Alternatives for Immobilizing SLAW

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Subjects for Discussion

- Ecology's Regulatory Perspective
- Agreements in Place
- Technical Concerns
- Significant Open Items

Ecology's Regulatory Perspective

- Resource Conservation and Recovery Act
- Hazardous Waste Management Act
- Hanford Federal Facility Agreement and Consent Order (Tri Party Agreement (TPA)) and the Tanks Consent Decree

Agreements in Place Supporting Vitrification

- Tri Party Agreement (TPA): there are references to vitrification as the *primary treatment protocol*. TPA indicate that System Plan should account for 100% of waste to be pretreated, 100% of HLW to be vitrified and 100% of LAW to be vitrified. There are references to supplemental treatment. For supplemental treatment those references include vitrification. "Such options include: Build and operate a 2nd LAW Vitrification Facility. Build and operate a Bulk Vitrification Facility." TPA also says, in M-062-32-T01 through M-62-34-T01 is "…Supplemental Treatment Vitrification Facility and/or WTP Enhancements…"..

- Consent Decree (CD): the definitions of "Hot Start of Waste Treatment Plant" (producing a waste glass product) and "Initial Plant Operations" (produce a high-level waste glass…and low-activity waste glass…) definitely speak to glass being the product output *for the initial configuration of WTP*. That said, there is nothing in the CD that speaks to supplemental treatment. There is also nothing said about grout in the CD.

Past Supplemental Treatment Down Select Criteria (As Good as Glass)

- This has been a subject of discussion for a while. And, there is disagreement as to the basis for this statement. Let me clear that up.
- Ecology sent a letter dated April 25, 2003 outlining four criteria.
- DOE responded with a letter dated June 12, 2003 clarifying DOE's position on these four criteria.
  - DOE's letter was to ensure that expectations were compatible.

"As Good as Glass" criteria

The four waste form performance criteria

1. Perform Over the Specified Time Period As Well As, Or Better Than, Vitrified Waste (reference: Hanford Immobilized Low-Activity Waste Performance Assessment, 2001 Version)
2. Be Equally Protective of the Environment as WTP Glass.
3. Meet Land Disposal Requirements (LDR) for Hazardous Waste Constituents.
4. Meet or Exceed All Appropriate Performance Requirements for Glass, Including Those Identified in the WTP Contract, ILAW Interface Control Documents, and ILAW Performance Assessment.

Technical Concerns

- WCH-SD-WM-ES-319, Rev 0, 1995, Evaluation of Low-Level Waste Forms for Immobilization of Hanford Site Tank Wastes: "…The glass waste form provides superior performance in terms of minimizing releases from the disposal site relative to the other waste forms…"
- As noted in Waste Management 2004 Conference (WM'04), it was noted by the Mission Acceleration Initiative (MAI) team at that time that "…the grout waste form performance is not comparable to WTP immobilized LAW glass…."

Concerns

- The Hanford Waste Task Force, a stakeholder advisory group, concluded that —grout doesn't adequately protect public, workers, and environment and that —reduction of waste volume was an issue for grout because grout increases final-waste-form volume significantly. (Final Report of the Hanford Waste Task Force, Appendix F, 1993.)
- DOE's 1995 waste form performance assessment resulted in identification of three constituents that would ultimately violate drinking water standards if grout is used. The three constituents (nitrate, iodine-129, and technetium-99) violated drinking water standards before and after the 10,000-year analysis timeframe. (Performance Assessment of Grouted Double Shell Tank Waste Disposal at Hanford, 1995, WHC-SD-WM-EE-004 Rev. 1.)
- The 2003–2006 supplemental treatment down-select showed that cast stone would not be appropriate for LAW treatment because it would significantly impact the groundwater, i.e., above drinking water standards, and would not be —as good as glass
- The 2009 Draft and 2011 Preliminary Final TC & WM EIS indicated that the environmental performance of the grouted waste form would not meet required standards and that grout actually performed the worst of all the supplemental treatment options considered.
- In 2012, the U.S. Nuclear Regulatory Commission (NRC) issued a report, Technical Evaluation Report for the Revised Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site, South Carolina, exposing issues related to long-term performance of the resulting waste form.

Concerns (con't)

- Research of available technical literature such as VSL, PNNL, and others has not shown:
  - The capability of grout formulations to fully encapsulate wastes as well as vitrification
  - In general, the resources seem to indicate a continuing need for further research and development
  - There do not seem to be any references that show grout capabilities for Hanford specific waste on a production scale.

Open Issues

- Cost: there is still much disagreement as to the validity of costs associated with the grout waste form for Hanford-specific waste.
  - Assumptions associated with cost estimates vary, most being based on waste processing at other sites with waste not comparable to Hanford-specific waste.
  - Many cost figures are class 5 estimates, using enabling assumptions that may or may not be valid for Hanford-specific waste.
  - References on slide 8:
    - "…shows costs is not a deciding factor…"
    - "…waste forms are cost neutral…"

FFRDC Report Expectations

- The grouting process for each alternative may be different, depending on both the process selected and the supernatant composition.
- The baseline for all grout options is to design all components of the disposal system to meet the criteria for disposal at the specified disposal site using the integrated retention properties of the waste form chemistry, container (if applicable), disposal environment (e.g. IDF or vault), and geotechnical cap.
- Several options for on-site and off-site waste processing.
- Many assumptions associated with each option; the assumptions have not been analyzed (to our knowledge) in a DOE AOA process
  - No discerning screening criteria
  - No relevant cost data
  - No relevant TRL level information
  - Many caveats and conditions associated with each option

Concerns with Selection Criteria Assessment Template Sections 3, 4, and 5

Section 3, Implementability

- This report only begins to outline the required facilities/infrastructure needs
  - The ability to take much credit for things already done is questionable given Hanford-type wastes
- Ecology has specific concerns about "analogous" DOE experience
  - Where else is this technology used in production scale on Hanford-type wastes?

