



OFFICE OF INSPECTOR GENERAL

U.S. Department of Energy

# INSPECTION REPORT

DOE-OIG-20-15

December 2019

**SANDIA NATIONAL LABORATORIES'  
CATEGORIZATION OF ITS  
RADIOLOGICAL FACILITIES**



**Department of Energy**  
Washington, DC 20585

December 9, 2019

MEMORANDUM FOR THE MANAGER, SANDIA FIELD OFFICE

A handwritten signature in dark ink, appearing to read "John E. McCoy, II", is positioned above the typed name.

FROM: John E. McCoy, II  
Deputy Assistant Inspector General  
for Audits and Inspections, West  
Office of Inspector General

SUBJECT: INFORMATION: Inspection Report on "Sandia National  
Laboratories' Categorization of its Radiological Facilities"

BACKGROUND

Sandia National Laboratories (Sandia) is a multidisciplinary national laboratory and federally funded research and development center headquartered in Albuquerque, New Mexico. Sandia's mission is to anticipate and resolve emerging national security challenges, innovate and discover new technologies, create value through products and services that solve important national security challenges, and inform the national debate where technology policy is critical to preserve security and freedom. The National Nuclear Security Administration contracted the management and operation of Sandia to National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc.

In accomplishing its mission, Sandia utilized controlled radiological materials that could pose dangers if released following a significant incident, such as an explosion, fire, spill, improper material transfer, flood, or earthquake. To minimize danger to life or property, the Department of Energy issued requirements for conducting safety analyses that included the categorization of radiological facilities. Contractors responsible for Department facilities must categorize nuclear facilities using the criteria set forth in DOE-STD-1027-92. DOE-STD-1027-92 required such facilities to be categorized into Hazard Category 1, 2, 3, or below Category 3, also known as a radiological facility.<sup>1</sup>

To properly categorize nuclear facilities, inventories of radiological materials must properly account for sealed radiological sources and in-growth products caused by decay, also known as

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<sup>1</sup> A Hazard Category 1 facility has the potential for significant offsite consequences; a Hazard Category 2 facility has the potential for significant onsite consequences; and a Hazard Category 3 facility has the potential for significant localized consequences, meaning that an incident would only affect the immediate worker.

daughter products.<sup>2</sup> DOE-STD-1027-92 allowed sealed radioactive sources to be excluded from the calculation of a facility's radioactive inventory if they were engineered to pass special form testing.<sup>3</sup>

In February 2011, Sandia identified five containers of legacy radioactive material (i.e., materials that were no longer in use) stored in a radiological facility that exceeded the threshold for radiological facilities, causing the facility to be miscategorized. Two years later, a similar issue occurred, again causing a facility to be miscategorized. These incidents occurred because the inventory system in place at the time the containers were put into storage did not account for daughter products. Based on the facility categorization errors and the risk posed if facilities are miscategorized, we conducted this inspection to determine whether Sandia properly categorized its radiological facilities.

## RESULTS OF INSPECTION

During our review of Sandia's process to categorize radiological facilities, nothing came to our attention to indicate that the facilities at Sandia in Albuquerque, New Mexico, were not properly categorized in accordance with DOE-STD-1027-92. Following the 2011 miscategorization incident, Sandia completed a comprehensive review of its radiological storage facilities to ensure that all legacy materials were properly accounted for in the inventory system. In addition, Sandia implemented a procedure to ensure that daughter products of radioactive materials were accounted for in the facility inventory used for categorization.

While we did not identify any instances of noncompliance, we did find areas for improvement within Sandia's internal controls and have made suggestions that will strengthen the primary hazard screening (PHS) process. Specifically, in order to reconcile the PHS documents back to the proof that sealed sources were engineered to pass special form testing in accordance with DOE-STD-1027-92, Sandia developed an indirect, ad-hoc method to link PHS's to proof of testing documentation that relied exclusively on the recollection of the PHS author. We were unable to confirm the results of this ad-hoc method based on documentation alone. This is because neither DOE-STD-1027-92 nor Sandia required the personnel completing PHS's to include information linking the excluded sealed sources to documentation showing that the sealed sources were properly engineered to pass testing. We view this as an area for improvement.

