OFFICE OF INSPECTOR GENERAL

U.S. Department of Energy

INSPECTION REPORT

DOE-OIG-24-26 August 2024

LAWRENCE BERKELEY NATIONAL LABORATORY SHOULD ENSURE PROPER MONITORING OF WORKERS FOR RADIATION EXPOSURE WHEN PROCESSING PACKAGES

Department of Energy
Washington, DC 20585

August 20, 2024

MEMORANDUM FOR THE MANAGER, BERKELEY SITE OFFICE

SUBJECT: Inspection Report: *Lawrence Berkeley National Laboratory Should Ensure Proper Monitoring of Workers for Radiation Exposure When Processing Packages*

The attached report discusses our review of allegations regarding the use of radiation areas and monitoring at Lawrence Berkeley National Laboratory (LBNL). We substantiated the allegations that workers were not properly monitored when opening a package of radioactive material; that a supervisor lifted a stop work order without establishing proper monitoring controls; and that LBNL did not adequately monitor gloveboxes. By not implementing the proper monitoring controls, LBNL did not comply with 10 Code of Federal Regulations 835 and may be unable to adequately ensure workers will not exceed exposure limits. We did not substantiate the allegation that Radiation Protection Group management and Office of Institutional Assurance and Integrity officials inappropriately communicated to hide the lack of high radiation controls after concerns were raised.

This report contains five recommendations that, if fully implemented, should help ensure that LBNL complies with 10 Code of Federal Regulations 835, Occupational Radiation Protection. Management fully concurred with our recommendations.

We conducted this inspection from February 2022 through April 2024 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.

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

cc: Deputy Secretary
Chief of Staff

DOE-OIG-24-26

Department of Energy
Office of Inspector General

Lawrence Berkeley National Laboratory Should Ensure Proper Monitoring of Workers for Radiation Exposure When Processing Packages
(DOE-OIG-24-26)

WHY THE OIG PERFORMED THIS INSPECTION

The Office of Inspector General received allegations concerning the handling of radiological materials at Lawrence Berkeley National Laboratory (LBNL). The complainant alleged: (1) the receipt survey of a package produced a radiation field above the threshold for a high radiation area (HRA), and that the workers were not monitored according to regulation; (2) a stop work order was lifted without establishing proper monitoring controls after concerns were raised to the supervisor; (3) Radiation Protection Group management and Office of Institutional Assurance and Integrity officials inappropriately communicated with each other to hide the lack of high radiation controls; and (4) inadequate monitoring inside gloveboxes may have exposed workers to undocumented levels of radiation.

We initiated this inspection to determine the facts and circumstances regarding the allegations at LBNL related to the handling of radioactive materials.

What Did the OIG Find?

We substantiated the allegation that a package containing a vial of Cerium-134 measured above the threshold for an HRA during a technicians' survey and that the workers were not monitored for exposure according to regulation due to the existence of HRA conditions. We also found that LBNL did not prepare the technicians for the elevated levels of radiation when the package arrived.

Additionally, we substantiated the allegation that a supervisor lifted a stop work order without establishing proper monitoring controls. We did not substantiate the allegation that Radiation Protection Group management and Office of Institutional Assurance and Integrity officials inappropriately communicated to hide the lack of high radiation controls after concerns were raised. Lastly, we substantiated the allegation that LBNL did not adequately monitor radiological conditions inside gloveboxes and may have exposed workers to undocumented levels of radiation.

What Is the Impact?

By not implementing the required monitoring of employees, LBNL did not comply with 10 Code of Federal Regulations 835 requirements, and the lack of proper planning created an increased risk of exposure to high radiation levels. Further, without sufficient monitoring of radiation levels within gloveboxes, LBNL cannot adequately ensure that workers will not exceed exposure limits.

What Is the Path Forward?

To address the issues identified in this report, we have made five recommendations that, if fully implemented, should help ensure that LBNL complies with 10 Code of Federal Regulations 835.

