



OFFICE OF INSPECTOR GENERAL

U.S. Department of Energy

AUDIT REPORT

DOE-OIG-19-18

March 2019

**THE FIRE SUPPRESSION SYSTEM AT
THE NATIONAL CRITICALITY
EXPERIMENTS RESEARCH CENTER AT
THE NEVADA NATIONAL SECURITY SITE**



Department of Energy
Washington, DC 20585

March 12, 2019

MEMORANDUM FOR THE NUCLEAR CRITICALITY SAFETY PROGRAM MANAGER,
NATIONAL NUCLEAR SECURITY ADMINISTRATION

Michelle Anderson
FROM: Michelle Anderson
Deputy Inspector General
for Audits and Inspections
Office of Inspector General

SUBJECT: INFORMATION: Audit Report on “The Fire Suppression System at
the National Criticality Experiments Research Center at the Nevada
National Security Site”

BACKGROUND

The National Criticality Experiments Research Center (NCERC) is located within the Device Assembly Facility (DAF) at the Nevada National Security Site in Mercury, Nevada. Responsibility for the DAF falls under the Nevada National Security Site management and operating contractor, and NCERC is operated by Los Alamos National Laboratory (Los Alamos). At the start of the audit, National Security Technologies, LLC (NSTec) managed and operated the Nevada National Security Site. However, in December 2017, Mission Support and Test Services, LLC (MSTS) replaced NSTec as the Nevada National Security Site management and operating contractor. The National Nuclear Security Administration (NNSA) has oversight of Los Alamos National Laboratory, Nevada National Security Site, and their respective management and operating contractors.

NCERC’s principal operation is to conduct research and experiments on nuclear criticality for the Department of Energy. NCERC maintains a special nuclear material inventory to support its nuclear security missions. In addition, NCERC contains the largest collection of nuclear critical mass assembly machines in the western hemisphere and is the sole remaining facility in the United States that uses a variety of nuclear materials such as uranium and plutonium for criticality experiments. Currently, NCERC has four critical assembly machines and two machines contain radioactive components. The unique aspects of the NCERC critical assembly operations represent critical processes that are incapable of being reproduced anywhere within the Department, and according to Los Alamos officials, the critical assembly machines and data are irreplaceable.

In June 2009, a Nuclear Explosive Safety Study Group reported concerns that activation of the NCERC fire suppression system would release water on the criticality machines, which could

lead to a criticality accident. According to the report, this concern was the basis for the protracted disagreement between Los Alamos and NNSA. The report concluded that the NCERC fire suppression system required further investigation and analysis, along with technical expertise to evaluate alternatives based on a graded risk basis. In addition, the report noted that because of criticality safety concerns, a compromise was reached in which the fire suppression system selected for NCERC was a dry pipe system. This type of system is designed to reduce the likelihood of an unplanned release of water, as the system piping does not contain water unless a smoke or heat detector is tripped.

Prior to the end of its contract, NSTec was in the process of repairing the degraded lead-in lines in the DAF that supply water to each individual building to correct original construction deficiencies. Since responsibility for the repairs flows to the new contractor, replacement of the deteriorated lines in the DAF, which includes NCERC, continued as part of the Fire Suppression System Deficiencies/Lead-In Line Repair Projects. The repair projects were completed by the end of October 2018 at a cost of approximately \$39 million.

We initiated this audit to determine whether the National Nuclear Security Administration fully evaluated fire suppression system alternatives prior to initiating repairs at NCERC.

RESULTS OF AUDIT

Our review found that NNSA had not fully evaluated fire suppression system alternatives based on a graded risk basis prior to initiating and completing repairs at NCERC. During our audit, NNSA directed that an analysis of the alternatives be performed; however, the analysis is not yet complete. There was a difference of opinion on the appropriate type of fire suppression system at NCERC, and MSTs and Los Alamos had not reached agreement. Specifically, we found that:

- In February 2017, NSTec evaluated the installation of a non-water based fire suppression system and concluded it was not suitable for use with special nuclear materials and proceeded with the repair of the current water-based system. The feasibility study did not address the criticality safety concerns with a water-based system and potential damage to the critical assemblies and special nuclear materials; and
- In April 2017, Los Alamos issued a report that contradicted the NSTec report by concluding that the non-water based fire suppression system evaluated was not a criticality safety concern and will not damage special nuclear materials.

