



OFFICE OF INSPECTOR GENERAL

U.S. Department of Energy

INSPECTION REPORT

DOE-OIG-24-08

November 2023

**ALLEGATION REGARDING
COMPUTING FACILITIES
MAINTENANCE AND CALIBRATION AT
THE OAK RIDGE NATIONAL
LABORATORY**



Department of Energy
Washington, DC 20585

November 29, 2023

**MEMORANDUM FOR THE MANAGER, OAK RIDGE NATIONAL LABORATORY SITE
OFFICE**

SUBJECT: Inspection Report on Allegation Regarding Computing Facilities Maintenance and Calibration at the Oak Ridge National Laboratory

The attached report discusses our review of the allegation regarding computing facilities maintenance and calibration at the Oak Ridge National Laboratory. This report contains three recommendations that, if fully implemented, should help ensure that the issues identified in this inspection are corrected. Management fully concurred with our recommendations.

We conducted our inspection from January 2023 through September 2023 in accordance with the Council of the Inspectors General on Integrity and Efficiency's *Quality Standards for Inspection and Evaluation* (December 2020). We appreciated the cooperation and assistance received during this inspection.

A handwritten signature in black ink, appearing to read "Anthony Cruz".

Anthony Cruz
Assistant Inspector General
for Inspections, Intelligence Oversight,
and Special Projects
Office of Inspector General

cc: Deputy Secretary
Chief of Staff
Director, Office of Science



Department of Energy Office of Inspector General

Allegation Regarding Computing Facilities Maintenance and Calibration at the Oak Ridge National Laboratory (DOE-OIG-24-08)

WHY THE OIG PERFORMED THIS INSPECTION

The Office of Inspector General received an allegation regarding computing facilities maintenance and calibration at the Oak Ridge National Laboratory (ORNL). Specifically, the complainant alleged that: the calibration program was inadequate, and pressure relief valves (PRVs) were not properly maintained.

We initiated this inspection to determine the facts and circumstances regarding the allegation concerning computing facilities maintenance and calibration at ORNL.

What Did the OIG Find?

We substantiated the allegation regarding computing facilities maintenance and calibration at ORNL. Specifically, we found that the calibration program was inadequate to meet quality assurance requirements. Further, we found that PRVs were not always maintained in accordance with applicable criteria.

These issues occurred because of a lack of ORNL oversight. For example, ORNL was unable to provide the required documentation showing how the quality assurance requirements were met for the relied-upon software. Additionally, ORNL did not always follow its Standards-Based Management System Procedure when maintaining PRVs.

Separately, while addressing the allegations, we found that for one subcontract, ORNL did not properly flow down Department of Energy Order 414.1D Change 2, *Quality Assurance*, as required. This was due to an oversight on ORNL's part.

What Is the Impact?

If quality assurance requirements are not met for the monitoring software that replaces manual calibration, maintenance issues or unforeseen outages could occur. Further, failure of PRVs could affect the availability of computational space, hindering customers' ability to meet their mission needs.

What Is the Path Forward?

To address the issues identified in this report, we have made three recommendations that, if fully implemented, should help ensure that the issues identified are corrected.

BACKGROUND

UT-Battelle, LLC (UT-Battelle) manages and operates the Oak Ridge National Laboratory (ORNL), which is a multi-program research laboratory in Eastern Tennessee for the Department of Energy. ORNL provides computing facilities, which include one of the most powerful high-computing centers in the world, providing researchers with leadership-class computers for scientific simulations. The computing facilities and their support facilities are maintained by UT-Battelle and multiple subcontractors through the Computational Facilities Complex. The complex was established to meet or exceed customer expectations for mission availability in these facilities. The electrical and mechanical infrastructure serving these facilities is crucial for maintaining internal and external customers' requirements 24 hours a day, 7 days a week to meet their mission needs.

On September 16, 2022, the Office of Inspector General received an allegation regarding computing facilities maintenance and calibration in the data centers related to buildings 5300, 5600, and 5800 at ORNL. The complainant alleged that operations and maintenance for ORNL's data center were poorly managed. Specifically, the calibration program was not adequate, and there was poor or no maintenance on pressure relief valves (PRVs). We initiated this inspection to determine the facts and circumstances regarding the allegation concerning computing facilities maintenance and calibration at ORNL.

MAINTENANCE AND CALIBRATION

We substantiated the allegation regarding computing facilities maintenance and calibration at ORNL. Specifically, we substantiated that UT-Battelle's calibration program was inadequate to meet quality assurance requirements in the data centers related to buildings 5300, 5600, and 5800 at ORNL. Further, we substantiated that maintenance was not always performed on PRVs according to applicable criteria.

