

Authorization to Proceed with Production Engineering for the Waste Treatment and Immobilization Plant's High-Level Waste Facility – 15595

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ABSTRACT

The U.S. Department of Energy restricted certain engineering, procurement, and construction 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 design, and a misalignment between the facility design and nuclear safety basis. The U.S. Department of Energy, Office of River Protection (ORP) needed a way to minimize project management risk, while continuing limited critical path construction work for the HLW Facility and resolving the technical and safety basis issues. ORP developed a process to systematically address and resolve the technical, management, and quality issues that led DOE to restrict HLW Facility production activities in 2012 and 2013. This process provided for a phased resumption of HLW engineering, procurement, and construction activities on an incremental basis and a final decision for release to full production.

In August 2014, ORP provided authorization for the WTP contractor to resume all engineering work necessary to finalize the HLW Facility design. The decision to proceed with production engineering in the HLW Facility, representing the first of two decision points, was based on significant progress in resolving HLW technical issues and improving work processes to align the HLW design and safety basis. Full release for HLW equipment procurements and construction is forthcoming based on conditions that must be fully satisfied and demonstrated during a transition period expected to continue for the next few years.

INTRODUCTION

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 design, and a misalignment between the facility design and nuclear safety basis. 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. As of September 2013, required corrective action plans for the majority of the ORP assessment findings had not been completed and approved by ORP. The WTP contractor had also self-identified and documented similar issues in their Project Issues Evaluation Reporting (PIER) System.

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 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 was made in August 2014.
- **Decision 2:** Full authorization to resume EPC. This is a future decision.

The evaluation and decision process is depicted in Figure 1.

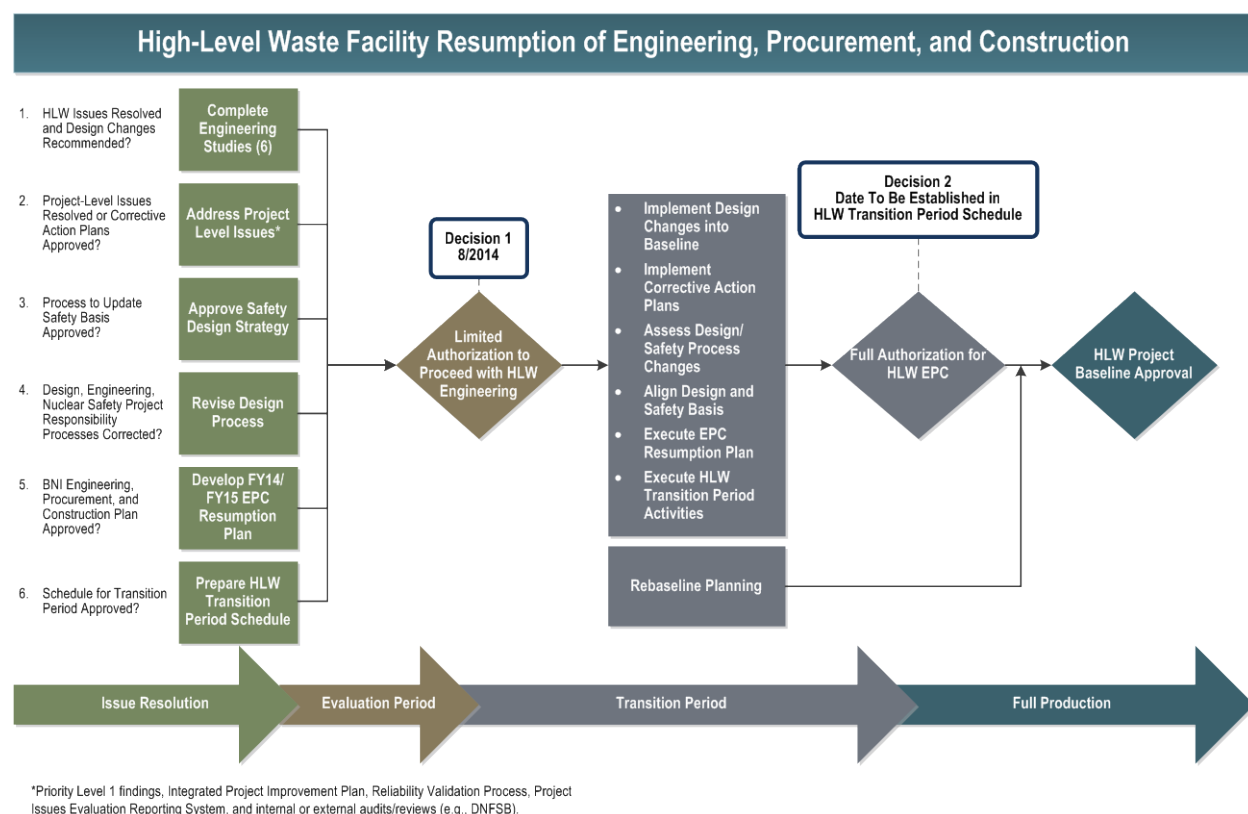


Fig. 1. Process for Resuming Production Activities in the High-Level Waste Facility.

