



U.S. Department of Energy  
Office of Inspector General  
Office of Audit Services

# Audit Report

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The National Nuclear Security  
Administration's Refurbishment of  
the B61

**DOE/IG-0697**

**August 2005**



## Department of Energy

Washington, DC 20585

August 30, 2005

### MEMORANDUM FOR THE SECRETARY

FROM:

*Gregory H. Friedman*  
Gregory H. Friedman  
Inspector General

SUBJECT:

INFORMATION: Audit Report on "The National Nuclear Security Administration's Refurbishment of the B61"

### BACKGROUND

The Department of Energy's National Nuclear Security Administration (NNSA) is responsible for ensuring that the Nation's nuclear weapons stockpile continues to meet military requirements. NNSA accomplishes this mission, in part, by using a comprehensive refurbishment program that designs, builds, tests, and installs new sub-systems and components necessary to extend the operational service life of the weapons in the stockpile.

Currently, the B61 weapon system, an important element of the U.S. arsenal, is being refurbished as part of an effort known as Alteration 357. The refurbishment is being performed at multiple sites across the complex and is designed to correct serious concerns that could impact weapon reliability. Los Alamos National Laboratory is responsible for the design work; the Y-12 National Security Complex and Kansas City Plant are engaged in production activities; and, other sites play various support roles. To manage the refurbishment, NNSA developed a project plan that called for building the "first production unit" by June 2006, at an initial total estimated cost of about \$540 million. Full-scale production is scheduled to begin once the Joint Nuclear Weapons Council approves the design and specifications of the refurbished weapon.

The Office of Inspector General has previously identified problems in project management and weapons refurbishment programs in NNSA. Consequently, this audit was conducted to determine whether NNSA would complete the B61 refurbishment within the schedule, scope and cost set forth in its project plan.

### RESULTS OF AUDIT

NNSA is at risk of not achieving the first production unit for the B61 refurbishment within the original schedule and scope specifications. NNSA experienced unforeseen technical problems, outside of its control, that delayed the design and testing of certain B61 components. However, other delays were avoidable had the proper internal control structure been in place. Furthermore, at the time of our review, NNSA did not have a valid estimate of total refurbishment costs. Specifically:



- A key component milestone had to be rescheduled at least 13 months later than originally planned because of inconsistent and conflicting production schedules among the participating sites;
- Receipt of essential production equipment was delayed as much as nine months because project officials had not agreed on the appropriate delivery schedule. Further, the program experienced problems with the commercial vendor responsible for providing the production equipment in question; and,
- NNSA's refurbishment baseline did not contain complete, consistent and validated cost data.

Finally, NNSA did not follow established procedures when making scope changes to the refurbishment project.

We concluded that NNSA's project planning and management processes were not adequate to ensure refurbishment completion in accordance with the original parameters. NNSA had not: (1) ensured that the individual production schedules of participating sites were linked and consistent with its overall Integrated Master Schedule; (2) provided sufficient authority to the refurbishment project manager to ensure that sites and contractors met the planned schedule; and, (3) validated its cost estimates in a comprehensive way to ensure that all costs were included and that only appropriate costs were charged to the project.

Failure to complete the refurbishment within the established schedule and scope could jeopardize B61 warhead reliability as well as delay other currently scheduled refurbishments. Further, the lack of a validated cost baseline impairs management's ability to control future costs. Consequently, we made specific recommendations to improve project management controls over the B61 project as well as other NNSA weapons systems refurbishments.

### MANAGEMENT REACTION

Management agreed with our recommendations for improving project planning and execution, yet expressed confidence that the appropriate program management tools and management focus are in place for successful completion of the B61 refurbishment. Management comments are summarized beginning on page 6 and are included in their entirety as Appendix 3.

