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Office of Inspector General
Office of Audits and Inspections

Audit Report

The Radioactive Liquid Waste Treatment Facility Replacement Project at Los Alamos National Laboratory

OAS-L-13-15

September 2013

Department of Energy
Washington, DC 20585

September 26, 2013

MEMORANDUM FOR THE ASSOCIATE ADMINISTRATOR FOR ACQUISITION AND PROJECT MANAGEMENT
MANAGER LOS ALAMOS FIELD OFFICE

FROM: David Sedillo
Western Audits Division
Office of Inspector General

SUBJECT: INFORMATION: Audit Report on "The Radioactive Liquid Waste Treatment Facility Replacement Project at Los Alamos National Laboratory"

BACKGROUND

The Department of Energy's Los Alamos National Laboratory (Los Alamos) is a Government-owned, contractor operated Laboratory that is part of the National Nuclear Security Administration's (NNSA) nuclear weapons complex. Los Alamos' primary responsibility is to ensure the safety, security and reliability of the nation's nuclear stockpile. To meet its mission, Los Alamos stores, treats and disposes of low-level waste and transuranic liquid waste (TRU) at the Radioactive Liquid Waste Treatment Facility (RLWTF). The facility has been in operation since 1963. In nearly 50 years of operations, the facility's systems have degraded and, on multiple occasions, failed, leaving Los Alamos with no method of processing radioactive liquid waste while the necessary repairs were made. Los Alamos officials have stated that, over time, facility systems are expected to fail again, limiting the Laboratory's ability to meet mission requirements.

NNSA and Los Alamos have been planning a replacement project for the RLWTF since 2004. NNSA and Los Alamos made multiple changes in the design of the facility with plans to construct two facilities in 2005, one facility in 2006, and then returning to the two facilities approach in 2011. The current two facility design, consisting of one facility for low-level waste and one for TRU waste, has a total estimated project cost as much as $214 million and respective completion dates of 2017 and 2020. The two facilities will provide similar capabilities as the existing facility and will be designed to have a 50-year life expectancy.

Due to the significant cost and importance of the project, we initiated this audit to determine whether NNSA and Los Alamos have effectively managed the RLWTF replacement project.

RESULTS OF AUDIT

While NNSA has recently taken action to address RLWTF replacement project issues, we observed that the NNSA and Los Alamos had not effectively managed the project over most of

its lifecycle. Despite more than 7 years of effort, and the expenditure of $56 million, design work for the TRU facility has not been completed and the project's completion date is 11 years behind schedule. Furthermore, the total estimated cost for the replacement project has increased from $86 million to as much as $214 million, a 149 percent increase. Additionally, independent peer and internal control reviews have noted that NNSA and Los Alamos had not:

- Developed reliable life cycle cost estimates;
- Used a Risk Management Plan; and
- Applied Value Engineering principles to optimize the design of the facility.

To its credit, NNSA and Los Alamos have made improvements since the project's inception to strengthen its project management of the RLWTF, including completing corrective actions to improve its project cost estimating, and documenting how the risk mitigation processes will be carried out during the project. Finally, Los Alamos initiated waste minimization measures that allowed NNSA to reduce the planned volume of waste for treatment, thereby reducing the needed square footage of space and the safety systems and components and cost growth. These actions, if sustained, should address project management weaknesses discussed in this report.

Life Cycle Cost Estimation

In a span of more than 7 years, NNSA and Los Alamos have developed three separate designs for the replacement project and as of August 2013, were making further design changes. At the start of Fiscal Year (FY) 2005, during the project's conceptual design phase, Los Alamos prepared an analysis that concluded the preferred alternative and lowest cost option was to build two facilities, one for low-level waste and one for TRU, at an estimated cost range of $61 million to $86 million. In 2006, NNSA and Los Alamos abandoned the two facility design after determining that having two separate treatment facilities was not as operational and cost beneficial as a single facility design using a different treatment technology. NNSA approved the single facility design with an estimated cost range of $82 to $104 million and a completion date of 2012.

