

**HANFORD WASTE TREATMENT  
AND IMMOBILIZATION PLANT PROJECT  
AFTER-ACTION FACT-FINDING REVIEW**

REPORT DE535T1

**LMI**  
GOVERNMENT CONSULTING

JANUARY 2006

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## Hanford Waste Treatment and Immobilization Plant Project: After-Action Fact-Finding Review

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## Executive Summary

In December 2000, the Department of Energy (DOE) awarded Bechtel National Incorporated (BNI) a contract to design, construct, and commission the Waste Treatment and Immobilization Plant (WTP) at DOE's Hanford site, near Richland, Washington. At contract award, the government fair cost estimate for total project cost was \$4.35 billion, with a commissioning date in mid-2011.

Since contract award, cost and schedule estimates for the WTP project have increased significantly. In April 2003, when DOE issued Modification A029 to the original contract and engineering design was about 30 percent complete, BNI had revised its estimate for the total project cost to \$5.78 billion, with no revision to the commissioning date. Those estimates became the baseline cost and schedule values for subsequent project management and performance evaluation. However, 2 years later, BNI revised its total project cost estimate to \$8.35 billion with a 4-year schedule delay to a mid-2015 commissioning date.

To better understand the root causes of the projected cost increase and schedule delay, DOE's Office of Engineering and Construction Management (OECM) directed LMI to perform an after-action fact-finding review of the WTP project. In its charter to LMI, OECM limited the review to the following "areas of focus" from the time of the 2003 contract Modification A029 to the present:

- ◆ Identify the main causes of the estimated cost increase and schedule delay.
- ◆ Identify the timeliness, accuracy, and clarity of the reporting to the Department concerning project and contract costs and potential increases thereto.
- ◆ Determine if the Department's project management and contract management policies and procedures were followed and identify impacts if they were not.
- ◆ Determine if the organization structures of the Office of River Protection (ORP) and Headquarters were appropriate, reporting relationships were

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clear and appropriate, and reporting structure was adequate, both within ORP and between ORP and Headquarters.

- ◆ Determine if the staffing level, qualifications, and experience of ORP and Headquarters federal staff have been adequate to oversee and support the WTP project.
- ◆ Determine if the provisions of DOE Order 413.3 were followed including adherence to approval authorities for changes to the project.
- ◆ Determine if acquisition rules and regulations were followed including adherence to approval authorities for changes to the contract.

## CAUSES OF THE COST GROWTH AND SCHEDULE DELAY

We found that the increases in estimated costs and the schedule delays for the WTP project primarily result from a faulty initial estimate and the optimistic treatment of uncertainty and risk for the following: design of novel technology for a large, complex nuclear-chemical plant; quantity, procurement, and availability of physical capital; availability and productivity of qualified (professional and craft) labor; and regulatory compliance. These four factors account for approximately \$2 billion in cost growth.

This cost misestimation was further aggravated by conditions created by a flawed acquisition strategy and a defective management approach. The flawed acquisition strategy spawned a rush to contract in late 2000, which established an unrealistic government fair cost estimate (and subsequent contract price) that has anchored expectations ever since. This strategy also exempted the contractor from selected DOE administrative requirements, including adherence to DOE project management practices, as prescribed in DOE Order 413.3 and DOE Manual 413.3-1.

The management approach employed by Environmental Management and followed by ORP not only bypassed appropriate Headquarters staff assistance and oversight, but also precluded prompt and timely consideration of the potentially costly, high-risk issues—particularly the technology design issues BNI raised in early 2001 and the seismic criteria issues the Defense Nuclear Facilities Safety Board raised in 2002—until they eventually and unavoidably came to a head in mid-2004. This approach allowed the WTP project to proceed long enough so that by the time cost increases surfaced, senior leaders had little choice but to find the funds to complete the project.

Other factors contributed to the estimated cost growth and schedule delay:

- ◆ BNI did not consider the design requirements specified in ACI 349 for the concrete elements of the structures.
- ◆ DOE costing guidance did not anticipate the unusual spikes (\$125 million) in the cost for labor and certain construction commodities, such as steel.
- ◆ BNI, ORP, and Environmental Management never had a useful, realistic cost estimate or baseline.
- ◆ Assuming incorrectly that the legacy design (from a previous contract) resolved most technological issues.
- ◆ Deleting work activities essentially financed some of the contingency costs and, along with frequent adjustments of the performance measurement baseline cost values, masked possible indicators of potential trouble.

Beyond the primary causes, secondary causes, and compounding factors, other factors impact the project: DOE constrained the annual funding and the Tri-Party Agreement (an agreement between DOE, the state of Washington, and the U.S. Environmental Protection Agency concerning the cleanup of the nuclear waste at the Hanford site) constrained the schedule. These two constraints directly opposed each other—a constrained schedule tends to push costs up, while constrained funding tends to push schedules into the future. ORP and BNI managers were caught in the middle—attempting to complete the project according to an unrealistic, mandated schedule and an inefficient, mandated funding profile.

Before Modification A029, ORP and BNI were aware of the issues (although they were not well quantified) that eventually caused the estimated WTP cost growth and schedule delay (between 2003 and 2005). The constrained funding profile and the politically driven schedule constraints existed at contract award in 2000 and combined to compound the problems faced by federal and contractor project managers. The availability and productivity of qualified labor and capital was an issue that the contractor encountered as it mobilized to execute the project in 2001. The evolving design and the need to resolve technical issues were daily challenges.

