Waste Treatment and Immobilization Plant Operability

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Operability is the ability of the Waste Treatment and Immobilization Plant (WTP) to safely complete its production mission, which is the treatment of Hanford tank waste.
The Purpose is to Deliver a Plant that is Fully Operational and Staffed by Fully Trained Personnel

- Operability was considered in work scope from the beginning of the project
- Assessment of operability is an iterative process that continues throughout the life of the project
- Operability is enhanced by plant operating experience, including best practices and lessons learned
- Assessment of operability improves safety, nuclear operations and is protective of workers, the public and environment
Operations and Commissioning Staff are Highly Experienced

- Successful commissioning and operation of other U.S. Department of Energy (DOE) vitrification facilities
  - West Valley, New York
    - Processed over 600,000 gallons of legacy commercial high-level waste (HLW)
    - Completed production of 278 glass canisters in 2002
  - Defense Waste Processing Facility (DWPF), Savannah River Site (SRS)
    - Processing 32 million gallons of DOE defense-related nuclear waste
    - Produced over 3,780 glass canisters since 1996
Operations and Commissioning Staff are Highly Experienced

- Other DOE nuclear facilities
  - SRS and Hanford Tank Farms
  - Integrated Waste Treatment Unit (IWTU) in Idaho
  - SRS and Hanford nuclear material production facilities
Focus on Operability is Continuous

- Operability input and feedback occur throughout the lifecycle of the plant
  - Conceptual design
  - Detailed design and procurement
  - Construction
  - Startup testing
  - Commissioning testing
  - Operations and maintenance
Operability Input – all Project Phases

Integrated into the design/construction process:
- Integrated Project Team - operations facility leads
- Drawing and document reviews
- Model reviews
- Observe software and vendor tests
- System, facility and area walk-downs for turnovers
- Hazard analysis review process and documented safety analysis development support to establish safety controls

Startup and commissioning support:
- Instrument calibrations
- Component refurbishment, maintenance support and repairs
- Control room and field operations
- Joint Test Group
- Test deficiency resolutions
- System acceptance and Care, Custody and Control transfer
- Transition to operating contractor

Transition to future WTP operating contractor
Project Phases

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- Design
- Procure
- Construction

- System Turnover
- Component Testing
- System Testing
- Qualify Personnel

- Demonstrate Facility Capacity
- Operational Readiness Review
- Hot Commissioning (Actual Tank Waste)
- Cold Commissioning (Simulant Tank Waste)

- Develop Programs & Documented Safety Analysis
- Ops Input to Design
- Implement Ops Programs, Documented Safety Analysis, and USQ Process

- Start Non-Rad Operations
- Start Radioactive Operations (CD-4)
- Completion of Project
Examples of Operations Influence on Design

- Pretreatment (PT) Facility
  - Reconfiguration to include hot cell
  - Replaceable components and piping (DOE “canyon” concepts)
  - Ability to modify/upgrade processes after radioactive operation
  - Remote connectors concepts from SRS and West Valley
Examples of Operations Influence on Design

- HLW Facility
  - Removal of PJM mixed high solids vessels
- Laboratory - Hot cells and radiological lab layouts
- Control room layouts and operator console graphics
- Operations Requirements Document
- Numerous detailed changes as design has progressed
  - Design meetings
  - Design document reviews
Examples of Defense Waste Processing Facility Lessons Learned

- Large bore jumper design (Graylok Connectors)
- Hanford electrical jumper with remote wire pull capability
- Remote crane and hoist – recovery features
- Remotability verification plan
- Dimensional record program for remote equipment
- Closed-loop steam system for process tank heating
- Remote pump and agitator vessel supports
- Transfer line leak detection boxes and pressure testing
- Macro-batch tank waste feed qualification
Examples of West Valley Lessons Learned

- Glass former batch recipes for variable waste streams
- Air Displacement Slurry Pumps for feeding melters
- WTP melter design
- Melter off-gas components
- HLW Facility glass canister and grapple design
- HLW Facility glass canister welder
- HLW Facility glass canister decontamination
- Low activity waste and HLW Facilities glass container/canister smear testing
- Power manipulators on cranes
- Remote electrical connectors
Sources of Operability Input and Feedback

- WTP Project
- Corporate – Bechtel and URS
- Vendors and suppliers
- DOE Office of River Protection and DOE Headquarters
- External review teams
- Stakeholders
- Training simulator
- Reliability, availability, maintainability, inspectability (RAMI) data and reviews
- Operational research modeling
- As Low As Reasonably Achievable (ALARA) reviews
- Failure mode, effects and criticality analysis
Commitment to Operability

We will deliver a fully operational plant with qualified staff and supporting programs, procedures and documentation.
Conclusion – Operability is Built In

- WTP project is staffed with personnel experienced in startup, commissioning and operations at other vitrification and nuclear facilities
- Lessons learned from other vitrification facilities have been incorporated into the design
Conclusion – Input and Feedback are Continuous

- Operability input and feedback are provided during all project phases
- External reviews provide independent sources of feedback and lessons learned
- Like other production facilities, operability and throughput improvements will continue throughout the mission
Backup Slides
Pretreatment Facility

*World’s largest radioactive chemical separations facility*

Confirming and improving reliability and flexibility in black cells

- In-service inspection
- Mitigation of potential events
High-Level Waste Vitrification Facility

*Turns high-level waste into glass with two 90-ton melters*

- 440 feet X 275 feet x 95 feet tall
- 88,000 cubic yards concrete
- 11,500 tons of structural steel
- 165,000 feet piping
- 1.6 million feet electrical cable
- 1.1 million pounds heating and ventilation ductwork

August 2014, DOE authorized resumption of engineering activities to complete design
Low-Activity Waste Vitrification Facility

*Turns low-activity waste into glass in two 300-ton melters*

- 330 feet X 240 feet x 90 feet tall
- 28,500 cubic yards concrete
- 6,200 tons of structural steel
- 103,000 feet piping
- 840,000 feet electrical cable
- 945,000 pounds heating and ventilation ductwork

Priority is to complete Low-Activity Waste Vitrification Facility first and to begin operations with direct-feed until the Pretreatment Facility is completed.
Analytical Laboratory

Ensures glass meets regulatory requirements 10,000 samples each year

Priority is to complete Lab to provide laboratory sampling of direct-feed low-activity waste and glass product

- 320 feet x 180 feet x 45 feet tall
- 12,000 cubic yards concrete
- 1,800 tons of structural steel
- 35,000 feet piping
- 172,000 feet electrical cable
- 314,500 pounds heating and ventilation ductwork
Balance of Facilities

Vast infrastructure to support operations

- Steam plant
- Chiller compressor facility
- Electrical substation and switchgear
- Water treatment facility
- Glass former storage
- Standby and emergency power generators
- Cooling tower
- Underground waste transfer systems

Priority is to complete Balance of Facilities to provide the infrastructure needed to produce low-activity glass.