In 2010, NNSA estimated that the project completion cost for the single facility had escalated to $350 million due to delays in design and requirement changes that were beyond the project's control. A Los Alamos official told us that some circumstances beyond the Laboratory's control resulted in increased costs and delays to the project. For example, a Los Alamos official told us that the project design was put on hold for about a year pending approval of the Record of Decision for the Los Alamos Site Wide Environmental Impact Statement. Los Alamos and NNSA officials also stated that regulatory and safety code changes required additional funding and delayed the project. For instance, the Defense Nuclear Facility Safety Board was concerned about the use of plastic water treatment equipment such as pipes and tanks. Los Alamos preferred plastic instead of stainless steel because it is corrosive resistant. After incurring the cost of completing numerous engineering studies, Los Alamos was unsuccessful in resolving the Board's concerns and eventually re-designed the related equipment to be stainless steel with anti-corrosive plastic linings. In 2011, Los Alamos incorporated these changes into a two-facility

design. The project's completion dates were 2017 for the low-level waste facility and 2020 for the TRU facility, at a cost range of $202 to $270 million. Finally, at the time of our audit NNSA and Los Alamos were addressing additional safety concerns pertaining to the proximity of the TRU and low-level waste facilities. In response to these concerns, officials were working on a design change to relocate the TRU facility a sufficient distance from the low-level waste facility to resolve safety design concerns at the time of our review.

According to the Department's FY 2014 Congressional Budget Request, the estimate for completion of the RLWTF is between $176 and $214 million, but no construction will be performed on the low-level waste until its performance baseline has been validated and approved. To complete the replacement project, NNSA estimated it will request construction funding of about $126 million in FYs 2014 through 2016. Additionally, a total of $23.4 million in Readiness in Technical Base Facilities funding is expected to be provided from FY 2013 through the completion of the replacement project. According to NNSA, Readiness in Technical Base Facilities funding will be used to operate and maintain the existing treatment facility.

Independent Peer and Internal Control Reviews

Neither NNSA nor Los Alamos had developed adequate life cycle costs information on alternatives designs to support design change decisions. A Partial Independent Project Review conducted by NNSA in March 2006, disclosed significant concerns about the RLWTF estimated costs. For example, the Partial Independent Project Review noted there was no basis for the proposed Total Project Cost range for the single facility option and further, the estimated cost for preliminary and final design was not sufficiently detailed to provide a performance measurement baseline. According to a February 2010 NNSA Technical Independent Project Review (TIPR), the 2005 decision to have two facilities was based on an inadequate life cycle cost analysis. The review noted there was a lack of documentation to support the two-facility decision and that the overall rigor of the evaluation was lacking. Similarly, the TIPR found that the life cycle cost for the single facility approach was not adequate and did not identify the best value to the Government. In addition, a June 2012 Department Independent Cost Review indicated that the life cycle cost estimate for the single facility approach in 2006 had not been updated or revised to reflect current pricing and other factors.

Risk Management

Los Alamos had not employed a formal Risk Management Plan during the early stages of project design. According to Department Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, formal Risk Management Plan for a major project should be initiated prior to conceptual design. In particular, a risk management plan identifies technical, performance, schedule and cost risks, and documents how the risk processes will be carried out during the project. The identified risks are reflected in funded contingency, budgetary requests and funding profiles. According to the TIPR, project performance for the replacement project had been adversely affected by inadequate risk management functions. Although Los Alamos had identified many risks to the project as early as April 2006, according to the 2010 TIPR, the documented risk management activities were not initiated until 2009.

Value Engineering

Additionally, neither NNSA nor Los Alamos had always applied Value Engineering principles to achieve optimal design of the single facility approach. To reach the best cost and benefit life cycle cost alternative, Department Order 413.3B requires the use of Value Engineering techniques as a key process. According to the Order, value engineering is a structured technique commonly used in project management to optimize the overall value of the project by improving the function and/or reducing the cost of an activity.

The TIPR noted the lack of a rigorous Value Engineering approach was likely a significant factor adversely affecting project cost and performance. Specifically, the TIPR indicated that based on the significant projected cost growth, the project team should have used Value Engineering techniques to re-evaluate previous alternatives to validate continuance down the single facility project path. Further, the TIPR found that Los Alamos had not demonstrated its Value Engineering program had been consistently applied to the replacement project for analyzing appropriate project functions using accepted industry techniques with the aim of improving performance, reliability, quality, safety and life cycle costs of the components, systems, structures and procedures.

Improvements

In response to the numerous issues that were disclosed in internal and independent reviews, NNSA and Los Alamos have taken actions to strengthen its project management of the RLWTF. These actions included improving life cycle cost estimations, implementing risk mitigation practices, and taking action to minimize liquid radioactive waste generation at the site, an action that resulted in the cost reduction of the planned facility.