BACKGROUND

Lawrence Berkeley National Laboratory (LBNL) is 1 of 10 Department of Energy, Office of Science, National Laboratories. LBNL is managed by the University of California and located on a 202-acre site near the University of California-Berkeley campus in Berkeley, California. LBNL conducts unclassified research across a wide range of disciplines that sometimes requires the use of radiation-generating devices and radioactive materials. LBNL's Environment, Health, and Safety Division's (EHS) Radiation Protection Group (RPG) and its policies establish a site-wide system of radiological controls tailored to meet facility and hazard-specific needs. As a part of their duties, RPG personnel perform radiological surveys of research areas, radiological incident response and recovery, and radioactive material shipping and receiving.

10 Code of Federal Regulations (CFR) 835 establishes radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation while conducting Department activities. 10 CFR 835.101(a) requires that activities be compliant with a documented Radiation Protection Program that is approved by the Department. LBNL implements the Radiation Protection Program through its *Radiological Control Manual*, which establishes site-specific policies and procedures to carry out tasks at the laboratory.

10 CFR 835.202 sets annual occupational radiological dose limits for general employees at a total effective dose of 5,000 milli roentgen equivalent man (mrem) and the sum of an equivalent dose to the skin or an extremity for external exposures and the committed equivalent dose to the skin or any extremity of 50,000 mrems, among others.[1] To monitor individuals' exposure, 10 CFR 835.402 requires the use of personnel dosimeters if workers are expected to receive an effective dose of 100 mrem or equivalent dose of 5,000 mrem to skin or any extremity annually, among others. The LBNL *Radiological Control Manual* requires personnel to use whole body dosimeters for individuals whose potential effective dose is greater than 50 mrem annually or potential equivalent dose is greater than 2,500 mrem to skin or any extremity. Dose measurement results from personnel dosimeters are routinely monitored, generally every 3–6 months, to ensure that individuals' exposure stayed under the established limits and radiological controls were effective. In certain situations, individuals must be monitored by a supplemental dosimetry device or other means capable of providing an immediate estimate of the individuals' dose to the whole body.

Additionally, gloveboxes may be used when working with radiological materials at LBNL. A glovebox is a sealed, protectively lined compartment having holes with attached gloves for use in handling specialized or potentially hazardous materials inside the compartment.

In December 2021, the Office of Inspector General (OIG) received allegations concerning the handling of radiological materials at LBNL. Specifically, the complainant alleged: (1) the survey of a package produced a radiation field above the threshold for a high radiation area (HRA), and that the workers were not monitored according to regulation; (2) a stop work order was lifted without establishing proper monitoring controls after concerns were raised to the

[1] The terms total effective dose, equivalent dose, and committed equivalent dose are defined at 10 CFR 835.2(b). 10 CFR 835 denotes these measurements in roentgen equivalent man (rem), but for reporting purposes, we converted all measurements from rem to mrem.

supervisor; (3) RPG management and Office of Institutional Assurance and Integrity (OIAI) officials inappropriately communicated with each other to hide the lack of high radiation controls; and (4) inadequate monitoring inside gloveboxes may have exposed workers to undocumented levels of radiation. We initiated this inspection to determine the facts and circumstances regarding the allegations at LBNL related to the handling of radioactive materials.

ADDITIONAL PREPARATION NEEDED TO SAFELY PROCESS PACKAGES

We substantiated the allegation that a package containing a vial of Cerium-134 (Ce-134) measured above the threshold for an HRA during the Radiological Control Technicians' (RCT) survey, and that the workers were not monitored for exposure according to regulation due to the existence of HRA conditions. We also found that LBNL did not prepare the RCTs for the elevated levels of radiation prior to the package's arrival.

