank levels that are expected. The majority of the variance relates to changes in how the strategy was executed. For example, Sludge Batch 6 was completed and transferred from Tank 51 to Tank 40 two months ahead of the schedule assumed in System Plan Rev. 15. This allowed Tank 51 to begin receiving waste that makes up Sludge Batch 7, consequently the actual level in Tank 51 is higher than the assumed level from System Plan Rev. 15. This specific change accounts for approximately 650 Kgal of the variance between actual and forecast. Changes in the useable tank space will continue as material is processed through the evaporator, salt and sludge batches. The forecast shows that the most significant change to useable tank space occurs once SWPF begins operations.

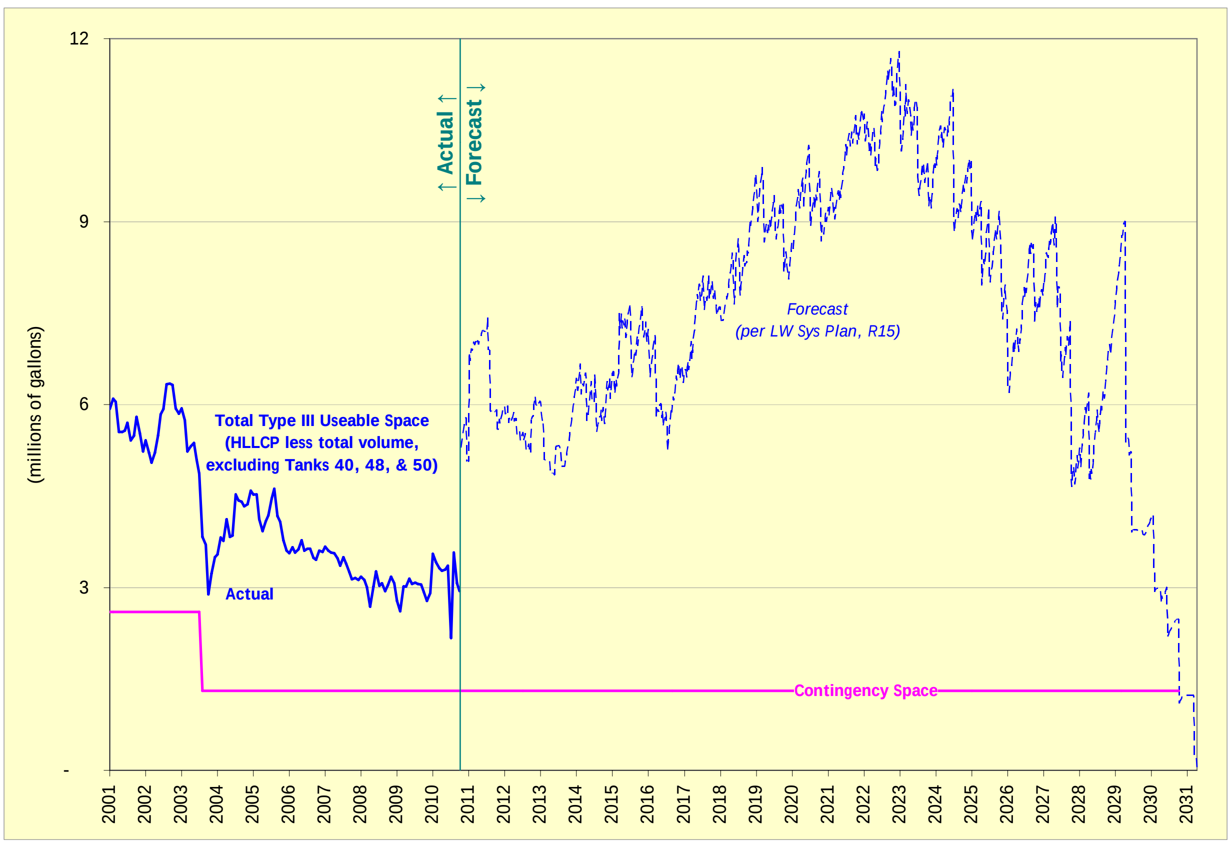


**Figure 1: Usable Type III Tank Space Impacts**

Tank space in the compliant tanks is used for various operations for waste processing and disposal. Tank space is recovered through the following: (1) evaporator operations; (2)

DWPF vitrification; (3) ISDP Treatment; and (4) saltstone disposal. This valuable space has been used to: (1) remove waste from and clean old-style tanks; (2) prepare, qualify, and treat sludge waste for disposal; (3) prepare, qualify, treat, and dispose salt waste, and (4) support nuclear materials stabilization and disposal through H-Canyon.