Calibration of Equipment

UT-Battelle's calibration program was inadequate to meet quality assurance requirements. Specifically, UT-Battelle was unable to provide sufficient documentation that demonstrated calibration had been performed in accordance with applicable criteria. Department Order (Order) 414.1D, Change 2, *Quality Assurance*, requires the calibration and maintenance of equipment used for process monitoring, data collection, inspections, and tests.

According to a UT-Battelle manager, routine calibration is not necessary because each piece of equipment is calibrated at installation, and the data center systems are continuously monitored by a subcontractor under a graded approach using a software system that notifies them of any subsequent issues. While the Order allows the use of this graded approach, it also states that all software, regardless of safety significance, must be controlled by a quality assurance program, and the quality assurance program must describe how the requirements are met. ORNL was unable to provide documentation describing how quality assurance requirements were met for the software. Therefore, UT-Battelle may not know if the software produces accurate information.

Pressure Relief Valves Maintenance

We found that maintenance was not always performed on PRVs according to applicable criteria. Specifically, we found that UT-Battelle did not always maintain and/or test the three types of data center PRVs in accordance with applicable guidance. ORNL staff provided a listing of PRVs in buildings 5600 and 5800. We reviewed all three air-type PRVs on the list and found that they had not always been tested within the timeframes, as required. Further, according to a UT-Battelle manager and documentation provided, of the 54 refrigerant-type PRVs on the list, 22 had not been tested, per requirements, and 12 of 27 water-type PRVs on the list had not been tested and/or inspected, as required.

ORNL's Standards-Based Management System Procedure (Procedure), Pressure System Safety, is based on the National Board Inspection Code, which is a standard cited in 30 Code of Federal Regulations 56.13030, Boilers. Per ORNL's Procedure, PRVs are subject to manual and/or pressure testing at certain time intervals based on type, as shown in the table below:

| Pressure Equipment Type | Type of Test and Testing Intervals | |
|-------------------------|------------------------------------|------------------------|
| | Manual | Pressure |
| Air | 1 Year | 3 Years |
| Refrigerant | N/A | 5 Years |
| Water | 1 Year | Per Inspection History |

According to a UT-Battelle manager, PRV testing did not occur because it was overlooked in some cases. In the case of refrigerant PRVs, testing was performed based on the manufacturer's recommendations rather than ORNL's Procedure. During our inspection, UT-Battelle stated that it is currently revising its Procedure to reflect the manufacturer's recommendation for refrigerant PRVs because ORNL began following the manufacturer's recommendation when the PRVs were installed. Further, UT-Battelle management stated that it had begun taking action to ensure compliance with its Procedure. Finally, UT-Battelle completed an assessment in 2020 that identified issues similar to those discussed in this report. While UT-Battelle's recommendations show signs of progress, we identified the need for continued improvement in this area.

Other Matter

We also found that UT-Battelle's quality assurance requirements did not always flow down properly to its subcontracts. For example, during our inspection, we identified one subcontract that did not include the requirements of the Order although the subcontractor was performing related work. Due to an oversight, UT-Battelle did not update this contract when it implemented prime flow downs in November 2020. The Order, which was approved in 2011, requires the contractor to flow down applicable requirements to subcontractors at any tier to ensure their compliance with the requirements and the safe performance of work.

POTENTIAL HARM TO SYSTEM OR PERSONNEL

If quality assurance requirements are not met for monitoring software that replaces manual calibration, maintenance issues or unforeseen outages could occur. Also, according to ORNL's Procedure, failure to test or inspect PRVs could cause the system to exceed allowable pressure limits, potentially resulting in events that may harm personnel and equipment. Finally, if the electrical and mechanical infrastructure is not properly maintained, it could affect the availability of computational space, hindering customers' ability to meet their mission needs.

RECOMMENDATIONS

We recommend that the Manager, ORNL Site Office, ensure that UT-Battelle:

1. Meets quality assurance requirements for calibration of equipment and related monitoring software and documents actions, as required;
2. Maintains PRVs in the data centers in accordance with its Procedure; and
3. Includes the Order in the subcontract identified in this report, as required.

MANAGEMENT RESPONSE

Management fully concurred with our recommendations. Management stated that UT-Battelle will develop a software quality assurance plan for the monitoring software that replaces manual calibration. Further, UT-Battelle will ensure that the data center PRVs are properly identified and are in conformance with current procedures and requirements. Finally, UT-Battelle will modify the one subcontract noted in the report to include updated flow down requirements.

Management's comments are included in Appendix 3.

INSPECTOR COMMENTS

Management's proposed corrective actions are responsive to our recommendations.

Appendix 1: Objective, Scope, and Methodology

OBJECTIVE

We initiated this inspection to determine the facts and circumstances regarding the allegation concerning computing facilities maintenance and calibration at the Oak Ridge National Laboratory.