FIGURE 1: RCT REMOVING VIAL OF CE-134 FROM SHIELDING.
SOURCE: LBNL RPG SURVEY FORM

On October 6, 2020, two RCTs surveyed a package containing two vials of Ce-134. One RCT removed each vial from its individual lead shielding to determine contamination levels and dose rates. After reviewing the data, the RCT concluded that the dose rate numbers they had written down were too low for the amount of material surveyed. Then, the RCT conducted a second survey by removing the higher activity vial from its shielding again. The vial measured a dose rate of 500 mrem per hour at 30 centimeters (cm) from the vial. The dose rate is the dose of radiation delivered per a unit of time. For example, a dose rate of 500 mrem per hour for a full hour exposes the worker to an estimated dose of 500 mrem.

LBNL did not control the area or perform monitoring and testing as required when the RCTs' survey measured above the threshold for an HRA. 10 CFR 835.2 defines an HRA as any area accessible to individuals in which radiation levels could result in an individual receiving an equivalent whole body dose in excess of 100 mrem in 1 hour at 30 cm from the radiation source. When the conditions for an HRA exist, 10 CFR 835.502 requires monitoring as necessary during access to determine exposure rates and provide an immediate estimate of the integrated equivalent dose to the whole body during entry in the area. The Department's Office of Environment, Health, Safety and Security management stated that the requirement is not a single dose rate, "but rather a cumulative potential dose (i.e., how much dose someone would have received if they were 30 cm from the source over a 1-hour time frame)." However, 10 CFR 835 establishes that HRA conditions exist when radiation levels could result in an individual receiving the identified dose if the exposure lasted an hour. The OIG interprets 10 CFR 835 as not requiring exposure to last an hour before implementing the required safety controls. Further, the determination whether radiation levels could result in an individual receiving an equivalent whole body dose in excess of 100 mrem in 1 hour at 30 cm should be calculated prior to exposure (i.e., before the package is opened). If it is determined that such exposure could occur, the package should be opened in an HRA. Also, when radiation is unexpectedly encountered

that could result in such exposure, such as the RCTs' survey, RPG Procedure EH-0261, *Conduct of Radiological Surveys*, states that the area must be immediately controlled, and workers should follow LBNL's *Stop Work Policy*. Therefore, the workers must either evacuate the area until it is determined that the HRA radiation level is no longer present or follow the monitoring and testing requirements found in 10 CFR 835.502 as long as the HRA radiation level exists.

LBNL did not monitor its employees for exposure because it concluded time was a factor in determining whether conditions for an HRA existed. Specifically, LBNL officials concluded that very short time durations of exposure to elevated radiation fields are expected, and that it was not expected, nor was it likely, for an RCT who is processing an incoming shipment to be exposed to elevated radiation fields for sufficient time to require supplemental dosimetry. Therefore, for this package survey, LBNL did not have documentation to indicate the immediate estimate of the integrated equivalent whole body dose to the RCTs when they surveyed the package. When we spoke with the RCT who handled the material during the package survey, they stated that it took less than 1 minute. RPG officials reported that the RCT who handled the material was wearing whole body and extremity dosimetry during the surveys, and that the RCT's dosimetry results for calendar year 2020 were below the established limits for annual exposure.

Additionally, even though RPG management concluded the RCTs' survey did not meet the conditions of an HRA, we found that management did not prepare the RCTs for elevated radiation levels prior to the package's arrival. Specifically:

- RPG management knew the package contained elevated levels of radiation. Three months prior to receiving it, RPG management approved the researcher's purchase of 40 millicuries (mCi) of Ce-134, 30 mCi above the researcher's inventory limit of 10 mCi for Ce-134. The additional 30 mCi would have equated to an additional dose rate of approximately 169 mrem per hour at 30 cm at the time of the survey, and based on requirements found in 10 CFR 835, the package needed to be opened in an HRA. According to a senior RPG official, the handling of the material by the RCTs when the shipment was received and surveyed was not considered during planning for the material. Also, the official stated that the possibility of an HRA's existence due to the amount of material received should have been communicated in advance. The RCTs involved in handling the package and other RPG personnel stated that it was not common to receive material at that radiation level. According to the Department's Office of Nuclear Safety Enforcement, the appropriate controls are required to be in place based on the anticipated radiological conditions; therefore, LBNL should have evaluated and established these controls before encountering the radiological conditions.

