INTERIM REPORT TO THE ENVIRONMENTAL MANAGEMENT ADVISORY BOARD

Environmental Management Tank Waste Subcommittee (EM-TWS)
FY 2011 Work Plan Status
Modeling for Life Cycle Cost Analysis (Interim Report)
February 24, 2011

Hanford Tank Farms and WTP

SRS Tank Farms

Presented by the EM Tank Waste Subcommittee
Las Vegas, Nevada

INTERIM REPORT TO THE ENVIRONMENTAL MANAGEMENT ADVISORY BOARD

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1. Introduction

1.1 DOE EM response to FY 2010 EM-TWS Phase 1 Report and Recommendations (Attachment 1)

The DOE Office of Environmental Management has adopted most of the recommendations contained in the 2010 EM-TWS Phase 1 Report. The only major recommendations not accepted fully are the ones concerning the need to fully integrate the Tank Farm contract with the Waste Treatment and Immobilization Project (WTP) contract and have DOE assume its role of "owner/operator" and immediately initiate a startup an operations group to take responsibility for the ultimate disposition of the Hanford tank wastes.

1.2 Overview of Briefings from the Phase 1 Report to DOE Executive Management and the Defense Nuclear Facilities Safety Board (DNFSB)

On October 19, 2010, the Phase 1 EM-TWS Report was briefed to the Secretary and Deputy Secretary. Both understood the findings, conclusions, and recommendations and expressed their general agreement with them. The Assistant Secretary for EM (EM-1) stated the steps that had already been taken to implement the recommendations that were still under review by the WTP Federal Project Director.

On December 8, 2010, the Phase 1 EM-TWS Report was briefed to the DNFSB. The basis of the briefing was the September 30 report. There was general agreement with the Findings, Conclusions, and Recommendations, and the point was made that the EM-TWS recommendations paralleled the thinking of the DNFSB. It was pointed out that several items of interest to the DNFSB were not covered because the EM-TWS followed the Statement of Work (SOW) given to it.

1.3 FY 2011 EM-TWS Phase 2 Work Plan (Attachment 2)

At the conclusion of the EMAB meeting in September, discussions of the potential SOW for FY 2011 (EM-TWS Phase 2 Work Plan) were held that included both the Savannah River and Hanford Sites in the Phase 2 effort. An agreed-to SOW was given to the Subcommittee in November 2010 and work began. Subsequently, the Subcommittee was asked to include two additional charges that were of interest to EM-1 and the DOE Office of the Chief Financial Officer (CFO) (Charge 1B), and of interest to EM-1 and the Construction Project Review (CPR) Team (Charge 7). Six of the seven charges are described fully in Attachment 2, and the status for each is described in Section 2.

Finally, because of EM's need to reach certain decisions by the fall of 2011, it was agreed that an additional Interim Report on all charges would be made at the June 2011 EMAB meeting. Finalization of the Phase 2 Report would occur by the end of August 2011. If any tentative recommendations are changed from what is discussed in June 2011, EMAB will hold a telephonic open meeting in early September to discuss the changes.

2. Status Update of Charges

2.1 EM-TWS Phase 2 Schedule (Attachment 3)

2.2 Progress Report for EM-TWS Phase 2 Charges

- **Charge 1A: Modeling for Life Cycle Cost Analysis (LCCA)**

  The modeling for the life cycle cost analysis interim report is attached (Attachment 4). Within this report is the EM-TWS early assessment of the background, issues, and some preliminary findings as well as recommendations.

  This Charge 1A report will be modified in the final report, which will be submitted prior to the June EMAB meetings.

- **Charge 1B: Assessment of Life Cycle Cost Analyses of High-Level Waste (HLW) Strategies**

  The EM Assistant Secretary has requested an additional review of life cycle options, as noted in the Work Plan for Phase 2, as amended, and noted in Attachment 1. This activity would require additional resources as well as added depth of analysis in reviewing the options that could impact overall program life cycle costs and possible program savings. Guidance has been provided with fact-finding meetings with the DOE CFO's office and will be included in the June 2011 report.

  This Charge 1B report will be submitted in June EMAB meetings.

- **Charge 2: Assess Candidate Low-Activity Waste (LAW) Forms**

  High-level tank wastes at both the Savannah River Site (SRS) and Hanford Site will be separated into high- and low-activity fractions for ultimate disposal.

  - The HLW fraction at both sites will be treated using vitrification into borosilicate glass for onsite storage until a geologic repository is ready for disposal.

- The LAW fraction at Savannah River has been treated using a cementitious waste form (Saltstone) and disposed of onsite for over two decades.

- The LAW treatment facility currently under construction at the Hanford site was designed to treat less than 50 percent of the expected LAW feed using vitrification to a borosilicate glass waste form for onsite disposal at the Integrated Disposal Facility (IDF).

Because of the advanced stage of LAW treatment at Savannah River and the construction of the Salt Waste Processing Facility (SWPF), the EM-TWS review will focus on Hanford LAW; however, any potential relevance to Savannah River LAW treatment will be considered.

Alternative treatment and waste forms have been considered for the Hanford LAW; recently the following technical approaches and corresponding waste forms have selected for evaluation for treating the remaining LAW material:

- 2^{nd} LAW Vitrification (ILAW) → borosilicate glass
- Bulk Vitrification → sodium silicate glass
- Cast Stone → cementitious waste form
- Fluidized Bed Steam Reforming (FBSR) → aluminosilicate mineral waste form

Considerable effort has been expended to narrow down the alternatives being considered above. The EM-TWS review will focus on these alternatives; however, other alternatives may be evaluated at a high level based on their likely technical maturation for the specific case of Hanford LAW treatment.

The EM-TWS is currently reviewing reports and background information provided by the DOE Office of River Protection (ORP) and Tank Farm Contractor on the status of the evaluation of alternative treatment technologies and waste forms for the Hanford LAW material that would not be treated by the ILAW facility currently under construction. These review materials provided a valuable perspective on the evaluation status for alternative treatment technologies and waste forms as of January 2011.

Potential Issues and Vulnerabilities

Issue 1

There appears to be a consistent approach within DOE to estimating costs that does not account for the full life cycle of a given project. For example, a life cycle cost analysis that excludes environmental liability, facility decontamination and decommissioning (D&D) costs and/or waste disposal costs (whether or not guidance mandates their inclusion) is not a true life cycle cost estimate. Some of these issues may be compensated for by focusing on the numbers of HLW and LAW waste canisters or packages that would be produced, or on the number of years site operations are reduced as well as the respective hotel load. However, the situation at a site like Hanford, where treatment and immobilization facilities are under construction and one critical treatment process has neither been selected nor designed, may not be approximated well by focusing too closely on the numbers of waste canisters or packages produced. A more complete life cycle analysis appears to be warranted that incorporates all significant cost elements.

Issue 2

The concept "as good as glass" may obfuscate the important issues that should be under consideration for the treatment and disposal of Hanford LAW. It would seem that a better concept would be the performance of a waste form that would be protective of human health and the environment for the regulated period of performance at the point of compliance. The various issues that relate to this concept include:

- There is no single standard test or suite of standard tests that can qualify the performance of a waste form (including glass) for a given disposal facility over the relevant period of performance. Excellent tests such as ASTM C1285 (also known as the Product Consistency Test (PCT)), the single-pass flow-through (SPFT) test, and the Vapor Hydration Test (VHT) provide valuable information concerning the behavior of waste forms (e.g., for parameterizing models), but do not test the performance of a waste form over the many years—often, millennia—required.

- Waste forms must satisfy regulatory limits for required tests (e.g., the U.S. Environmental Protection Agency's Toxicity Characteristic Leaching Procedure (TCLP) or ASTM C1285); however, these regulatory limits do not necessarily correspond to the required performance of the waste form at the point of compliance over the regulated period. When considering performance, the tests are used instead to parameterize the models (e.g., Transition State Theory model) that are used to predict performance of the waste form over time. Furthermore, the performance of a waste form is also dependent on the alteration products that form over time (dependent on the disposal environment), that are often difficult to characterize and may have to be factored into the performance modeling for predictions to be reasonable.

- The parameters obtained from the tests described above and the performance models used have uncertainties that are difficult to characterize often making their predictions highly uncertain. Assumptions are often made in performance assessments to account for difficult-to-characterize uncertainties that may produce unreasonably conservative predictions, resulting in very costly treatment alternatives. These highly conservative assumptions are then often taken as defaults and thus propagate through subsequent assessments that may restrict options or dictate more costly solutions.

The above issues make not only the assessment of the performance of a borosilicate waste glass form difficult to assess, but the comparison of different types of waste forms even more challenging. These difficulties may become paramount if one is attempting to begin to treat LAW using a method other than vitrification in the next decade. However, as stated above, the assessment of performance of any candidate waste form could instead be made in light of what is protective of human health and the environment under relevant uncertainties for the mandated period of compliance.

Another alternative approach would be that all parties could agree on the benchmarks, tests, and limits that define acceptable performance for treated Hanford LAW. However, there currently appears to be disagreement between the DOE and the Washington State Department of Ecology on the accepted treatment path for the Hanford LAW material that exceeds the capacity of the ILAW facility currently under construction.

The EM-TWS will continue to evaluate the issues described above in preparation for issuing a final report. Several Tank Farm Contractor reports are anticipated between now and June 2011 that may shed additional light on the issues raised above, and the EM-TWS looks forward to receiving additional materials as they become available over the next several months.

This Charge 2 report will be submitted in June 2011 EMAB meetings.

- **Charge 3: Assess At-Tank or In-Tank Candidate Technologies for Augmenting Planned Waste Pretreatment Capabilities.**

Status – Hanford

The Tank Farm Contractor is currently working on Critical Decision (CD)-1 prerequisites for the Hanford Supplemental Treatment Process. The Supplemental Treatment Process comprises treatment (solid/liquid separations and cesium removal) and immobilization. The Supplemental Treatment processes have been furthermore subdivided into in-tank and at-tank (or near-tank) options.

The EM-TWS reviewed reports and background information provided by ORP and the Tank Farm Contractor on the status of the solid/liquid separations and cesium removal processes. Topics included mission needs, schedule, technology down-selection, and project cost. This provided a valuable perspective on the project status as of January 2010. The Tank Farm Contractor is currently working to prepare a CD-1 package by September 2011, which should contain new and more extensive information.

Potential Issues and Vulnerabilities

Issue 1 – ORP
Pre-conceptual cost data include preliminary engineering and design (PED), capital cost, and annual operating cost estimates, but do not include LCC elements of D&D and disposition. This is a significant omission considering the long-term cost of

HLW and LAW waste form storage. For example, the material balance described in Revision 5 of the River Protection Project (RPP) System Plan indicates that 10,713 HLW canisters are expected to be produced over the life of the project. The anticipated material balance (the final version that will be described in Revision 6 of the System Plan) predicts the generation of 11,884 HLW canisters. Assuming a disposition cost of approximately $1,000,000 per canister, the additional LCC attributable to HLW glass disposition is on the order of $1,000,000,000.

Issue 2 – ORP
Several RPP documents include the statement:

> The life cycle cost of tank waste treatment is strongly influenced by the WTP operating duration. Fixed costs for tank farm and WTP operations result in relatively large annual operating costs that are independent of the quantity of waste treated in a year. Therefore, a significant life cycle cost incentive exists to complete tank waste treatment processing at the earliest practical date.

The end date for tank waste processing will be affected by the time required for the Supplemental Treatment and Immobilization Processes design, build, and commission steps; the time it takes to reach design capacity once commissioning is complete; and the on-stream factor of the finished facility. These factors need to be thoroughly considered during the down-select process.

For example:

- Can the near-tank option, which uses elements in common with WTP (cross-flow filtration (CFF) and conventional spherical resorcinol formaldehyde (sRF) ion exchange), be designed, built, commissioned, and brought to design capacity in less time than the in-tank option, which uses unconventional technology?

