



U.S. Department of Energy
Office of Inspector General
Office of Audits and Inspections

Audit Report

Implementation of Beryllium Controls at Lawrence Livermore National Laboratory

DOE/IG-0851

June 2011



Department of Energy
Washington, DC 20585

June 17, 2011

MEMORANDUM FOR THE SECRETARY

FROM: 
Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Audit Report on the "Implementation of Beryllium Controls at Lawrence Livermore National Laboratory"

BACKGROUND

The Department of Energy has a long history of using beryllium – a metal essential for nuclear operations and other processes. Exposure to beryllium can cause beryllium sensitization or even Chronic Beryllium Disease, an often debilitating, and sometimes fatal, lung condition. In December 1999, the Department established a Chronic Beryllium Disease Prevention Program (Prevention Program) to reduce the number of workers exposed to beryllium at Department facilities, minimize the levels of, and potential for, exposure to beryllium, and to establish medical surveillance requirements to ensure early detection of the disease.

In response, Lawrence Livermore National Laboratory (Livermore), operated for the Department by Lawrence Livermore National Security, LLC, implemented a Beryllium Prevention Program. The National Nuclear Security Administration (NNSA) reviewed and the Department's Office of Enforcement (Enforcement) investigated Livermore's Prevention Program in October 2008 and July 2009, respectively. The NNSA review identified weaknesses in Livermore's Prevention Program and the Enforcement investigation identified violations in the vital areas of identifying the presence of beryllium in facilities, communicating beryllium hazards to workers, training workers in beryllium control procedures, and monitoring personnel for medical effects of exposures. As of November 30, 2010, Livermore reported that it had completed a number of corrective actions designed to address weaknesses in these areas.

Due to the significant risk to the work force of beryllium exposure, we initiated this audit to determine whether Livermore had fully implemented controls to resolve previously identified weaknesses in its Prevention Program.

RESULTS OF AUDIT

Livermore expended significant effort and had completed a number of corrective actions designed to improve its Prevention Program. However, in certain instances, all actions necessary to completely resolve previously observed weaknesses had not been completed. Specifically, we found that Livermore had not always:

- Identified the presence of beryllium and provided adequate notice to workers through the consistent use of facility maps, signs and labels;

- Utilized and documented reviews of historical records and interviews with employees to identify the presence of beryllium when completing the baseline inventory of beryllium contamination;
- Tested equipment to determine whether it was contaminated when beryllium was detected at a specific location in a facility;
- Established training requirements for all employees and ensured that managers and other employees attended training necessary to inform them of beryllium control procedures;
- Performed hazard assessments for 94 of its legacy facilities which may have housed beryllium operations in the past; and,
- Provided updates to its website to communicate the current status of onsite beryllium contamination to workers.

We concluded that the issues we observed occurred, at least in part, because the Livermore Site Office's (Site Office) oversight efforts during the implementation of Livermore's corrective actions were not completely effective. According to Site Office officials, they exercised required due diligence over the implementation of Livermore's corrective actions. However, we found that neither the Site Office nor Livermore corrective action verification and closure processes ensured that initiated actions were always fully implemented. For example, Livermore officials told us that they had completed corrective actions to communicate beryllium hazards, in part, through the use of facility maps. However, we determined that although it had developed the maps, Livermore had not posted the maps in any of the seven known beryllium facilities that we toured. Both the Site Office and Livermore had not taken action to verify that facility maps were actually used and posted to alert workers to the presence of beryllium. Rather, Site Office and Livermore officials considered the corrective action closed based solely on the development of the maps. Site Office and Livermore officials explained that actual field inspection of corrective action implementation was not required as part of the verification process prior to closing a corrective action. These officials stated that, in general, actual field inspections are part of effectiveness reviews and occur 6 to 12 months after corrective action closure to allow sufficient time for implementation. NNSA management acknowledged in comments on a draft of our report that beryllium program concerns raised during this audit resulted from procedural problems that inadvertently combined the corrective action verification process with effectiveness reviews.

Symptomatic of problems with the process, we found that inspections had not been performed for corrective actions that had been closed for over six months. Specifically, the Site Office and Livermore had not planned to perform an effectiveness review to evaluate the implementation of corrective actions, such as the use and posting of facility maps, until March 2011, or approximately 19 months after closing the facility map and other corrective actions. Based on the results of our review, we concluded that more timely inspections would have alerted Site Office management that further improvements were needed in Livermore's Prevention Program.