### **Legacy Materials and Daughter Products**

In 2011, Sandia identified five containers of legacy materials that caused a radiological facility to exceed the threshold for that categorization — the facility should have been categorized as a Hazard Category 3 facility. This happened because the inventory system in place when the containers were put into storage did not account for in-growth products caused by decay, also known as daughter products. In response to this incident, Sandia completed an inventory review

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<sup>2</sup> Per the U.S. Nuclear Regulatory Commission, a radioisotope may transform into one or more different isotopes over time (known as "decay products" or "daughter products").

<sup>3</sup> For example, testing of sealed sources required by the Department of Transportation included impact, percussion, bending, heat, and leaching tests, among others.

on all of its radiological storage facilities to identify legacy materials that may have been improperly accounted for as a result of changing inventory systems and requirements. During its review, Sandia identified another container of radiological materials that exceeded the radiological facility threshold, again causing a facility to be miscategorized. According to Sandia officials, there should not be a reoccurrence of the 2011 and 2013 incidents because all legacy radiological materials in storage were entered into an inventory system called the Radiological Information Tracking System during the comprehensive inventory review.

To verify that Sandia had a process in place to account for daughter products moving forward, we randomly selected 10 PHS documents that included any of the 5 isotopes identified in DOE-STD-1027-92 as being capable of creating daughter products and met with responsible Sandia officials to discuss their process and calculations. While we did not have the technical expertise to verify Sandia's calculations, we determined that Sandia had a process in place to account for daughter products, and nothing came to our attention to indicate that the process was improper.

### **Primary Hazard Screenings**

We found that Sandia had a procedure in place to conduct PHS's in accordance with DOE-STD-1027-92. DOE-STD-1027-92 required only a "minimal effort to identify the inventory of hazardous material in order to perform an initial hazard categorization." In addition, DOE-STD-1027-92 stated that reviewing basic facility information, including likely isotopes and quantities that will be used, should lead to an acceptable assessment. While Sandia's Environmental, Safety, and Health Planning (ES&H) Department performed an annual review of PHS's, it did not have a process to validate the accuracy of PHS's.

Sandia utilized a PHS tool to categorize facilities that contain radiological materials. The amount of radiological materials present at a facility may fluctuate throughout the year. Thus, conducting PHS's based on actual inventories at one point in time may significantly differ from the inventories at another point in time. To account for these fluctuations, Sandia took a conservative approach when conducting the PHS's and included all radiological materials that were expected to enter the facility throughout the course of the year. For example, a roving material could be used in a number of Sandia's facilities and was therefore included in each facility's PHS, even though it could only be present in one facility at a time.

We randomly selected 12 PHS documents from a universe of 380 and conducted interviews with the personnel responsible for completing the documents. Sandia officials responsible for completing the PHS documents stated that the conservative estimate approach used to complete the screening documents accounted for maximum annual anticipated values. This was important because the amount of on-hand radiological materials varied from day-to-day depending on planned activities and an underestimation could result in the facility being miscategorized. A miscategorization as a lower hazard category (i.e., a radiological facility rather than a Hazard Category 3) could result in the facility having improper safety protocols in place because higher Hazard Categories require additional safeguards. However, as a result of the conservative estimate approach and changing on-hand amounts of radioactive materials, we could not conduct an inventory to verify the materials listed on the PHS documents.

The ES&H Department at Sandia had a policy to review and approve PHS documents that were authored and submitted by the manager responsible for the activity. However, Sandia lacked a policy or procedure detailing either the manner or the frequency by which the ES&H Department should validate the accuracy of PHS's for radiological activities — we believe that this is an important step to fulfill its approval role. Further complicating their ability to accurately approve PHS's, officials from the ES&H Department explained that they did not have the staffing or resources required to validate the accuracy of PHS's. As a result, the accuracy of PHS's was exclusively reliant on the inputs of the manager responsible for the activity, the author of the document. We believe that this reliance on the author and the lack of any verification by the ES&H Department represented a control weakness. While we did not find any instances of facility miscategorization during the course of our inspection, and although not required by current policy or guidance, we believe that the ES&H Department's failure to validate the accuracy of PHS's increases the likelihood of such errors.

### **Excluded Sealed Sources**

We reviewed 53 excluded sealed sources and, while we did not identify any systemic instances of noncompliance, we did find areas for improvement within Sandia's internal controls. DOE-STD-1027-92 allowed sealed radioactive sources to be excluded from the calculation of a facility's radioactive inventory during the PHS if (1) the sealed sources were engineered to pass special form testing, and (2) the facility maintained documented proof that the excluded sources were appropriately engineered to pass required testing.<sup>4</sup> At Sandia, proof that sealed sources were engineered to pass required tests was documented by a certificate issued by the U.S. Department of Transportation, the Canadian Nuclear Safety Commission, the State Office for Nuclear Safety, or the manufacturer of the container. We conducted our review of sealed sources because of the risk that facility inventories would be understated if sealed sources were improperly excluded. Improper exclusion could occur if Sandia could not show that a sealed source was engineered to pass the special form testing specified in DOE-STD-1027-92, which could result in a facility miscategorization.