SCOPE

The inspection was performed from January 2023 through September 2023 at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. The scope was limited to the facts and circumstances regarding the allegation concerning computing facilities maintenance and calibration in the data centers related to buildings 5300, 5600, and 5800 at the Oak Ridge National Laboratory. The inspection was conducted under Office of Inspector General project number S23OR008.

METHODOLOGY

To accomplish our inspection objective, we:

- Reviewed Federal and Department of Energy regulations, polices, procedures, and guidance;
- Reviewed contractor policies, procedures, and guidance;
- Held discussions with Department and contractor personnel with knowledge and experience in the inspection areas;
- Toured facilities related to the inspection areas;
- Reviewed subcontract requirements related to calibration; and
- Reviewed the status of pressure relief valve maintenance.

We conducted our inspection in accordance with the *Quality Standards for Inspection and Evaluation* (December 2020) as put forth by the Council of the Inspectors General on Integrity and Efficiency. We believe that the work performed provides a reasonable basis for our conclusions.

Management officials waived an exit conference on October 26, 2023.

Appendix 2: Prior Report

Inspection Report on [*Management of Calibration Activities at the Kansas City National Security Campus*](#) (DOE-OIG-18-48, September 2018). Our review of calibration procedures at the Kansas City National Security Campus (KCNSC) did not find any significant issues with the management of the calibration program. In particular, we found that KCNSC had a process for calibrating Measuring and Test Equipment, and we observed several calibration activities where KCNSC appeared to follow the process to ensure Measuring and Test Equipment was calibrated, as necessary. Although we found that the program was effectively managed overall, we identified two opportunities where the program could be enhanced. Therefore, we provided two suggestions to management that, if implemented, could potentially decrease the risk of non-conforming products being accepted.

Appendix 3: Management Comments



Department of Energy
Office of Science
ORNL Site Office
P.O. Box 2008
Oak Ridge, Tennessee 37831-6269

October 13, 2023

MEMORANDUM FOR TERI L. DONALDSON
INSPECTOR GENERAL
IMMEDIATE OFFICE OF THE INSPECTOR GENERAL

FROM: JOHNNY O. MOORE
MANAGER
OAK RIDGE NATIONAL LABORATORY SITE OFFICE

SUBJECT: DRAFT INSPECTION REPORT ON ALLEGATION REGARDING COMPUTING
FACILITIES MAINTENANCE AND CALIBRATION AT THE OAK RIDGE
NATIONAL LABORATORY – OFFICE OF THE INSPECTOR GENERAL
ASSIGNMENT NUMBER (S23OR008)

Thank you for the opportunity to review and comment on the subject draft report. The Oak Ridge National Laboratory Site Office (OSO) appreciates the auditors' audit work. The attachment details actions planned to be taken by the OSO and provides technical comments.

If there are any questions or additional information required, please contact Claire Sinclair at (865) 576-7710.

Attachment

cc:

Tara D. Fuller, CF-20
Janet B. Venneri, OB-FAD
Michele G. Branton, SC-OSO
Claire A. Sinclair, SC-OSO
Jamie W. Seiss, SC-OSO
Deborah L. Garland, SC-OSO

Appendix 3: Management Comments

ATTACHMENT

Management Response

OIG Draft Inspection Report on Allegation Regarding Computing Facilities Maintenance and Calibration at the Oak Ridge National Laboratory - OIG Assignment Number (S23OR008)

Recommendation #1: Meets quality assurance requirements for calibration of equipment and related monitoring software and documents actions, as required.

DOE Response: Concur

Concur - UT-Battelle will develop a software quality assurance (SQA) plan for the monitoring software that replaces manual calibration. The plan will be developed in accordance with the ORNL Software Quality Assurance Program, which meets requirements of DOE 414.1D, Change 2.

Estimated Completion Date: February 29, 2024

Recommendation #2: Maintains PRVs in the data centers in accordance with its Procedure.

DOE Response: Concur

Concur - UT-Battelle will ensure the data center PRVs are properly identified and are in conformance with current procedures and requirements.

Estimated Completion Date: April 30, 2024

Recommendation #3: Includes the Order in subcontract identified in this report, as required.

DOE Response: Concur

Concur - UT-Battelle will modify the one subcontract noted in the report to include updated flow down requirements. These corrective actions will be completed by March 31, 2024.

Estimated Completion Date: March 31, 2024

FEEDBACK

The Office of Inspector General has a continuing interest in improving the usefulness of its products. We aim to make our reports as responsive as possible and ask you to consider sharing your thoughts with us.

Please send your comments, suggestions, and feedback to OIG.Reports@hq.doe.gov and include your name, contact information, and the report number. You may also mail comments to us:

Office of Inspector General (IG-12)
Department of Energy
Washington, DC 20585

If you want to discuss this report or your comments with a member of the Office of Inspector General staff, please contact our office at 202-586-1818. For media-related inquiries, please call 202-586-7406.