- Will experience in commissioning the near-tank option provide experience that could facilitate the WTP startup?

- Will maintenance issues associated with the rotary microfilter's (RMF's) moving parts significantly reduce the Supplemental Treatment facility's availability?

- The WTP External Flowsheet Review Team (EFRT) finding on Critical Equipment Purchases indicated that proper operation of an ion exchange column depends on slight differences between one ion exchange column design and another by stating:

  > An example [of a critical equipment purchase] is the design of the current ion exchange column. In the preliminary drawings submitted by the vendor, the process fluid distribution/collection piping for removing fluids from the column does not permit complete

displacement of one process fluid by another. This may result in undesirable contamination/mixing of the process fluids.

The in-tank ion exchange column application is unusual, in fact possibly unique, for a system requiring loading, elution, and regeneration. Will this adversely affect throughput and on-stream time?

- The EM-TWS (WTP-001) previously identified a need at WTP for "Alignment with Chemical Plant and Industry Standards" including a recommendation that "the EM-TWS believes that a chemical industry practice for Hazard and Operability analysis (i.e., HazOp) is warranted for each campaign." The EM-TWS also recommends using HazOp as part of the Hanford Supplemental Treatment and Immobilization facility down-select processes to help identify significant differences among process alternatives associated with operability and equipment reliability.

The EM-TWS will continue to work on the issues described above in preparation for issuing a final report in June 2011. The Tank Farm Contractor is expected to issue several interim reports between now and September 2011, when the CD-1 package is published. The subcommittee looks forward to receiving additional materials as they become available over the next several months. A final report will be issued in June 2011.

Status – SRS

The Supplemental Treatment Salt Processing Strategy at SRS comprises several elements to mitigate the impacts of a delay in the startup of the SWPF, including the RMF/Small-Column Ion Exchange (SCIX) project comprising solid and liquid separations using RMF and cesium removal using crystalline silicotitanate (CST) SCIX. The treatment processes will be deployed using the In-Tank option, in which the RMF and SCIX equipment is installed in risers internal to Tank 41.

SRS has completed the RMF/SCIX conceptual design and is currently working on elements of preliminary and final design for the Supplemental Treatment Salt Processing Strategy. Commissioning is scheduled to begin in June 2012.

The EM-TWS reviewed reports and background information on the status of the solid/liquid separations and cesium removal processes including mission need, schedule, and provided by SRS. The subcommittee has requested additional documentation describing the scale up and expected performance of the MST mixing and down-selection to CST ion exchange.

Potential Issues and Vulnerabilities

- Will maintenance issues associated with the RMF's moving parts significantly reduce the Supplemental Treatment Facility's availability?
- Why was a new technology, RMF, selected over the CFF already used at Savannah River?

- Does the choice of ion exchange resin type significantly affect the number of HLW canisters and related LCC?
- What are the differences between the work processes used at SRS for the RMF/SCIX project, and how do they compare with the work process described in DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*?

The SRS data call package is being supplemented, and the supplemental data should provide additional insight into the proposed operational approach. The EM-TWS will continue to work on the issues described above in preparation for issuing a final report in June 2011. Additional materials have been requested, and the EM-TWS expects to have further requests over the next several months.

This Charge 3 report will be submitted in June EMAB meetings.

- **Charge 4: Evaluate various Melter Technologies**

A literature search has been completed of melter technology from 1980 to the present. Besides the current baseline technology of Joule-heated ceramic melters, the following melter and immobilization technologies and approaches are being evaluated:

- Cold crucible melting
- Induction heating
- Plasma torch continuous melter
- In-can melter
- Rotary plasma arc melter
- Bulk vitrification

This material, along with that supplied by ORP in its reply to the data call, is being evaluated using the following subject areas:

- Respective pros and cons of each technology
- State of development of each technology readiness level (TRL) (i.e., the TRL rating)
- Technology development effort for moving each technology to TRL 6
- Estimated life cycle cost/benefit for implementing each technology
- Effect of waste form choice on immobilization technique
- Ease of installation as a replacement to current Joule-heated melters

Although many of the above melter technologies have been available for over 30 years, significant operating experience has only been accumulated for the slurry feed Joule-heated ceramic melters (Pamela, West Valley, and the SRS Defense Waste Processing Facility (DWPF)) and the two-step, calcine-fed, cold crucible induction heated melter (Marcoule and La Hague). These processes produce HLW vitrified in borosilicate or aluminaborosilicate glass. Because of the operating experience for these two processes and the minimal (if any) experience with the other technologies, it is difficult to provide a rational comparison because there is a good chance that all of the issues with the unproven technologies have not been worked out and the claimed advantages might disappear during actual implementation.

While implementation of a new technology in a new facility could lead to some long-term savings, it is questionable that backfitting a new technology into an already operating plant would be of significant benefit. This is due to the loss of production during the installation and startup phases and potential bottleneck limitations from the surrounding processes.

Finally, many of the original concerns with the Joule-heated melters, such as limited lifetimes due to corrosion, shorting due to accumulation of metals, and erosion of the pour spout, have either been overcome or have not materialized. Thus, the financial advantage of pursuing a new technology may still be an unknown and may not be fully answered by this report.

For a non-melter process such as steam reforming, which is proposed for the immobilization of LAW at Hanford, the issue exists as to the acceptability of the waste form—a mineralized waste form in the case of Hanford—instead of a glass. While current testing and analyses indicate that this waste form may be as good as the current vitrified material, it is still not an internationally or legally accepted waste form for LAW or HLW and does not have the benefit of over 30 years of testing. This also applies to the use of alternate glass formulations such as iron phosphate in melters.

If alternate waste matrices are accepted, there could be savings in the long-term operation of a new plant that is built expressly for their use. These savings would likely accrue due to increased waste loading, thereby decreasing the long-term disposal costs of the waste due to a lower number of waste containers, rather than from the relatively minor effect of lower capital costs for the immobilization process itself.

This Charge 4 report will be submitted in June EMAB meetings.

- **Charge 5: Evaluate the Reliability of Waste Delivery Plans**

High-level tank wastes at the Savannah River and Hanford Sites either are or will be retrieved, respectively, for subsequent separation into higher- and lower-activity fractions for treatment and ultimate disposal. The steps involved in preparing feeds for treatment include often include a combination of retrieval, mixing, pretreatment (including separation), qualification, and finally feeding the pretreated and qualified waste material to the appropriate treatment facilities.

A requisite balance must be established and maintained between the preparation of waste feed material and its treatment to various contract and programmatic requirements, including the minimization of the potential mismatch between the treatment of the higher- and lower-activity waste fractions.

At SRS, a balance has been struck between the production of qualified feed batches and treatment processes for the past 15+ years of radioactive operations. However, there have been changes to the DWPF melter to increase throughput and the construction of the Salt Waste Processing Facility (SWPF) that may require an increase in the production and qualification of waste material for treatment.

A balance similar to that which was struck at SRS must be established and maintained at the Hanford Site. The delivery of feed to the WTP is more complicated than that at SRS because there are more tanks at Hanford with more waste types—some of which are recalcitrant, resulting in more complicated characterization, retrieval, pretreatment, and qualification to produce feeds for much higher contract rates for treatment. Valuable information can be learned from the delivery of waste at SRS for the past 15+ years and applied at both sites.

The EM-TWS is currently reviewing reports and background information provided by DOE and its primary contractors regarding the plans for waste feed delivery at SRS and Hanford. These review materials provided valuable information on the waste feed delivery plans for both sites as of January 2011.

Potential Issues and Vulnerabilities

Issue 1

The necessary increase in the production of qualified waste feed for future SRS operations to accommodate increased HLW treatment throughput and SWPF has not been demonstrated with the existing infrastructure. At SRS, pretreatment is performed in the tank farm and often suffers from a lack of tank space; furthermore, when tanks are emptied, they are not used for processing, but instead readied for closure. The various steps needed to plan the pretreatment and qualification of feeds are highly labor-intensive and not completely understood, often by only a few. These conditions may make a significant increase in the production of qualified feeds for treatment at SRS problematic.

Issue 2

At Hanford, potential vulnerabilities related to feed delivery result primarily from the complex, interdependent, and highly constrained nature of the operations that must be carried out to produce feed for subsequent treatment. When compared to SRS, there are more waste tanks containing more waste types (that often have been mixed) resulting in more variable wastes, including some that are recalcitrant, making characterization, retrieval, processing, and qualification more difficult than at SRS. There are also significant constraints on the waste tanks that will be processed (e.g., the single-shell tanks) and their order based on the Hanford Tri-Party Agreement.

Issue 3
The Hanford 242-A evaporator currently represents a single point of failure for the production of wastes for treatment in the WTP. Additional evaporative capacity is being researched; however, even with this additional capacity, a significant failure in the 242-A evaporator system would impact the delivery of feed to the WTP for treatment. These concerns are reinforced by the fact that the 242-A evaporator will have to be operated in a different (continuous) mode than previously (i.e., in campaigns with significant planned outages for maintenance and repair).

The EM-TWS will continue to evaluate the issues described above in preparation for issuing a final report. DOE contractor reports are anticipated between now and June 2011 that may shed additional light on the issues raised above, and the EM-TWS looks forward to receiving additional materials as they become available over the next several months.

This Charge 5 report will be submitted in June EMAB meetings.

- **Charge 6: Identify other Tank Waste Vulnerabilities at SRS and Hanford**

The tank waste vulnerabilities charge will be started in March 2011. The reason for the later start is due to a delay in the data calls as well as in the EM-TWS's understanding of the issues, risks, and vulnerabilities as they relate to the first five charges.

The EM-TWS will be conducting a facilitated session of issues and vulnerability risk mitigation steps that could impact the program success both in a positive and potentially negative manner.

A few of the major vulnerabilities that will be considered are:

- Schedule risk; the 2020 Vision schedule is demanding and possibly at risk based on required gated process requirements and approvals
- Funding risk
- Regulatory compliance
- Workforce integration and workforce lines of jurisdiction
- Technology Readiness Level (TRLs)
- Tank Farm readiness for accelerated treatment and operations

This Charge 6 report will be submitted in June EMAB meetings.

3. Modeling for Life Cycle Analysis

Briefing for the Modeling for Life Cycle Analysis – Interim Report (Attachment 4)

Attachment 1 - DOE EM response to FY 2010 EM-TWS Phase 1 Report and Recommendations
Attachment 2 - EM-TWS Phase 2 Work Plan
Attachment 3 - EM-TWS Schedule of Activities
Attachment 4 - Modeling for LCC Analysis (Interim Report)

Department of Energy
Washington, DC 20585

January 24, 2011

MEMORANDUM FOR JAMES AJELLO
CHAIRMAN
ENVIRONMENTAL MANAGEMENT ADVISORY BOARD

FROM: INÉS R. TRIAY
ASSISTANT SECRETARY FOR
ENVIRONMENTAL MANAGEMENT

SUBJECT: Office of Environmental Management Response to the September 2010 Report Submitted by the Tank Waste Subcommittee of the Environmental Management Advisory Board on the Waste Treatment and Immobilization Plant

On September 15, 2010, the Tank Waste Subcommittee (TWS) of the Office of Environmental Management Advisory Board (EMAB) briefed both the full EMAB as well as EM management on the results of its review of several technical aspects of the Waste Treatment and Immobilization Plant (WTP). The EMAB accepted the results of the review and on September 30, 2010 you forwarded the full report, *Environmental Management Advisory Board EM Tank Waste Subcommittee Report for Waste Treatment Plant, Report Number EMAB EM-TWS WTP-001*, to me for evaluation and implementation of recommendations.

As I noted during the public EMAB meeting I am extremely impressed with the ability of the TWS to be able to complete this effort in the short amount of time available for this task, and for the insights the TWS has provided for the completion of this important project. The report provided observations, findings and recommendations regarding the three charges you provided to the Subcommittee. The actions EM and the WTP Federal Project Director (FPD) are taking to address the TWS recommendations are discussed below.