According to Los Alamos officials, they have taken actions to improve cost estimation. In response to the March 2006 Partial Independent Project Review, Los Alamos officials told us that they completed corrective actions such as re-evaluating the Total Project Cost range. Los Alamos officials also told us that they ensured the Total Project Cost range was fully reflective of the opportunities, risks and uncertainties that may impact the project costs and the basis and rationale for the Total Project Cost range were fully documented. To correct the deficiencies noted in the Independent Cost Review, Los Alamos officials told us that they completed corrective actions such as ensuring the cost estimates and design and construction schedules were revised to reflect the current project plans and realization of opportunities. Finally, NNSA conducted an Independent Project Review in November 2012, to ensure that corrective actions that resulted from the Independent Cost Review had been completed and were implemented into the low-level waste baseline and the TRU cost range. The review found that in general, the project team had greatly improved the quality of the baseline and the life cycle cost estimate was detailed and complete.

Further, Los Alamos officials told us that they had developed a Risk Report Plan in May 2013. NNSA officials told us that the current risk management practices incorporated in the Risk Report Plan, if continued, should produce beneficial results going forward.

Although Los Alamos disagreed with the TIPR findings on cost estimating, risk management and Value Engineering, Los Alamos indicated that areas of cost estimating and risk management have been improved by addressing the findings from the Independent Cost Review and Partial Independent Project Review. We noted that Los Alamos disagreed with the TIPR findings regarding Value Engineering and had not prepared a corrective action plan. Additionally, the TIPR identified a number of technical issues for which Los Alamos had not prepared a corrective action plan because it questioned the factual accuracy of the TIPR findings. Due to the different disagreements we observed and the importance of this project, it is essential for the Department to continuously monitor the Value Engineering and other issues identified in the TIPR.

Waste Minimization

Additionally, according to Los Alamos officials, the site has taken action to minimize liquid radioactive waste generation by implementing practices to limit the amount of newly generated waste sent to the existing waste treatment facility. This reduction in waste volumes enabled the site to reduce the planned volume of waste for treatment, thereby reducing the square footage of space and the safety systems and components required for the replacement facility design. Specifically, according to NNSA, based on current evaluations of pollution prevention measures on the past and current waste volume amounts, the two facilities will be designed with the capacity to process about 65 percent less TRU and 47 percent less low-level waste per year than previously forecasted.

PATH FORWARD

NNSA and Los Alamos have made improvements in the project management of the RLWTF. However, we suggest that the Associate Administrator for Acquisition and Project Management and the Manager, Los Alamos Field Office: (1) ensure continuous monitoring of the RLWTF design and construction activities including Los Alamos' use of Value Engineering principles and the technical performance of the project; and (2) optimize opportunities to mitigate risks and reduce costs throughout the project to completion.

Attachment

cc: Deputy Secretary
Acting Administrator, National Nuclear Security Administration
Chief of Staff

Attachment

OBJECTIVE, SCOPE AND METHODOLOGY

OBJECTIVE

The objective of this audit was to determine whether National Nuclear Security Administration (NNSA) had effectively managed its Radioactive Liquid Waste Treatment Facility (RLWTF) Replacement project.

SCOPE

This audit was performed between December 2011 and September 2013, at Los Alamos National Laboratory (Los Alamos) and the Los Alamos Field Office, located in Los Alamos, New Mexico, and the National Nuclear Security Administration Headquarters located in Washington, DC.

METHODOLOGY

To accomplish the audit objective, we:

- Researched laws, regulations and other applicable criteria regarding subject audit;
- Obtained and analyzed the operational capabilities and mission requirements;
- Reviewed and analyzed documents concerning the continued degradation and recurring system failures of the RLWTF;
- Analyzed Defense Nuclear Facility Safety Board documentation and recommendations for the RLWTF;
- Reviewed Safety Basis Documentation for the RLWTF;
- Examined overall budgets and the costs to maintain the system failures at the RLWTF;
- Analyzed plans for a path forward for the RLWTF; and
- Interviewed Los Alamos, Field Office and NNSA Headquarters officials responsible for the RLWTF.

We conducted this performance audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Accordingly, we assessed significant internal controls

and compliance with laws and regulations necessary to satisfy the audit objective. We also assessed the Department's implementation of the *GPRA Modernization Act of 2010* and determined that it had established performance measures for project management. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. Based on our comparisons of computer-processed data to supporting documentation, we determined that the data were sufficiently reliable for the purposes of our report.

Management waived an exit conference.

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