

External Technical Review Summary

United States Department of Energy Office of Environmental Management (DOE-EM)

Evaluation of System Level Modeling and Simulation Tools in Support of Hanford Site Liquid Waste Process

Why DOE-EM Did This Review

The objective of the reviews was to evaluate the current Process Simulation Tools that support the planning basis for ORP Life-cycle Liquid Waste Disposition System Plan: (1) assess whether the tools yield reasonable estimates; (2) evaluate methods used to model facilities currently in design, construction, planning or operational stages; (3) evaluate methods to improve the rate of system model predictions; and (4) determine if additional tools are needed to guide actual execution of individual processing steps.

What the ETR Team Found

- The current System Plan relies on software tools that are limited to the movement of materials. These tools currently do not predict material composition, resulting in systems at high risk of not meeting waste acceptance criteria beyond the initial batches. There is a need for a system planning tool that is chemistry based.
- Incomplete synchronization of G2 based models for tank farm operations (HTWOS) and WTP operation (G2 dynamic flowsheet) limits overall system analysis, since the current set of assumptions used by the two ORP contractors are different. HTWOS is one step behind WTP, which results in the system plan not reflecting current design/operations considerations and as a consequence timely "what if" scenarios cannot be analyzed.
- The lack of an "overall" model that addresses entire plant/process reliability, availability, and maintainability (RAM) for WTP and the Tank Farm hampers life cycle analysis. There is a need to evaluate system bottlenecks and conduct "what if" scenarios to improve process efficiency.

- The system plan needs to capture uncertainties in cost, retrieval, processing.

What the ETR Team Recommended

Short-term (6 to 12 months): (1) Update computer resources (processor, memory and software); (2) Engage software engineers and modeling experts to integrate current tools; (3) Develop approach to calculate propagation of uncertainties through the planning process; (4) Reconcile differences in assumptions between HTWOS and WTP Dynamic Flowsheet Model; (5) Link to EM-20 supported activities regarding experimentation and model development for predictive chemistry; and (6) Evaluate methods to approximate tank chemistry in HTWOS and/or WTP G-2.

Mid-term (next 2 years): (1) Determine computing environment for long-term planning needs, including optimization and what if scenarios; (2) Implement approach to account for uncertainty analysis, with respect to appropriate constraints (e.g., cost, glass properties, etc.) in system plan; (3) Consolidate HTWOS and WTP Dynamic Flowsheet Models; (4) Add "cost" module in the combined G-2 or alternative model; and (5) Incorporate expanded capabilities for chemical process modeling (thermo, kinetics and transient unit operations).

Long-term (3 to 4 years): (1) Implement improved planning tools for optimization and decision making; (2) Work with DOE HQ and other program offices to adopt consensus standards for material properties and RAM data across all models; (3) Implement unified operations research model for WTP and Tank Farms; and (4) Fully implement expanded capabilities for chemical process modeling (thermo, kinetics and transient unit operations).

To view the full ETR reports, please visit this web site:
<http://www.em.doe.gov/Pages/ExternalTechReviews.aspx>

ETR Summary: September 2011

The purpose of an External Technical Review (ETR) is to reduce technical risk and uncertainty. ETRs provide pertinent information for DOE-EM to assess technical risk associated with projects and develop strategies for reducing the technical risk and to provide technical information needed to support critical project decisions. Technical risk reduction increases the probability of successful implementation of technical scope. In general, ETRs assesses technical bases, technology development, and technical risk identification and handling strategies.



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