

GAO Highlights

Highlights of [GAO-23-105714](#), a report to the Committee on Armed Services, House of Representatives

Why GAO Did This Study

NNSA is responsible for ensuring the performance, safety, and reliability of the nation's nuclear stockpile without nuclear explosive testing. Subcritical experiments are used to support NNSA's assessments. NNSA conducts these experiments at the U1a underground facility at the Nevada National Security Site. This allows NNSA to obtain experimental data on plutonium and high explosives together without a nuclear explosion—hence, the experiments remain subcritical.

In 2014, NNSA identified the need for new data from these experiments and established the ECSE program to provide such data.

House Report 117-118, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2022, included a provision for GAO to review the ECSE program. GAO's report (1) describes the objective of the program and (2) examines the risks that NNSA has identified to completing the program and the extent to which NNSA has used appropriate program management processes to manage these risks.

To address both objectives, GAO reviewed program documentation, interviewed NNSA and contractor officials, and conducted site visits.

What GAO Recommends

GAO is recommending that NNSA ensure adoption of additional management processes to improve risk management of the Zeus ECSE program elements. NNSA concurred with GAO's recommendation and plans to implement it by September 2025.

View [GAO-23-105714](#). For more information, contact Allison Bawden at (202) 512-3841 or BawdenA@gao.gov or Karen Howard at (202) 512-6888 or HowardK@gao.gov.

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NUCLEAR WEAPONS

Program Management Improvements Would Benefit U.S. Efforts to Build New Experimental Capabilities

What GAO Found

The National Nuclear Security Administration's (NNSA) objective for the Enhanced Capabilities for Subcritical Experiments (ECSE) program is to improve NNSA's ability to assess the performance, safety, and reliability of nuclear weapons without nuclear explosive testing. To do so, NNSA plans to make new measurements of plutonium during subcritical experiments by building

- an instrument named Scorpius to produce a series of x-ray images of the plutonium and
- an instrument named Zeus to measure the rate of the nuclear chain reaction.

As of March 2023, NNSA estimated that constructing both instruments and related infrastructure upgrades in the U1a facility will cost about \$2.5 billion to \$2.6 billion. NNSA requires both instruments by 2030 to inform plans for modernizing the nuclear weapons stockpile.

Images of a Subcritical Experiment Vessel and the U1a Underground Experimental Facility



Sources: Lawrence Livermore National Laboratory and Nevada National Security Site. | [GAO-23-105714](#)

NNSA has identified risks to the ECSE program and has appropriately managed risks to build Scorpius. Specifically, NNSA identified risks to the ECSE program in four categories: integration of efforts, safety, economic conditions, and technology development. GAO found that NNSA applied appropriate processes to manage these risks for Scorpius and associated infrastructure, such as using a technical change control board to integrate the efforts to design and build Scorpius and the associated infrastructure upgrades.

NNSA used less rigorous processes to manage risks for Zeus and its associated infrastructure, resulting in a 2-year delay and increased cost. Specifically, the lack of processes to integrate the instrument and infrastructure, such as a technical change control review board, resulted in the need for additional mining at U1a to accommodate instrument design changes. While NNSA used less rigorous management processes typical of research and development programs, such as Zeus, NNSA's program management requirements provide flexibility to use additional processes to appropriately address risks. As of May 2023, NNSA began implementing more rigorous processes to manage Zeus' infrastructure, but NNSA has not yet adopted more rigorous processes to manage risks for the Zeus instrument, in particular related to technology development and integration. By implementing additional risk management processes, NNSA may prevent further delays to Zeus and the associated infrastructure and ensure that it obtains necessary data for stockpile modernization.