The Consortium for Risk Evaluation with Stakeholder Participation III

Consortium Universities: ***Vanderbilt University****, Georgia Institute of Technology, Howard University, New York University School of Law, Oregon State University, Rutgers University, University of Arizona, University of Wisconsin - Madison*

October 15, 2014

Mr. William Hamel
Federal Project Director/Assistant Manager, Hanford Waste Treatment Plant
U.S. Department of Energy
PO Box 450, MSIN H6-60
Richland, WA 99352

Re: CRESP WTP PTF Technical Issues Review Team, Letter Report 2

Dear Mr. Hamel:

The focus of this letter report is the CRESP Review Team's analysis of the DOE-ORP and Contractor's approach to defining the requirements for the standard high solids vessel (SHSV) design and associated testing to support the SHSV design. The CRESP WTP Review Team has received several briefings from the project team since the CRESP Team's letter report of December 2, 2013, including an on-site meeting in March 2014. The Team also was asked to review the document "Plan for Resolving Technical Issues Regarding Pretreatment Pulse Jet Mixed Vessels Mixing Capability" (24590-PTF-PL-ENG-14-0004, Rev B) as a central component of the design and testing program for this letter report.

The CRESP Team has found, based on the progress to-date with respect to SHSV design, that the project is in need of greater focus, leadership and productivity by the responsible contractor, who should engage expertise from a wider range of providers when the issues requiring resolution are beyond the core expertise of either the contractor, Pacific Northwest National Laboratory or Savannah River National Laboratory. The Team makes the following specific recommendations to facilitate more efficient progress:

Recommendation 1. "The Plan for Resolving Technical Issues Regarding Pretreatment Pulse Jet Mixed Vessels Mixing Capability" includes discussion and partial plans, often requiring development of subsidiary plans, of too many diverse issues to achieve accountability. The CRESP Review Team recommends that the Contractor develop a brief, single high-level plan (i.e., a strategy of approximately 10 pages in length) that identifies the primary needs for technical resolution to be achieved, along with a schedule that provides the sequence and needed dates for each of the identified strategy components. Subsequently, individual detailed execution plans should be developed for each component of this strategy. Separate leadership, schedule, execution teams and accountability needs to be clearly established for each of the strategy components, from plan development through successful completion.

Recommendation 2. A detailed basis of design for the SHSV must be clearly defined that includes quantitative performance requirements that must be measurable and verifiable through testing. The resulting basis of design should clearly define the limiting conditions for vessel performance based on the design requirements for the Pretreatment Facility (PTF) and considering performance requirements during processing of (i) Newtonian fluids and (ii) non-Newtonian fluids, and also (iii) during design basis events. A set of unambiguous design limiting operating conditions, rather than a single operating condition, needs to be the primary end product of this evaluation. Completion of the SHSV basis of design should be the Contractor's highest priority with respect to resolution of technical issues for PJM mixed vessels, and this should be completed by Dec. 31, 2014.

Recommendation 3. The design of the SHSV should consider inclusion of air lift circulators (i.e., draft tubes) to achieve greater mixing height for solids, and more effective mixing for both Newtonian and non-Newtonian fluids. A literature review should be completed of the design basis for suspending solids using air-lift circulators in other processing applications such as bioprocessing and mining beneficiation.

Recommendation 4. The design of the SHSV should consider use of a primary withdrawal method above the vessel bottom to avoid solids plugging (i.e., not an up-facing or side withdrawal at the vessel bottom which are subject to plugging by sedimentation) and a secondary mechanism for complete tank emptying such as a steam ejector.

Recommendation 5. Current testing should focus on demonstrating functionality and full-scale performance of specific vessel features using appropriate test stands rather than small-scale integrated tests because of the absence of validated scaling methods. Examples of needed component testing that may be completed in vessels or test stands smaller than the full-scale vessel include:

a. Specification and verification of simulants to be used in large-scale testing, including for Newtonian, non-Newtonian, design basis event and gas release design limiting conditions;
b. PJM clearing and particle mobilization using a single PJM for non-Newtonian fluids and filling data gaps with respect to its operation under the design limiting conditions;
c. Synergistic performance of two PJMs in concert with a draft tube and/or sparger to achieve fast settling particle mobilization and enhanced mixing height, as well as mitigation of settled solids adjacent to the vessel wall; and,
d. Measurement techniques to be used for integrated full-scale vessel testing.

The National Energy Technology Laboratory (NETL) and the Naval Research Laboratory (NRL) should be retained by DOE-ORP for scopes of work to provide technical expertise in test program design, fluid-particle dynamics and measurement techniques as part of development and execution of the test plans.

Recommendation 6. DOE-ORP should carry out a systems level review of the necessary functions to be provided by PTF and design limiting operating conditions in the context of

recent DOE commitments to overall tank waste flow sheet revisions including the Low Activity Waste Pretreatment System (LAWPS) facility and the Tank Waste Characterization and Staging (TWCS) facility, as well as advanced glass formulations. Several of the current design-limiting conditions for PT that have resulted in the current set of unresolved technical issues may be resolvable through consideration of the new facilities and modifications to the PTF waste acceptance criteria and operating conditions. For example:

a. Separation of cesium from solids using the LAWPS followed by separated processing of cesium from solids in PT to reduce hydrogen gas release issues during design basis events;
b. Reduced waste leaching requirements based on advanced glass formulations;
c. Separation or size reduction of fast settling particles in TWCS to address issues associated with solids accumulations in vessels; and
d. Segregated processing of wastes containing non-coprecipitated plutonium to simplify criticality-based design considerations.

The outcome of the review should lead to clear direction to the Contractor for changes, where appropriate, to the design requirements for the PTF.

Recommendation 7. DOE-ORP should consider including one SHSV with additional instrumentation, inspection and cleanout capabilities within the canyon of PTF that can serve as a test facility for waste processing when PTF operation transitions between waste types. This SHSV and associated equipment could serve as an internal pilot plant for the facility in parallel with full operations.

The Review Team would appreciate a written initial response from DOE-ORP to this set of recommendations within 30 days of receipt of this letter.

Sincerely,

David S. Kosson, Chair

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Chris Guenther

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Cc: DOE Office of River Protection: L. Holton, K. Smith
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