Charge 1: Verification of closure of Waste Treatment and Immobilization Plant (WTP) External Flowsheet Review Team (EFRT) issues

The Tank Waste Subcommittee concluded that "*... the current WTP Contractor, with DOE's concurrence, has met the WTP procedures and protocols that constitute issue closure and is continuing to pursue the resolution of remaining technology issues in parallel with engineering, procurement, and construction (EPC) activities.*"

The TWS had 10 recommendations related to this charge (**Recommendations 2010-02 through 2010-11**). Each recommendation dealt with a specific EFRT-identified issue. The contractor will review each of the recommendations and compare them to the residual risks identified through the EFRT resolution process to determine if actions are already in process to address the recommendation. For those items that represent new actions, the contractor will propose specific actions, as needed, to address the recommendations. The contractor will provide these actions to the FPD for his review and concurrence to ensure that any remaining vulnerabilities from the EFRT resolution process are being adequately addressed. The majority of actions are germane to the Pretreatment Facility only.

Charge 2: WTP Technical Design Review

The TWS reported that the WTP project has reached the "pivot point," where the principal focus of management attention is shifting from Engineering Procurement (EPC) and Construction to Engineering Procurement Construction and Commissioning (EPCC). The technical risks associated with EPC have been sufficiently resolved (i.e., the remaining risk is sufficiently low), and the design has advanced to a sufficient level of maturity. On the basis of its review, the TWS has concluded that, independent of the EFRT issues: 1) no substantial risk to compliance with contract functional specifications was identified, and 2) the design appears to be sufficiently mature to proceed with completion of EPC activities.

The Tank Waste Subcommittee identified five recommendations related to this charge:

- The EPC process should proceed to completion **(2010-12).**
- Diligence should be maintained in conducting regular and redundant audits to identify and mitigate potential impacts of any potential project nonconformances **(2010-13).**
- The focus of attention should shift from EPC to EPCC, requiring a coordinated effort by a single owner/operator representative in marrying the WTP and Tank Farm activities **(2010-14).**
- DOE, as the project owner/operator, should take near-term action to create a resource base that is concerned with operability and the proper integration of operability concerns and commissioning activities with Tank Farm and WTP processes and activities **(2010-15).**
- In support of this new resource base, DOE should take action to obtain an integrated Tank Farm/WTP plant operator as soon as practicable **(2010-16)**

The mechanism to address these recommendations will be the actions recommended by the WTP FPD and acted upon by the Deputy Secretary. Of particular relevance is the transition of a DOE-WTP Project Office to a site office function that will allow DOE to implement its role as "owner" of the WTP. This organization includes a senior manager responsible for integrating tank farm activities with the construction and subsequent commissioning of the WTP.

Charge 3: WTP Potential Improvements

The Tank Waste Subcommittee determined at this point in time, the possibility of making changes to the WTP design that do not adversely affect the total project cost or project completion date is limited. The Tank Waste Subcommittee recommended that the project should complete the final design and proceed with construction, considering some areas of recommended focus.

The Subcommittee proposed five recommendations that focus on enhancing system safety, provide improved accountability, and strengthen project management oversight and execution, which it believes will promote early startup and testing, provide added design efficiency, reduce lifecycle cost, enhance plant reliability, reduce operating risk, and improve chemical and nuclear conduct of operations:

- Unify the mission with single-point authority and oversight **(2010-17)**.
- Create a Strong Owner/Operator Group **(2010-18)**.
- Alter current contractual startup plans to conform with chemical industry best practices **(2010-19)**.
- Begin development of operator training plans and tools **(2010-20)**.
- Evaluate options for improving availability **(2010-21)**.

As for Charge 3, the mechanism to address these recommendations will primarily be the actions recommended by the WTP FPD and acted upon by the Deputy Secretary. As noted previously one of the recommendations regarding the transition of the DOE-WTP Project Office to a site office function will facilitate DOE implementing its role as "owner" of the WTP. Other recommendations by the FPD will also address the other related aspects, including development of a "one-system" model for delivery of WTP and elements of the tank farm operating contractor associated with waste feed delivery.

I appreciate the dedication of the TWS to complete their effort in an expeditious manner while maintaining a high degree of rigor in its review activities. We have begun discussions with the TWS for activities that we would like the subcommittee to perform during Fiscal Year 2011. As we progress in these activities, we will have an opportunity to apprise the TWS on the status of addressing its recommendations related to the WTP. If you have any questions, do not hesitate to contact me at (202) 586-7709.

cc: Dae Chung, EM-2
John Mocknick, EM-2
Cynthia Anderson, EM-3
Mark Gilbertson, EM-50
Melissa Neilson, EM-42
Jonathan Dowell, ORP
Dale Knutson, ORP

Attachment 2

Environmental Management Advisory Board
Environmental Management Tank Waste Subcommittee
FY 2011 Work Plan

Subcommittee Purpose: The Subcommittee provides independent technical review of the Office of Environmental Management's tank waste cleanup program at Hanford, Washington, the Savannah River Site in South Carolina, and the Idaho National Laboratory and will focus on facilities being planned, designed and constructed at those sites. The Subcommittee advises on a wide range of matters, including, but not limited to, technical improvements to the strategy for retrieving waste from storage tanks and subsequently immobilizing the waste for eventual disposal. This includes review of the strategies for implementing such projects, the proposed pretreatment and treatment processes, the technical design of specific facilities, and the safety of such facilities. The Subcommittee will produce reports and propose recommendations to the EMAB as necessary.

Background:

The management and disposition of tank waste is the single largest lifecycle cost element and poses the most significant environmental, safety and health threat in the Office of Environmental Management environmental cleanup program. It accounts for nearly 36% of the total EM cleanup cost and is the major contributor to EM's cleanup liability. EM's lifecycle cost from FY 2011 forward, ranges from $182 billion to $237 billion. EM estimates cleanup will be completed between 2050 and 2062. With so much of the program cost and schedule still in front of us, there are many opportunities to make meaningful investment decisions that will significantly reduce the lifecycle cost and accelerate cleanup.

The safe management of tank waste in the form of sledges, liquids and salts in tanks, some of which are over 55 years old, as well as its subsequent retrieval, pretreatment, and final treatment for disposal in a geologic repository, constitute the large program costs. The following summary facts provide an overall perspective of the tank waste management Program:

- Over 230 large HLW storage tanks;
- Over 90 million gallons of sludges, liquids, and salts;
- Treatment facilities that are among the largest of their type in the world; and
- Over 700 million curies of activity.

DOE's tank waste constitutes some of the largest quantity of material (both volume and radioactivity) which the Department manages. The table below provides a summary tank waste inventory by site:

Attachment 2

Tank Waste Inventory

HLW Site	Waste Form	Storage Tanks	Activity Curies (Ci)	Volume
Hanford[1]	Liquids, Sludges	177 Tanks	175M Ci	53M gals
SRS[2]	Liquids, Sludge	49 Tanks (2 closed)	400 M Ci	38M gals
INEEL[3]	Liquids	7 Tanks (4 closed)	3 M Ci	1M gals
WVDP[4]	Liquids	2 HLW Tanks	0.25 M Ci	0.1M gals

[1]Approximately 2000 capsules contain 130 M curies in the form of salts
[2]Approximately 2700 canisters of a borosilicate glass waste form have been produced at SRS representing 10 M curies
[3] Approximately 4400 m^3 of HLW calcine reside in 6 bin sets
[4]275 canisters of borosilicate glass were produced capturing approximately 100 M curies

Work Activities:

The three active tank waste sites that present the predominant challenges are Hanford, SRS and Idaho, with Hanford posing the most challenging due to the more complex chemical composition of the tank waste. Because the tank waste disposition program is the largest single cost component of the EM program, EM has begun to identify and evaluate candidate tank waste strategies targeted at reducing these costs.

Specific vulnerabilities to achieving the technical baseline at a reasonable cost include the following:

- Tc-99 and I-129 Management
  Although Low-Activity Waste (LAW) glass is selected to contain Tc-99 and I-129, tests indicate the ability to capture Tc-99 vary widely, ranging from 0% to 80% with the average being ~38%. Tc-99 and I-129 capture percentages may possibly be increased by recycling LAW off-gas condensate, however, maintaining a 100% recycle loop is very problematic (parallel buildup of sulfates, phosphates, and halides) and questionable effects on waste loading that could further extend the treatment mission and increase the lifecycle cost.

- Sodium and Sodium Management
  Sodium is the largest chemical component in the Hanford tanks; 49,000 metric tons (MT). Sodium hydroxide must be added during pretreatment to keep aluminum (Al) in solution in order to meet the waste loading limits for aluminum in HLW glass. The WTP Pretreatment baseline requires ~30,000 additional MT of sodium that would increase total sodium in LAW up to 80,000 MT. An Aluminum Removal Facility was added to the Hanford baseline to

mitigate additional sodium but the technology readiness is low (Technology Readiness Level = 2) which threatens mission cost/schedule.

- Lifecycle Cost and Schedule Challenges
  At Hanford, LAW vitrification capital and operating costs are potentially substantially greater than competing technologies. A second LAW vitrification plant is currently part of the baseline in order to treat the balance of the low activity waste volume. The estimated additional capital cost is >$1B. At SRS, minimizing lifecycle costs is dependent upon successfully implementing pretreatment capabilities and ensuring its low-activity waste treatment facility can be operated in such a manner as to match the HLW vitrification campaign.

- Low-Activity Waste Forms
  Two separate waste forms are proposed for low-activity wastes – a grouted "saltstone" waste form at SRS, and a vitrified borosilicate glass waste form at Hanford. There may be advantages to utilization of alternative waste forms, particularly at Hanford, to address Tc-99 and I-129 capture and contribute to lower lifecycle costs due to the chemical complexity of the waste.

To address some of these vulnerabilities, EM has established a Technical Expert Group (EM-TEG), to perform some very specific detailed technical reviews. These reviews include:

- Low activity vitrification waste loading evaluation
- Capture of Tc-99 and I-129 in LAW glass
- Identification of any Tc-99 and I-129 environmental risks not currently identified
- Selection of Hanford tank waste LAW samples for Fluidized Bed Steam Reforming (FBSR) testing

<u>Subcommittee Members:</u> D. Ferrigno (Co-chair), L. Papay (Co-chair), K. Brown, E. Lahoda, A. Leviton, R. Ewing, R. Strand

<u>Technical Advisors</u>: Barry Naft, Herb Sutter, Mark Frei

<u>Designated Federal Officer (DFO):</u> Kristen Ellis

<u>Subcommittee Support Staff:</u> Elaine Merchant

The Tank Waste Subcommittee is charged to follow-up on those specific reviews and will perform the following activities in FY 2011, in the order identified below:

Attachment 2
EM Tank Waste Subcommittee FY 2011 Work Plan

Issue	Suggested Activities	Expected Output/ Work Product	Notes
Charge 1A Modeling for lifecycle analysis	Charge 1A This task entails reviewing the modeling approaches for determining tank waste remediation lifecycle costs at both SRS and Hanford. This includes evaluating assumptions in system plans for completing tank waste missions at Hanford and SRS, as well as the rigor of the models for identifying activities and costs through the end of each site's program	Recommendation(s)	At Hanford, LAW vitrification capital and operating costs are potentially substantially greater than competing technologies. A second LAW vitrification plant is currently part of the baseline in order to treat the balance of the low activity waste volume. The estimated additional capital cost is >$1B. At SRS, minimizing lifecycle costs is dependent upon successfully implementing pretreatment capabilities and ensuring its low-activity waste treatment facility can be operated in such a manner as to match the HLW vitrification campaign.
Charge 2 Assess candidate low-activity waste forms	At Hanford, the WTP is being designed, constructed and commissioned to treat, via vitrification, all of the high level tank waste and up to 50% of the low-activity tank waste. The Subcommittee shall evaluate candidate waste forms including a vitrified glass waste form, a mineralized FBSR form, and grout as to their suitability for completing the Hanford tank waste mission. This assessment will use the results of the TEG review related to 1) waste loading in low-activity vitrified glass, 2) Tc-99 and I-129 capture in glass, and 3) whether tank waste samples for FBSR testing are sufficiently bounding to make mission critical decisions regarding waste form performance.	Recommendation(s)	Two separate waste forms are proposed for low-activity wastes – a grouted "saltstone" waste form at SRS, and a vitrified borosilicate glass waste form at Hanford. There may be advantages to utilization of alternative waste forms, particularly at Hanford, to address Tc-99 and I-129 capture and contribute to lower lifecycle costs due to the chemical complexity of the waste.
Charge 3 Assess at-tank or in-tank candidate technologies for augmenting planned waste pretreatment capabilities.	This includes use of technologies currently being considered to perform some at or in-tank pretreatment activities, such as rotary micro-filtration for solids separation and use of small-column ion exchangers for removal of Cesium.	Recommendation(s)	