- The RCT Supervisor and Health Physicist did not screen the package or discuss the discrepancies with the RCTs according to LBNL procedures when the package arrived at a higher amount of activity than authorized. When the Ce-134 package arrived, the manifesto stated that it had been shipped at more than 115 mCi, almost 3 times more than the 40 mCi that was authorized and expected by RPG. LBNL procedure EHS-750, *Receipt and Delivery of Radioactive Material*, requires that a Zone Health Physicist screen packages over 50 mCi prior to opening. Moreover, EHS-750 requires that

packages arriving with shipment discrepancies must be discussed with either the RCT Supervisor or Zone Health Physicist prior to opening a package. We found no evidence that either of these requirements were followed.

Lastly, the procedures that RCTs follow to survey the package do not address what to do with packages containing radioactive material with radiation levels above the threshold for an HRA. For instance, EH-0261, *Conduct of Radiological Surveys*, states that if an unplanned HRA is encountered to immediately control the area and follow LBNL's *Stop Work Policy*. Moreover, RPG's standard receiving procedures EH-0123, *Radioactive Material Shipping and Receiving*, EH-0322, *Receipt and Delivery of Radioactive Material*, and EHS-750, *Receipt and Delivery of Radioactive Material*, do not address the 10 CFR 835 requirement to only open packages in an HRA that may contain radioactive material with radiation levels above the threshold for an HRA.

A lack of proper planning can lead to an unexpected exposure to radiation levels above the threshold for an HRA. Failure to adequately monitor workers when HRA conditions exist may leave their exposure level unknown for weeks or months affecting the ability to properly plan future work, and may not adhere to 10 CFR 835 requirements. In this case, the RCT was exposed to dose rates over 100 mrem per hour, twice in the same day, and the actual equivalent whole body dose the RCT received was not recorded at the time of the survey.

STOP WORK ORDER LIFTED WITHOUT CONSIDERING ADDITIONAL CONTROLS

We substantiated the allegation that a supervisor lifted a stop work order without assessing whether additional monitoring controls were necessary during the survey of the package discussed above. LBNL's *Radiological Control Manual* states that everyone has authority to stop work activities due to inadequate radiological controls, and work should not be resumed until the proper radiological controls have been established. Additionally, the RPG procedure EH-0261, *Conduct of Radiological Surveys*, states that if an unplanned HRA is encountered to immediately control the area and implement LBNL's *Stop Work Policy*. The procedure also allows supervisors to restart work after evaluation and appropriate remedial actions are taken. We were unable to find evidence that an evaluation took place with respect to the higher-than-anticipated radiation level of the container.

On October 6, 2020, the RCT was stopped prior to conducting the second survey of the higher activity Ce-134 vial by another RCT who expressed concerns regarding the high level of radiation and the need to implement HRA monitoring controls, including supplemental dosimetry. The concerned RCT called their supervisor for direction because the amount of radioactive material in the package may have contained radiation levels above the threshold for an HRA and asked what precautions to take. Despite the expressed concerns, the supervisor directed the survey to continue without implementing any additional monitoring controls.

The supervisor directed work to continue because the supervisor did not believe that an HRA existed due to the short amount of time the material was exposed. The supervisor stated that they evaluated the information and decided to direct the RCTs to continue the second survey of the

material. Similarly, the critique[2] of the incident stated that the supervisor did not consider the radiation levels to be outside of what could be safely evaluated by an RCT within the existing controls. As mentioned previously, the material was already known to emit a high level of radiation; the material arrived at a higher radiation level than expected or authorized; and RPG management did not conduct or document specific dose calculations.

Lifting the stop work order without assessing whether additional controls were needed did not comply with LBNL's *Stop Work Policy* and exposed the RCT to an unrecorded radiation dose for a second time in the same day.