We selected 53 sealed sources for review and requested the certificates documenting that the source was engineered to pass special form testing. Sandia provided certificates for 52 sealed sources; however, the PHS documents did not contain enough information for us to be able to reconcile the certificates back to the excluded sealed sources listed on the PHS documents. DOE-STD-1027-92 did not specify how contractors (in this case Sandia) should document that excluded sealed sources were engineered to pass the required testing in their PHS's. In addition, Sandia did not have a policy or procedure in place requiring that PHS documents include certificate information, such as the certificate number or type, for sealed sources that were excluded from the inventory calculations. As a result, we were only able to directly link certificates for six of the sealed sources to the associated PHS documents because those PHS's included the certificate numbers.

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<sup>4</sup> DOE-STD-1027-92 was updated in November 2018 (DOE-STD-1027-2018). The updated standard requires facilities that exclude material in sealed radioactive sources to maintain records for each excluded sealed source which demonstrate that the source is engineered to pass and continues to meet appropriate American National Standard Institute/International Organization for Standardization or International Atomic Energy Agency special form performance criteria.

The ES&H Department developed an indirect, ad-hoc method to link the certificates for 46 of the remaining 47 excluded sources. This method required contacting the personnel that completed the PHS's to obtain additional information. However, we were unable to confirm the results of this ad-hoc method based on documentation alone due to the lack of information on the PHS's. We view this as an area for improvement.

Lastly, Sandia did not have the certificate for one excluded sealed source. When we brought this to the attention of responsible ES&H Department officials, they acknowledged that this source should not have been excluded from the facility inventory and stated that the PHS document was corrected.

## **DOE-STD-1027**

When completing PHS's and categorizing radiological facilities, contractors are directed to utilize DOE-STD-1027-92, Change Notice 1, September 1997. However, during interviews with officials from Sandia and the Sandia Field Office, we were told that DOE-STD-1027-92 was outdated and that the Department was in the process of revising the guidance.

The application of DOE-STD-1027-92, Change Notice 1, September 1997, was cause for concern because the revised draft version of DOE-STD-1027 updated the isotope thresholds and Sandia officials stated that the revised draft would also increase the number of isotopes tracked that produce daughter products. Because Sandia was required to apply the DOE-STD-1027-92, Change Notice 1, when categorizing its radiological facilities, it was only accounting for some daughter products.

In November 2018, the Department issued the revised standard, DOE-STD-1027-2018. Following the issuance of the revised standard, Sandia created a draft implementation plan to be used once the Field Office modified the management and operating contract to include the new DOE-STD-1027-2018.

## **SUGGESTIONS**

Nothing came to our attention to indicate that the facilities at Sandia in Albuquerque, New Mexico, were not properly categorized in accordance with DOE-STD-1027-92. Therefore, no recommendations are associated with this inspection; however, we have the following suggested actions.

To strengthen Sandia National Laboratories' PHS process, we suggest that the Manager, Sandia Field Office:

1. Advise the Environmental, Safety, and Health Planning Department at Sandia to establish a process to ensure PHS's are validated for accuracy on a routine basis.
2. Ensure that documentation proving that sealed sources have been engineered to pass special form testing can be easily reconciled to the document where sealed sources are being excluded from a facility's radioactive inventory.

## MANAGEMENT RESPONSE

Management stated that it would consider the report suggestions as opportunities to further enhance operations. Management provided technical comments under separate cover.

Management's formal response is included in Appendix 3.

## INSPECTOR COMMENTS

We reviewed management's technical comments provided under separate cover and held meetings with NNSA officials. Based on those discussions, we updated the report to address technical comments related to their concerns, where appropriate, to enhance the clarity of the report. However, we stand by the factual accuracy of our report. We encourage management's consideration of our suggestions.

### Attachments

cc: Deputy Secretary  
Chief of Staff  
General Counsel

## **OBJECTIVE, SCOPE, AND METHODOLOGY**

### **OBJECTIVE**

We conducted this inspection to determine whether Sandia National Laboratories (Sandia) properly categorized its radiological facilities.