Attachment 2
EM Tank Waste Subcommittee FY 2011 Work Plan

Issue	Suggested Activities	Expected Output/ Work Product	Notes
Charge 4 Evaluate various melter technologies.	Over the last 15 to 20 years the EM program has considered various melter technologies and operational strategies to increase the efficiency of tank waste vitrification processes. This task will entail review of the different approaches and technologies that would be considered as second-generation (at Hanford), or third/fourth generation (at SRS) replacement melters, (e.g. cold crucible melters and advanced joule heated melters). The Subcommittee will consider the merits of different glass formulations, both borosilicate and other glass types, e.g., iron phosphate, as they apply to the advanced melter technologies above.	Recommendation(s)	
Charge 5 Evaluate the reliability of waste delivery plans	A key component of the tank waste programs at Hanford and SRS is the ability to reliably provide feed materials to existing and planned waste treatment facilities. At SRS this has been demonstrated, but further reduction of lifecycle costs will require enhancements to current waste retrieval and delivery processes. For Hanford this will require an evaluation of proposed plans to finalize waste acceptance criteria (WAC) for treatment facilities, optimally sequence tank waste delivery to meet the WAC, and identify specific vulnerabilities to achieving waste delivery. The Hanford baseline waste feed delivery approach to date consists of two major phases of operation – single-shell tank (SST) waste retrieval into the double-shell tank (DST) system for waste staging prior to treatment, and mixing and delivery of DST	Recommendation(s)	

Issue	Suggested Activities	Expected Output/ Work Product	Notes
	waste to the treatment facilities. The Subcommittee will consider the SST retrieval and waste staging options to enable timely, reliable feed delivery.		
Charge 6 Identify other tank waste vulnerabilities at SRS and Hanford	During the course of performing the tasks above, the Subcommittee should identify other vulnerabilities not specifically encompassed by those tasks and propose any recommendations to mitigate those vulnerabilities.	Recommendation(s)	

Attachment 3
EM Tank Waste Subcommittee Schedule

Dates	Action	Who
12/13-15/10	Meet in Augusta, GA; tour DWPF, SWPF, GSB	Full Subcommittee
1/17/11	Preliminary draft of interim report of the assessment of Lifecycle Cost Analysis (LCCA) models	
1/24-26/11	Meet at Hanford to review Hanford advanced tech and discuss tentative findings, conclusions and recommendations for LCCA; tour Hanford Tank Farms	Full Subcommittee
2/11/11	Final draft of LCCA Report sent to TWS	
2/18/11	Forward LCCA Report DRAFT to EMAB	
2/24/11	Report out the LCCA Report at EMAB open meeting in Las Vegas	Ferrigno/Papay/Ellis
2/27-3/3/11	EM-TWS planning meeting phase 2 in Phoenix, AZ	Full Subcommittee
3/21-24/11	Technical meeting at SRS. Review presentation materials. Make assignments for write ups, by topics for both interim and final reports, as needed.	Full Subcommittee
4/4-6/11	Technical meeting at Hanford. Review presentation materials. Make assignments for writeups, by topics for both interim and final reports, as needed.	Full Subcommittee
5/2/11	Preliminary draft of Interim Report Due	
5/23/11	Telephonic meeting to discuss preliminary findings, conclusions and recommendations for Interim Report	
5/30/11	Final draft of Interim Report sent to TWS. Findings and recommendations should be identified by this time.	
6/13/11	Forward Interim Report to EMAB.	
6/22/11	Report out the Interim Report at EMAB open meeting	
8/1-2/11	Meeting to run through draft final report and reach tentative findings, conclusions, and recommendations for Final Report - Washington, DC	Full Subcommittee
8/24/11	Forward Final Report to EMAB	
8/31/11	Report out the final report at EMAB open telephonic meeting.	

Attachment 4
Liquid Tank Waste Processing Program Modeling for Lifecycle Cost Analysis Interim Report Issues and Recommendations

Prepared by the Environmental Management Tank Waste Subcommittee
for the Environmental Management Advisory Board
February 24, 2011

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Foreword

This **draft** document was generated by the Environmental Management Advisory Board (EMAB) Environmental Management Tank Waste Subcommittee (EM-EM-TWS) to assess DOE EM Lifecycle Cost Analysis Processes, Procedures, and Systems used by the Liquid Tank Waste Programs at the Hanford Site (Hanford)and Savannah River Site (SRS) to estimate, budget, manage, appropriate funds, and close out the tank waste operations at each site. This is a preliminary document to be finalized with additional input pending from the sites. Portions of this document will be used, as needed, to support the final findings and recommendations of the EM-EM-TWS to the EMAB.

Introduction

The management and disposition of tank waste is the single largest life-cycle cost (LCC) element within the EM budget and poses a significant environmental, safety and health threat to the public. It accounts for nearly 36% of the total EM cleanup LCC and is therefore the major contributor to EM's cleanup legacy. EM's LCC from FY 2011 forward ranges from $182 billion to $237 billion. EM estimates cleanup will be completed between 2050 and 2062. With so much of the program cost and schedule still forecasted to be completed, there are continual opportunities to make meaningful engineered value-added technology and operational improvements that could reduce the LCC and potentially accelerate the reduction of overall liability and risk of the cleanup.

DOE-EM has charged the EM-EM-TWS with the following as it relates to LCC Analysis:

> "…This task entails reviewing the modeling approaches for determining tank waste remediation LCCs at both SRS and Hanford. This includes evaluating assumptions in system plans for completing tank waste missions at Hanford and SRS, as well as the rigor of the models for identifying activities and costs through the end of each site's programs…

The EM-EM-TWS has been tasked by EMAB to gather data related to six issues related to departmental projects and mission (Exhibit 1). EM-EM-TWS visited the Savannah River Site (SRS) and the Hanford Site (Hanford) (See Appendix A for schedule and agenda) where presentations by Tank Waste Program DOE Operations Office and contractor representatives provided status of individual projects and the overall site liquid tank waste programs. EM-EM-TWS also requested several documents (See Appendix B for data calls) from each site to perform this work.

Exhibit 1: EM-EM-TWS Work Plan

Issue	Suggested Activities
• Modeling for lifecycle analysis	This task entails reviewing the modeling approaches for determining tank waste remediation lifecycle costs at both SRS and Hanford. This includes evaluating assumptions in system plans for completing tank waste missions at Hanford and SRS, as well as the rigor of the models for identifying activities and costs through the end of each site's waste management program.

• Assess candidate low-activity waste forms	At Hanford, the current WTP baseline is being designed, constructed, and commissioned to treat, via vitrification, all of the high-level tank waste and up to 50% of the low-activity tank waste, plus secondary waste streams. The Subcommittee shall evaluate candidate waste forms including a vitrified glass waste form, a mineralized FBSR form, and grout as to their suitability for completing the Hanford tank waste mission. This assessment will use the results of the TEG review related to 1) waste loading in low-activity vitrified glass; 2) Tc-99 and I-129 capture in glass; and 3) whether tank waste samples for FBSR testing are sufficiently bounding to make mission critical decisions regarding waste form performance.
• Assess at-tank or in-tank candidate technologies for augmenting planned waste pretreatment capabilities.	This includes use of technologies currently being considered to perform some at or in-tank pretreatment activities, such as rotary micro-filtration for solids separation and use of small-column ion exchangers for removal of cesium.
• Evaluate various melter technologies.	Over the last 15 to 20 years, the EM program has considered various melter technologies and operational strategies to increase the efficiency of tank waste vitrification processes. This task will entail review of the different approaches and technologies that would be considered as second-generation (at Hanford), or third/fourth generation (at SRS) replacement melters, (e.g., cold crucible melters and advanced joule heated melters). The Subcommittee will consider the merits of different glass formulations, both borosilicate and other glass types, e.g., iron phosphate, as they apply to the advanced melter technologies above.
• Evaluate the reliability of waste delivery plans	A key component of the tank waste programs at Hanford and SRS is the ability to reliably provide feed materials to existing and planned waste treatment facilities. At SRS, this has been demonstrated, but further reduction of lifecycle costs will require enhancements to current waste retrieval and delivery processes. For Hanford, this will require an evaluation of proposed plans to finalize waste acceptance criteria (WAC) for treatment facilities, optimally sequence tank waste delivery to meet the WAC, and identify specific vulnerabilities to achieving waste delivery. The Hanford baseline waste feed delivery approach to date consists of two major phases of operation – single-shell tank (SST) waste retrieval into the double-shell tank (DST) system for waste staging prior to treatment, and mixing and delivery of DST waste to the treatment facilities. The Subcommittee will consider the SST retrieval and waste staging options to enable timely, reliable feed delivery.
• Identify other tank waste vulnerabilities at SRS and Hanford	During the course of performing the tasks above, the Subcommittee should identify other vulnerabilities not specifically encompassed by those tasks and propose any recommendations to mitigate those vulnerabilities.

1 Modeling for LCC Analysis

1.1 Requirements

This task entails reviewing the modeling approaches for determining tank waste remediation LCCs at both SRS and Hanford. This includes evaluating assumptions in system plans for completing tank waste missions at Hanford and SRS, as well as the rigor of the models for identifying activities and costs through the end of each site's program.

1.2 Existing LCC Guidance, Processes and Modeling

1.2.1 Guidance and Requirements

The DOE guidance for appropriation of capital-funded projects comes primarily from the Office of Management and Budget's (OMB's) Capital Programming Guide, which was initially released in 1997 (the 2006 current version 2.0 is to help clarify and provide examples for capital asset planning and management). The Guide is intended to assist Federal departments, agencies, and administrations (herein collectively referred to as agencies) effectively plan, procure and use these assets to achieve the maximum return on investment. The guidance integrates the various Administration and statutory asset management initiatives, including:

- *Government Performance and Results Act* (Public Law No. 103–62),
- The Clinger-Cohen Act (Divisions D and E of Public Law No. 104-106, the *Federal Acquisition Reform Act and the Information Technology Management Reform Act of 1996*, as amended; popularly known as the Clinger-Cohen Act)
- Federal Acquisition Streamlining Act of 1994 (Pub. L. No. 103–355)
- Executive Order 13327 of February 4, 2004, *Federal Real Property Asset Management*, and
- OMB Circular A-11, Part 7, *Planning, Budgeting, Acquisition, and Management of Capital Assets*, OMB June 2008.