### Attachments

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

# **REPORT ON THE NATIONAL NUCLEAR SECURITY ADMINISTRATION'S REFURBISHMENT OF THE B61**

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## Project Management Controls Over the B61 Refurbishment

### **Refurbishment Project Schedule, Scope, and Cost**

The National Nuclear Security Administration (NNSA) is at risk of not achieving the First Production Unit (FPU) for the B61 refurbishment within the original schedule and scope specifications. NNSA was unable to reuse a key material in the refurbishment which, in turn, delayed the design and testing of key components and increased costs for research and development of a substitute material. NNSA also experienced other delays that, in our opinion, were avoidable. Specifically, we found that:

- Completion of a key component milestone was delayed at least 13 months due to inconsistencies in participating sites' production schedules and,
- Delivery of key production equipment was delayed as much as 9 months due to the failure of project officials to agree on the delivery schedule and problems with a commercial vendor.

In addition, NNSA reduced the project scope by eliminating testing against certain physical environments and had not developed a valid cost baseline to control costs.

#### Component and Equipment Delays

NNSA experienced delays in the design, testing, and production of certain components and delivery of production equipment. For example, the need to develop a substitute material led to delays of about two years for the final designs of five components. Consequently, nine of 10 component tests scheduled to be accomplished between October 2002 and August 2004 were delayed an average of 214 days each.

In addition, inconsistencies in production schedules led to re-scheduling the completion of key components. Specifically, the Integrated Master Schedule (Master Schedule) called for a critical component to be completed by June 2003, yet Y-12's production schedule indicated it would not be completed until October 2006 (4 months after the FPU date). After we brought the inconsistency to their attention, management rescheduled the completion of this milestone to July 2004, or 13 months after originally planned.

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The refurbishment also experienced significant delays in equipment delivery. The project plan indicated that the refurbishment was dependent on the efforts of other NNSA programs to provide equipment to reconstitute production capabilities. However, agreement on production equipment delivery schedules was delayed as much as 16 months; and equipment delivery, in some cases, was delayed as much as 9 months.

NNSA management acknowledged that delays had occurred but maintained that it was not necessary to change the completion date. In responding to a draft of this report, NNSA officials asserted that equipment delays were partly caused by problems with their vendor, and the delays would not affect the ability of production sites to meet the FPU schedule. Because of inconsistencies between the Master Schedule and site schedules, we were not able to confirm this assertion. In addition, NNSA officials asserted that they had developed recovery plans but did not provide them to demonstrate how these plans would mitigate the delays so that the FPU date could be met.

#### Scope Change

Although NNSA originally planned to test the B61 against certain physical environments, some tests will not be performed. In March 2004, an intra-Department of Defense memorandum requested the elimination of testing against certain physical requirements. Such scope changes are required by the project plan to be vetted and approved by the interagency Project Officer Group composed of representatives from the Department of Defense commands, the Air Force and NNSA. However, NNSA made this scope change without obtaining formal Project Officer Group approval. Laboratory project officials and Air Force personnel expressed concerns to us about how this scope reduction could affect the ability to utilize the weapon.

NNSA stated that the scope change was not accomplished in accordance with the established process but contended that the Project Officer Group and the Design Review and Acceptance Group acknowledged this requirement change and subsequent impact. We found no documentation to support this contention.

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### Cost Baseline

NNSA had not established a valid baseline to control the cost of the refurbishment. Initially, it estimated that the refurbishment would cost about \$540 million. Currently, NNSA estimates that the refurbishment has decreased in cost to about \$368 million, primarily as a result of the reduction in production units. However, these estimates:

- Omitted certain costs related to the project, such as the manufacture of production equipment; and,
- Excluded production support costs after Fiscal Year 2005 but included these costs for prior periods.

The project manager told us that he had concerns about the accuracy of the cost estimate and was unable to use it to manage the refurbishment.

NNSA stated that certain costs were omitted since they were for purchases that may at some time in the future be used by other programs. However, DOE Manual 413.3-1 requires that cost estimates include all costs necessary to complete the project. Additionally, NNSA stated that a valid cost baseline existed, but its purpose was to report costs rather than to control costs. This statement contradicts established Federal requirements. The Office of Management and Budget Circular A-11 requires a documented, systematic process for program management, which includes the integration of program scope, schedule, and cost objectives, as well as the establishment of a baseline plan for accomplishing program objects.