OFFICIALS DID NOT INAPPROPRIATELY COMMUNICATE AFTER INCIDENT

We did not substantiate the allegation that RPG and OIAI officials inappropriately communicated with each other to hide the lack of high radiation controls. During our inspection, we reviewed relevant documentation regarding the initial reporting of the incident, the intake of the concern, RPG's critique of the incident, and we also interviewed Department and LBNL officials. We found no evidence that RPG and OIAI officials worked together to hide the complainant's concern regarding the HRA.

GLOVEBOXES NOT ADEQUATELY MONITORED

We substantiated the allegation that LBNL did not adequately monitor radiological conditions inside gloveboxes and may have exposed workers to undocumented levels of radiation. Specifically, we found that gloveboxes require radiation monitoring because they are accessible areas.

FIGURE 2: SHIELDED GLOVE BOX
SOURCE: OIG INSPECTOR

During a routine survey in December 2021, an RCT identified a possible radiation area when the sleeve ports of a shielded glovebox were left open and radiation levels measured above 5 mrem at the sleeve port. An RCT expressed concerns about workers' whole body exposure and proper glovebox monitoring. The concerns raised by the RCT resulted in a critique held by RPG officials in January 2022; however, the critique did not address the RCT's concerns about radiation exposure and glovebox monitoring. Instead, the critique focused on posting gloveboxes as radiation areas, but it concluded that there was no need to do so because LBNL states that the definition of an area does not include gloveboxes.

10 CFR 835.401 requires the monitoring of areas for multiple purposes, including to document radiological conditions, detect changes in radiological conditions, and detect the gradual buildup of radioactive material. Additionally, according to Department Standard 1098-2017,

[2] Critiques are meetings of the individuals knowledgeable about an event (either a successful event or an abnormal event) to document a chronological listing of the facts. The purpose of the critique is to establish and record the facts and develop lessons learned.

Radiological Control,[3] gloveboxes should be marked with, or survey measurements should be posted to identify, whole body and extremity dose rates on the exterior surfaces of the glovebox. The markings or posted survey measurements of dose rates are important for monitoring purposes because to know the dose rate, monitoring must take place.

LBNL officials stated that they actively monitor radiological conditions on external surfaces of gloveboxes but not within them. Specifically, RPG officials stated that radiological workers take radiation readings at the sleeve openings of the glovebox and 30 cm from the sleeve openings, but the workers do not survey inside the sleeves or take readings within the glovebox.

FIGURE 3: STANDARD GLOVE BOX
SOURCE: OIG INSPECTOR

LBNL did not monitor gloveboxes because LBNL's policy, *Operational Health Physics Technical Note 11 Areas, as Pertaining to Gloveboxes and Interlocked Enclosures* (tech note), excludes gloveboxes from the definition of an area. Specifically, the tech note states that gloveboxes are not areas "accessible to individuals" within the requirements of 10 CFR 835, which would include the meaning of these terms as used in 10 CFR 835.603 and 10 CFR 835.2. The tech note also states that the terms "area" and "accessible" are undefined by 10 CFR 835 and, hence, must be defined by LBNL. The tech note defines an "area" as "any area large enough to accommodate a major portion of the whole body. Area does not include gloveboxes or enclosed containers/equipment designed to contain radioactive material." Additionally, the tech note defines "accessible" as "an area that can be entered." However, LBNL's policies and procedures do not define what it considers a major portion of the whole body. The tech note also states that "the guidance documents are silent on the accessibility and posting expectations for gloveboxes."