Additional guidance has been issued within DOE to establish an integrated capital programming process to ensure that capital assets successfully contribute to the achievement of agency strategic goals and objectives. DOE O 413.3B (*Program and Project Management for the Acquisition of Capital Assets*, revised November 2010) and its accompanying guides provides requirements and guidance to ensure sound project management for capital asset management and is applicable to capital asset acquisition projects having a Total Project Cost (TPC) ≥ $50M, along with Project Assessment and Reporting System (PARS) reporting requirements that apply to all projects with a TPC ≥ $10M. In addition to the OMB guidance, DOE O 413.3B provides for a more rigorous cost estimating development and independent review process, integration of safety into design and construction, enhancement to DOE's structured project management policies, organizes projects by five critical decisions with clear prerequisites (or gateways to the subsequent Critical Decision (CD) phase) related to each CD, enhanced roles and responsibilities for all entities, and a contractor requirements document similar to other key DOE Orders. DOE O 413.3B allows for a tailoring process within these requirements to accommodate the unique nature and requirements of each capital project. In EM's parlance, capital projects range from large design/construction projects that are budgeted for via line-item funding (like Hanford's WTP or SRS's SWPF), to small projects that are budgeted for via operating-expense funding that involve work in the field (like retrieval of subsurface-stored waste, installation of a groundwater treatment system, D&D of an excess facility, or design/construction of a new processing line/system.

According to OMB guidance, the cost of a capital asset is its full LCC (Figure 1.2.1) (Ref 1.5.2), which is defined to include all direct and indirect costs for planning, procurement (purchase price and all other costs incurred to bring it to a form and location suitable for its intended use), operations and maintenance (including service contracts), and disposal (OMB Circular No. A–11, Part 7, *Supplement: Capital Program Guide*). These costs are reflected in Exhibit 300s that each Federal agency must submit in December as part of the proposed President's budget request to Congress; an Exhibit 300 is required for each proposed or ongoing capital asset project that the agency seeks to have funded. [In DOE's parlance for nuclear facilities, LCC begins with planning (before CD-0, *Approve Mission Need*) and ends with final decontamination and decommissioning (with all equipment and waste dispositioned) once operations (authorized via CD-4) are completed.]

OMB also requires an Executive Review Committee (ERC), acting for or with the Agency Head, to be responsible for reviewing the agency's entire capital asset portfolio on a periodic basis and making decisions on the proper composition of agency assets needed to achieve strategic goals and objectives within the budget limits. This committee should be composed of the senior operations executives and the chief information, financial, budget and procurement officers.

> In addition to review by the ERC, each project requires an Integrated Project Team (IPT) composed of a qualified program manager and necessary personnel from the user community, budget, accounting, procurement, value management, and other functions to be formed, as appropriate, to: "…establish a baseline inventory of existing capital assets; (2) analyze and recommend alternative solutions; 3) manage the acquisition, if approved; and (4) manage the asset once in use…"

Whether the capital project is a line-item funded (i.e., a standalone project with a (construction) project data sheet submitted as part of the Federal Agency's budget request to Congress) or operating expense funded project, the process and procedure is to instill discipline and rigor to effectively select and deploy technologies and operational resources to complete mission requirements.

DOE O 413.3B provides additional guidance on IPTs for each project or program managed under the Order to ensure that each Federal Project Director has the resources and support needed to effectively manage to its scope, cost, and schedule baseline.

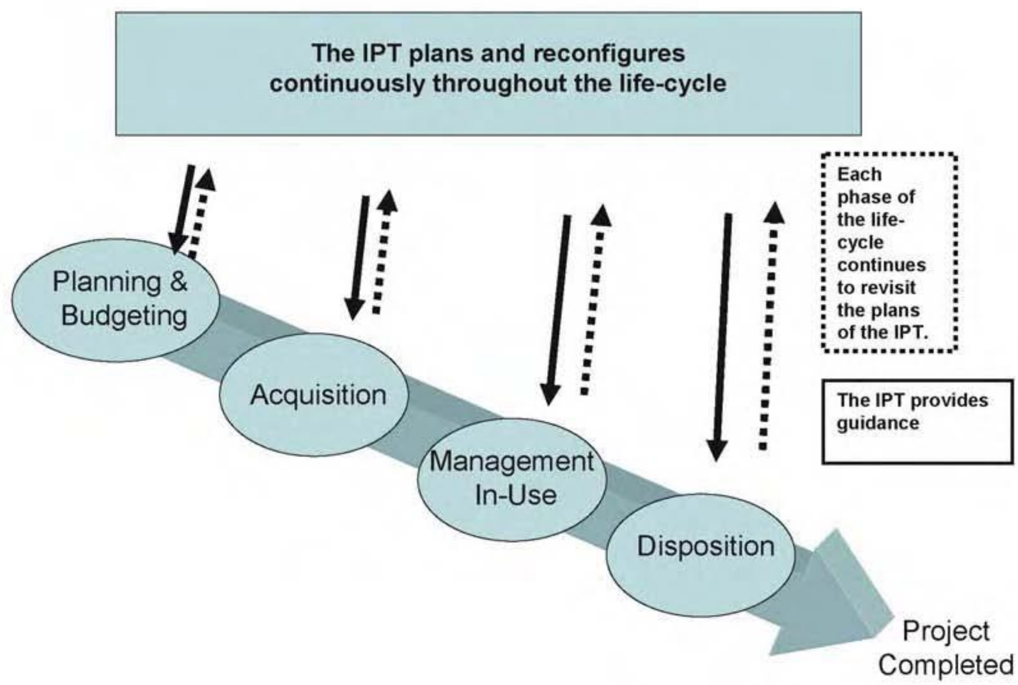
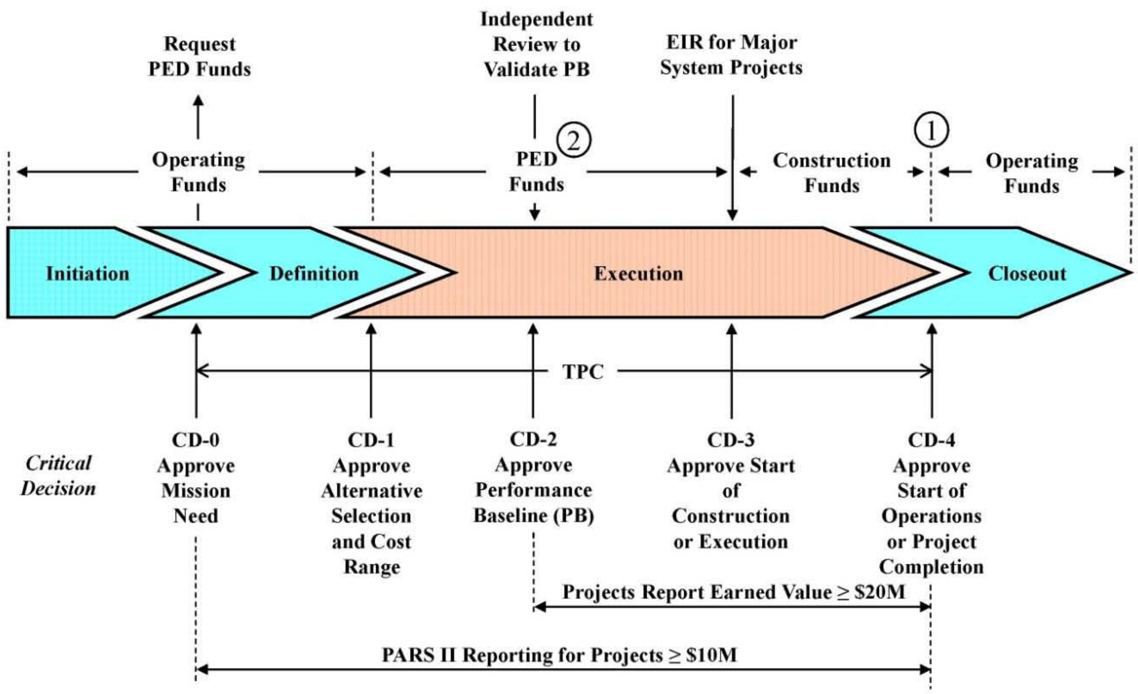


Figure 1.2.1. The Capital Planning Life Cycle

DOE's Office of Engineering and Construction Management (OECM) provides overall guidance on the critical decision (CD) process that is to be used for aligning funding decisions with the engineering process for acquiring capital assets. Figure 1.2.2 (Ref. 1.5.20) shows the CD processes, reviews required, and reporting requirements through a standardized process that can provide uniform cost elements across the Department. This process also mandates various levels of independent cost estimates or reviews to verify the forecast cost of the project. While CD-0 includes a rough order of magnitude (ROM) cost range, based on a preconceptual engineering formulation, with LCC assumptions, the primary focus of a project going through the CD steps is on "total project cost," which excludes costs before mission need (upfront planning costs, for example) and after facility or project operations are started up or initiated (commissioned) – meaning that LCC per se is not managed via the DOE Order 413.3B process. It should be noted that the Order does define LCC as "The sum total of all direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the planning, design, development, procurement, production, operations, and maintenance, support, recapitalization, and final disposition of real property over its anticipated life span for every aspect of the program, regardless of funding source". However, the Project Execution Plan required for all CD-2 (Approved Performance Baseline) and beyond projects must contain LCC information including drivers, key applicable assumptions, and other relevant factors. Additionally, the project data sheet for Congressional line-item projects requires estimates of cost and schedule for the lifecycle of the project, but this only includes operations and maintenance of the facility. The Project Accounting and Reporting System (PARS)-II allows field elements to input through a central database current costs against an approved baseline to allow Field and Headquarters elements to view the most current and accurate project performance data.



NOTES:
1. Operating Funds may be used prior to CD-4 for transition, startup, and training costs.
2. PED funds can be used after CD-3 for design.

Figure 1.2.2. DOE O 413.3B Critical Decision Process for Projects

DOE O 413.3B requires these prerequisites for each CD, as follows:

- CD-0:
  - Pre-conceptual planning
  - Mission validation independent review
  - Mission Need Statement
  - Independent Cost Review
  - Safety-in-Design (DOE-STD-1189)
- CD-1:
  - Acquisition Strategy
  - Project Execution Plan (Federal Project Director, Risk Management Plan, and Integrated Project Team)
  - Independent Cost Estimate or Independent Cost Review if TPC > $100M
  - One-for-one replacement compliance
  - Conceptual Design (including Code of Record requirements)
  - Preliminary Hazard Analysis Report (for nuclear facilities less than Hazard Category 3)
  - Integrated Safety Management Plan
  - Quality Assurance (QA) Program
  - National Environmental Protection Act strategy
  - Project Data Sheet
  - Safety Design Strategy (DOE-STD-1189)
  - Independent Project Review (IPR) by Program Office

  - Conceptual Safety Design and Validation Reports (for Hazard Category 1, 2, and 3 nuclear facilities)
- CD-2:
  - Updated Acquisition Strategy (TPC and funding profile – 413.3-13)
  - Performance Baseline (TPC, CD-4 date, and Key Performance Parameters)
  - Updated Project Execution Plan (funding profiles; long-lead procurements)
  - Project Management Plan
  - Preliminary Design (including Code of Record) (facility complexity drives design maturity expectation)
  - External Independent Review (EIR) of Performance Baseline
  - Independent Cost Estimate for TPC > $100M
  - Project Definition Rating Index Analysis for TPC > $100M
  - OECM EIR if TPC > $100M or Program IPR if TPC < $100M
  - Earned Value Management System (compliant)
  - Technology Readiness Assessment/Technology Maturation Plan
  - Hazard Analysis Report
  - Updated QA Program
  - Preliminary Security Vulnerability Assessment
  - Final Environmental Impact Statement or Environmental Assessment with Finding of No Significant Impact
  - Updated Project Data Sheet
  - Technical Independent Project Review
  - Updated Safety Design Strategy
  - Preliminary Safety Design and Validation Reports
- CD-3:
  - Final Design (including Code of Record)
  - Earned Value Management System (certified)
  - External Independent Review for Construction Readiness
  - Independent Cost Estimate for TPC > $100M
  - OECM EIR if TPC > $100M or Program IPR if TPC < $100M
  - Technology Readiness Assessment
  - Hazard Analysis Report
  - Safety and Health Plan
  - Updated QA Program
  - Final Security Vulnerability Assessment
  - Updated Project Data Sheet
  - Updated Safety Design Strategy
  - Preliminary Documented Safety Analysis and Safety Evaluation Report
- CD-4:
  - Validation of Key Performance Parameters and Project Completion Criteria
  - Transition to Operations Plan
  - Final Hazard Analysis Report
  - Operational Readiness Review or Readiness Assessment
  - Documented Safety Analysis and Safety Evaluation Report
  - Code of Record

Regarding the project cost, funding and budget cycle:

- To request preliminary engineering and design (PED) (as shown in Figure 1.2.2 above), funds in the Congressional budget (e.g., FY 2012), a project needs to receive approval for CD-1 by December of the previous budget year (e.g., for a FY 2011 approval, submittal would be required by December 2010).
- Starting with CD-2, a line item in the DOE budget must include a (construction) project data sheet, which includes:
  - Significant Changes,
  - Design, Construction and D&D Schedule,
  - Baseline and Validation Status,
  - Project Description, Justification, and Scope,
  - Financial Schedule,
  - Details of Project Cost Estimate,
  - Schedule of Project Costs (see Financial Schedule),
  - Related O&M Funding Requirements,
  - Required D&D Information, and
  - Acquisition Approach.
- If conceptual design is to exceed $3M, then the Secretary must request funds from Congress.
- Conceptual design must be completed before requesting funds for a construction project.
- If the total estimated cost (TEC) for design is > $600K, funding must be authorized by Congress.
- A project cannot continue obligating funds (e.g., construction cannot start) if current TEC is > 25% of TEC in the project data sheet submitted to Congress, unless the Secretary notifies Congress via formal letter with an updated PDS.
- Projects with a TPC < $50M should request all project funding in same FY appropriation.
- Funding profile changes after CD-2 that negatively impacts the project requires acquisition executive endorsement.
- Risks are to be analyzed using a range of 70%-90% confidence level (80% used as basis for CD-2 baseline and DOE-funded contingency).