Livermore did not always mitigate employees' risk of exposure to beryllium. As noted in NNSA's 2008 review of Livermore's beryllium activities, without an effective Prevention Program, there remains an unacceptable level of risk to workers from potential exposure in known legacy facilities. In fact, in October 2010, NNSA took action against Livermore for its failure to properly manage risks to workers from beryllium and announced a consent order under which Livermore paid \$200,000 to settle findings identified during the July 2009 Enforcement investigation. Additionally, as a result of the consent order, Livermore agreed to correct a number of outstanding findings from the 2009 Enforcement investigation.

Beryllium exposure is not a trivial matter, potentially affecting the health and safety of the Department's workforce. In fact, since 2007, Livermore has had at least seven beryllium-related reportable events, two of which occurred within the last year. In addition, Livermore has had 27 beryllium sensitization cases and 2 Chronic Beryllium Disease cases. Livermore officials told us that the rate of beryllium sensitization was consistent with, and in the case of Chronic Beryllium Disease significantly lower than, comparable data across the Department. Livermore also noted that there was good reason to believe that the increase in reported cases may be attributable to the fact that it had improved its Prevention Program by increasing surveillance testing of workers. We are unable to affirm or dispute Livermore's assertions in this area, but concluded that sustained, aggressive action is necessary to ensure that the incidence of sensitization and disease are eliminated or kept to the minimum number possible.

Livermore had developed some positive corrective procedures to strengthen controls in its Prevention Program. According to Livermore officials, they have analyzed all beryllium-related events, internal and external audits, and worker feedback; and have developed and, for the most part, implemented comprehensive corrective actions to improve worker safety. While Livermore officials told us that they planned to implement additional corrective actions to address the issues we identified, our findings suggest that additional effort is required to ensure complete resolution of these weaknesses. As such, we made several recommendations designed to help address these issues.

MANAGEMENT REACTION

Management did not dispute the findings but indicated that it did not agree with our conclusions as they related to oversight weaknesses at the Site Office. Management also disagreed with what it believed was the implication in the report that, despite Livermore's corrective actions, worker exposure to beryllium and/or incidence of beryllium disease had increased. Further, management indicated that the report presented an incomplete characterization of progress and accomplishments under Livermore's corrective action program. Yet, management expressed partial concurrence with the findings and recommendations.

Management agreed with our recommendations for ensuring that Livermore performs various actions as opportunities for continuous improvement and stated it had already taken corrective action or will take additional corrective action. Management's comments are included in their entirety in Appendix 3.

AUDITOR RESPONSE

While management's comments were, for the most part, generally responsive to our recommendations, we disagree with management's assertions regarding our conclusions. As previously noted, we found that the Site Office had not provided effective oversight since the verification and closure processes did not ensure that corrective actions had actually been implemented. NNSA, in its comments, acknowledged that procedural problems with its verification and effectiveness review processes contributed to implementation issues. We remain convinced by the facts developed during the audit that timely verification of completed actions and a determination of effectiveness would have alerted the Site Office that further improvements were needed in Livermore's Prevention Program.

Finally, we clarified sections of our report related to the incidence of beryllium exposure and beryllium-related disease at Livermore and recognized Livermore's progress in its corrective action program. We also acknowledged, as pointed out in management comments, that a joint Federal and contractor effectiveness review of Livermore's Prevention Program had been completed in March 2011. That review found that Livermore had made significant improvements in achieving the objectives of the beryllium regulation, but expressed concerns about whether the changes would be enduring. Furthermore, of the 44 deficiencies reviewed, the Laboratory/Departmental Review Team found that 20 percent of the actions taken to resolve the deficiencies were only partially effective. Thus, additional improvements in Livermore's Prevention Program are still necessary.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Associate Deputy Secretary
Chief of Staff
Chief Health, Safety and Security Officer
Manager, Livermore Site Office

AUDIT REPORT ON THE IMPLEMENTATION OF BERYLLIUM CONTROLS AT LAWRENCE LIVERMORE NATIONAL LABORATORY

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Implementation of Beryllium Controls at Lawrence Livermore National Laboratory

Beryllium Corrective Actions

We found that even though Lawrence Livermore National Laboratory (Livermore) reported that it had closed a number of corrective actions designed to correct deficiencies in its Chronic Beryllium Disease Prevention Program (Prevention Program), needed controls were not always fully implemented. For example, our test work revealed that Livermore had not always:

- Identified the presence of beryllium and provided adequate notice to workers through the consistent use of facility maps, signs and labels as required in corrective actions;
- Utilized and documented reviews of historical records and interviews with employees as required by the Department of Energy (Department) to identify the presence of beryllium in completing the baseline inventory of beryllium contamination;
- Tested equipment to determine whether it was contaminated when beryllium was detected at a specific location in a facility; an acceptable method based on Departmental expectations;
- Established training requirements for all employees and ensured that managers and other employees attended training necessary to inform them about beryllium control procedures;
- Performed hazard assessments for 94 of its legacy facilities which may have had beryllium operations in the past; and,
- Provided updates to its website to communicate the current status of beryllium contamination onsite to workers.