DOE continues to monitor tank space utilization at the SRS on a routine basis. Performance indicators have been developed to provide management the ability to assess performance against the goals of the interim processing strategy. These indicators include waste tank summary reports each year which document waste transfers, evaporator performance, and total space gain. These reports are available back to FY 2001. DOE will continue to explore options, develop contingency plans and incentivize the Liquid Waste Project contractor to support the earliest liquid waste system mission completion dates.

Commitments

The series of commitments completed regarding Sub-recommendation 3 is shown in Table 4.

**Table 4: Commitments Regarding Sub-recommendation 3**

| Commitment | | Completion Date |
|---|---|---|
| 3.1 | Assess Tank Farm Space Management Options and System Vulnerabilities | 1/2002 |
| 3.2 | Issue Revised HLW System Plan Incorporating Actions from 3.1 | 5/2002 |
| 3.3 | Tank 49 Available for HLW Service | 10/2001 |
| 3.4 | Tank 50 Available for HLW Service | 3/2003 |
| 3.5 | Assess the Technical Feasibility of Dispositioning the Current Tank 48 Material and Returning Tank 48 to HLW Service. | 9/2002 |
| 3.6 | Return 2H Evaporator to Operations. | 11/2001 |
| 3.7 | Complete Tank 37 Modifications Required for Normal 3H Evaporator Operations. | 12/2002 |
| 3.8 | Complete Technical Evaluation of Acceptable Tank 48 Residual Levels. | 4/2006 |
| 3.9 | Develop Plan and Schedule for Return of Tank 48 to Waste Service. | 4/2006 |
| **3.9a**<br>**3.9b** | **Return Tank 48 to Waste Service.**<br>**Tank 48 Return to Service CD-2 Approval is Replaced with Commitments in Table 6** | **OPEN**<br>**Described in Section 3.3.2** |
| 3.10 | Startup a DWPF Evaporator. | withdrawn |
| 3.11 | Issue a Program Evaluation for Integration of Processing Facilities. | 10/2007 |
| **3.12** | **Reduce DWPF Recycle by 1.25 Million Gallons per year is Replaced with Commitments Below in Table 5.** | **OPEN**<br>**Described in Section 3.3.1** |
| **3.13** | **Tank 50 Return to General Service is Replaced with Commitments in Table 7.** | **OPEN**<br>**Described in Section 3.3.2** |

### 3.3.1. Reduce or Eliminate the DWPF Recycle Stream

A steady, stable volume of new-style tank space has been available since DWPF startup although the DWPF recycle stream is the single largest volume influent to the waste tanks. The management of the DWPF recycle stream includes a series of improvements in the handling of the recycle in the tank farms as well as initiatives to reduce the volume generated at DWPF. The DWPF Recycle Management Plan (RMP) projects that between the 2H Evaporator system's capability to reduce DWPF recycle volume and the planned beneficial usage of DWPF recycle for salt dissolution and sodium molarity adjustment of salt solution feeds for salt processing, the Liquid Waste system can adequately accommodate the DWPF recycle volume generated through 2015. Beyond 2015, the projected demand for utilization of recycle in the Tank Farm for salt dissolution and sodium molarity adjustment exceed the volume of recycle generated by DWPF through the end of the life-cycle.

The management of the DWPF recycle in the tank farms to maintain compliant tank space includes:

- **Successfully utilizing the 2H Evaporator to manage the recycle volumes:** The average volume reduction of DWPF recycle water transferred to the H Tank Farm has been 1.6 million gallons per year and the 2H Evaporator had to operate at an average utility of only 56% per year during that period to generate those results.

- **Beneficially re-using DWPF recycle for salt dissolution chemistry adjustment of the salt batch feeds to ARP/MCU at a rate of 1 million gallons per year:** Under the same premise, DWPF recycle can be applied to help fill the need for up to 4.8 million gallons per year needed for salt dissolution and molarity adjustment when SWPF operations commence.

- **Utilizing one old-style tank to receive, store, and prepare DWPF recycle prior to processing in the 2H Evaporator:** The low levels of radioactivity and other hazardous constituents in this stream have enabled acceptance of this approach as a means of safely managing tank farm volume.

Actions taken in the past to reduce DWPF recycle waste sent to the Tank Farms include:

- **Isolation of the steam atomized scrubber (SAS) system from the melter off-gas system in January 2000:** Resulting in a reduction of 700,000 gallons annually being sent to the Tank Farm. Recent operational experience has resulted in the need to operate one scrubber train to maintain a nominal operational life of the high efficiency mist elimination filters.