Section 4, Life Cycle Cost

- This report is lacking relevant cost data
  - There are significant contributors to cost, throughout the life cycle
    - It is unlikely that there are any cost estimates other than class 5, and those estimates at +100/-50 are gross estimates
    - DOE seems not to have funding for current requirements; this would be seen as yet more funding needed
  - Those costs are not just dollars; they are regulatory and political
    - For example, off-site treatment agreements
    - Ensuring no orphan waste

Community Acceptance

- Community acceptance will be required throughout the life cycle of this process, at the provider end as well as the receiver end.
- Transportation needs will be required
- Stakeholders
- And, it is important to remember that there are regulatory requirements that must be met here at Hanford and at any receiving facilities where treatment and ultimate disposal could take place.

Alternative Treatment / Test Bed Initiative (With Offsite Disposal)

- Ecology has been and continues to be supportive of exploring possibilities and options associated with offsite disposal of grouted LAW. Advantages include:
  - Offsite disposal units unique geology able to safely retain higher amounts of leachable, mobile, long lived constituents such as Tc-99 and Iodine-129
  - Could allow for earlier retrieval, treatment and final disposal of single shell tank waste
- Project considerations should include:
  - Mechanisms to avoid orphaned waste or waste coming back to Hanford for disposal
  - Project should not interfere or compete with: budget, management or political will to complete and fully operate DFLAW and Pretreatment and High Level Vitrification Facilities

Question on Groundwater Drinking Standard

- I-129 and Tc-99 MCLs: 4 mrem v. 4 mrem ede for On-site Disposal
- Today, the State considers the criteria settled. Reconsideration of changing to an ede basis for I-129 and Tc-99 would prompt a broader consideration of the complex nature of Hanford groundwater, new data, and additional criteria. The time required for such an effort at this point is unknown and ultimate resulting criteria change and scope of such reconsideration to the tank waste treatment mission and other cleanup efforts is unknown.
- While considering 4 mrem ede for I-129 or Tc-99 in a simple single contaminant groundwater contamination situation may make sense, but that is not the situation at Hanford.
- Complex nature of Hanford groundwater:
  - There are wastes from other sources that is already committed to the environment at Hanford that do and will continue to contribute to groundwater cancer risk hazards for thousands of years.
  - IDF will add waste contaminants that increase cancer risk over already committed waste to the environment.
  - I-129 and Tc-99 are not the contaminants that contribute to cancer health risk in groundwater - other radionuclides and chemical contaminants contribute cancer health risk.
- DWP/RCRA permitting of landfills requires no impact to groundwater.
- Recommendation 5-1 asks a good question. While the State is sensitive to attempts to decrease protecting Human Health and the Environment, State is glad to consider new credible data and analysis to advance Hanford cleanup while being protective.

Scope, Schedule, and Cost Elements Necessary for a Complete FFRDC Study

- Selection of an SLAW alternative technology other than vitrification will require considerable demonstration and public process to achieve public acceptance toward implementation of that SLAW technology
- Based on the outline, these elements do not readily appear to be adequately considered in the FFRDC study scope
  - Public involvement in the technical demonstration to achieve stake holder acceptance
  - Integrated performance demonstration testing of primary and secondary waste forms for the various Hanford tank waste envelopes
  - Long term waste form performance demonstration testing for onsite disposal
  - Pretreatment of nitrate/nitrite, chromium, and mercury to protect groundwater for onsite disposal
  - Achieving a Technology Readiness Level (TRL) of 6 for the Hanford waste matrix
  - Meeting Washington LDR Requirements
  - Revising the agreements for onsite disposal
  - Preparation of new agreements for offsite disposal to avoid orphaned waste
  - Preparing a new EIS for another SLAW technology

Conclusions

- Supplemental Treatment is an important component to Tank Waste Treatment at Hanford.
- Timing issue at hand or several timing issues
  - There are significant limitations on the information Ecology can provide, because of holistic negotiations.
  - Ecology's highest priority is the successful operation of DFLAW, and we are currently most concerned with construction completion of HLW Vitrification and Pretreatment
  - Full scale Supplemental Treatment is not needed at this time and its configuration cannot be decided on until pretreatment capacity, timing and capability are established.
- Many of issues and options discussed in report are worth further discussion however we are limited by on-going negotiations
- Past tank waste treatment down select processes (2003) give us an idea of what might be discussed in the future for onsite disposal of LAW Supplemental Treatment. Key criteria were:
  - Protection of groundwater from further degradation
  - Comparing of treatment option composite-modeled leach rates and contaminant concentrations in groundwater from secondary and primary waste forms
  - Protection of future inadvertent intruder
  - Land use impacts
  - Cost
  - Regulatory expectations and acceptance
  - Public expectations and acceptance