



Highlights of [GAO-10-488](#), a report to the Subcommittee on Energy and Water Development, Committee on Appropriations, U.S. Senate

## Why GAO Did This Study

In March 2009, the National Nuclear Security Administration (NNSA), a separately organized agency within the Department of Energy, completed construction of the National Ignition Facility (NIF). NNSA considers NIF critical to its stockpile stewardship program to ensure the safety and reliability of the nation's nuclear weapons, absent live nuclear testing. NIF is intended to simulate the extreme temperatures and pressures of “ignition”—an atomic fusion event propagating a nuclear explosion—for the first time in a laboratory. GAO was asked to examine (1) the extent to which NNSA has addressed key scientific and technical challenges that could prevent ignition at NIF; (2) whether NNSA has an effective approach for managing the cost, schedule, and scope of ignition-related activities; and (3) potential impacts to NNSA's stockpile stewardship program if ignition at NIF is not achieved, as planned, between fiscal years 2010 and 2012. To conduct this work, GAO analyzed relevant budgets, reports, and plans, and interviewed NNSA and national laboratory officials and independent experts.

## What GAO Recommends

GAO recommends that NNSA take actions to improve its effectiveness in (1) using outside experts to advise on scientific and technical challenges—by ensuring, for example, that the new committee reports to NNSA and advises on ignition activities early—and (2) managing NIC's cost, schedule, and scope. NNSA agreed with the recommendations.

View [GAO-10-488](#) or [key components](#). For more information, contact Gene Aloise at (202) 512-3841 or [aloise@gao.gov](mailto:aloise@gao.gov) or Tim Persons at 202-512-6412 or [personst@gao.gov](mailto:personst@gao.gov).

## NUCLEAR WEAPONS

### Actions Needed to Address Scientific and Technical Challenges and Management Weaknesses at the National Ignition Facility

#### What GAO Found

Despite substantial progress, NNSA, its national laboratories, and the other organizations carrying out the NIF ignition effort face difficult scientific and technical challenges, which could limit the extreme temperatures and pressures that can be achieved using NIF's 192 lasers and, thus, delay or prevent ignition at NIF. As a result, successful ignition at NIF during the first attempt, scheduled for late 2010, remains unlikely, according to independent experts. In addition, Lawrence Livermore National Laboratory, which operates NIF for NNSA, waited 4 years to implement a recommendation to form a standing external review committee of experts to advise on the challenges. Although a committee met for the first time in December 2009, three factors could limit its effectiveness. First, the committee may not be able to give fully objective, candid advice, because the committee will take direction from, and report to, Livermore's Director, rather than to NNSA. Second, the committee will mainly review ignition activities after the fact, rather than advising on them sooner. Third, although its membership includes at least one scientist with significant nuclear weapons design experience, the committee may lack sufficient expertise to determine whether ignition-related efforts will meet the future needs of scientists conducting stockpile stewardship research at NIF.

Weak management by NNSA has allowed the cost, schedule, and scope of ignition-related activities to increase substantially, and further increases are possible. In 2005, NNSA established the National Ignition Campaign (NIC) to focus the management of ignition activities. Since then, however, NIC's costs have increased by around 25 percent—from \$1.6 billion to over \$2 billion—and the planned completion date has slipped by 1 year to the end of fiscal year 2012. Also, major new scope activities and milestones were added to NIC in 2008 to prepare NIF for stockpile stewardship experiments by the 2012 date. In addition, NNSA allowed tasks critical for the first ignition attempt—such as constructing concrete doors to protect personnel from radiation—to be removed from the NIF construction effort, which began in 1997, and deferred years later to NIC. Delays in completing the long-deferred tasks under NIC could delay, beyond 2012, ignition or other goals.

There would be no immediate impact to NNSA's Stockpile Stewardship Program if ignition at NIF is not achieved by the end of fiscal year 2012, according to NNSA and national laboratory officials. The consequences of not achieving ignition, however, would become more serious over time, possibly reducing NNSA's confidence in the data it uses to certify the safety and reliability of the nuclear weapons stockpile. In September 2009, during the first stockpile stewardship experiments at NIF, Livermore scientists began using NIF to validate NNSA's data and models on weapon performance under nonignition conditions. However, Livermore and NNSA officials said that only ignition experiments can help address some significant areas of uncertainty in predicting weapon performance, particularly as weapons in the stockpile age or are refurbished.