

United States Government

Department of Energy

Office of River Protection

# memorandum

DATE: **AUG 23 2012**REPLY TO  
ATTN OF: WTP:GEB 12-WTP-0274SUBJECT: **Summary of Actions and Design Outcomes that Erode Confidence in the ability of Bechtel National Inc. to complete their assigned role as Design Authority for the WTP**TO: Scott L. Samuelson, Manager,  
Office of River Protection/Acting Federal Project Director for the Waste Treatment and Immobilization PlantDelmar L. Noyes, Deputy Federal Project Director,  
Waste Treatment and Immobilization Plant

This memorandum documents 34 instances and technical issues in which Bechtel National Inc., acting as Design Authority for the Waste Treatment and Immobilization Plan (WTP) has provided design solutions and technical advice to the Department of Energy which either:

- was determined to be factually incorrect,
- provided a design solution that was not technically defensible, technically viable, or was technically flawed considering identified requirements.
- provided a design solution that was not safe for the WTP operators, or designs that did not comply with the safety basis,
- provided a design solution that represented higher River Protection Project life cycle operating costs compared to other alternatives,
- provided a design solution that was difficult and costly to verify considering other alternatives, thereby increasing WTP completion costs and extending the WTP completion schedule,
- provided a design that was new and unique and does not clearly provide benefits compared to existing technologies and which required special qualification testing,
- provided an installed equipment system that did not meet safety requirements or was not adequately inspected following installation even when defects became known, or
- did not represent best value to the Government in terms of design costs, operating costs, or completion schedule.

Mr. S. L. Samuelson  
Mr. D. L. Noyes  
12-WTP-0274

-2-

These technical issues have occurred over the life of the WTP Contract. They illustrate the general behavior and performance of the BNI Engineering Organization acting as the WTP Design Authority and Design Agent.

The definition of the Design Authority is provided in the Engineering Department procedure, "Design Authority and Design Agency," 24590-WTP-3DP-G04T-00912. This procedure defines Design Authority as:

*The organization (person or group) responsible for establishing and approving the design basis; and for ensuring that the design (including changes to the design and disposition of design basis affecting nonconformance, deficiencies, and deviations) conforms to the design basis and meets applicable codes and standards.*

NOTE: This responsibility applies whether design is conducted fully in-house, partially contracted to outside organizations, or fully contracted to outside organizations.

Section 3.1 of 24590-WTP-3DP-G04T-00912 defines the responsibilities of the Design Authority as:

- *Establishing the design requirements, including those in the 24590-WTP-DB-ENG-01-001, Basis of Design, and those derived from the Contract and approved deliverables and work products such as the Authorization Basis (see 24590-WTP-GPP-SREG-002, E&NS Screening and Authorization Basis Maintenance).*
- *Ensuring that the design requirements and design basis are fully identified and maintained in a form compatible with needs (see 24590-WTP-RPT-ENG-01-001, Technical Baseline Description).*
- *Ensuring that design documents appropriately and accurately reflect the design basis, and that the project facilities are designed, procured, and constructed in a safe, reliable, and efficient manner in accordance with policies and all applicable laws, regulations, the Authorization Basis, and technical requirements.*
- *Design control and technical adequacy of the design process. This includes developing, approving, and maintaining procedures for conducting Design Authority and Design Agency activities.*
- *Implementing appropriate corrective actions, up to and including cessation of work, when technical work is not within procedural requirements.*

The technical issues described in the attachment demonstrate consistent non-compliance between requirements and selected designs implemented in the field, and between design of and realization of a safe operating facility. Repair and rework of these non-compliant designs are leading to significant project cost and schedule impacts. It has been separately disclosed that the

Mr. S. L. Samuelson  
Mr. D. L. Noyes  
12-WTP-0274

-3-

Pretreatment and HLW Vitrification facility designs are not in compliance with the Authorization Basis. A plan to bring the design and authorization basis in alignment is due to DOE in September 2012. The number and significance of these issues indicate that Bechtel National Inc. is not competent to complete their role as the Design Authority for the WTP, and it is questionable that BNI can provide a contract-compliant design as Design Agent.

Bechtel National Inc., has established an engineering team within the Vessel Completion Team (VCT) to resolve the technical issues associated with mixing in the PJM vessels. Bechtel Engineering and the Advanced Simulation and Analysis group have established a strategy for completing design verification of the PJM vessels. This strategy is based on an approach to use Computational Fluid Dynamics for verifying the design of the Newtonian PJM mixed vessels and full scale testing of the vessels designated as Non-Newtonian. Currently this strategy has many issues that have been independently identified by DOE, their independent subcontractor the National Energy Technology Laboratory (NETL) and the Defense Nuclear Facilities Safety Board. At this time it does not appear that CFD will be useful as a design verification tool for vessels that contain appreciable solids concentrations (e.g. > 5 wt%) based on these reviews. BNI Engineering has not developed a technically adequate and complete plan to resolve the vessel mixing issues, including a contingency plan due to the high risks associated with design verification.

The issues identified in the attachment were preceded by similar findings and concerns. Specifically, letters 02-OSR-0480, *Notification of Construction Authorization Readiness Assessment and Associated Concerns*, October 4, 2002, and 02-OSR-0530, *Inspection Report IR-02-015 - Design Process Inspection*, November 21, 2002, document findings associated with Quality Assurance and BNI's design process. That similar issues continue today is objective evidence of a complacent and ineffective Design Agent and Design Authority.

In addition, 5 Level 1 Findings have been issued over the past year starting in October, 2011. BNI still has not produced a root cause analysis/common cause analysis and corrective action plan, for any of the Level 1 Findings, acceptable to the Department.


The behavior and performance of Bechtel Engineering places unnecessarily high risk that the WTP design will not be effectively completed, resulting in fully operational facilities that are needed to comply with Contract requirements. Thus a change in approach to WTP project completion is warranted. The following recommendations are made based on my review of past, present, and future expectations for BNI Engineering performance.

1. The role of the WTP Design Authority should be immediately removed from BNI. The DOE should evaluate and select a preferred option to establish an Independent Design Authority for the WTP that will represent the interests of the DOE and the DOE operator. In addition, DOE should identify an independent operating contractor with approval authority for design and system turnover, consistent with other successful DOE projects.

Mr. S. L. Samuelson  
Mr. D. L. Noyes  
12-WTP-0274

-4-

2. DOE should retain the services of NETL to complete a feasibility study for the application of CFD to the verification of the PJM vessel designs for mixing. DOE and NETL should direct the required testing at the Mid-Columbia Engineering and the Energy Solutions testing facilities via the BNI VCT team to evaluate the feasibility of verification and validation of CFD for what will be its first-time Departmental use in support of nuclear design verification.
3. DOE should independently assess the strategies proposed by the BNI Engineering to complete vessel design verification. These strategies include: 1) the use of CFD, 2) engineering scaling, and 3) full scale testing of a prototype or the actual vessel. These strategies should be defined and characterized. Cost and schedule of these strategies should be estimated. A recommendation of the preferred strategy or combination of strategies should be made based on: cost, schedule to complete, and schedule for completion of the WTP design and commissioning of the WTP. The study should consider vessels already installed and those vessels that remain to be installed including the mixing performance risk associated with each vessel design.
4. DOE management should always seek Federal engineering staff counsel and advice for design, construction, and commissioning issue resolution in advance of, and in preference to, the WTP Contractor and the Design Authority. (Unlike the contractor, Federal staff have no other motive than to represent the interests of the Department and the taxpayer.)



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