However, we determined that "area" and "accessible" have been defined by the Department. Specifically, 10 CFR 835 provides specific definitions for multiple types of areas,[4] and it provides a definition for an access point as "any location through which an individual could gain access to areas controlled for the purpose of radiation protection." It also defines whole body "for the purposes of external exposure, as the head, trunk […], arms above and including the elbow, or legs above and including the knee." Gloveboxes are accessible areas because they can be accessed with a portion of the body through the sleeve ports. Moreover, Department Guide 441.1-1C, *Radiation Protection Programs Guide*, states that "an area is considered to be accessible to individuals when it contains entrance or access points of sufficient size to permit human entry, i.e., such that any portion of the body may be exposed to the radiological hazard." Inadequate monitoring increases the risk that workers are exposed to unknown levels of radiation, and LBNL cannot effectively ensure that radiation exposure limits will not be

[3] Department Standard 1098-2017 discusses specific measures that should be implemented by affected line managers, workers, and support staff to ensure proper fulfillment of their radiological control responsibilities.
[4] The different definitions for areas include airborne radioactive area, contamination area, controlled area, high contamination area, HRA, radiation area, radioactive material area, radiological area, and very high radiation area.

exceeded. Inadequate monitoring was evidenced by a situation that occurred in October 2021 when RPG officials identified a radiological worker's exposure to radiation. The worker was approaching LBNL's administrative control level, or the initial level of exposure below regulatory limits before needing managerial approval, for the year. The discovery of the worker's exposure level was due to an unrelated incident involving the removal of material from a glovebox that prompted an RPG official to request the worker's dosimeter to be read ahead of schedule. Without the early reading, the researcher could have exceeded the control limits without proper authorization.

IMPACT

A key element of the Department's radiological control programs is that workers should not be exposed to radiation without the expectation of an overall benefit from the activity causing the exposure. That element is supported by the Department's safety principle that programs conduct radiological operations in a manner that reduces exposure to the workforce to levels that are as low as reasonably achievable. Without adequate preparation for the receipt and survey of the Ce-134 package, LBNL did not immediately know the levels of radiation received by the workers and risked exceeding workers' radiation exposure limits. Further, LBNL did not comply with 10 CFR 835 HRA monitoring requirements when it did not ensure that supplemental monitoring was in place before opening the package. In addition, without sufficient monitoring of the radiological conditions within gloveboxes, LBNL cannot adequately ensure that workers will not exceed exposure limits.

OTHER MATTERS

We identified other areas of concern during our inspection related to the receipt survey, inventory delivery log documentation, and the critique process that indicated possible internal control weaknesses.

We found that the Ce-134 receipt survey included incorrect dose rates. Specifically, the RCT who completed the survey documented the dose rate as rem instead of mrem, resulting in an administrative error that showed a different radiation level than the one that existed. The error was not identified when the receipt survey was reviewed and approved by the RCT Supervisor and Health Physicist.

Additionally, we found that inventory delivery logs[5] contained errors. Specifically, one delivery log listed the amount of material in the higher activity vial as 156 mCi of Ce-134, going into RPG inventory, when the actual amount was only 115 mCi. Another delivery log showed the researcher was given 36.2 mCi in material when they were only authorized to receive 10 mCi for their inventory. These errors were not identified by those receiving the material or by RPG leadership.

The delivery log errors occurred because the RCT generated them manually instead of using the electronic inventory, as required by RPG procedures. According to RPG procedures EH-0322,

[5] LBNL uses delivery logs to acknowledge the receipt of material and to verify inventory tracking.

Receipt and Delivery of Radioactive Material, and EHS-750, *Receipt and Delivery of Radioactive Material,* the delivery logs are generated by the electronic inventory system. When questioned why the amounts on the delivery logs were incorrect, RPG officials stated that while the electronic inventory had the correct amounts, the RCT generated the form by hand due to inexperience. The RCT did not follow procedure and generated the form by hand even though they were accompanied by another senior RCT and working with the RCT Supervisor.

Further, we found no evidence that the delivery log for the lower activity vial of Ce-134 was completed, as required by RPG procedures. EHS-750 requires that material placed on hold by RPG must be signed for by the appropriate RPG official, in this case, the RCT Supervisor. When the lower activity vial of Ce-134 was placed on hold with RPG because it still exceeded the researcher's authorization limit of 10 mCi after 48 hours, the RCT did not generate the required delivery log. Without proper and accurate delivery logs of materials, LBNL may not be able to verify the amount delivered or ensure that inventories are accurate if discrepancies appear.