### **Project Management Weaknesses**

NNSA's project planning and management authority were not adequate to meet the refurbishment's original schedule, to ensure scope changes were justified, and to control costs.

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## Project Planning

NNSA did not ensure that the Master Schedule and site schedules were consistent. Project personnel stated that there had never been a validation of the Master and site schedules to ensure consistency. Further, while project personnel attempted to update the Master and site schedules quarterly, they were hampered by the lack of standardized scheduling software. The various sites used at least two different software programs; this lack of standardization did not allow for the automated reconciliation of inconsistent schedules, and necessitated using manual reconciliation processes. Those processes required a line-by-line manual review of schedules (some as long as 200 pages) that often resulted in logic errors.

Also, project officials did not follow the process for approving scope changes. The B61 project plan required a Baseline Change Request and Project Officer Group approval to justify changes to the scope. NNSA, however, eliminated testing under certain physical environments but did not prepare either a Baseline Change Request or obtain Project Officer Group approval for the scope change. The project manager told us that the intra-Department of Defense memorandum requesting the change constituted the necessary approval. However, as previously noted, other project officials remained concerned about the effect of the scope change on the refurbished weapon. Such concerns should have been resolved through the Baseline Change Control process.

Furthermore, project management did not ensure that cost information was comprehensively validated, as required by Department Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*. NNSA personnel stated they had difficulty validating the costs at each of the sites due, in part, to the sites not following NNSA cost guidance. For example, the Kansas City Plant reported tooling costs in the "other" category in one estimate and in the "direct costs" category in another estimate. Further, the cost validation team only spent a limited amount of time at each site and was unable to confirm the accuracy of the data. The inconsistent and inaccurate costs information resulted from discrepancies and variations in contractor reporting systems.



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## Project Management Authority

The project manager lacked the necessary authority to ensure that NNSA organizations and contractors met schedule and cost milestones. For example, the project manager did not have control over the work to be performed as called for under the Work Breakdown Structure (WBS). A WBS defines the project's total scope, establishes the relationship between schedule and costs, and provides a mechanism for managing the overall project. However, NNSA allowed each of the sites to maintain their own WBS, which was not linked to the project manager's Master Schedule. Consequently, the refurbishment project manager could not easily assess site progress in meeting milestones in the Integrated Master Schedule and could not readily determine what resources were needed to complete the project. For example, equipment delivery was under the control of other NNSA programs and was affected by the budget of those programs. The refurbishment project manager did not have the ability to ensure that adequate resources were devoted to obtaining production equipment in a timely manner.

### **National Security Implications**

Failure to complete the B61 refurbishment within the established schedule and scope could jeopardize warhead reliability, as well as delay other currently scheduled weapons systems refurbishments. The lack of a validated cost baseline also impairs management's ability to control costs.

### **RECOMMENDATIONS**

We recommend that the Administrator, NNSA:

1. Improve project planning by:
  - Validating and periodically reconciling Master and site schedules;
  - Validating cost baselines; and,
  - Ensuring that project managers follow established Baseline Change Request procedures in making scope changes.

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2. Enhance project execution by providing project managers with clear operational authority to ensure that all NNSA organizations meet cost and schedule milestones.

**MANAGEMENT  
REACTION**

Management agreed with our recommendations for improving project planning and execution, yet is confident that the appropriate project management tools exist to allow them to successfully execute the B61 refurbishment, which is a high priority for NNSA and national security. Management's response is included as Appendix 3.

**AUDITOR  
COMMENTS**

Management's comments are responsive to our recommendations. Despite the assertion that appropriate project management tools are in place for successful execution of the B61 refurbishment, these tools were not fully effective. For example, management stated that it normally reconciled the Master and site schedules, however as previously noted, this was a manual process that often resulted in the introduction of logic errors. Until management fully utilizes effective project management tools, the risk will remain that the FPU may not be achieved within schedule, scope, and cost.

**OBJECTIVE** The objective of this audit was to determine whether NNSA would complete Alteration 357 of the B61 within the schedule, scope, and cost set forth in its project plan.

