

**FINAL MEETING SUMMARY**

**HANFORD ADVISORY BOARD  
TANK WASTE COMMITTEE**

*March 12, 2014*

*Richland, WA*

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*This is only a summary of issues and actions in this meeting. It may not represent the fullness of ideas discussed or opinions given, and it should not be used as a substitute for actual public involvement or public comment on any particular topic unless specifically identified as such. The Tank Waste Committee has further noted that the discussion provided in the Tank Waste Characterization and Staging section does not capture the full range of perspectives presented during the March 12, 2014 meeting.*

**Opening**

Dirk Dunning, Tank Waste Committee (TWC) chair, welcomed the committee and introductions were made. The committee approved the February summary.

**Glass Tutorial**

*Agency presentation\**

Albert Kruger, U.S. Department of Energy—Office of River Protection (DOE-ORP), provided a tutorial on Waste Treatment Plant (WTP) glass formulations. In his presentation, Al noted the following points:

- After extensive educational and professional experience in the field of glass, Albert was hired by DOE to oversee vitrification after Bechtel completes their contract.
- Advanced glass formulations may allow for greater flexibility and a reduction of high level waste (HLW) canisters by one-third as well as a 50% reduction in low-activity waste (LAW). Advanced

\* Attachment 1: Vitrification 101 & WTP Glass Formulations (DOE-ORP presentation)

HLW glass formulations can also address concerns about corrosion in pretreatment vessels. Another benefit includes additional flexibility in reconsidering feed vectors to WTP.

- Albert outlined the chemical makeup of glass and physical properties of different glass forms.
- Hanford tanks wastes include products from nine reactors and four fuel reprocessing flowsheets; 100,000 metric ton of fuel was processed at the site.
- The WTP key process flows include Hanford tank waste moving to a pretreatment facility where it will be separated for either LAW vitrification or HLW vitrification.
- The WTP mission can be significantly improved without costly mechanical changes or new capital projects by improved LAW and HLW loadings.
- DOE is working to optimize the baseline delivered by Bechtel through enhanced glass formulations and addressing the balance of mission feeds. The integration of glass formulation with melter engineering is crucial.
- DOE-ORP initiated a glass testing program in 2007 to evaluate higher waste loadings and higher throughput to meet processing and product quality requirements. There are a number of low-risk, high probability changes that could be made to significantly increase capacity.
- Challenges for HLW vitrification include the robustness of glass formulation, property-composition model enhancement, and processing and formulating glasses with higher crystal contents.
- Use of phosphate glass would lead to larger uncertainty in the amount of glass mass produced and a greater process time/capacity. Phosphate glass would lead to a reduced waste processing rate and only modest improvements in waste loadings. There would also be material corrosion issues.
- DOE has been studying development of a technetium-99 management strategy for LAW vitrification. Ninety percent of the technetium-99 inventory is to be immobilized in LAW glass. The primary concern with processing LAW into glass is its high volatility and low retention in glass.

#### *Regulator perspectives*

Dan McDonald, Washington State Department of Ecology (Ecology), stated that the agency will be interested to see if these efforts demonstrated through reproducible field operations, particularly considering the differing batch criteria in the tanks. DOE-ORP's assumptions will need to be verified at the full operational scale to prove optimized throughput. There is still a long way to go before these theoretical possibilities can be included in operational flow sheets. Ecology will have more detailed discussions about the information contained in the presentation both internally and with DOE. Dan added that design and construction of new facilities will need to be permitted. The Hanford Site has a variety of risk budget tools and assessments that the glass processes will need to fall under.

## *Committee Questions and Responses\**

*Note: This section reflects individual questions, comments, and agency responses, as well as a synthesis where there were similar questions or comments.*

Q. Does DOE-ORP have an understanding of the scale of materials that will need to be vitrified, especially considering that the batches may redefine volumes of glass?

