U.S. Department of Energy

Office of Inspector General

Office of Audits and Inspections

AUDIT REPORT

Subcritical Experiment Activities at the Nevada National Security Site

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Department of Energy
Washington, DC 20585

June 26, 2015

MEMORANDUM FOR THE MANAGER, LOS ALAMOS FIELD OFFICE
MANAGER, NEVADA FIELD OFFICE

FROM: David Sedillo, Director
Western Audits Division
Office of Inspector General

SUBJECT: INFORMATION: Audit Report: "Subcritical Experiment Activities at the Nevada National Security Site"

BACKGROUND

The National Nuclear Security Administration's (NNSA) Stockpile Stewardship Program seeks to maintain confidence in the safety, security, and reliability of U.S. nuclear weapons without nuclear testing. As part of the program, NNSA conducts subcritical experiments to obtain scientific data on the behavior of nuclear weapon materials, such as plutonium, with the use of complex, high-speed diagnostic instruments. The experiments are subcritical because no critical mass is formed and no self-sustaining nuclear chain reaction can occur. These experiments are conducted at the Nevada National Security Site's (NNSS) U1a Complex, which is the only site where the Department of Energy (Department) performs these unique experiments.

In the past decade, Los Alamos National Laboratory (Los Alamos) has been the design authority responsible for overseeing subcritical experiments, while National Security Technologies, LLC, (NSTec) has been responsible for fielding and executing the experiments. Twenty-eight subcritical experiments have been performed between 1997 and 2014.[1]

Given the importance of subcritical experiment activities to NNSA's Stockpile Stewardship Program, we initiated this audit to determine whether the Department had effectively managed subcritical experiment activities performed at the U1a Complex.

RESULTS OF AUDIT

Nothing came to our attention to indicate that the Department had not effectively managed the subcritical experiment activities at the U1a Complex. To the contrary, we noted that both Los

[1] One of the 28 experiments was a surrogate scaled hydrodynamic experiment that was conducted with the same rigor as a subcritical experiment by maintaining subcritical experiment formality of nuclear operations in fielding and executing the experiment with its personnel, facilities, and processes.

Alamos and NSTec used project management tools to plan and track the cost, scope, and schedule of the two most recent subcritical experiments. In addition, both used resource loaded schedules in developing their project plans.

Although both organizations used project management tools for planning and conducting the subcritical experiments, we found there were some inconsistencies in budgeting methods for the treatment of contingency/management reserves between Los Alamos and NSTec. Incorporating project reserve funds into the budgeting process is an essential management system component for research and development projects such as subcritical experiments, because they are more likely to encounter cost estimating challenges related to their experimental and developmental nature. Therefore, we consider it a prudent business practice to include contingency/ management reserves in preparing and executing project plans to mitigate the risk of cost overruns inherent in developing cost baselines for such projects.

Project Management

Both Los Alamos and NSTec managed subcritical experiments using project management tools to plan and monitor their cost, scope, and schedule. We examined two subcritical experiment projects: Pollux and Leda. Pollux, with total costs of $108.3 million for the associated Gemini Experimental Series, was executed on December 5, 2012, and was completed 3 weeks behind schedule. It was the first in a series of experiments supporting scaling and surrogacy and dealing with implosions in weapon-like configurations. Leda, with total costs of $41.7 million, was executed on August 12, 2014, and was completed nearly 3 months behind schedule. Leda was a similar experiment to Pollux but used a surrogate material. We reviewed project management data, including the project execution/management plans, and determined that the project plans incorporated resource loaded schedules, established a cost baseline, assessed risks, and identified milestones necessary for tracking the program's performance and progress. We also noted that Los Alamos and NSTec used other tools to keep informed of the experiments, such as weekly team meetings, monthly reports, and interface milestones. Although Los Alamos and NSTec worked jointly on subcritical experiments, each contractor tracked project and financial data separately.

