Waste Treatment and Immobilization Plant

- High-Level Waste Facility
- Pretreatment Facility
- Analytical Laboratory
- Low-Activity Waste Facility
- Balance of Facilities (20 support buildings)
- Future Site of LAWPS Facility
- Effluent Management Facility Site
- Building 87
- Tank waste is pumped to the Pretreatment (PT) Facility’s interior waste feed receipt vessels
- PT separates the low-activity radioactive waste from the high-level radioactive waste
- During pretreatment, waste is concentrated by removing water in an evaporator
- Solids filtered out for inclusion in high-level waste stream; remaining soluble, highly radioactive isotopes removed with ion-exchange process
In late 2012, the U.S. Department of Energy (DOE), Office of River Protection (ORP) limited project activities at the PT Facility.

Restrictions were imposed on the remaining engineering, procurement, and construction work due to:

- Unresolved technical, management, and quality issues
- Need for design and nuclear safety basis alignment
Pretreatment Facility
Technical Issues

- **T1 Hydrogen Gas Events in Vessels***
  - Risk of combustion in the headspace of high-solids vessels due to hydrogen accumulation
  - Resolved with approval of revised hydrogen safety control strategy consisting of both preventive and mitigative safety and process controls

- **T2 Criticality in Pulse-Jet Mixer (PJM) Vessels***
  - Dense fissile particles could settle on the bottom of Waste Treatment and Immobilization Plant (WTP) vessels with sufficient mass and geometry such that a criticality event is credible
  - Issue resolved via calculations, engineering and chemistry studies, criticality safety evaluations, and integrated process controls

- **T3 Hydrogen in Piping and Ancillary Vessels***
  - Flammable gases generated by waste treated in WTP could accumulate in process piping and cause deflagration event
  - Resolved by updating WTP safety basis, basis of design, and process piping design criteria to prevent or control potential hydrogen explosions

- **T4 PJM Vessel Mixing and Control***
  - Concern with adequacy of pulse jet mixer (PJM) mixing and control system
  - Complete testing of standard high solids vessel prototype

- **T5 Erosion/Corrosion in Piping and Vessels***
  - Uncertainties exist in waste feed characteristics and ability to meet 40-year service life
  - Confirm erosion/corrosion design basis, including margin, through testing and analysis

- **T6 Design Redundancy/In Service Inspection***
  - Perform failure modes, effects, and criticality analysis
  - Complete conceptual design of planning areas 2, 3, and 4

- **T7 Black Cell Vessel/Equipment Structural Integrity***
  - Seismic ground motion criteria for WTP changed around 2005
  - Complete structural analysis of standard vessel and strategy for structural upgrades to installed vessels

- **T8 Facility Ventilation/Process Off-Gas Treatment***
  - Multiple technical challenges associated with ventilation system, including high-efficiency particulate air (HEPA) filters
  - Complete engineering/nuclear safety assessments to ensure ventilation meets requirements

*This technical issue has been sufficiently resolved to allow engineering to proceed in support of design and safety basis development.*
Design changes
- Standard high-solids vessel (SHSV) PJM vessel designs
- Planning areas 2, 3, and 4 conceptual design study

Pretreatment flowsheet changes
- Removal of oxidative leaching process
- Reduced aluminum leaching temperature
- Removal of cesium concentration evaporator

Test SHSV at full scale

Updated nuclear safety analysis
- Hydrogen in vessels
- Criticality
- Hydrogen in piping and ancillary vessels
PJM control testing began in December 2016

Testing completion expected end of 2017

An overhead view of the 16-foot-diameter by 35-foot-tall vessel shows the platform and all test equipment installed.
Focus of Technical Issues

- Technical Issues Focused in Pretreatment Planning Areas 2, 3, and 4
- DOE is evaluating replacing up to eight vessels with smaller vessels; approximately 17,000 gallons, 16-feet diameter, six PJMs
- Candidate vessels to replace in design represent five designs: 30,000 - 160,000 gallons
Vessel color coding depicts common functionality between current design configuration (top) and proposed design configuration with SHSV (bottom).
ORP striving to have all remaining technical issues resolved in 2018 and return WTP Pretreatment to design

WTP Pretreatment authorization to proceed with production engineering

Complete facility designs and safety basis documentation in accordance with federal regulations
Safety Always Comes First!