*R. [DOE-ORP] DOE is completing glass development work that involves defining the combination of how known components coexist within the melter; glass will meet the requirements.*

Q. How does Ecology take a critical look at the glass formulation proposal when so much knowledge and expertise has already been involved in these efforts?

*R. [Ecology] Ecology will take a thoughtful look at the proposal and have collegial discussions. Ecology will focus on the regulatory requirements to ensure that human health and the environment are protected. Any design or reconfiguration will need to be permitted.*

C. Yucca Mountain was mentioned in the presentation as the final location for waste to be deposited after vitrification but Yucca Mountain is not currently being funded.

*R. [DOE-ORP] The statutory framework still includes Yucca Mountain as the destination for the final waste form so that is what DOE must consider.*

C. The operator of the facility has yet to be determined; it is important for an operator to be identified and to be able to state that the proposed plans will work.

*R. [DOE-ORP] There are a number of coordination issues that will need to be addressed before the facility begins operation. DOE hires one contractor during the design, build, and turnover phases. There are also maintenance contractors. DOE is questioning who will be handling the turnover of facilities and who will be responsible for operation.*

Q. Does this proposal include possibility of orphan waste streams being created?

*R. [DOE-ORP] The requirements for HLW glass disposal are strict and must comply with waste acceptance criteria. DOE must document all waste forms; these documents are reviewed locally as well as by DOE headquarters (DOE-HQ). The baseline documentation was also reviewed by staff at Yucca Mountain. The plan has been determined to be satisfactory aside from some questions that still need to be verified. The contractor currently has good practice guidelines that are carried into materials specifications. The same review process is used for all waste disposition plans.*

Q. Is variability of feed a major concern for outputs of vitrification?

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\* Attachment 2: Transcribed Flipcharts

*R. [DOE] Feed variability is not a major concern. The system will be designed to minimize variation for each batch through extensive characterization and pre-staging. If a batch is troubling for some reason, DOE will be able to use different mechanisms to pump that batch into pretreatment. The HLW facility will have the greatest flexibility in terms of processing solid suspensions; DOE has yet to investigate the full engineering criteria for the types of vessels and treatment proposed. The greatest challenge would likely be having all material entering one pipe for waste treatment and having all that material go through the same process. DOE must ensure that all materials are processed through the facility and do not cause any erosion issues.*

Q. How are materials created during pretreatment handled?

*R. [DOE] Secondary waste is produced from every facility. There is classic Hanford waste and waste that is created as a result of treating that waste. All materials must be treated, stabilized, and disposed under regulatory permits.*

The committee thanked Albert for his very informative presentation, noting that the information was highly technical but answered many questions about glass and waste vitrification plans at the Hanford Site. TWC would like to have additional briefings as DOE completes more research or whenever there are major accomplishments. Bob Suyama will continue tracking the topic as issue manager. Albert noted that the current glass models will be revised next year and that may be a good time for DOE to provide another briefing.

### **DOE Framework Topic Briefing: Tank Waste Characterization and Staging**

#### *Agency presentation\**

Isabelle Wheeler, DOE-ORP, provided a presentation on provision of tank waste characterization and staging capability at Hanford. In her presentation, Isabelle noted the following points:

- The mission need is to provision the desired connectivity between tank farms and WTP, bridging known performance gaps in the waste feed delivery and certification system to meet waste acceptance criteria.
- Tank waste characterization and staging will allow the capability to mix, sample and blend tank waste to support WTP start up and operations. The tank farms will have the capability to manage potentially problematic waste. The tank farm risks associated with upgrading aging waste tanks will be reduced, plus certain costs will be avoided. The exposure risks to workers will also be reduced.
- Benefits of tank waste characterization and staging include the ability to finalize waste acceptance criteria and reduce costs, finalize design and WTP facility construction, and allow

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\* Attachment 3: Provision of a Tank Waste Characterization and Staging Capability at Hanford (DOE-ORP Presentation)

WTP operations to have flexibility in start-up and operations, even when the pretreatment facility is off-line.