Communication of Beryllium Hazards

Livermore officials told us that they had completed corrective actions to communicate beryllium hazards through the use of facility maps, signs and labels. Our test work revealed, however, that such was not always the case. Livermore required that facility maps identifying beryllium areas be posted in known beryllium facilities and that standardized signs

and labels be used to alert workers to beryllium areas. As a result, Livermore developed 19 facility maps to communicate known or potential areas of beryllium hazards. It also revised its policies and procedures to require the posting of standardized signs and labels alerting workers to beryllium hazards. However, we determined that facility maps, signs and labels were not being fully utilized and, therefore, were not effective in alerting employees to the potential for beryllium exposure.

Posting of Facility Maps

To illustrate, we toured seven known beryllium facilities, escorted by various Livermore facility and health and safety personnel, and determined that maps were not posted in any of the facilities we visited. Facility maps are used to identify beryllium areas and are also used in conjunction with beryllium sign postings to alert workers to the known presence of contaminated work spaces before workers enter into the area. According to the tour escorts, with the exception of Livermore's subject matter expert (SME), they had not seen the facility maps and were unaware of their existence.

We also found that the facility maps that Livermore developed did not always identify the true extent of beryllium contamination. For instance, the facility map for Building 231 documented beryllium contamination areas in the first floor of the building; however, there was no facility map created for the second floor. This is significant given that beryllium contamination is known to exist on the second floor. In fact, this area was the location of the most recent potential beryllium exposure that occurred in September 2010, an event in which a technician was potentially exposed to beryllium while performing preventative maintenance on facility-related equipment.

Further, we observed that facility maps did not accurately identify areas already posted as containing beryllium. We observed and Livermore personnel confirmed that beryllium was stored in rooms 1145 and 157 of Building 141; however, the facility map did not identify these rooms as beryllium storage areas. Accordingly, workers were not warned of potential beryllium hazards before entering into these areas. Livermore's SME told us that he will work to ensure rooms and areas are posted correctly and in accordance with beryllium

policies and procedures. In addition, the SME stated that he will ensure that the maps are updated to accurately reflect actual beryllium areas in the noted facilities.

Posting of Beryllium Signs and Labels

Although Livermore updated its policies and procedures to require the posting of standardized signs and labels to alert workers to beryllium hazards, our review showed inconsistent implementation of these policies and procedures. Livermore updated its policy to require that beryllium areas are identified with one of five applicable signs: Beryllium Contamination Area, Beryllium Storage Area, Beryllium Buffer Area, Beryllium Work Area, and Regulated Beryllium Work Area. In addition, Livermore's policy requires that access points to legacy contamination areas be posted appropriately.

Our tours of 10 facilities, however, revealed that warning signs were missing or inaccurate. Livermore did not post signs for 3 rooms in Building 253 where beryllium samples were analyzed or in Building 255 where Livermore personnel confirmed that beryllium contamination was detected. In response to our observation, Livermore posted the appropriate signs shortly after our tours. The appropriate signs are necessary to properly inform Livermore employees regarding the potential for beryllium exposure and ensure that employees obtain the correct training and take necessary precautions before entering the various operational areas.

In another example, although Livermore officials knew that a mechanical room in Building 231 had beryllium contamination, beryllium warning signs were not posted at all access points to alert employees of the hazards. According to a Livermore report into a potential beryllium exposure, the inadequate signage resulted in potential exposure of an employee who entered the mechanical room to perform authorized maintenance on an air conditioning unit.

During our tours, we also noticed that Livermore had not always affixed appropriate warning labels on beryllium-contaminated waste as required by its updated policies and procedures. For example, during our tour of Building 253, we and our tour escorts observed three containers with beryllium-contaminated waste that were not labeled correctly. Although the waste containers were labeled "Caution Radioactive Material," there were no labels to warn the employees handling

the waste that it was contaminated with or contained beryllium. Livermore's policy stated that organizations performing beryllium work at each facility will post and control their own areas. However, beryllium processing organizations we spoke with were not aware of the requirements or their roles and responsibilities. For example, the organization that processes beryllium samples was not aware of its responsibility to affix the beryllium labels on the waste containers because that task had been traditionally performed by the waste management group on its behalf. In response to our audit, Livermore started affixing the beryllium labels to the waste containers in November 2010.