Commitments

DOE is adding a new commitment to reduce the DWPF recycle volume by 1.25 million gallons per year by October 2014 by implementation of the three modifications to DWPF:

- **Installation of a dry frit delivery system (250 kgal/yr);**
- **Installation of modification to the SAS system in the melter off-gas treatment system (400 kgal/yr); and**
- **Installation of a solids/liquid separator for canister decontamination solution (600 kgal/yr).**

**Table 5: DWPF Recycle Management Commitments**

| Commitment | | Completion Date |
|---|---|---|
| **3.12** | **Reduce DWPF recycle by 1.25 Mgal/year** | **OPEN**<br>**October 2014** |

### 3.3.2. Recover Former ITP Tanks for Tank Farm Operations

The three primary tanks associated with the ITP process were Tank 48, Tank 49 and Tank 50.

Commitment: Tank 49

Tank 49 was returned to service in 2001.

Commitment: Tank 48

Tank 48, which contains approximately 250,000 gallons of precipitate from the startup of the ITP process, will be safely recovered to Tank Farm service once the technical challenges are resolved while precluding unacceptable levels of organics in facilities downstream of Tank 48. A team chartered (2005) to define an achievable and allowable end state for the Tank 48H Project proposed aggregation of the material with DDA material to be disposed in the Saltstone Facility. Based on the results of these work activities, DOE provided to the Board a technical evaluation of acceptable Tank 48 residual levels on April 4, 2006, and closed Commitment 3.8. However, discussions with the State of South Carolina led to the DOE directing the Liquid Waste Project contractor to develop an organic destruction technology as the primary option for Tank 48 material disposition with aggregation as an alternative. Consequently, Revision 4 to this IP reflected this change in the approach from aggregation to organic destruction, but did not modify the Commitment 3.9 date of January 2010 for recovery of Tank 48, which was based on the aggregation approach.

Feasibility testing for two candidate technologies, fluidized bed steam reforming (FBSR) and wet-air oxidation (WAO) for organic destruction began in 2006. During 2007, the technology maturity for each was assessed, test reports were reviewed by independent technical teams, and additional testing was planned in Technology Maturation Plans for each technology to address the issues identified. Revision 14 of the System Plan provided to the Board in October 2007, assumed a return-to-service date of September 2012, based upon the change in approach from aggregation to organic destruction. The Tank 48 Treatment Project received approval for CD-1 in March 2008, Approve Alternative Selection and Cost Range, in accordance with DOE O 413.3A. The primary technology selected was FBSR, with WAO identified as a backup. CD-1 for this project also established a schedule range for CD-4, Approve Start of Operations or Project Completion from November 2011 to August 2012. On June 2, 2009, following maturation of the two technologies, the contractor submitted its Business Decision to DOE recommending FBSR as the single preferred technology for remediation of Tank 48 and DOE accepted the contractor's recommendation on June 10, 2009. By 2010, the Liquid Waste Project contractor completed solicitation, evaluation and award of a contract for design and fabrication of an FBSR processing system. Design is expected to be 35% complete by the end of 2010.

A Board letter of March 5, 2009, to DOE about the Tank 48 Treatment Project notes a concern with "continued delays" in this project. A Board letter dated May 27, 2010 further suggests that "one commitment per year" be provided to allow for more efficient monitoring of progress. As such, commitments 3.9a "Recovery of Tank 48" and 3.9b "Obtain CD-2 Approval" are replaced with the commitments described in Table 6.

There is uncertainty associated with revising this commitment date prior to completing conceptual design and establishing an approved CD-2 project baseline, which is planned to occur after completing 90 percent of the design. As requested by the Board, DOE is adding interim commitments, milestones, and deliverables as shown in Table 6. If necessary, DOE will revise this IP upon approval of the CD-2 project baseline.

**Table 6: Tank 48 Return to Service Commitments**

| Commitment | | Due Date |
|---|---|---|
| 3.9.1 | Complete 35% Design of FBSR | December 2010 |
| 3.9.2 | Authorize Procurements of FBSR Auger/grinder | December 2011 |
| 3.9.3 | Complete 90% Design of FBSR | December 2012 |
| 3.9.4 | FBSR Major Module Skids Received at SRS | June 2013 |
| 3.9.5 | Begin Tank 48 FBSR Radioactive Operations | December 2014 |
| 3.9.6 | Process 25,000 Gallons of Tank 48 Materials | May 2015 |
| 3.9.7 | Return Tank 48 to Waste Service | December 2016 |

An evaluation of the risk of a delay in the Tank 48 return to HLW service and an identification of risk handling strategies that are being implemented for this risk are provided in Risk #184 of PBS-SR-0014 Radioactive Liquid Tank Waste Stabilization and Disposition Risk Management Plan, Revision 5.