- Key functions of the conceptual scope include: receive, stage, mix and blend tank waste; sample and characterize HLW feed; export HLW feed to WTP facilities; store problematic waste, as necessary; potential pre-condition option to address problematic wastes; provide consistent HLW feed to WTP.
- The proposal is currently in the early phase of justifying mission need and is pending approval of DOE-HQ.

### *Regulator perspectives*

Dan McDonald, Ecology, noted that he was surprised by some of the information in the presentation. He clarified that the proposal addresses an existing capability gap between waste feed from the tank farms to the WTP, allowing for potential HLW delivery. The proposal adds potential for a fairly large capability and footprint between the tank farms and WTP. Dan stated that it seems reasonable that the new pretreatment capability would change characterization. Since DOE is still in the process of developing a Critical Decision-0 (CD-0), approval from DOE-HQ would likely be approximately one year away. Following this approval, an additional five to seven years would be pass before the facility was constructed. Conservatively, waste feed could begin in 2021-2022, assuming that DOE receives the necessary funding. Dan noted that Ecology will be very interested to hear more about the technical details, and his agency will likely ask DOE for more information about the underlying assumptions of the presentation. Dan stated that this proposal addresses some of the necessary functions of the WTP.

*R. [DOE-ORP] Pretreatment would occur between the tank farms and WTP on a green field. Feed would not occur within the tank farms themselves, and there would be a construction site independent of the tank farms to avoid any radiation issues until WTP is operational. Tank waste characterization capability is not new. This proposal is a culmination of known issues with the tank farms, and it addresses the capability to mix waste. The concept itself is not new; the new concept may be the facility construction. If this project moves forward there will be an interface control document for the HLW facility that is separate from pretreatment. This proposal will not enter the baseline until receiving approval for CD-0, which will likely either occur in Fiscal Year (FY) 2016 or FY 2017.*

### *Committee Questions and Responses\*\**

*Note: This section reflects individual questions, comments, and agency responses, as well as a synthesis where there were similar questions or comments.*

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\* **Note:** the TWC committee has identified that this section does not fully capture the full breadth and depth of information and perspectives offered during committee discussion.

\* Attachment 2: Transcribed Flipcharts

Q. These ideas seem very early in the pre-conceptual stage. Can DOE confirm that this is the characterization and staging facility from the Framework document? When would be an appropriate time for the Board, Ecology or others to offer input on the design criteria and other attributes that will be used in planning?

*R. [Ecology] Ecology has stated that DOE did not include enough detailed technical information in the Framework document to offer an opinion on the merits of the proposal. Ecology will examine the proposal more thoroughly as more information becomes available.*

*R. [DOE] DOE is following all the required processes and is currently in the pre-CD-0 phase. Once approval and funding are received, DOE will have authorization to begin design, planning, and alternatives analysis and would appreciate hearing ideas and experiences. The CD-0 stage would provide a good opportunity to build on all historical information and pull expertise together.*

C. It will be important to design facilities with all potential needs in mind, including consideration of all the types of blending that may be required. Tanks today were not designed for many of the functions they are now required to accommodate. This presents many challenges. The seeds of ultimate failure are often sewn in birth, and it is important to consider every eventuality as early in the design process as possible.

*R. [DOE] This early stage presents a good opportunity to hear all ideas that can then be evaluated. DOE will put every effort into ensuring a robust facility is constructed. During the pre-construction and pre-design phase, it is important to engage people in dialogue, since these are the most critical phases of the project. The Defense Nuclear Facilities Safety Board has also expressed interest in the proposal.*

Q. The concepts outlined in this proposal sound very exciting and they could be promising. It will be beneficial to have multiple perspectives weighing in throughout the process. How will DOE engage the public? A workshop may be one option.

