



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

Audit Report

Status of the National Ignition Facility Project



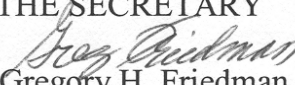
Department of Energy

Washington, DC 20585

April 28, 2003

MEMORANDUM FOR THE SECRETARY

FROM:


Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Audit Report on the "Status of the National Ignition Facility Project"

BACKGROUND

The National Ignition Facility (NIF) at Lawrence Livermore National Laboratory will be an integral part of the National Nuclear Security Administration's (NNSA) mission of maintaining the safety, reliability, and effectiveness of the nuclear stockpile without underground nuclear testing. The facility will be key to the science-based stockpile stewardship program – creating temperatures, pressures, and densities that approach those found in an exploding nuclear weapon. NIF will be the only NNSA facility to achieve fusion ignition with energy gain, which is important for understanding the performance of nuclear weapons, as well as for future energy security. Other experiments planned for the facility will advance basic understanding in areas such as materials science and astrophysics.

The facility was originally estimated to cost \$1.2 billion for project construction. However, in 1999, the Department of Energy reported that there would be significant schedule and cost problems in completing the facility by the June 2003 completion date. In April 2001, NNSA revised the completion date to September 2008 and presented revised cost estimates of \$2.2 billion for project construction and another \$1.2 billion for demonstrating and commissioning the facility's laser performance. In light of the initial schedule and cost concerns, we conducted the audit to determine whether NNSA would be able to complete the construction of the facility within the revised schedule and cost baselines.

RESULTS OF AUDIT

Our audit showed that significant progress has been made towards constructing the facility within the revised schedule and cost baselines. As of February 2003, about 73 percent of the facility was completed and Livermore had met all revised milestone dates within the cost baseline. Further, Livermore had developed project management controls, including developing internal milestone dates that were more aggressive than the dates set by NNSA, to keep construction, commissioning, and operating cost estimates up to date and within the revised cost baseline.



Despite the positive progress made, rigorous and continuous monitoring of the project's progress is warranted. Future uncertainties related to the remaining work on the project exist. For example, the construction of a primary component, the laser system, is extremely complex and will not be performance tested until the end of 2006.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Director, Office of the National Ignition Facility Project, NA-10.2
Director, Policy and Internal Controls Management, NA-66

STATUS OF THE NATIONAL IGNITION FACILITY PROJECT

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NATIONAL IGNITION FACILITY

Background

Construction of the National Ignition Facility, a 192-beamline 1.8 megajoule laser being built by Lawrence Livermore National Laboratory (Livermore), began in 1997. The project is comprised of six major components: conventional facility; laser system; target experimental system; integrated computers and controls; assembly, installation, and refurbishment equipment; and utilities. To manage the project to the revised schedule and cost baselines, Livermore established control account plans for each of the six components in conjunction with a work breakdown schedule. Control account managers were assigned and held responsible for maintaining the schedule and keeping the component cost estimates up to date for each control account plan.

Analyses Performed

In order to accomplish our audit objective, we identified specific cost and schedule milestones contained in the revised project execution plan; verified that each of the planned major milestones were completed within cost and schedule; and compared projected future costs to remaining budget and contingency funds. We also physically examined completed portions of the facility; confirmed component test results; and examined the accuracy of status reports submitted to National Nuclear Security Administration (NNSA) headquarters.

Schedule and Cost

To date, significant progress has been made towards constructing the facility within the revised schedule and cost baselines. Our review showed that, as of February 2003, the overall project was about 73 percent complete and Livermore had met all revised scheduled milestone dates ahead of schedule. Further, Livermore had developed project management controls to ensure that the estimated construction, commissioning, and operating costs for the facility were kept up to date and the project remained within the revised cost baseline.

Milestone Schedules

To ensure that the project remained on schedule, Livermore developed internal milestone dates that were more conservative than the required milestone dates set by NNSA and agreed to by Congress. For example, Livermore's established internal target date to demonstrate the first laser light to the target chamber was set for the second quarter of FY 2003, whereas the NNSA target date was set for the third quarter of FY 2004. Livermore achieved this milestone in January 2003. In another test of the laser system, NNSA required Livermore to achieve a 10 kilojoule, 1-omega light through the beamline infrastructure by the fourth quarter of FY 2004. Livermore set and achieved the internal milestone date in the first quarter of FY 2003.