NSTec and Los Alamos disagreed on the fire suppression system for use at NCERC. While criticality safety issues have been addressed, further review is needed to fully evaluate the protection of equipment. Even though a prior NSTec official involved with the fire suppression system evaluation transitioned to the new contractor, the disagreement regarding the preferred system continues between MSTs and Los Alamos.

MSTs and Los Alamos disagreed on the appropriate type of fire suppression system to be installed at NCERC because:

- Los Alamos had not provided a criticality safety evaluation to determine possible reactions that a fire suppressant may have on special nuclear materials; and
- According to an NNSA official, prior to our audit, NNSA did not formally request Los Alamos to evaluate or analyze the criticality safety concerns on fire suppression options at NCERC in accordance with Department Order 420.1B, *Facility Safety*.

The presence of nuclear materials creates a fire suppression system challenge for NCERC because water, as a firefighting medium, has the potential for initiating a criticality accident. In fact, MSTs and Los Alamos acknowledged that using water as an extinguishing agent for a fire could potentially cause an unplanned criticality incident or damage the NCERC critical assemblies. In addition, Los Alamos officials stated that water discharged from a fire suppression system could become radiologically contaminated, collect on the floor, and eventually spread into other areas of the DAF.

NNSA has analyzed the potential for criticality accidents with regard to the use of water for the NCERC fire suppression system. It is of the utmost importance that a fire suppression system at NCERC protect lives and assets by detecting and extinguishing a fire, as well as limiting the extent of fire damage. Los Alamos officials consider the NCERC critical assemblies to be national security assets, one of a kind, and irreplaceable. In response to our draft report, on September 14, 2018, NNSA directed the Nuclear Criticality Safety Program manager to evaluate the feasibility of implementing an alternative to the current water-based automatic fire suppression system at NCERC. According to an NNSA official, NNSA plans to start the feasibility study in March 2019.

Path Forward

We suggest that the NNSA, Nuclear Criticality Safety Program Manager:

1. Complete the feasibility study of implementing an alternative to the current water-based automatic fire suppression system at NCERC as planned.

Attachment

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

OBJECTIVE, SCOPE, AND METHODOLOGY

OBJECTIVE

We conducted this audit to determine whether the National Nuclear Security Administration fully evaluated fire suppression system alternatives prior to initiating repairs at the National Criticality Experiments Research Center (NCERC).

SCOPE

The audit was performed from October 2016 through March 2019. The scope of the audit was limited to the NCERC facility. We conducted work at the Nevada National Security Site, located in Mercury, Nevada and the Nevada Field Office, located in North Las Vegas, Nevada. The audit was conducted under Office of Inspector General project number A17LV001.

METHODOLOGY

To accomplish the audit objective, we:

- Reviewed and analyzed Department of Energy and contractor criteria, including applicable laws, regulations and program guidance applicable to the fire suppression system at the NCERC Facility;
- Interviewed key Department and contractor officials, as well as Department and contractor officials that were subject matter experts in the areas of fire suppression and criticality safety;
- Reviewed and analyzed reports related to fire suppression systems; and
- Toured the NCERC facility at the Nevada National Security Site.

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 objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Accordingly, the audit included tests of controls and compliance with laws and regulations to the extent necessary to satisfy the objective. We considered the *GPR Modernization Act of 2010* as necessary to accomplish the objective and determined that it was not applicable to our audit scope. 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-processed data to accomplish the audit objective. Therefore, an assessment of the reliability of this computer-processed data was not performed.

We held an exit conference on February 11, 2019.

FEEDBACK

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