Commitment: Tank 50

Tank 50 currently receives and stores low level waste streams including ETP bottoms, decontaminated salt solution (DSS) from ARP/MCU, and low-activity waste from H-canyon. Tank 50 currently operates as the feed tank to the Saltstone Facility and is critical to salt disposition. However, Tank 50 is a new-style, compliant tank and its value in providing reserve compliant tank space has prompted DOE to begin activities to place Tank 50 in general service. This requires direct routing of the low-level waste streams to the Saltstone Facility including construction of additional low level waste lag storage capability at the Saltstone Facility and ETP. The procurement of these vessels will allow Tank 50 to return to higher-curie service. DOE is committing to Tank 50 return to service by December 2012, which includes these interim procurements and infrastructure modifications as described in Table 7.

**Table 7: Tank 50 Return to General Service Commitments**

| Commitment | | Due Date |
|---|---|---|
| 3.13.1 | Award ETP and Saltstone Procurements | June 2011 |
| 3.13.2 | Complete MCU DSS tie-in Design | December 2011 |
| 3.13.3 | Complete Tank 50 Return to Service | December 2012 |

### 3.3.3. Assess the Desirability of Adding an Additional HLW Evaporator to Support Tank Farm Operations

Previous revisions of this IP proposed an evaporator at DWPF to minimize generation of new salt waste in the tank farms and reduce DWPF's dependency on Tank Farm evaporator operations. However, Section 3.3.1 describes multiple initiatives to reduce and manage the DWPF recycle stream, the largest influent into the tank farms. DOE considers that implementation of the recycle handling strategies identified in the DWPF Recycle Management Plan along with the initiatives for recycle reduction and beneficial use of recycle included in the Liquid Waste System Plan offer greater benefit than would be realized through implementation of a recycle evaporator. In addition, sufficient evaporator capacity exists in the Tank Farms with three operating evaporators, and the commitment for an additional evaporator for DWPF has been deleted.

### 3.3.4. Assess the Feasibility of Constructing New HLW Tanks

The Liquid Waste System Plan provides a detailed analysis of the new-style tank space management strategy and is structured in a way to provide contingency when allowable to provide the best opportunity for success. The System Plan recognizes that availability of new-style tank space is a risk which specifically ties to the success of SWPF. However, the System Plan confirmed that no additional tanks are required to store, treat and manage the high level waste within the requirements put forth by the Federal Facility Agreement.

### 3.3.5. Resolve Waste Compatibility and Equipment Degradation Problems to Allow Unconstrained Operations of the Three Existing Evaporators

DOE recognizes that the multiple evaporator systems are critical to liquid volume reduction and managing tank space to support waste disposition operations. The evaporators support specific missions and their operation is planned around these missions as described in the following:

(1) The 2F Evaporator serves to recover space from tank closure and H-canyon missions as well as volume reducing sludge batch decants.

Improvements to the 2F Evaporator system have made the system more reliable, and current performance has met system planning requirements. Inspections of the 2F Evaporator pot continue to demonstrate its integrity; however, a spare evaporator pot and associated work packages for installation/modification are staged onsite for either the 2F or 2H Evaporator pot replacement in the event one is needed. Predictive and preventive maintenance programs are in place to extend service life. Pre-staging of work packages and parts are intended to shorten outage times and consequently will not impact continued waste disposition and tank closure activities.

(2) The 2H Evaporator primarily recovers space from DWPF recycle receipts, which are relatively high in silica concentration.

At the time that Board Recommendation 2001-1 was written, the tank farm's ability to receive and evaporate DWPF recycle was significantly impacted by unresolved issues relating to formation of sodium aluminosilicate scale inside of the 2H Evaporator pot. However, through a systematic recovery and improvement process, the 2H Evaporator continues to meet system planning requirements. This recovery and enhancement process is as follows:

- Four chemical cleanings have been performed since DWPF startup. The first acid chemical cleaning was completed in late

2001 and was successful in removing solids from the 2H Evaporator pot. A second chemical cleaning campaign was completed in early 2006 with sodium hydroxide, but proved marginally effective in removing the solids from the 2H Evaporator pot. A third acid chemical cleaning campaign was completed late 2006 and was successful in removing the solids from the 2H Evaporator pot. The fourth (last) acid chemical cleaning campaign was completed late 2008 and was successful in removing the solids.