Scheduled milestones were also being achieved for the construction and assembly of the target experimental system. NNSA required Livermore to install the chamber's target positioner by the third quarter of FY 2003; however, Livermore established their internal milestone for the first quarter of FY 2003 and met this milestone goal in January 2003.

For the utilities component, NNSA required Livermore to complete installation of the utility components for the laser bay number 2-cluster line number 3 beampath by the first quarter of FY 2003. With a goal for the fourth quarter of FY 2002, Livermore completed the installation in April 2002.

Management of Construction Costs

Livermore was also managing the construction and demonstration costs within the revised baseline. Managers were required to manage the funds allocated in their control account plans to the schedule and to identify cost savings within their plans. Control account managers were also required to develop cost savings approaches to help maintain the project within the cost baseline of the control account plans and to alert senior project managers of project cost increases in a timely manner. In this regard, senior project managers established controls to ensure that the major component cost estimates were kept up to date and potential cost increases identified by the control account managers were justified. Further, the control account managers did not automatically have access to contingency funds. Rather, control account managers were required to justify the need for the contingency funds based on an on-going or annual evaluation of the status of the control account plans.

Also, when the control account managers determined that components would be completed at less than the estimated amount, senior management reduced the balance in the control account plan and moved the amount to the contingency fund. For example, the original cost to build and install the laser system component was estimated at \$1.2 billion. After completing 65 percent of the construction and installation of the laser system, the control account manager updated the total cost estimate for completion of the laser system to reflect a reduction of \$12.7 million. Through the annual cost account plan evaluation, senior project managers and the control account manager identified this cost reduction and transferred the cost reduction to the contingency fund.

Further, Livermore was managing its contingency funds to ensure an adequate balance for the remainder of the project. As of February 2003, Livermore had \$127 million available in construction contingencies, of which \$82 million was fenced for anticipated cost increases, leaving \$45 million available for the remainder of the project.

Livermore had an additional reserve for the laser demonstration and commissioning of \$135 million, of which \$61 million was fenced for anticipated cost increases, leaving \$74 million for the remainder of the project.

Future Uncertainties

While it is encouraging that significant progress has been made towards constructing the overall facility within the revised schedule and cost baselines, it is important to note that the remaining work to be completed on this project is complex. Specifically, construction of the facility's laser system, at the time of our review, was still underway. The laser system is a primary component of the facility and involves constructing lasers that are capable of producing power of about 1,000 times greater than the electric generating power of the United States. We were not able to determine if the facility will meet NNSA's laser performance requirements for project completion, since Livermore is not planning to fully test these performance requirements until the end of 2006.

The NNSA has faced significant challenges in the past regarding this project, and other risks may arise as the project progresses towards completion. Therefore, in our judgment, rigorous and continuous monitoring of the status of the project is fully warranted.

APPENDIX

SCOPE

The audit was performed from August 2002 to February 2003, at NNSA Headquarters and Lawrence Livermore National Laboratory.

METHODOLOGY

The audit focused on revised cost and schedule documents prepared during 2001 through February 2003. To accomplish the audit objective, we:

- Interviewed NNSA and Livermore officials associated with the NIF project;
- Reviewed Congressional Data Sheets outlining project expectations;
- Examined the Project Execution Plan detailing the methodology for accomplishing the project objectives;
- Assessed status reports and schedules to compare actual milestone accomplishments to planned targets;
- Analyzed actual and planned cost data to identify if milestones were being accomplished within budget targets and potential future cost increases were being mitigated by contingency funds;
- Reviewed performance reporting requirements for the facility; and,
- Reviewed related internal and external management reports.

At the completion of our field work, the Office of Inspector General received an allegation of potential performance problems at NIF. Prior to the issuance of our report, we discussed this allegation with NNSA management. NNSA had also received the allegation and was investigating. We reviewed the results of NNSA's investigation and did not identify any reportable issues.

The audit was conducted in accordance with the 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 audit objective. Accordingly, we assessed internal controls related to the facility's cost and schedule. We also assessed the performance measures under the Government Performance and Results Act of 1993 and found that performance

measures were in place related to our audit objective. We did not test computer-processed data since we did not rely on the data to satisfy the audit objective. 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 discussed the results of this audit with officials from NNSA and Livermore on February 26, 2003. Since no recommendations were made, a formal response was not required.

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