*R. [DOE] DOE will create a communications plan that will evolve throughout the phases of the project as decisions are being made. The public does offer valuable input; DOE would like to encourage inclusion and information sharing.*

C. The proposal sounds very promising and provides confidence in the ability to feed waste to WTP; the Hanford Site needs tank waste treated as soon as possible. Hanford Communities received a briefing on DOE's Framework and will be creating a video for local television. The program is near the end of the editing phase and will be airing on local television soon. The public would like to learn about the path forward and resolution for Hanford Site waste treatment.

C. The WTP facility should have the capabilities being outlined for the separate pretreatment facility. During the presentation it was noted that pretreatment could lead to long-term cost savings but the facility itself will also have a cost. Costs are just being transferred from one area to another. There should be an interface between pretreatment and the WTP so that additional facilities are not built if WTP can be capable of pretreatment.

*R. [DOE] DOE has an integrated waste feed delivery plan within the tank farms and is working to build capabilities within the current double-shell tank (DST) infrastructure. The WTP is seven miles away from tank farms and it will require a huge amount of infrastructure to build feed mechanisms. The costs to upgrade the tank farms are estimated to be in excess of \$1 billion, which is one reason that DOE is spreading capabilities instead of concentrating efforts in one location. This proposal offers huge benefits in terms of mixing and sampling capabilities. There have been well-publicized issues with pretreatment, some of which occurred prior to groundbreaking. This facility will be designed with certain capabilities that support both pretreatment and the WTP. Addressing and mobilizing tank waste is a big challenge. DOE has limited capabilities to remove materials from tanks, and this capability gap is driving these efforts. There will be a capital cost with this project, but it could lead to operational savings in the future. There needs to be a balance.*

Q. The system does need to include the capabilities being described. The original plan was to use tank AY-102. During the morning discussion on glass, it was stated that some of the originally planned functions for pretreatment are no longer being considered. Is DOE considering the use of the tank space that would no longer be needed for this proposal?

*R. [DOE] DOE is considering all options and alternatives; there are a number of vessels that DOE is analyzing in term of capabilities and availability. DOE is also evaluating lessons learned for building any new DSTs. All these options will be outlined in an alternatives analysis.*

C. This proposal is very exciting. The Board is very concerned about the lack of tank space available for mixing and the need for additional tank space. The leak in tank AY-102 is a compelling reason to move forward on this work.

*R. [DOE] DOE has written a revised mission need statement with some terminology about the need for additional DST space.*

Q. Many of the challenges with waste feed blending involve analyzing the data about the tanks. Will this new effort use the huge amount of information currently available? Are there plans for data arrangement and management? The tank inventory can provide information about how to process and mix waste streams to feed WTP in order to ensure that the material is manageable. The data inventory appears to be underutilized currently, and it would be beneficial to use the raw data in new ways.

*R. [DOE] DOE uses the Best Basis Inventory for tank farms to help determine the different waste contents. That information is integrated into system planning processes. DOE also plans to complete additional core sampling on plutonium content and some other elements that could affect criticality.*

Q. If this project is approved and the tentative timeline estimated is reasonably close to the reality, will that have an effect on TPA milestones? Will there be any additional, substantial delays?

*R. [DOE] DOE cannot comment on TPA milestones at this stage. The project does have a timeline and DOE does not anticipate commissioning the project until sometime around 2020. Fast-tracking the project may accelerate that date.*

Q. How long does DOE anticipate it will take before DOE-HQ will approve the proposal?

*R. [DOE] The CD-0 package was submitted to DOE-HQ in January 2014 and it is currently going through the approval protocol. Since this is a capital project, the Undersecretary of DOE must approve the work. There is not a definite timeline but DOE-ORP is hoping for approval by summer 2014. The local DOE office is pushing for timely approval.*

Q. This facility should not be built if the throughput capability is not the same as WTP. There is a concern that this is a tank farms approach to avoiding the pretreatment issues by building a smaller pretreatment facility with direct feed. This process seems to involve reinventing a process where a great deal of money was already expended. DOE should not walk away from a facility that needs to be corrected; a new facility may be constructed but pipes will still be required over some distance. Has DOE considered building another tank to replace the DST that is leaking? The Board supports waste treatment; not necessarily reinventing previous efforts and spending a lot of money that could be used to retrofit existing facilities.