**SCOPE** The audit was performed between August 2003 and May 2005, and examined the B61 Alteration 357 refurbishment activities. Audit work was performed primarily at Headquarters, National Nuclear Security Administration; the Albuquerque Service Center; Los Alamos and Sandia National Laboratories; and, the Y-12 National Security Complex.

**METHODOLOGY** To accomplish the audit objective, we:

- Reviewed applicable Public Laws, Department orders, other Departmental guidance, related correspondence and contracts;
- Analyzed prior OIG and Government Accountability Office reports;
- Reviewed compliance with the *Government Performance and Results Act of 1993*;
- Analyzed key documents related to the B61 Alteration 357 refurbishment;
- Interviewed key headquarters, field, laboratory and plant personnel; and,
- Consulted with Department officials regarding standard project management practices.

The audit was conducted in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the objective of the audit. Accordingly, we assessed the significant internal controls and performance measures established under the *Government Performance and Results Act of 1993* and found that measures

## Appendix 1 (continued)

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specifically related to the B61 Alteration 357 refurbishment were not performance based. 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 conduct a reliability assessment of computer-processed data because we did not consider such data critical to achieving our audit objective.

NNSA management waived an exit conference on August 3, 2005.

### RELATED REPORTS

#### OFFICE OF INSPECTOR GENERAL REPORTS

- *Reestablishment of Enriched Uranium Operations at the Y-12 National Security Complex* (DOE/IG-0640, February 2004). The audit found that Department efforts to reestablish enriched uranium operations within technical scope, cost, and schedule were hindered because an effective project management system was not utilized before or during the project.
- *Refurbishment of the W80 Weapon Type* (DOE/IG-0590, March 2003). This audit reported inconsistencies between the NNSA project plan and the sites' detailed plans; lack of change control or other means to ensure that the NNSA manager knows when the sites make changes that could impact cost, scope or schedule; and, design and peer review delays.
- *The Department of Energy's Pit Production Project* (DOE/IG-0551, April 2002). The audit found that the Pit Production Project experienced delays because the original schedule was too aggressive. Additionally, the program lacked a robust critical path linking required work to project milestones. Also, work packages were not fully integrated.
- *Best Practices for Environmental Management Baseline Development* (DOE/IG-0476, July 2000). Baseline development best practices include the verification of baselines to ensure they are accurate and supportable and that major changes were incorporated. This can be accomplished by the use of external validation, use of external cost estimators, use of cost contingency to measure risk, and updating baselines to reflect changes in scope, cost, and schedule.

#### GOVERNMENT ACCOUNTABILITY REPORTS

- *NUCLEAR WEAPONS: Opportunities Exist to Improve the Budgeting, Cost Accounting, and Management Associated with the Stockpile Life Extension Program* (GAO-03-583, July 2003). This audit found that all associated costs were not included with the life extension programs' FY 2003 budgets. Also, the NNSA accounting system did not align the programs and activities in order to provide the full cost of the life extension programs. Further, planning processes did not fully integrate the individual life extensions into an overall program, and there was not an adequate process for reporting cost and schedule changes against established baselines.

## **Appendix 2 (continued)**

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- *NUCLEAR WEAPONS: Improved Management Needed to Implement Stockpile Stewardship Program Effectively* (GAO-01-48, December 2000). The audit found that coordination between the design laboratories and plants was weak. Additionally, there were no overall project plans, cost, and schedule baselines for the design process, and no overall baseline for the production processes.