Both Los Alamos and NSTec encountered unplanned issues during the experiments that contributed to the schedule delays experienced by both projects. For example, Pollux experienced budget shortfalls and issues with vessel fabrication that negatively affected the schedule at both Los Alamos and NSTec. To address these two significant issues, an engineering experiment was removed from Pollux to ease the budget and schedule issues, which allowed additional time to resolve issues in the procurement of the confinement vessels. For Leda, Los Alamos experienced some delayed deliverables due to challenges in the fabrication of blast hardware and a damaged experimental device shell after it was dropped. NSTec also had several other challenges that contributed to the nearly 3-month delay, including machine shop calibration deficiencies affecting the quality of machined parts critical to the experiment, and a pause in operations related to rewritten high explosives procedures. Despite the schedule delays, only NSTec experienced a cost overrun over its original estimate. NSTec's increased costs were attributed to difficulties in designing and fabricating a tapered glass imaging feedthrough and optical coupling to a camera; redesigning pulse forming network boards; and fabricating additional imaging and fiber optic feedthroughs.

Even though Los Alamos and NSTec were not required to use project management tools, such as those prescribed in Department Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, for research and development experiments, it is commendable that they implemented the practices. We observed that most elements of good project management were applied, such as well-defined project requirements and effective communication among all project stakeholders. In addition, Los Alamos and NSTec implemented a process for identifying and using operating experiences and lessons learned to improve future subcritical experiment performance. Specifically, soon after the completion of Pollux and Leda, Los Alamos and NSTec project personnel participated in compiling lessons learned and implementing corrective measures and improvement actions.

Contingency and Management Reserve

Although both organizations used project management tools for the subcritical experiments, we noted the inconsistent use of contingency and management reserves by Los Alamos and NSTec among experiments. For example, Los Alamos included contingency in its Pollux Project Management Plan but did not include contingency in the Leda experiment baseline, even though Leda was considered a higher risk for successful project execution than Pollux. NSTec's Project Execution Plan for the Pollux experiment also included management reserve but did not include management reserve for the Leda experiment. An NSTec official stated that it was an oversight for not including management reserve for Leda for potential risk of cost/schedule overruns. NSTec overran the budget estimate costs for the Leda project by $4.6 million. NSTec officials stated that even though management reserve was not included in Leda's Project Execution Plan, NSTec was able to fund the cost overrun from other sources. An NSTec official stated that management reserve was for uncertainties identified through the risk management process and was held and applied at the directorate level rather than at the project level.

Consistent application of project management tools such as contingency and management reserve helps ensure that subcritical experiments are executed on cost and schedule and that the risks encountered can be minimized. According to *Improving Project Management*, dated November 2014, by the Contract and Project Management Working Group, adequate contingency, funding stability, and accurate project cost and schedule estimates are key considerations in a project's funding process.

SUGGESTED ACTIONS

We did not identify any significant issues with Los Alamos' and NSTec's management of subcritical experiment activities. We suggest, however, that the Los Alamos and Nevada Field Office Managers work together to ensure that project management tools are consistently applied when planning and executing subcritical experiments.

Attachment

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

OBJECTIVE, SCOPE, AND METHODOLOGY

OBJECTIVE

The objective of this audit was to determine whether the Department of Energy (Department) had effectively managed subcritical experiment activities performed at the U1a Complex.

SCOPE

We performed this audit between September 2014 and June 2015 at the Los Alamos National Laboratory and the Los Alamos Field Office in Los Alamos, New Mexico; the Nevada Field Office in North Las Vegas, Nevada; and the Nevada National Security Site in Mercury, Nevada. The audit was conducted under Office of Inspector General project number A14LV044.

METHODOLOGY

To accomplish the objective, we:

- Reviewed and analyzed Department and contractor criteria including policies, procedures, functions, and responsibilities for performance of subcritical experiment-related activities;
- Interviewed key Federal and contractor personnel associated with the subcritical experiment activities;
- Toured the U1a Complex at the Nevada National Security Site;
- Reviewed prior assessments and reports related to subcritical experiment activities;
- Reviewed and analyzed project execution and project plans for the most recent subcritical experiments executed, Pollux and Leda; and
- Reviewed databases and systems used for monitoring and tracking subcritical experiment issues.

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. The audit included tests of controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Additionally, we assessed the implementation of the *GPRA Modernization Act of 2010* as necessary to accomplish the objective and determined that performance measures related to subcritical experiments were established as required. 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. We did not rely on computer-generated data to satisfy our objective and therefore did not conduct a data reliability assessment. Management waived an exit conference.

FEEDBACK

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