The Project Accounting and Reporting System (PARS)-II allows field elements to input through a central database current costs against an approved baseline to allow field and Headquarters elements to view the most current and accurate project performance data. Monthly reporting into PARS begins from CD-0 through CD-4 (with earned value management system reporting starting at CD-2). Assessments are performed monthly by the Federal Project Director, Program Manager, and OECM, and project reviews are held quarterly with the acquisition executive.

Two types of independent cost reviews are performed during certain critical decision steps:

1. ICR (Independent Cost Review) an evaluation of the cost estimate for quality and accuracy – with an emphasis on cost and technical risks, approach, and assumptions, and
2. ICE (Independent Cost Estimate) an evaluation to determine accuracy and reasonableness using the project's baseline database.

At CD-0, an ICR is performed to validate the ROM cost range basis and reasonableness of range; at CD-1, an ICR or ICE is performed to validate the basis of preliminary cost range, to assure reasonableness and ability to be executed, with a full accounting of lifecycle cost to support alternative selection and budget; and at CD-2, an ICE is performed to validate the performance baseline cost parameters of TEC, TPC, and the funding profile.

1.2.2 Processes for Modeling Costs and Planning

Recent reviews completed by EM's Tank Waste System IPT and by outside organizations show the need to have a tool available to analyze alternatives to the EM baseline (Ref 1.5.8). This tool should have the capability to make changes to the tank waste system process flow sheet (new steps, production rates) in addition to cost and schedule adjustments, and it should be capable of analyzing the impacts and synergies between multiple strategies. As part of this IPT's effort, a limited lifecycle model has been developed. The next steps are for site-specific process characteristics from current system plans to be loaded into the model and validation runs to be completed. This work should be continued (Ref 1.5.8) as the Department will continue to be challenged to look for means to improve tank waste system performance and minimize lifecycle costs. In particular, multiple attributes of the tank waste systems should be evaluated together to determine if additional transformational changes can be made to the tank waste systems at Hanford and Savannah River.

The EM Tank Waste System IPT also recognized a need for development of sampling systems for large tank characterization technologies and of tank modeling capabilities (Ref 1.5.8). Also recognized was technology development that includes improved model development and data integration from both sites (Ref 1.5.8).

However, the use of computer modeling to replace large pilot- and full-scale testing with simulants carries large technical risk (Ref 1.5.9). These technical risks could be reduced if Computation Flow Dynamics (CFD) models or other models of relatively complex behaviors could be calibrated using data from tests with actual wastes. The models would then be used to predict the fluid system's behavior under other conditions. Engineering tests under those conditions would determine the degree to which the computer-generated predictions were met. This approach could be used for a number of different phenomena including heat transfer, fluid flow in tanks and porous media, explosive atmosphere testing, chemisorption phenomena on resins and other solid media, and precipitate formation in heat exchangers and on pipes, pumps, and vessels. An essential component of bridging the gaps among waste simulants, computer models, and the behavior of actual waste will be R&D aimed at discovering potential, unexpected interactions or other phenomena inherent in the actual wastes that could lead to a process upset or failure. This is an example of discovery-oriented R&D that may help ensure that the conceptual model, which is manifested by the computer model, is correct (Ref 1.5.9).

Two other examples to reduce life cycle costs are included below. Work on waste forms such as sintered or minimally bonded sludges at SRS or Hanford may rely heavily on computer modeling of waste and repository characteristics to show that they could meet their disposal requirements (Ref 1.5.9). Ensuring that the calcine can be disposed without further treatment or an addition of a binder would provide a strong cost driver for this R&D.

Increased waste loading develops options to increase the amount of radioactive tank waste that can be incorporated into the currently deployed borosilicate glass waste form. An increase of the waste-to-glass ratio has a dramatic impact on the timeframe established to process radioactive tank waste inventories at Hanford and SRS; an improvement of a few percent would decrease the radioactive tank waste processing lifecycle by a year (or more) and provide substantial cost savings. Improved glass formulations included in this effort also allow a higher waste loading to reduce the number of waste packages and improve throughput. This effort also develops supplemental treatment operations for radioactive tank wastes that are not appropriate for vitrification (Ref 1.5.11, Ref 1.5.12, Ref 1.5.13).

1.3. Observations and Findings (Preliminary)

1.3.1. DOE O 413.3B

As stated above, while the initial CD-0 (Approve Mission Need) includes a rough order of magnitude (ROM) cost range with LCC assumptions, the primary focus of a project going through the CD steps is on "total project cost," which excludes costs before mission need (up-front planning costs, for example) and after facility or project operations are started up or initiated (commissioned) – meaning, LCC is not used as part of the project management and decision-making process as mandated by OMB requirements, as identified in GAO's 12-step cost estimating process, and as required in the DOE Order 413.3B (Ref. 1.5.20) process.

As noted above, GAO has issued a 12-step cost estimating process to guide Federal agencies' review and approval of projects. A key step (step 11) in this process includes a briefing to management on the cost estimate, including the documented LCC and a comparison of the LCC estimate to the budget. (Reference 1.5.19) This process, when applied to projects with capital line item funding and program operating expense dollars, is of great value to defining LCC, and could include trade-off analyses to determine the most cost-effective alternative to a mission need.

As a general observation gained from historical reviews of each site, the EM-EM-TWS has concerns over the uniformity of the approaches used at each site to achieve program authorizations and capitalization budget requests. With annual operating budgets used to achieve progress on tank waste technology projects where significant expenditures (i.e., more than $100 M) are required, particularly in the small-column ion exchange (SCIX) project, the lack of rigor and compliance to Federal requirements and guidelines in the area of LCC may lead to non-optimal decisions regarding waste processing alternatives.

It appears that there is inconsistency between Operations Office and contractor submittals in the approach to secure appropriated funding for the capital/operating funds for the tank waste programs. Some projects (e.g., the proposed in-tank SCIX separations project at SRS) are to be funded within the operating budgets of the site and are not being treated as line-item capital asset acquisitions (i.e., not formerly completing project data sheets; not compliant with OMB Exhibit 300; and seem to not be planning to utilize the CD process steps per by DOE Order 413.3B).

The buildup of operational costs as well as operational savings appears to be based on historical "level of effort" based on site staffing and schedule reductions. There seems to be a hesitancy to provide a bottoms-up estimate for operations and maintenance of the new capital projects based on the uniqueness of the technology deployed; nuclear conduct of operations protocol and the specific resource requirements for power, infrastructure, manpower, and ALARA assessments. Since operational costs are such a dominant component of LCC, a more detailed and rigorous methodology seems to be warranted.

It appears that the rigor for LCC analysis, as defined by OMB and DOE Order 413.3B, and recommended by GAO, is not being used in its entirety in the project decision making process. LCC currently being utilized or reviewed does not include costs beyond facility shutdown (i.e., deactivation, decontamination, decommissioning (including removed equipment and waste disposition), and post-decommissioning reclamation) and disposition of facilities to return the site to the original condition; i.e., the LCC analysis does not seem to include disposition of the facilities built to process and manage the waste. **It is the EM-EM-TWS observation that the decision making process of alternative choices should include capital, operating, decommissioning, and waste disposition costs modeled at the appropriate cost of money over the lifecycle period.**

1.3.2. Risk

OMB and DOE O 413.3B (Ref 1.5.15) require a risk management plan for capital investments which includes probabilities, impacts, mitigation strategy, and a process for management throughout the lifecycle. The Hanford Tank Operations Contractor (TOC) risk analysis model used to perform the TOC near-term baseline and out-year planning estimated risk analysis consists of two Excel workbooks—one with risk information, and the other with risk analysis. For the TOC, this tool is used to derive estimates for resources and commodities and to quantify residual risks. The analysis provides for management reserve and contingency for TOC operations.

A risk strategy that includes the determination of critical technology elements (CTEs) and Technology Readiness Levels (TRLs) has been extensively used for evaluating technologies to be deployed at both sites for proposed new tank waste processing projects (Ref 1.5.10). This process also provides for the development of a Technology Maturation Plan (TMP). The TMP, in addition to describing the required technology development activities, also provides for a brief discussion of the lifecycle benefit of the technology. This process is well documented with its utilization described in DOE O 413.3. It has been used by NASA, DOD, and FDA to determine risks associated with technologies and products.

It appears that EM programs at Hanford and SRS, as well as the site direction itself, are not uniformly following LCC protocols in a consistent and disciplined manner. The communication between sites appears to be good; however, the end product in how and what tools deployed for the appropriation of funds as well as representation of LCC savings and justifications may need additional review for consistency. Additionally the integration of analysis between the WTP and the Tank Farm Operation appear to additionally require additional uniformity and discipline to establish similar methodology and consistency of analysis.

1.3.3. LCC Uncertainty

Managing uncertainty and risk is a key part of our liabilities management process that, with the duration between full operations and closure being quite lengthy, can be minimally attended to during the baseline preparation and validation. A number of uncertainty factors have been identified by the EM-EM-TWS that greatly affect the LCC.

a. Technology R&D has many uncertainties and unknowns that are inherent to the process; It appears there is no technology strategy that addresses alternative plans in the event of failure. Thus, technology development has uncertainty that is introduced to the LCC and appears to not be factored in the LCC in a manner that reflects operational contingency and back-up planning.

b. The estimates for the structures, components, and controls (SC&Cs) appear to be underestimated. The SC&Cs are one of a kind (in some cases first of a kind application) and are generally more complicated than currently presented.

c. Radioactive waste treatment inevitably involves auxiliary systems (e.g., off-gas systems and treatment systems for secondary waste streams) that could turn out to be far more complicated and costly than first thought. It appears that the secondary treatment costs for operations are modeled in a simplistic methodology without detailed operations backup.

d. The estimates at this point involve vendor estimates that are sometimes underestimated when it comes to applying the technology to a new situation and nuclear quality standards. **The EM-EM-TWS makes a point that this should be cautioned and observed even at the CD-0/1 point of project review.**

e. Most estimates are based on technology maturation plans that are success oriented where each test is expected to produce the desired result. This is unrealistic in that the process of maturation requires an evaluation of assumptions and conditions that can lead to trying something else. This greatly affects LCC. It appears that this method of approach needs a greater element of realism.

f. Some estimates are optimistic which realistically only considers design and construction portion of the LCC. Operations, decommissioning, and disposition costs should be a considered factor when evaluating alternatives.

g. The LCC effect of facility processing rate can be significant, overwhelming all other parameters since operating costs tend to dominate capital costs and are most sensitive to operational efficiency. WTP pretreatment contains many first-of-a-kind applications for process technologies (e.g., filtration, ion exchange, pulsejet mixers, chemical leaching), has uncertainty in the waste feed characteristics, and involves high solids content processing. If one believes, commercial industry experience for first-of-a-kind chemical processing, and experience at other DOE nuclear process facilities, the odds are not great that the facility could reach nameplate capacity. That translates to extending the treatment mission with substantial increases in LCC.

h. The final facility for each technology will greatly affect D&D costs, which affects LCC. In most cases, the estimate can only be a ROM because the final facility characteristics are unknown.

i. The uncertainty of the physical and chemical properties of the wastes, their disposal characteristics, and regulatory compliance directly affect LCC.

j. GAO recognized technology uncertainty and introduced the TRA (TRL) Program and the associated requirements for TRL 6 for CD-2. DOE 413.3B only requires a TRA be performed for CD-2. EM has held to the TRL/TMP Guide for CD-1 and CD-2 recommendations.