### **OTHER REPORTS**

- *Progress in Improving Project Management at the Department of Energy, 2003 Assessment* (National Research Council, 2004). The report found that Department management did not have a consistent set of expectations about project management. Further, the Department invests little in project management human resource development compared to other federal agencies. The report attributed the slow pace of project management improvement to several factors, including the desire of Department personnel and contractors to be independent of oversight from Headquarters and the lack of management emphasis.
- *Progress in Improving Project Management at the Department of Energy, 2002 Assessment* (National Research Council, 2003). The report noted that poorly planned projects were observed for which it was obvious that all of the requirements of Department Order 413.3 were not met. Specifically they noted that some projects were not using Earned Value Management Systems properly or at all. Changes in project scope were not recognized quickly.
- *FY 2001 Report of the Panel to Assess the Reliability, Safety and Security of the United States Nuclear Stockpile* (March 2002). The report notes that project managers do not have control over the resources needed to execute their projects and do not have decision-making authority for the projects.
- *Improving Project Management in the Department of Energy* (National Research Council, 1999). The report stated that baselines should be set when 10 – 30 percent of design is completed and should be validated by an independent review. Projects should have contingency for both cost and schedule. Further, the report found that the project manager should have control of the budget, schedule, and contingency for the project.




Department of Energy  
National Nuclear Security Administration  
Washington, DC 20585



JUL 07 2005

MEMORANDUM FOR George W. Collard  
Assistant Inspector General  
for Audit Operations

FROM: Michael C. Kane   
Associate Administrator  
for Management and Administration

SUBJECT: Comments to B61 Draft Report

The National Nuclear Security Administration (NNSA) appreciated the opportunity to have reviewed the Inspector General's (IG) draft report, "The National Nuclear Security Administration's Refurbishment of the B61." We understand that the IG conducted this audit to determine whether NNSA would complete Alteration 357 of the B61 within the schedule, scope, and cost set forth in its project plan.

The IG noted that if NNSA is unable to complete the B61 refurbishment in a timely manner, national security may be impacted by the uncorrected concerns that exist with the weapon system, and may delay other currently scheduled weapons systems refurbishment. The B61 refurbishment is a high priority for NNSA and National Security. NNSA is confident that the appropriate program management tools and management focus are in place for successful execution of the B61 refurbishment

NNSA appreciates the IG's validation of this programmatic information that was provided by our weapons' managers. We have provided some technical comments as well as the following:

- The comment that NNSA has not developed a valid cost baseline to control costs is not completely accurate. There is a valid cost baseline, but its purpose is to report costs rather than to control costs. NNSA is required by the joint Department of Defense (DoD) / Department of Energy 6.X process to establish a baseline cost report by the end of phase 6.3. This report, completed at the end of FY2003 validated by an independent team in 2004 (this information was provided to the auditors) is the cost baseline for the project. Subsequent changes to the baseline are documented in the Selected Acquisition Report published annually.

- The change in scope that the IG mentions was as a result of a letter from the DoD where they increased the minimum delivery altitude for these bombs, thus reducing the “slap down” (term of art) environment to be tested and certified. The Project Officers Group, led by the U.S. Air Force, and the Design Review and Acceptance Group acknowledged this requirement change and the subsequent impact (and change) to the project was reported to them. The Project Officers Group is officially documenting this change in a revision of the Stockpile-to-Target Sequence. Additionally, NNSA has a formal change control process in place when altering the scope of the refurbishment effort for the B61 and for all Life Extension Programs. However, the IG is correct that there was an example of a change that was not completed according to the established process.

- Regarding the recommendations:

NNSA agrees with the recommendation to validate and reconcile the master and site schedules since this is a normal course of action within the project.

NNSA agrees with the recommendation to validate cost baselines, and, as pointed out by the IG, we had limited success. Therefore, we will refine our guidance and implementation to the field elements to ensure consistency.

NNSA agrees that project managers must follow established Baseline Change Request procedures in making scope changes. This is our established procedure and, although the IG pointed out one instance of non-compliance, NNSA does not have any systemic weaknesses in this area.

Since Project Management is a Departmental Management Challenge, the IG is correct in recommending the enhancement of project execution. NNSA continues to actively improve its project management processes by its adherence to Departmental Order 413 for construction projects, Manual for Weapon Programs and Campaigns, and NNSA Business Operating Policy on Project Management.

Should you have any questions about this response, please contact Richard Speidel, Director, Policy and Internal Controls Management.

cc: Deputy Administrator for Defense Programs  
Senior Procurement Executive  
Director, Service Center



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