A New Path Forward for WTP

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Introduction

The "Framework" document, issued by the Department of Energy (DOE) in September of 2013, is purported to show the path forward for completion and operation of the Hanford Waste Treatment Plant (WTP) for treatment of Hanford tank wastes. Construction on two principal facilities (HLW and Pretreatment) was halted in August of 2012, because of major problems with the process systems in those facilities that could prevent those facilities from operating safely and successfully. The Framework document is an interim report on DOE's attempts to resuscitate a failing project. It has become apparent that the current WTP concept, which is based on a litany of 60 years of broad commercial nuclear policy decisions, misapplied regulations, and questionable technology selections, will be unable to achieve its mission in a timely and cost-effective manner.

The key to successfully beginning near-term vitrification of Hanford tank wastes and providing the DST space needed to continue/accelerate SST retrieval is to keep the system modifications as simple as possible and avoid creating any Capital Projects to implement those modifications. Under DOE's Capital Project rules, if any of the proposed solutions require design and construction of additional facilities, seven or more years would likely be added to the WTP implementation schedule. The approach suggested herein is a major change to the existing project baseline, and could make possible start-up of the LAW Vitrification Facility (refunctioned as the WTP Vitrification Facility) within 2 to 3 years, rather than the 5 to 7 years currently anticipated. The principal features of this proposed alternative approach are described below.

Alternative Path

It is **NOT** necessary to separate the tank waste into two fractions in order to successfully vitrify those wastes. The original decision to separate the tank wastes into a high-level waste (HLW) fraction and a low-activity waste (LAW) fraction was intended to reduce the eventual programmatic costs of disposal of HLW canisters in the national geologic repository, by minimizing the number of canisters produced. The original repository concepts have been terminated and a new repository selection process has been initiated with potential startup in approximately 2050. The added process complexity associated with the planned fractionation of the tank wastes has resulted in extensive design problems, construction delays, operational safety concerns, and long-term programmatic delays, all of which have greatly increased the projected life-cycle costs of the ORP mission, and show little likelihood of achieving the expected program cost reductions.

This alternative approach would eliminate the very complex waste separation operations (cesium ion exchange, caustic leaching, sludge washing, etc.) from the Pretreatment Facility, and would process the total inventory of tank waste into vitrified glass using the slightly modified LAW (now the WTP Vitrification) Facility. Vitrification of the wastes would be accomplished using an iron-phosphate glass matrix, instead of the baseline borosilicate glass matrix, to provide more operational flexibility in the mix of constituents in the waste, and to reduce the total amount of glass produced. The canisters of vitrified waste glass would be stored on-site in a near-surface retrievable storage facility (essentially a field of

drywells, no massive storage vault facility needed) until national decisions on disposal of nuclear wastes are resolved, sometime in the coming decades.

Initial tank selection and waste, Phase I, will focus on DSTs that contain little sludge, primarily clarified supernate and/or solutions from retrieved salt-cake SSTs. The waste glass produced during phase I operation may meet the current concentration limits of Class C Low-Level Waste (LLW), but will be handled as if it is HLW material. There is a sufficient inventory of this type of waste (see the Best Basis Inventory) to supply feed to the WTP Vitrification Facility for at least 4 to 6 years, gaining DST space that is badly needed to continue SST retrievals, and providing time for modifications to the Pretreatment Facility (refunctioned as the Vitrification Feed Preparation Facility) that would facilitate blending of residual sludges, supernates and other Hanford radioactive wastes into appropriate feed for the WTP melters. This follow-on operation with vitrification of blended sludges, supernates, and other wastes is designated Phase II. The waste glass produced during Phase II operation is considered 'HLW' by the current source- based definition,

Also during the time of Phase I operation, unused space in the Pretreatment Facility is equipped as treatment cells for converting the stored N-Reactor fuels into finely divided oxides for blending with tank wastes and vitrification, and for decanning and converting the contents of the cesium and strontium capsules into liquid streams or finely divided solids for blending with tank wastes and vitrification.

Conclusions

It is believed that the system modifications necessary to begin waste vitrification can be accomplished in a few (2-3) years without initiating a DOE Capital Project. The subsequent modifications to the Pretreatment Facility to facilitate spent fuel and cesium/strontium capsules conversion for waste feed stream blending might require a Capital Project approach, which if initiated promptly could be completed within the available 5 to 7 year window. Following this alternative path should get the ORP mission back on track and close to its original schedule (glass in 2016 and fully operational in 2019). Final completion would be determined by plant operational efficiency (both retrieval and vitrification), but should be within the goals of the Tri-Party Agreement. Further delays in achieving waste vitrification are neither necessary nor acceptable.