Decision 1, conditional authorization to proceed with HLW EPC activities, was predicated on six inputs that required specific actions and deliverables. The six inputs were:

1. **Complete Engineering Studies:** The five technical issues that apply to the HLW Facility are associated with the following:
 - Mixing in vessels with pulse-jet mixers
 - Erosion and localized corrosion
 - Vessel structural integrity

- Single-point failures and in-service inspection in HLW black cells and hard-to-reach areas
- Facility ventilation.

The WTP contractor conducted engineering studies for each HLW technical issue to determine the degree of resolution and to identify recommended design changes and alternatives needed to resolve the issues. ORP concluded the engineering studies provided the approach for resolving the technical issues or, as a minimum, a path forward for final resolution.

2. Address Project Level Issues: ORP staff teamed with the WTP contractor to identify and assess project-level issues for potential impact on the decision to resume HLW production activities. These issues were sourced from the contractor's Project Issues Evaluation Reporting System; ORP assessment reports; the WTP contractor's Reliability Validation Process; and a variety of external audit reports and technical reviews of the project. The ORP team recorded each issue in a three-part issue resolution summary form to document ORP's confidence that the issues would be adequately addressed by the proposed resolution, and recommended any conditions of approval, as warranted.
3. Develop and Approve a HLW Safety Design Strategy: To address the misalignment between the HLW design and safety basis, the WTP contractor developed a safety design strategy (for ORP approval) for the HLW Facility [1]. The safety design strategy provided the basis for updating, and ultimately revising, the preliminary documented safety analysis (PDSA) to ensure the final design is compliant with 10 CFR 830, "Nuclear Safety Management," Subpart B, "Safety Basis Requirements." The safety design strategy provided the guiding philosophies and assumptions to be used in design development, the safety-in-design and safety goals, the approach to develop the overall safety design basis, and the interfaces impacting safety. It established the control strategy for the development of safety-class and safety-significant structures, systems, and components.
4. Revise Design Processes: The WTP contractor's root cause analyses in response internal and external reviews concluded the procedures governing design and nuclear safety activities needed to be revised to ensure the processes could deliver consistent, high-quality products that meet the WTP contract requirements. The WTP contractor updated over 20 engineering processes and procedures and trained personnel on the updated procedures. ORP reviewed the content and implementation of the new procedures and concluded the new procedures and training of personnel were effective in addressing the process weaknesses.
5. Develop HLW Resumption Plan: The WTP contractor developed a resumption plan to describe the management approach to complete transition period activities (between Decision 1 and Decision 2) necessary to support a full authorization for HLW EPC activities.
6. Develop a Transition Period Schedule: The WTP contractor developed a preliminary, resource-loaded schedule for the transition period activities to provide a basis for an update to the HLW project schedule that was focused on the work needed to advance the HLW Facility design and complete an update the HLW PDSA.

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 WTP contractor had made significant progress in resolving technical issues and establishing work processes to align the HLW design and safety basis. These accomplishments provided the foundation to execute production engineering activities effectively. Full release for HLW equipment procurements and construction is forthcoming based on conditions that must be fully satisfied and demonstrated during the transition period between Decision 1 and Decision 2,

including completion of an update to the PDSA. Major accomplishments that enabled Decision 1 included:

- The WTP contractor substantially resolved the HLW technical issues as documented in internal engineering reports addressing pulse-jet-mixed vessel mixing, erosion-corrosion risk, HLW equipment redundancy, in-service inspection, pipeline plugging, HLW vessel and component structural design, and facility ventilation.
- The WTP contractor submitted and ORP approved corrective action plans for high-priority DOE assessment findings.
- The WTP contractor documented and ORP approved the HLW safety design strategy.
- The WTP contractor revised its design and nuclear safety processes, aligned roles and responsibilities, and developed plans and procedures to implement the HLW safety design strategy.
- The WTP contractor developed the Reliability Validation Process extent-of-condition plan and associated process gates instruction.
- The WTP contractor implemented a systems engineering management program.
- The WTP contractor completed a risk assessment to support continued civil construction of the HLW Facility. This included preparation of risk assessment sheets for confinement ventilation and process offgas systems.
- ORP and the WTP contractor evaluated WTP project-level issues, including the degree of resolution and risk assessment of these issues.
- The WTP contractor developed and ORP evaluated the planning basis for implementing transition period activities between decision 1 and Decision 2.

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 will continue to hold the significant restrictions on procurements and construction activities until the HLW Facility design matures, and the design is aligned with an updated safety basis.

REFERENCES

1. 24590-HLW-PL-ENS-13-0001, 2014, *Safety Design Strategy for the High-Level Waste Facility*, Rev. 0, Bechtel National, Inc., Richland, Washington.