1.3.4. Modeling and Planning

DOE's Federal Energy Management Program (FEMP) sponsors a system called BLCC5 that is maintained by the U.S. National Institute of Standards and Technology (NIST) to build LCC for capital projects. Although not mandated, **the EM-EM-TWS suggests that DOE review this modeling and evaluate its application for the HLW alternatives analysis. This system is being successfully used for capital projects.**

Discussions were held on efforts being made to develop an overall model of WTP and Tank Farm process reliability, availability, and maintainability. Without such a tool, scenario development, bottlenecks, and quantification of uncertainties in the development of LCC is not possible. It is recognized by the sites that such a tool would also help in maintaining and modifying the system plans and allow for linkage of cost and schedule to such parameters as retrieval, waste processing, disposal, etc., to an overall LCC.

The Hanford Tank Waste Operations Simulator (HTWOS) flowsheet model has been developed by the Tank Farm Contractor. The HTWOS is a dynamic event simulation model, governed by prescribed initial conditions, boundary conditions, and operating logic that is used to simulate the full duration of the U.S. Department of Energy, Office of River Protection (ORP) mission. The HTWOS model uses simple chemistry assumptions to provide a gross estimate of the solid/liquid equilibrium of the wastes and does not necessarily provide an accurate estimate of the waste chemistry. Use of the HTWOS-predicted waste compositions should be with due consideration of the uncertainty behind the estimate. The necessary information and tools are not available to improve the chemistry predictions made by the HTWOS model. Limited ability to analyze the chemistry associated with tank wastes via a model or tool limits the formulation of how the pre-treatment or processing capability will affect LCC (Ref 1.5.8).

An integrated tool as shown in Figure 1.3.4 was found to be lacking for SRS HLW planning and scenario development. (Ref 1.5.17).

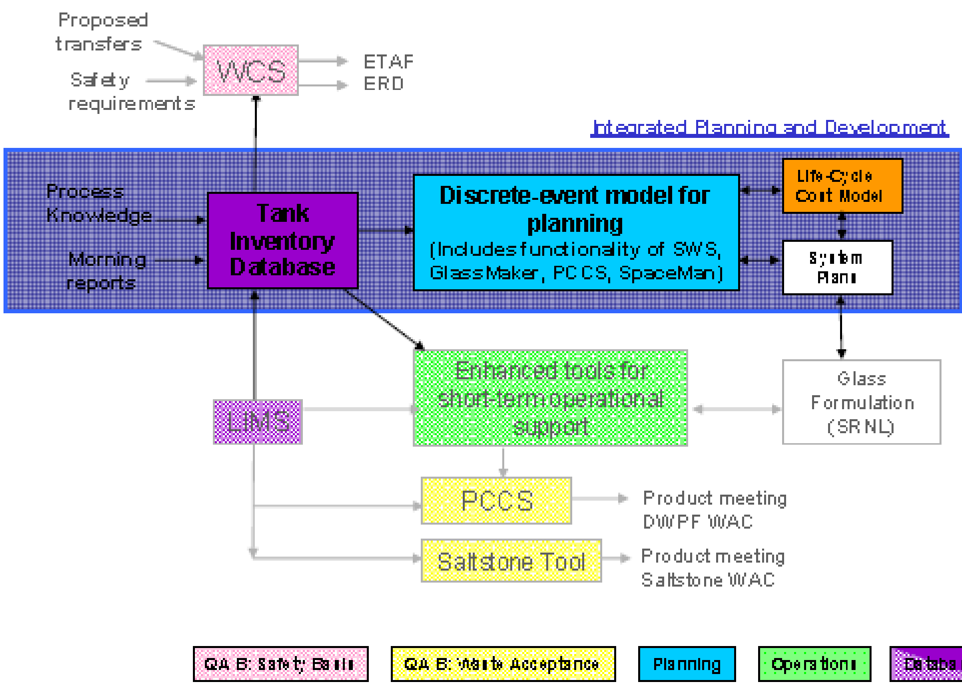


Figure 1.3.4. Integrated Planning and Development Tool, Decouple from Safety, Operations, and Waste Acceptance (Ref 1.5.17).

Similarly, an integrated planning tool was recommended for Hanford (Ref 1.5.18) and is shown in Figure 1.3.5.

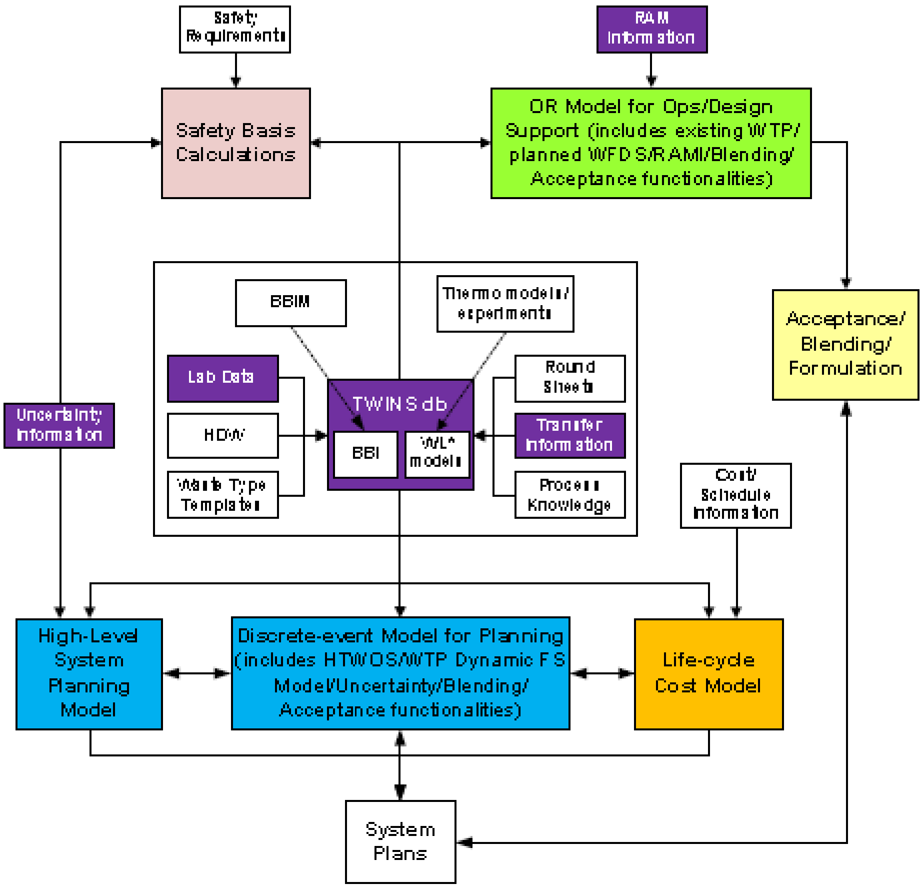


Figure 1.3.5. Integrated Planning and Development Tool for Hanford HLW (Ref. 1.5.18). Both show the potential linkage to LCC and, when coordinated between the two sites, would allow cost sharing and technology sharing, resulting in cost savings as well.

1.4. Recommendations

1.4.1. EM-TWS is considering a recommendation to develop a standardized and consistent methodology for lifecycle cost analysis that includes a software tool to be used across the HLW Program Office the decision for evaluation and decision making.

1.4.2. EM-TWS is considering a recommendation to develop a consistent methodology for uncertainty characterization and management to facilitate analysis of error propagation and calculate overall system uncertainty.

1.4.3. EM-TWS is considering a recommendation to finalize the planning for and the deployment of a general planning model suited for uncertainty analysis, sensitivity analysis, and feasibility/optimization of retrieval, blending, and processing. This would include the capability to propagate uncertainties through the planning process, and characterization of important uncertainties (Ref 1.5.18).

1.4.4 EM-TWS is considering a recommendation to develop expanded capabilities for chemical process modeling (i.e., link to EM-supported activities for development and implementation) that would include thermodynamics and kinetics and transient unit operations.

1.4.5 EM-TWS is considering a recommendation to continue to develop system-specific models with site-specific process characteristics that can be used to validate scenarios on tank waste system performance and to minimize lifecycle costs.

1.4.6 EM-TWS is considering a recommendation to consider requiring the GAO 12-step cost estimating process to be applied to all capital projects for tank waste processing — both line-item funded and operating-expense funded.

1.4.7 EM-TWS is considering a recommendation that recommends that SRS and Hanford (both within the Contractors and within DOE) use a standardized and tailored approach to project planning/management and decision-making, including having a documented LCC, in accordance with DOE O 413.3B for all HLW processing projects, regardless of the estimated cost of the project.

1.4.8 Based upon reviews of the latest details of LCC for the technologies being considered and the assumptions for full implementation, EM-TWS is considering a recommendation that SRS, like Hanford, rethink LCC beyond site boundaries and project operations to define the portion of the LCC that is waste disposition and facility disposal, validate the inclusion of those costs in the baseline, and update program documents accordingly for each of the HLW systems plans.

1.5. References

1.5.1. Waste Processing Multi-Year Program Plan, Fiscal Year 2008-2012, Office of Environmental Management, U.S. DOE, May 2008, 64 pp.

1.5.2. Office of Management and Budget (OMB) Capital Programming Guide

1.5.3. Government Performance and Results Act (Public Law No. 103–62),

1.5.4. The Clinger-Cohen Act (Divisions D and E of the Public Law No. 104-106, the Federal Acquisition Reform Act and the Information Technology Management Reform Act of 1996, as amended; popularly known as the Clinger-Cohen Act)

1.5.5. Federal Acquisition Streamlining Act of 1994 (Pub. L. No. 103–355)

1.5.6 Executive Order 13327 of February 4, 2004, *Federal Real Property Asset Management*

1.5.7. OMB Circular A-11, Part 7, Planning, Budgeting, Acquisition, and Management of Capital Assets, OMB June 2008.

1.5.8. Technical Evaluation of Strategies for Transforming the Tank Waste System. Tank Waste System Integrated Project Team Final Report. Volume 1, Summary and Recommendations, Office of Environmental Management, U.S. DOE. January 2010, 28 pp.

1.5.9. Advice on the Department of Energy's Cleanup Technology Roadmap: Gaps and Bridges. Committee on Development and Implementation of a Cleanup Technology Roadmap, National Research Council, 2009, 285 pp.

1.5.10. Technology Readiness Assessment (TRA) Technology Maturation Plan (TMP) Process Guide, Office of Environmental Management, U.S. DOE, March 2008, 48 pp.