- Two de-liquoring campaigns have been performed on the 2H Evaporator system since DWPF startup. The first, performed during late 2003, removed 800,000 gallons of liquor; and the second, performed during early 2009, removed 400,000 gallons of liquor. Subsequently, the 2H Evaporator demonstrated the ability to operate and maintain a maximum steam flow for a period of approximately 12 months. The liquor removed from the 2H Evaporator system is being used, in lieu of inhibited water and caustic, in the sludge removal program.

The tank farms have demonstrated the ability to manage sodium aluminosilicate scale formation in the 2H Evaporator and remove accumulated scale such that the evaporating capacity of the 2H Evaporator has exceeded influents of DWPF recycle. Recent past operational history for the 2H Evaporator system has demonstrated its capability to reduce the recycle water generated by DWPF operations of up to 2.1 million gallons per year, achieving an average reduction of 1.6 million gallons per year for the period FY 2005 – FY 2008. This has been accomplished through reduced frequency and duration of cleaning cycles and improved 2H Evaporator system health monitoring and predictive maintenance resulting in less unplanned outages. These improvements to the 2H Evaporator system in combination with DWPF recycle reduction initiative and beneficial reuse initiatives described in 3.3.1 provide the basis for the Liquid Waste System Plan which accommodates and provides the most efficient processing strategy. However, given the critical nature of the 2H Evaporator operation, an evaluation of the risk of DWPF recycle volume exceeding the capacity of the 2H Evaporator and an identification of risk handling strategies that are being implemented for this risk are provided in Risk #116 of PBS-SR-0014 Radioactive Liquid Tank Waste Stabilization and Disposition Risk Management Plan.

(3) The 3H Evaporator primarily recovers space from sludge batch processing.

The 3H Evaporator system is operating to accommodate the restricted cooling rate of Tank 30, its concentrate receipt tank. However, despite this operational constraint, the 3H Evaporator system received and processed all necessary sludge wash decant wash water in support of the preparation of Sludge Batch 5, i.e. over 900,000 gallons.

### 3.4. Sub-recommendation 4: Reassess contractor incentives to ensure that near-term production at DWPF is not overemphasized at the expense of safety margin in the Tank Farms

The newly awarded contract (2009) for management and operation of the SRS Liquid Waste system is a Cost Plus Award Fee contract which is a Federal Acquisition Regulation (FAR) based contract that differs from prior contracts for this workscope that were M&O contracts. In this new contract, commitments made in the contract awardee's technical proposal have been incorporated into the contract as contract requirements. The incentive structure put in place for this contract will be tied to these contractual commitments. SRR technical proposal comprehensively addresses DOE's stated desire to optimize Liquid Waste system performance, i.e., "accelerate tank closures and maximize waste throughput at the Defense Waste Processing Facility while ensuring sufficient tank space for continued long-term operation and compliance with other requirements of this Statement of Work." SRR's technical approach calls for the early operational closure of old-style tanks at SRS, the reduction of the DWPF recycle stream by 1.25 million gallons per year, and a number of other initiatives directed at improving the safety margin in the Tank Farms. DOE has, in the development of its Performance Evaluation and Measurement Plan for SRR, incorporated incentives to ensure that near-term DWPF production is not overemphasized at the expense of safety margin in the Tank Farms.

All previous commitments associated with this sub-recommendation have been successfully completed and no additional commitments are planned for this issue.

## 4. Management and Organization

The Principal Deputy Assistant Secretary (EM-2) is the Responsible Manager for this IP. EM-2 is responsible for ensuring that all associated planning, response, and implementation activities are performed consistent with requirements and guidance provided in Interface with the Defense Nuclear Facilities Safety Board (DOE M 140.1-1B). The Manager of the Savannah River Operations Office is the point of contact responsible for the site-specific actions of this recommendation.

To ensure that the various Departmental implementing elements and the Board remain informed of the status of Plan implementation, DOE's policy is to provide periodic progress reports until IP commitments are completed. For this Plan, the Responsible Manager and/or designee is expected to provide annual reports (either in oral briefings or written format) to the Board and/or its staff.

This Plan requires sufficient flexibility to accommodate changes in commitments, actions, or completion dates that may be necessary due to additional information, improvements, or changes in baseline assumptions. DOE's policy is to: 1) provide prior, written notification to the Board on the status of any Plan commitment that is not be completed by the planned milestone date; 2) have the Secretary of Energy approve all revisions to the scope and schedule of Plan commitments; and 3) clearly identify and describe the revisions and basis for the revisions. Fundamental changes to the Plan's strategy, scope, or schedule are expected to be provided to the Board through formal revision and re-issuance of the Plan. Other changes to the scope or schedule of planned commitments are expected to be formally submitted in appropriate correspondence approved by the Secretary of Energy, along with the basis for the changes and appropriate corrective actions.

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