C. This proposal is exciting from a worker perspective. It is reassuring to hear that DOE is taking dose to workers into account. Another major benefit to this proposal is that waste could be sent to a facility with improved methods for sampling waste. Workers hope sampling plans will become more sophisticated to improve the Best Basis Inventory.

Q. With the loss of Tank AY-102, it is much easier to see the tank capacity issues and the challenges becoming much more difficult. The most recent DST was built 30 years ago without the intention to mix waste or accommodate any of the other processes necessary for waste treatment. The proposed facility offers the ability to address tank capacity needs in addition to addressing other concerns. Members are particularly interested in how this facility relates to the entire cleanup mission at the Hanford Site. When would be an appropriate time for the Board to be involved in the discussion?

*R. [DOE] DOE could return to the committee once approval for CD-0 is received to discuss next steps. DOE will be asking for input from a technical and public relations perspective on the next phases moving forward.*

C. The facility represents pretreatment for pretreatment. There are 12 million gallons of sludge and only 9 million meet requirements for WTP, leaving 3 million gallons that will require preconditioning before treatment. Some of those 3 million gallons must be strained for solids before moving into pretreatment. This proposal does avoid the issue with pulse jet mixing and mixing settlers, but, since this is pretreatment, a secondary pretreatment function will be required. The system is redundant and should have been incorporated into the originally designed pretreatment facility. The facility was not designed adequately from the beginning.

*R. [DOE] One critical feature of the facility is the ability to mix material. The aging tanks are a major concern, especially since AY-102 has been declared a leaking (it was originally intended to be the feeder tank). DOE does not want to put anything with a lot of horsepower into any of the tanks and risk a failure. As part of the tank waste characterization project, DOE would like to have tanks that are robust enough to accommodate high-powered mixer pumps and be able to move material through three-inch pipes with enough force to reach the destination. The tank farms require these kinds of capabilities for effective waste treatment. The proposed new facility may be a compromise, but it addresses fundamental issues with the tank farms that need to be resolved and will ultimately benefit WTP operations.*

*R. [Ecology] One requirement for the tank farms is that the envelope of wastes transported to WTP meet waste acceptance criteria. DOE now seems to be saying that the tanks farms do not currently have the capability to meet the criteria, so the proposed new facility will allow raw waste from the tank farms to be treated so it will meet the waste acceptance criteria.*

C. This capability planning will divide high level waste with a parallel facility for pretreatment. There could be two significant construction projects underway simultaneously, both of which are essential for any waste processing. It is unlikely either of these facilities will be completed by 2019 so there will continue to be delays in waste treatment.

*R. [DOE] The proposal does not represent a new concept; similar facilities have been proposed in the past at the Hanford Site, but these have never been approved to move forward. It is crucial to identify a solution and a path forward; this project is very pre-conceptual so there are no design criteria at this point. Pretreatment has always been a need but has never been fully funded or addressed. DOE is working to identify a solution and path forward. There are many questions about the specifics of this project; however, because it is preconceptual, there are currently no design criteria. The needs in this proposal have always been needed but have never been adequately funded or addressed.*

Q. Is DOE concerned about the condition of the current DSTs and the ability of these tanks to remain intact for an additional 20-30 years through tank waste treatment operations?

*R. [DOE] DOE is concerned about the length of mission for this project; the risk of tank failures is on the risk register along with many other risks.*

TWC decided to revisit the topic after DOE receives approval for CD-0 and moves into the planning stage, potentially around August 2014. TWC also felt this information would be useful to share with the entire Board. TWC would like to hear Ecology's perspectives on DOE's proposal once the agency is able to more carefully review the information. The committee suggested that it may be useful to hold a Sounding Board after the Board is briefed or to convene a Committee of the Whole so the Board can discuss the information outlined in DOE's Framework. An issue manager team should track the issues and capture concerns and questions as the Board hears more information about DOE's Framework.

