Supplemental Treatment Hanford Immobilized Low Activity Waste Discussion

(concerning NAS Review #2)

National Academies of Sciences, Engineering, and Medicine

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November 2018

Perspectives

- We appreciate the Committee's balanced treatment of the issue and willingness to collect all pertinent information.
- We value and support the recommendation that the FFRDC's final report should include a structured direct comparative analysis that could be used in educating selection of treatment alternatives.

  The analysis should include direct comparison for each technology's approach to:

  - Waste performance
  - Full life cycle cost
  - Technology alternatives reliability
  - Identification of key information and analyses needed for decision makers

Analyses Perspectives

We, similar to the Committee, have concerns that:

- Perhaps the FFRDC has not done enough “to ensure a fair and equitable comparison of alternatives.”
- “The treatment approaches are presented in isolation from one another, and that there is insufficient integration to be of use for comparison purposes.”
- The cost-estimation data and choices for analogous facilities lack supporting detail.

The comparative analysis already exists

The Tank Closure Waste Management Environmental Impact Statement (TC&WM EIS)

- The information has been vetted with outside experts.
- Ecology believes the FFRDC should use the TC&WM EIS as the primary source of data and outputs for FFRDC comparison.
  - FFRDC should augment with any new waste performance or cost information.
- If the FFRDC develops different outcomes or results than the TC&WM EIS, those results should be compared to the EIS, including
  - Explanations of the equitable treatment of all assumptions and outputs.
  - Explanations of the differences and why the differences exist.

Waste Performance Perspectives

- The primary waste form must be shown to perform “as good as glass,” given that the commitment to glass has long been part of the agreement to allow 90% of the volume of tank waste to be disposed of in near surface burial at Hanford.
- Results must be shown in comparison to the TC&WM EIS results, with differences explained.
- The primary waste form must be demonstrated to be protective of human health and the environment from an intruder scenario, risk to future groundwater users, and the Columbia River.
  - Must include estimated impacts to groundwater.
  - Must include analysis out to the peak concentrations many thousands of years in the future.
  - Must be calculated or modeled with the existing Hanford waste risk burden in mind.
  - New landfills should be managed through waste acceptance criteria and treatment of waste so as to not impact groundwater at all.
  - Integrated Disposal Facility Landfill permit conditions require modeling and waste management activities to be conducted so that groundwater concentrations do not exceed 70% of the drinking water standards for the total landfill inventory.
  - Must account for all disposal of the waste produced – both primary and secondary – and its risk burden.

Other analyses already exist for waste performance

Numerous studies over many years have evaluated waste forms for Hanford Tank Waste and determined only “Glass” meets the criteria:

- *1993 Final Report of the Hanford Waste Task Force, Appendix F*
- *1995 Performance Assessment of Grouted Double Shell Tank Waste Disposal at Hanford*, WHC-SD-WM-EE-004 Rev. 1
- *1996 Tank Waste Remediation Systems Environmental Impact Statement* (which supported DOE’s Record of Decision committing to the current HLW/LAW treatment pathway).
- 1997 NRC Waste Incidental to Reprocessing determination that allows for near surface disposal of the low activity fraction of Hanford tank waste is predicated on the LAW being vitrified.
- 2003-2006 Washington State and USDOE explored alternative supplemental treatment approaches for LAW to see if any performed "as good as glass.“ Waste forms in the study did not perform as well as glass and impacted groundwater above drinking water standards
- *2012 Tank Closure Waste Management EIS*, showed only LAW glass prevented exceedances of groundwater drinking standards for technetium, nitrate and chromium.

"As Good As Glass"

- Washington State's performance standard for a waste form: The waste must minimize the risk that near surface disposal of ILAW at Hanford poses to the vadose zone and the groundwater.
- This performance standard is driven by the release rate of contaminants (especially Tc-99, I-129, NO3, and Cr6) from the immobilized waste form to the vadose zone and groundwater.
- To date, the State has not seen evidence that any waste form other than glass prevents the release of these contaminants in amounts that exceed drinking water standards in groundwater.

Cost Perspectives

As noted in slide 3, there was insufficient information to support cost estimations.

We believe that any cost comparison of different alternative should include:

- All facilities necessary for full life cycle processing of waste, including engineering, construction, commissioning, operation, close out, and decommissioning.
- Any additional pretreatment and secondary waste needs for each alternative.
- Cost estimates for waste transportation, storage, and disposal.
- Volume of waste produced and associated volume of disposal land use needed.
- Cost of modifications needed in tank farms or Hanford Site infrastructure to accommodate each alternative.

FFRDC should use existing cost estimate information

- USDOE's *Assessment of Low-Activity Waste (LAW) Treatment and Disposal Scenarios for the River Protection Project* (2003) did not show a favorable grout waste treatment cost estimate.
- USDOE's *Hanford River Protection Project Low Activity Waste Treatment: A Business Case Evaluation*, examined the cost and viability of implementing cast stone, bulk vitrification, and steam reforming waste treatment (2007). The report stated:
  - "cost differences between [the different treated waste forms] are unlikely to be the major factor in selecting a supplemental LAW technology."
  - All the technologies were cost neutral when compared to each other and to vitrified LAW.
  - Added time and cost that would be required to bring the supplemental technologies up to the technology readiness level of vitrified LAW.
- The 2009 *Draft* and 2012 *Final TC & WM EIS* indicate that the costs are relatively equivalent for vitrified LAW and grouted LAW approaches.

Ecology's "Show Stoppers"

- Analyses that are inconsistent with TW&WM EIS. Appropriate and robust explanations are required.
- A primary waste form that does not perform as good as glass.
- A primary waste form that:
  - Does not meet LDR HLVIT treatment standard,
  - Or, does not have an approved treatability variance or determination of equivalent treatment
  - Does not protect the inadvertent intruder, Columbia River, or groundwater
- A cost analyses that is not full life cycle and does not include all necessary facilities, treatment costs, transportation costs, and disposal costs for all associated waste forms.

Conclusions

- A robust structured comparative analysis is needed in FFRDC documents, and we would recommend using the TC&WM EIS as the primary source.
- USDOE's current and evolving approaches on Direct Feed HLW and slow down of the pretreatment facility indicate that a second LAW treatment facility may not be needed any time soon, if at all.
- There is a technical, as well as a legal and political basis, for the "as good as glass" requirement for ILAW at Hanford.
- All studies the State has seen of different waste forms for Hanford's tank waste have shown that glass is the only waste form that prevents exceedances of Washington's drinking water standards over the applicable time of compliance.
- This is why the governing agreements and decision documents reflect that vitrification is the current agreed-upon pathway for treating Hanford's supplemental low activity waste.

Back Up Slides

"As Good As Glass"

- **Tri Parties developed criteria for what is "as good as glass" in the early 2000s:**
  - "All waste forms produced from any supplemental technology need to:

    (1) Perform over the specified time period as well as, or better than WTP vitrified waste;

    (2) Be equally protective of the environment as WTP glass;

    (3) Meet land disposal restrictions (LDR) requirements for hazardous waste constituents. HLVIT is required for metals associated with high level waste or be able to obtain a treatability variance or Determination of Equivalent Treatment;

    (4) Meet or exceed all appropriate performance requirements for glass, including those identified in the WTP contract, Immobilized Low Activity Waste (ILAW) Interface Control Documents, and ILAW Performance Assessment."