### **SCOPE**

The inspection was performed from August 2018 through July 2019 and included a review of Sandia's process to categorize radiological facilities. The scope of this inspection was limited to the current radiological facilities at Sandia National Laboratories in Albuquerque, New Mexico. The inspection was conducted under Office of Inspector General project number S18IS010.

### **METHODOLOGY**

To accomplish the inspection objective, we:

- Identified the laws, regulations, and Department of Energy directives that affect the categorization of radiological facilities, including DOE-STD-1027;
- Identified all current radiological facilities at Sandia that have known radiological material;
- Interviewed National Nuclear Security Administration and contractor personnel regarding the categorization of radiological facilities;
- Identified the method used to categorize the radiological facilities; and
- Performed tests of internal controls to ensure that all radioactive materials were included in Primary Hazard Screening (PHS) inventory documents. Specifically, we:
  - a. Sampled 12 PHS documents from a universe of 380 and interviewed the personnel responsible for them to determine what process is used to create PHS documents and how personnel ensure that all materials are included on PHS documents. We also requested a site visit and observed the physical inventory.
  - b. Sampled 10 PHS documents from a universe of 24 that had radioactive materials that could produce daughter products and interviewed personnel to determine how they account for those daughter products in the PHS.
  - c. Sampled 10 PHS documents from a universe of 15 that had excluded sealed sources from the facility's radioactive inventory. Those 10 PHS documents listed multiple excluded sealed sources, resulting in a total of 53 being tested. The purpose of our testing was to determine if Sandia had the required documentation to exclude the sources from the DOE-STD-1027 requirements.

This inspection was conducted in accordance with the Council of the Inspectors General on Integrity and Efficiency, *Quality Standards for Inspection and Evaluation*. Those standards require that we plan and perform the review to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our inspection objective.

We believe that the evidence obtained provided a reasonable basis for our findings and conclusions based on our inspection objective. The inspection included tests of controls and compliance with laws and regulations to the extent necessary to satisfy the inspection 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 inspection. Also, we assessed the Department of Energy's implementation of the *Government Performance and Results Act (GPRA) Modernization Act of 2010* as it relates to our inspection objective and found that the Department had established performance measures related to Sandia's radiological facility categorization program. Additionally, we relied on computer-processed data to some extent to satisfy our objective. We confirmed the validity of such data, as appropriate, by conducting interviews and reviewing source documents, and deemed it to be sufficiently reliable for our purposes.

An exit conference was held on September 6, 2019.

## **PRIOR REPORT**

Inspection Report on [Review of Management and Accountability of Sealed Radioactive Sources Maintained at Department Sites](#) (OAI-L-16-09, May 2016). The inspection found that Los Alamos National Laboratory and Pacific Northwest National Laboratory had controls in place to manage and account for sealed sources. Administrative errors were identified that were not material to the safe and secure management of the sealed sources. When these errors were brought to management's attention, it immediately resolved the issues.

**MANAGEMENT COMMENTS**

**Department of Energy**  
**Under Secretary for Nuclear Security**  
**Administrator, National Nuclear Security Administration**  
**Washington, DC 20585**



September 5, 2019

MEMORANDUM FOR TERI L. DONALDSON  
INSPECTOR GENERAL

FROM:

LISA E. GORDON-HAGERTY

SUBJECT:

Response to the Office of Inspector General Draft Report  
*Sandia National Laboratories' Categorization of Its  
Radiological Facilities (S18IS010)*

Thank you for the opportunity to review and comment on the subject draft report. The Department of Energy's National Nuclear Security Administration (NNSA) appreciates the inspectors' validation of the effectiveness of the National Technology & Engineering Solutions of Sandia, LLC (NTESS) process for categorizing radiological facilities at the Sandia National Laboratories, as well as procedural enhancements to address previously self-identified categorization issues.

While no instances of noncompliance were identified, as written, the reader may interpret the report to imply there are control deficiencies impacting the hazard categorization process. We would like to clarify that NTESS's process meets all applicable requirements and standards. We will, however, consider the inspectors' suggestions as opportunities to further enhance operations.

Subject matter experts have provided technical comments for the inspectors' consideration under separate cover to enhance the clarity and factual accuracy of the report. If you have any questions regarding this response, please contact Mr. Dean Childs, Director, Audits and Internal Affairs, at (301) 903-1341.

Attachment



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