## **Committee Business\***

### *Committee leadership selection*

Dirk Dunning was re-elected to serve as TWC chair and Bob Suyama was re-elected to serve as vice-chair.

### *April potential meeting topics table*

The committee completed the preliminary April meetings topics table. TWC tentatively identified the following topics for discussion:

- Tour of full-scale mixing test facility as part of the Framework topic briefing series. Sharon Braswell, MSA, will determine the logistical considerations for a possible tour.
- Discuss responses to HAB Advice #271 on Leaking Tanks and HAB Advice #273 on Openness and Transparency.
- The committee will also have an open forum to discuss Hanford related issues and identify future committee topics of interest.
- Receive an update on the status with AY-102 and DOE-ORP's Pumping Plan.

The committee discussed concerns about a possibly catastrophic mechanism for tank AY-102. AY-102 may have one to three leaks in the welds around the bottom center square of the tank. Because of the stress on the tank due to it being bowed up in the middle (or "oil canned"), a serious failure mechanism would be a weld rip on one of the leaking seams. Because of the stress and relieved height differential, the outside of the weld rip would slap the secondary shell with sufficient force to make it also fail. There would be no time for annulus pumping. The waste would almost instantly fill the leak detection pit well and overflow underground in a circular ring around the tank concrete base pad. The Board believes that DOE should pump the tank but would like to hear more information on DOE's plan to address it.

### *Update 3-Month Work Plan\**

The committee identified some preliminary topics for possible discussion during a May meeting. These topics include: a briefing on transuranic (TRU) waste definitions and how TRU waste applies at Hanford, and a discussion of DOE Order 435.1 which is a redefinition of waste classifications. TWC tentatively identified holding a briefing on treating and packaging TRU waste that does not fall under the HLW category during a June meeting. Several TWC members noted that topics require more issue manager work prior to coming before the committee to help frame questions and information that would be important for the entire committee to hear.

TWC expressed interest in freeze barriers and having future discussions on options for use of cryogenics at Hanford. An issue manager team should investigate the topic.

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\* Attachment 2: Transcribed Flipcharts

\* Attachment 4: Tank Waste Committee 3-Month Work Plan

**Attachments**

**Attachment 1:** Vitrification 101 & WTP Glass Formulations (DOE-ORP presentation)

**Attachment 2:** Transcribed Flipcharts

**Attachment 3:** Provision of a Tank Waste Characterization and Staging Capability at Hanford (DOE-ORP Presentation)

**Attachment 4:** Tank Waste Committee 3-Month Work Plan

## Attendees

### Board members and alternates

David Bernhard	John Howieson	Maynard Plahuta
Richard Bloom	Steve Hudson	Mecal Seppalainen (phone)
Allyn Boldt	Pam Larsen	Dick Smith
Shelley Cimon	Susan Leckband	Bob Suyama
Shannon Cram (phone)	Liz Mattson (phone)	Jean Vanni
Dirk Dunning	Melanie Myers	
Rebecca Holland	Jerry Peltier	

### Others

Albert Kruger, DOE-ORP	Robbie Biyani, Ecology	John Tseng, ISMS
Jim Lynch, DOE-ORP	Dan McDonald, Ecology	Rod Skeen, CTUIR
Isabelle Wheeler, DOE-ORP	Nancy Uziemblo, Ecology	Nicole Addington, EnviroIssues
	Ginger Wireman, Ecology (phone)	Cathy McCague, EnviroIssues
		Sharon Braswell, MSA
		Mark McKenna, MSA
		Mike Rodriguez, public
		Annette Cary, Tri-City Herald
		Tom Rogers, W-DOH