It is likely that the total project cost estimate will continue to increase beyond the current \$8.35 billion estimate. Three of the more prominent reasons are as follows. First, ORP has been restricted from committing additional funds from the project's contingency allowance since November 2004. Consequently, BNI has had to slow down its construction operation. This slowdown will likely result in additional schedule delays and the associated increased spending once construction resumes at full tempo. Second, BNI has recently identified potential funding increases (of about \$350 million) needed to comply with its contractual requirements of performing no more than 40 percent of the work itself. Third, BNI has

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identified a potential funding requirement (of about \$150 million) to implement new congressionally mandated health and occupational health requirements.

## ORGANIZATION AND STAFFING

Though many earlier reports criticized ORP for being too small an organization, we have been unable to fully validate those criticisms. Moreover, with few exceptions, the ORP staff appears qualified and experienced. We believe reserving \$6 million to acquire consultants on a short-term basis to meet needed technical expertise was a prudent ORP management decision, but we were not persuaded that those funds were effectively used for these purposes. In particular, we believe better and more efficient use of contract technical support, particularly for reviewing technological issues, might have identified and mitigated fundamental issues and looming problems at an earlier date, perhaps saving significant costs attributable to project delay.

Also, we believe a slightly larger ORP contracting staff would have improved the effectiveness of ORP contract management activities. In particular, ORP needs a larger contract administration staff with more contracting officers and contract specialists. Likewise, a dedicated legal advisor on matters of contract law would likely benefit the ORP Manager.

## PROGRAM MANAGEMENT

The acquisition strategy for the WTP project exempted the contractor from selected DOE administrative requirements, including adherence to DOE project management practices, as prescribed in DOE Order 413.3 and DOE Manual 413.3-1. This strategy, plus Environmental Management's approach that bypassed routine Headquarters staff assistance and oversight, ensured that DOE's project management policies and procedures were not fully followed. In the main, Headquarters staff in Environmental Management and OECM was unaware of the true status and issues confronting the WTP project. Consequently, at Headquarters

- ◆ potential problems with the project's cost, schedule, and technical scope were not readily detected, identified, and analyzed;
- ◆ use of contingency funds was not clearly known (except by senior leadership in Environmental Management); and
- ◆ senior DOE management was not notified in a timely manner of the potential for a Performance Baseline deviation.

While ORP project management documents were in place and approved, ORP was not fully following the project management procedures outlined in DOE Order 413.3 and DOE Manual 413.3-1. Moreover, DOE Order 413.3 requirements were intentionally left out of contract documents. As a consequence, project status

reporting from ORP to Headquarters (other than Environmental Management) lacked detail or was misleading.

## REPORTING

The reporting between ORP and Environmental Management senior leadership has been effective. The quantity, quality, and frequency of ORP's formal and informal reports were such that Environmental Management had sufficient data to be fully informed at all times on the status and potential problems of the WTP project.

However, prior to January 2005, ORP's reporting did not serve the Headquarters staff particularly well. The Headquarters staff was not given copies of the ORP weekly reports, nor did they attend the ORP quarterly reviews. They received copies of the briefing slides used in the oral presentation; however, no narrative description or notes of what was actually discussed were included.

Moreover, ORP submitted cost and schedule performance data into the Headquarters' Project Assessment and Reporting System (PARS) that were virtually useless and, indeed, misleading. These data suggested that the project was always perfectly on budget and on schedule, when, indeed, that was not the case. This deficiency stemmed from ORP's use of data obtained from BNI's project control system, which produced data incompatible with ORP's PARS reporting requirements. The root cause of this problem, however, is ORP's decision to approve the BNI project control system for use in this project at the outset of the contract, and then its failure to ensure that the data BNI submitted were appropriate for PARS.

## CONTRACT MANAGEMENT

In general, ORP met the intent of the contract management activities described in DOE Manual 413.3-1. However, we found three significant deficiencies in strictly meeting acquisition rules and regulations. Two deficiencies occurred in 2003 during the development of Contract Modification A029. First, ORP did not obtain formal approval to negotiate the terms and conditions of Modification A029 with BNI before presenting the modification to the Energy Systems Acquisitions Advisory Board for decision on March 28, 2003. Second, ORP exceeded its authority in negotiating modifications in the contract's terms and conditions relating to cost and fee. Notwithstanding these irregularities, the Procurement Executive subsequently approved the modification on April 22, 2003, with conditions. ORP addressed the conditions and, along with BNI, signed Modification A029 on April 25, 2003.

The third significant contracting deficiency occurred in 2005 when a senior ORP official directed BNI to adopt more stringent seismic criteria. There were two issues with this action. First, the letter directed a contract change, which had cost implications (\$758 million) that far exceeded the \$3 million change order



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authority delegated to ORP. Second, the senior ORP official lacked the authority to issue this directive to BNI. ORP incorrectly thought that the senior official had inherent head of contracting authority and, consequently, didn't need a specific delegation letter granting that authority. Nevertheless, this direction far exceeded the ORP head of contracting authority for change orders, delegated or not.

These three deficiencies represent a situation where the ORP contract management processes did not follow a strict interpretation of DOE contract management policy. However, there is no evidence to suggest that the outcome would have been any different had appropriate interpretation of DOE contract management policy occurred. The irregularities do indicate that from a contracting perspective, project momentum was running ahead of project process.

Our after-action fact-finding review also found that rarely were contracting officers and legal counsel involved in reviewing WTP-related correspondence between the ORP and BNI. This is simply not a good practice. We consider the size of the ORP contracting staff inadequate for the workload generated by a project of this magnitude. There is a need for additional contract specialists.