

Progress on Resuming Full Construction on the Waste Treatment and Immobilization Plant's High-Level Waste Facility – 16283

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ABSTRACT

The U.S. Department of Energy (DOE) restricted certain engineering, procurement and construction work on the Waste Treatment and Immobilization Plant's (WTP) High-Level Waste (HLW) Facility in 2012 and early 2013 because of unresolved technical issues, and a need to align the nuclear safety basis with the design as the HLW Facility technical issues were resolved. The DOE Office of River Protection (ORP) needed a way to minimize the government's risk exposure, while continuing limited critical path construction work and resolving the technical and safety basis issues. ORP issued the Plan for Evaluation and Decision to Proceed for the High-Level Waste Facility in October 2013 to establish the process to evaluate the WTP contractor's progress on resolving the issues and to identify actions and deliverables needed to facilitate an ORP decision to resume production activities. This process provided for a phased resumption of HLW engineering, procurement and construction activities, with two decision points:

Decision 1: Authorization to resume design/production engineering along with limited procurements and construction ramp-up.

Decision 2: Full authorization to resume engineering, procurement and construction.

In August 2014, ORP provided authorization for the WTP contractor to resume all engineering work necessary to finalize the design of the HLW Facility. The decision to proceed with production engineering in the HLW Facility was based on significant progress in resolving technical issues and improving work processes to align the HLW design and safety basis.

ORP is working closely with the WTP contractor to facilitate decisions for resuming procurement of HLW Facility equipment with safety functions, and resuming full construction in the most complex process cells in the Facility.

INTRODUCTION

The Hanford Waste Treatment and Immobilization Plant will cover 65 acres with four nuclear facilities – Pretreatment, High-Level Waste Vitrification, Low-Activity Waste Vitrification and an Analytical Laboratory – as well as operations and maintenance buildings, utilities and office space. The waste treatment process will begin in the Pretreatment Facility, where waste will be divided into high-level solids and low-activity liquids. From there, the high-level waste will be transferred via

underground pipes to the High-Level Waste Vitrification Facility, also known as the HLW Facility. When complete, the HLW Facility will be 134 m (440 ft) long and 84 m (275 ft) wide, approximately the size of three football fields, and 29 m (95 ft), or six stories, high.

In the HLW Facility, concentrated high-level waste from the Pretreatment Facility will be mixed with glass-forming materials in two 82 t (90-ton) melters and heated to 1 422 K (2,100 °F). The mixture will then be poured into stainless steel canisters that are approximately 0.6 m (2 ft) in diameter, 4.4 m (14.5 ft) tall, and weigh more than 3.6 t (4 tons). When fully operational, the HLW Facility will produce an average of 480 canisters per year. The HLW Facility, in its current construction state, is shown in Figure 1.



Figure 1. Construction of Waste Treatment and Immobilization Plant's High Level Waste Facility

BACKGROUND

The U.S. Department of Energy (DOE) restricted certain engineering, procurement, and construction (EPC) work on the Waste Treatment and Immobilization Plant's (WTP) Pretreatment Facility, and to a lesser degree the High-Level Waste (HLW) Facility in 2012 and early 2013 because of the impact of unresolved technical issues on the facility designs. The HLW Facility had five unresolved technical issues that required resolution in order to establish a basis for continued design. These technical issues impacted EPC activities in critical areas of the facility.

Although limited HLW Facility procurement and construction activities had continued in areas not directly impacted by the technical issues, much of the work in the HLW Facility's most complex process cells could not continue until the technical issues were resolved and the safety basis was updated and documented. DOE had also issued a number of high-priority assessment findings that required resolution of other technical, quality, and management concerns related to the WTP contractor's engineering and procurement processes. Finally, a DOE led design and operability review of HLW systems identified issues with ventilation system capacity and airflow between operational boundaries, as well as secondary waste handling.

ORP is working closely with the WTP contractor to facilitate decisions for resuming procurement of HLW Facility equipment with safety functions, and resuming full construction in the most complex process cells in the facility. The progress toward resuming full production for the HLW Facility is described further in the following sections of this paper.

DISCUSSION

The DOE needed a way to minimize project management risk, while continuing work to resolve the technical issues and the limited construction work in key areas of the HLW Facility. In October 2013, ORP established a process for systematically addressing and resolving the technical, management, and quality issues that led DOE to restrict the aforementioned production activities on the HLW Facility in 2012 and 2013. ORP's plan provided for a phased resumption of HLW EPC activities, with two decision points:

Decision 1: Conditional authorization to resume EPC activities. This decision, made in August 2014, authorized the WTP contractor to resume all production engineering necessary to finalize the design of the HLW Facility. The decision to resume production engineering for the HLW Facility was based on significant progress by the WTP contractor that included addressing outstanding technical issues, completing updates to system engineering and design processes to improve quality outcomes, developing a Safety Design Strategy as a tool to achieve alignment between the design and safety basis, and completing a number of other management improvement actions. These accomplishments provided the foundation for the WTP contractor to execute production engineering activities effectively.

Decision 2: Full authorization to resume EPC. This is a future decision that will be based on a series of actions to advance the HLW design and safety basis sufficiently to minimize the DOE's risk for completing construction and commissioning of the HLW Facility.

Keys activities for resuming full production on the HLW Facility include:

Resolve Current Design Issues:

The WTP contractor will complete a series of engineering studies to resolve outstanding design issues associated with the HLW Facility ventilation and melter offgas systems, as well as other design issues identified during a recent design and operability review of the HLW Facility. The contractor will also complete testing of the High Efficiency Particulate Air (HEPA) filters used in several systems in the facility. Once the engineering studies and tests are complete, DOE will review the results and recommendations and provide direction to proceed with any preliminary design change activities, if required.

Update the Preliminary Documented Safety Analysis (PDSA):

The WTP contractor will update the PDSA in parallel with design activities. The first step in the process will be to update the PDSA utilizing the preferred control

strategies from Safety Design Strategy, which was developed as a prerequisite to resuming production engineering for HLW (Decision 1). The PDSA will then be updated incrementally (as required), to incorporate any changes resulting from the engineering studies and/or preliminary design activities for any potential design changes.

Validate Effectiveness of Process Improvements and Management Systems:

Both the WTP contractor and DOE have assessment and oversight programs in place to monitor effectiveness of contractor process improvement initiatives that have been put in place to improve the quality outcomes from the contractor's engineering, procurement, and nuclear safety processes. At DOE's direction, the WTP contractor developed and issued a Managed Improvement Plan, Revision 1, in August 2014 that captures the improvement initiatives and provides the management structure for sustained process improvement.

The completion of the activities described above are expected to provide the necessary technical basis and confidence in the design and safety strategy that DOE will need to finalize a performance baseline for HLW Facility completion.

CONCLUSIONS

In October 2013, ORP established a comprehensive and effective process for completing the actions to facilitate the decision to proceed with the engineering and nuclear safety activities necessary to complete the HLW Facility design. The plan and process established clear expectations with defined deliverables and the necessary accountability to complete actions in a timely and effective manner, leading to a resumption of design engineering for the HLW Facility in August 2014. ORP is now working closely with the WTP contractor to resolve design issues, update the safety basis, and establish the confidence needed to update the HLW performance baseline, and after appropriate approvals, resume full production on the HLW Facility.