1.5.11. Tank Waste Research and Development Plan, Office of Environmental Management, U.S. DOE, June 2010, 86 pp.

1.5.12. Certa, P. J., Wells, M.N., *River Protection Project System Plan*, ORP-11242, Revision 4, September 2009.

1.5.13. Chew, D.P., Hamm, B.A., SRR-LWP-2009-00001, *Liquid Waste System Plan*, Revision 15, January 2010.

1.5.14. Hanford Tank Taste Operations Simulator (HTWOS) Version 6.0 Model Design Document, RPP-17152, Rev. 4, Aug 2010, 349 pp.

1.5.15. TFC-PLN-39, 2010, *Risk Management Plan*, Rev. F, Washington River Protection Solutions, LLC, Richland, Washington, 116 pp.

1.5.16. TWRS Retrieval and Disposal Mission Immobilized Low-Activity Waste Disposal Plan, HNF-1517, Rev. 0, Dec 1997,142 pp.

1.5.17. External Technical Review for Evaluation of System Level Modeling and Simulation Tools in Support of Savannah River Site Liquid Waste Process, June 2009, 66 pp.

1.5.18. External Technical Review for Evaluation of System Level Modeling and Simulation Tools in Support of Hanford Site Liquid Waste Process, September 2009, 72 pp.

1.5.19 GAO Cost Estimating and Assessment Guide (Best Practices for Developing and Managing Capital Program Costs), GAO-09-3SP, March 2009, 440 pp.

1.5.20. DOE O 413.3B Program and Project Management for the Acquisitions of Capital Assets, Nov 2010, 102 pp.

Appendix A – EM-EM-TWS Agendas and Topics

ENVIRONMENTAL MANAGEMENT ADVISORY BOARD
TANK WASTE SUBCOMMITTEE MEETING
AGENDA

Augusta Marriott Hotel and Suites • Moody and Hamilton Rooms
Two Tenth Street, Augusta, Georgia 30901
December 13-15, 2010

DECEMBER 13, 2010 – MOODY ROOM (CLOSED SESSION)

Introduction 1:00 p.m.

- ***Larry Papay, EM-TWS Co-Chair***

Administrative and Legal Matters 1:30 p.m.

- ***Larry Papay, EM-TWS Co-Chair***
- ***Terri Lamb, DFO***

General discussion on EM-TWS charges for 2011 2:00 p.m.

- ***Mark Frei***
- ***Barry Naft***
- ***Herb Sutter***

Lifecycle Costs (LCC) 2:30 p.m.

- ***Mark Frei and Rod Strand***
  - *–OMB Requirements*
  - *–DOE 413.3 Requirements*
  - *–Standardization models used at DOE/DoD/Others*
  - *–Budget Process for Capital Projects and how LCC is used in Appropriations/Critical Decision Process*

BREAK 3:15 p.m.

Welcome 3:30 p.m.

- ***Inés Triay, Assistant Secretary for Environmental Management (via telephone 706-823-6554)***

Resume Lifecycle Costs discussion 4:00 p.m.

- ***Mark Frei***
- ***Rod Strand***

HLW Journey to Excellence/near-term objectives 5:00 p.m.

- ***Shirley Olinger, Associate Principal Deputy for Corporate Operations, EM-2.1 (via telephone 706-823-6554)***

Roundtable Discussion (15 min.) 5:30 p.m.

Adjourn 6:30 p.m.

DECEMBER 14, 2010 – MOODY ROOM (CLOSED SESSION)

Welcome and Overview 8:00 a.m.
- ***Dennis Ferrigno and Larry Papay, Co-Chairs, EMAB Tank Waste Subcommittee***

Welcome and Introduction 8:15 a.m.
- ***Terry Spears, Assistant Manager for Waste Disposition, DOE-SR***

SRS Liquid Waste Mission 8:25 a.m.
- ***Terry Spears, AMWDP, DOE-SR***
- ***Tank Waste Operations Overview and System Planning***
- ***Doug Bumgardner, SRR***

Roundtable Discussion (15 min.) 9:00 a.m.
- ***Brent Gifford, SRR Interim Salt Processing: ARP and MCU***

Salt Waste Processing Facility Project 9:15 a.m.
- ***Tony Polk, Acting Federal Project Director***

Roundtable Discussion (15 min.)

BREAK 10:00 a.m.

Deployment of Accelerating Technologies 10:15 a.m.
- ***Karthik Subramanian, SRR***
- ***Sludge Processing: DWPF bubblers, Evaluation of CCIM***
- ***Supplemental Salt Processing: SCIX, NGS, ELAWD***

Roundtable Discussion (15 min.)

Fluidized Bed Steam Reforming for SRS Tank 48 11:15 a.m.
- ***Karthik Subramanian, SRR***

Roundtable Discussion (15 min.)

Non-Glass Waste Forms for Potential 12:00 p.m.
Hanford Low-Activity Waste Disposition
- ***Carol Jantzen, SRNL***

LUNCH 12:30 p.m.

OPEN SESSION – HAMILTON ROOM

SR Site-Specific Advisory Board Issues and Concerns 1:00 p.m.

- ***Manuel Bettencourt, Outgoing Chair***

Roundtable Discussion (15 min.)

South Carolina Department of Health and Env. Control 1:45 p.m.

- ***Shelly Wilson, SCDHEC***

Roundtable Discussion (15 min.)

RETURN TO THE MOODY ROOM FOR CLOSED SESSION

Small Column Ion Exchange (SCIX) 2:30 p.m.

- ***Richard Edwards, SRR***

Technical Support Team Presentation 3:30 p.m.
on Understanding of Issues

- ***Barry Naft and Herb Sutter***

Work Session 4:30 p.m.

- ***Dennis Ferrigno and Larry Papay, EM-TWS Co-Chairs***

Adjourn 6:00 p.m.

DECEMBER 15, 2010

Closeout/Next Steps 8:00 a.m.

- ***Larry Papay/Dennis Ferrigno, EM-TWS Co-Chairs***

Transportation to Site for Tours 9:00 a.m.

- ***Sheron Smith/SRS Transportation Department***

Obtain SRS badges at SRS Visitor Control 9:45 a.m.

Welcome and Waste Operations Overview

- ***Terry Spears, SRS***

Transport to H-Area 10:00 a.m.

Tour of H-Area HLW Tank Farms 10:15 a.m.

- ***Tom Gutmann, Waste Disposition Operations***

Transport to S-Area 10:45 a.m.

Tour the Defense Waste Processing Facility 11:00 a.m.

- ***Phil Giles, Waste Disposition Operations***

Drive-by of the Salt Waste Processing Facility Site 12:00 p.m.

- ***Tony Polk/Dave Bender, SWPF Project***

Depart SRS to return to Augusta Marriott 12:15 p.m.

- ***Sheron Smith/SRS Transportation Dept.***

Return to Hotel/Adjourn 1:00 p.m.

EM-EM-TWS Agenda
Marriott Courtyard Hotel
480 Columbia Point Drive
Richland, WA 99352
January 24 – 27, 2011

Monday, January 24

3:00 – 5:00 PM Review “Where we are” with emphasis on LCCA
5:00 - 6:00 PM Dale Knutson meeting with Dennis and Larry

Tuesday, January 25

8:00 AM – 1:00 PM Working Session (working lunch at 12:00 PM)

Overviews:
- Jonathan "JD" Dowell
- Tom Fletcher
- Dale Knutson

As time allows, focus on the following:
- Status of the WTP Construction Project (SPI, CPI, Quality, PJM technical issues)
- Status of the Integrated Commissioning Strategy
- Present program policy / procedure for compliance with Appropriations Strategy for the In-Tank / Out-of-Tank Capital Projects
- How does the Tank Farm and WTP work the integration of startup and operational readiness?
- How do you envision Lifecycle Cost Analysis and representation of savings to the budget process for each of the assigned programs?

Presentations by Federal Directors and Contractors (include, as appropriate, Small-Column Ion Exchange Program, Rotary Bed Microfiltration, Precipitation, Grinding)
- Lifecycle Cost Analysis - Assumptions, Methodology, Application in System Planning, Results
- Assessment of Low-Activity Waste Forms
- At-Tank/In-Tank Technologies
    a. Design basis heat/mass balance and process description including ARF/LiHT and waste streams for integrated At-Tank/In-Tank process (Tank waste staging → Feed to Glass Forming)
    b. Corresponding design basis heat/mass balance including waste streams for WTP PT process (Tank waste staging → Feed to Glass Forming)
    c. Describe the LiHT process and your plans to use it to precipitate Al from feeds to the WTP.
    d. Pros/cons of alternate technologies that were considered but not selected
    e. Scale-up: What’s been done and what remains to be done
- Melter Technology
    a. What technologies are being considered?
    b. What parameters are being used to evaluate the different technologies?
    c. What are the evaluation results?
    d. How would you implement new technologies in time, space, retrofit within a radioactive facility, issues with interface, etc.?

  e. What is the cost basis that is being used to compare new technologies against?
  f. How are you doing the costs of new replacement technology (detailed design and engineering costs, operating costs, or ROM)?

- Waste Delivery Plans
- Waste Disposition Pathways
- Waste Acceptance Criteria
- Risks for Waste Disposition
- Orphan Waste Potential
- System Plans 4, 5, and 6
- Secondary Treatment Strategy
- Tc-99 Issues and how WTP In-Tank / Out-of Tank-Technologies address this waste treatment concern

2:00 – 5:00 PM Public Session

- Site-Specific Advisory Board
- Washington State Department of Ecology
- State of Oregon
- Other interested members of the public

Adjourn at 5:00 PM

Wednesday, January 26

7:15 – 11:00 AM Tank Farm Tour (meet at the Federal Building with ID)

11:00 – 3:00 PM Wrap-Up Action Items / Path Forward (working lunch at 12 pm)

3:00 – 7:30 PM Finishing presentations from WRPS

Conclude any working session business from Tuesday

Chapter Captain Reports / drafts for review

2. Introduction – Papay / Naft
3. Modeling Lifecycle Costs – Strand / Frei
4. Assessment of LAW Waste Forms – Brown / Naft
5. Initial Assessment of Augmentation Prospects for In-Tank / Out-of-Tank Candidate Technologies – Leviton / Sutter
6. Evaluation of Melter Technologies – Lahoda / Sutter
7. Evaluation of the Reliability of Waste Delivery Plans – Brown / Naft
8. Identification of Other Tank Waste Vulnerabilities – Strand / Sutter
9. Findings / Conclusions – Ferrigno / Frei

Thursday, January 27

8:00 AM Dennis, Kevin, Alan, and Herb meet at Chris Burrows' office with WRPS and ORP personnel

Appendix B – Data Call

Lifecycle Analysis

The following represents information requested from Savannah River and Hanford to provide further clarification of the presentations and discussions held during site visits:

1. Lifecycle cost analysis performed in support of the System Plan (including all assumptions, uncertainties, and selection criteria) the will help us understand how risk is quantified and managed; Focus on SRS system plan Rev 15 and for Rev 16, the page 5 statement regarding optimization of program lifecycle cost---for Hanford Rev 5 and Draft Rev 6.
2. The modeling tools used to support the System Plan(s), including the validation process.
3. Cost analysis including assumptions and uncertainty with the model at SRS comparing the following 2 scenarios where a $100M cost differential was found for:
   a. ARP/MCU operations (then shutdown) followed by SWPF and SCIX operations in parallel, versus
   b. ARP/MCU continued operations in parallel with SWPF, with no SCIX deployed or operated.
4. Cost analysis information and LCC modeling including the list of limiting factors and the risk profile for each to support SRS SWPF cost information.
5. Cost analysis information and LLC modeling to support SCIX cost information.
6. SRS's cost information and decision analysis that supports their proposal to proceed with SCIX and the other waste disposition enhancements per briefing to the EM-TWS.
7. OMB Exhibit 300 (FY 2011 and FY 2012 budget versions) for SWPF, and the corresponding DOE Project Data Sheets.
8. DOE and Site/Program policy and procedure documentation that covers lifecycle cost estimates/analyses, and the consideration of management reserve/contingency, and their use in project management and program decision-making (like the System Plan).