Lastly, LBNL's critique process of the Ce-134 incident did not adequately address issues or identify root causes. For example, the critique did not address why the Ce-134 package was shipped at 115 mCi when only 40 mCi were approved. Further, it did not address why a Zone Health Physicist did not review the package prior to the RCTs conducting a survey. EHS-750 requires such a review when there is a discrepancy in the amount of material received. Additionally, not all RPG employees involved in the incident were mentioned in the critique report. For example, two RCTs conducted the initial survey of the material, but the critique report never mentioned that a second RCT was present, and management never contacted the second RCT. Further, the critique states that the Zone Health Physicist responsible for the material told the RCT after the first survey that the lead-shielded container would be considered the primary container and not the vial. However, the RCT risked a second exposure to elevated radiation levels by removing the vial from its lead shielding during the second survey. The critique did not explore why the RCT removed the vial the second time.

RECOMMENDATIONS

After the critique was completed, LBNL officials identified some improvements related to the receipt of radiation packages. These improvements included ensuring that RCTs and Health Physicists were aware of incoming packages; establishing administrative hold points for specific types of packages to prevent unpacking prior to the Health Physicist performing a technical survey to determine the necessary controls; and devising a layered and detailed survey plan that contains clear hold points. Another area of improvement included conducting scenario-based training and documenting stop work requests prior to approval or denial to resume work. We agree that these process changes will improve the RPG.

To further improve radiation protection at LBNL, we recommend that the Manager, Berkeley Site Office, direct the University of California to ensure that:

1. RPG complies with 10 CFR 835 requirements, including requirements pertaining to opening packages containing material that may emit radiation above the threshold for an HRA;

2. RPG's procedures are updated to reflect improvements identified in this report and in the critique, including adequate planning for the receipt and survey of material that could exceed HRA thresholds;

3. RCTs follow procedures when receiving radiological materials that differ from authorized amounts;

4. The policy related to gloveboxes is revised to ensure that radiological conditions are adequately monitored inside gloveboxes, as required by 10 CFR 835, and ensure that workers are aware of those conditions; and

5. Staff use the electronic inventory system when receiving packages, as required by RPG procedures.

MANAGEMENT RESPONSE

Management fully concurred with our findings and recommendations. Management stated that the Manager, Berkeley Site Office, will ensure the University of California complies with requirements of 10 CFR 835. Additionally, management stated that: the Manager, Berkeley Site Office, will direct the University of California to ensure that RPG's procedures are updated to reflect improvements identified in this report and in the critique; RCTs follow procedures when receiving radiological materials that differ from authorized amounts; the policy related to gloveboxes is revised to ensure that radiological conditions are adequately monitored inside gloveboxes; and staff use the electronic inventory system when receiving packages, as required by RPG procedures. Management stated that the estimated completion date for these actions is January 15, 2025.

Management's comments are included in Appendix 2.

INSPECTOR COMMENTS

Management's comments and 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 allegations at Lawrence Berkeley National Laboratory (LBNL) related to the handling of radioactive materials.

SCOPE

This inspection was performed from February 2022 through April 2024 at LBNL in Berkeley, California. The scope was limited to a review of the facts and circumstances stemming from allegations related to handling of radioactive materials in two separate incidents. The first incident occurred in October 2020, and the second incident occurred in December 2021. This inspection was conducted under Office of Inspector General project number S22DN013.

METHODOLOGY

To accomplish our inspection objective, we:

- Reviewed applicable laws and regulations and assessed LBNL's policies and procedures to ensure consistency;
- Reviewed critique audio files, reports, and relevant documentation for both incidents;
- Interviewed key officials involved with radiological safety at LBNL and the Department of Energy; and
- Interviewed personnel involved with the specific incidents and the Employee Concerns Program investigation.

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 July 25, 2024.

Department of Energy
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Berkeley Site Office
Lawrence Berkeley National Laboratory
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July 17, 2024

MEMORANDUM FOR: ANTHONY CRUZ
ASSISTANT INSPECTOR GENERAL
FOR INSPECTIONS, INTELLIGENCE OVERSIGHT,
AND SPECIAL PROJECTS
OFFICE OF INSPECTOR GENERAL, IG-60

FROM: PAUL GOLAN
BERKELEY SITE OFFICE MANAGER
OFFICE OF SCIENCE

SUBJECT: Berkeley Site Office (BSO) Response to Office of Inspector General (OIG) Draft Report, *Lawrence Berkeley National Laboratory Should Ensure Proper Monitoring of Workers for Radiation Exposure* (S22DN013)

Thank you for providing a draft copy of the OIG report, "*Lawrence Berkeley National Laboratory Should Ensure Proper Monitoring of Workers for Radiation Exposure.*" We have reviewed the draft report, and our responses to the recommendations are attached.

In addition, attached are technical comments provided by the U.S. Department of Energy Office of Environment, Health, Safety and Security (EHSS).

If you have any questions, please contact me at paul.golan@science.doe.gov or the BSO Subject Matter Expert, Salma El Safwany at salma.el-safwany@science.doe.gov.

Attachments:
Draft Report Technical Comments EHSS

Response to Report Recommendations

Recommendation 1: To further improve radiation protection at LBNL, we recommend that the Manager, Berkeley Site Office, direct the University of California to ensure that RPG complies with 10 CFR 835 requirements, including requirements pertaining to opening packages containing material that may emit radiation above the threshold for an HRA.

Management Response: **Concur**. Site Office Manager will ensure University of California complies with requirements of 10 CFR 835 including those provisions and exceptions contained in section §835.604 *Exceptions to Posting Requirements*. Estimated completion date is January 15, 2025.

Recommendation 2: To further improve radiation protection at LBNL, we recommend that the Manager, Berkeley Site Office, direct the University of California to ensure that RPG's procedures are updated to reflect improvements identified in this report and in the critique, including adequate planning for the receipt and survey of material that could exceed HRA thresholds.

Management Response: **Concur**. Manager, Berkeley Site Office, will direct the University of California to ensure that RPG's procedures are updated to reflect improvements identified in this report and in the critique, including adequate planning for the receipt and survey of material that could exceed HRA thresholds. Estimated completion date is January 15, 2025.

Recommendation 3: To further improve radiation protection at LBNL, we recommend that the Manager, Berkeley Site Office, direct the University of California to ensure that RCTs follow procedures when receiving radiological materials that differ from authorized amounts.

Management Response: **Concur**. Manager, Berkeley Site Office, will direct the University of California to ensure that RCTs follow procedures when receiving radiological materials that differ from authorized amounts. Estimated completion date is January 15, 2025.

Recommendation 4: To further improve radiation protection at LBNL, we recommend that the Manager, Berkeley Site Office, direct the University of California to ensure that the policy related to gloveboxes is revised to ensure that radiological conditions are adequately monitored inside gloveboxes, as required by 10 CFR 835, and ensure that workers are aware of those conditions.

Management Response: **Concur**. Manager, Berkeley Site Office, will direct the University of California to ensure that the policy related to gloveboxes is revised to ensure that radiological conditions are adequately monitored inside gloveboxes, as required by 10 CFR 835 including policy clarification promulgated by DOE in August 2023. (https://pcportal.doe.gov/PCPortalFiles/Answers/D23-03-001_D23-03-001_HighRadiationArea_Final_01AUG23_signed.pdf) Estimated completion date is January 15, 2025.

Recommendation 5: To further improve radiation protection at LBNL, we recommend that the Manager, Berkeley Site Office, direct the University of California to ensure that staff use the electronic inventory system when receiving packages, as required by RPG procedures.

Management Response: **Concur**. Manager, Berkeley Site Office, will direct the University of California to ensure that Staff use the electronic inventory system when receiving packages, as required by RPG procedures. Estimated completion date is January 15, 2025.

FEEDBACK

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Washington, DC 20585

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