Completion of the Baseline Beryllium Inventory

While Livermore noted that it had implemented a corrective action to update its policies and procedures to mandate the use of information sources required by the Department in developing a baseline beryllium inventory, we found that Livermore had not consistently utilized and documented reviews of historical records and interviews with employees to update its baseline inventory. In 2000, the Department required each site to develop a baseline inventory. This inventory was to be completed within two years, by 2002. Also, when developing the baseline inventory, the Department required contractors to: (1) review current and historical records; (2) interview workers; (3) document the characteristics and locations of beryllium at the facility; and, (4) conduct air, surface, and bulk sampling.

We noted, however, that Livermore did not always utilize and document historical record reviews and personnel interviews for the facilities identified through its baseline inventory. Specifically, as of April 2010, Livermore had not reviewed historical records for 50 facilities and had not interviewed workers for 178 facilities that were listed in its facilities inventory. During the course of the audit, we raised the concern that by not utilizing and documenting all the required data gathering methods some contaminated areas may not have been identified. We also noted that without a complete baseline inventory, key personnel cannot perform accurate hazard assessments or adequately identify potentially hazardous areas. As a result of our concerns, Livermore officials told us that they performed additional work by reviewing historical records and interviewing workers to

update and complete the baseline inventory in November 2010 – eight years after they were required to be completed. Through this work, Livermore was able to identify some additional facilities where beryllium work may have been performed in the past.

Testing of Equipment

Livermore reported that it had completed corrective actions to characterize facilities as part of the baseline inventory. However, we noted that Livermore did not always test equipment to determine whether it was contaminated when beryllium was detected at specific locations in a facility, as expected by Department officials responsible for beryllium policy. According to the Code of Federal Regulations Title 10, Part 850 (Regulation), sites are required to develop a baseline inventory of the locations of beryllium operations and other locations of potential beryllium contamination. In developing its baseline inventory, Livermore was required to conduct air, surface, and bulk sampling in contaminated areas. Further, the Department's Beryllium Program Implementation Guide (Implementation Guide), for use with the Regulation, states that at a minimum the sampling plan should address where samples are to be taken based on where beryllium was stored, transported, and used at the facility as well as consideration of ventilation and airflow patterns and worker movement patterns. Finally, while testing equipment is not specifically required by the Regulation, testing other locations of potential beryllium contamination, such as equipment, enables proper work controls to be set to minimize worker exposure.

Livermore, however, did not always test equipment in legacy facilities as part of conducting the baseline inventory. For instance, when a sample tested above the release criteria in a facility, Livermore did not always test equipment located in known areas of contamination. We compared equipment inventories to sampling details at two beryllium facilities and found that equipment in two areas with known contamination was not tested. However, according to Department and Livermore Site Office (Site Office) officials, based on their expectations of the Implementation Guide, testing of equipment should be included when other potential locations of beryllium exposure need to be tested. This is significant given that two previous Office of Inspector General reports, [*Beryllium Controls at the Oak Ridge National Laboratory*](#) (DOE/IG-0737, September 2006) and [*Beryllium Surface*](#)

[Contamination at the Y-12 National Security Complex](#)

(DOE/IG-0783, December 2007) found that contaminated equipment was a source for potential worker exposure. As such, although not specifically required by the Regulation, based on the Department's expectations, equipment should be included when facilities are tested for potential beryllium contamination.

Beryllium Training

Livermore indicated that it had completed corrective actions to improve training in industrial hygiene activities. Our review, however, revealed that the corrective actions were not fully implemented. For example, Livermore developed initial qualification standards and incorporated requirements for new employees into its policies and procedures; however, the standards did not include specific training courses for Hygienists who perform hazard assessments and needed requalification, as required by Livermore's requalification requirements. Livermore officials told us that they revised the qualification standards to identify specific training courses for Hygienists after we brought the issue to their attention.

In another case, Livermore established training requirements for Environmental, Safety & Health (ES&H) employees when personnel changes occurred in beryllium facilities. Although Livermore developed new procedures for the facility and/or personnel turnover process, including the training requirements, Livermore did not ensure that all employees were informed about the procedures. In one instance, we found that approximately 25 percent of ES&H managers did not attend the training class on the new procedures for personnel change over. Furthermore, we concluded, that the training should have been extended to facility management to ensure that facility hazards were communicated and transferred to new personnel. Without providing training to all applicable managers, there is a risk that the new requirements will not be implemented as intended and incoming employees would not be aware of the beryllium hazards that exist in a facility.

Completion Hazard Assessments

Livermore could not demonstrate that it had corrected weaknesses in its assessments of hazards in its legacy facilities. In response to National Nuclear Security Administration's (NNSA) 2008 report and the Department's Office of

Enforcement 2009 report, Livermore included a requirement in its Prevention Program to perform hazard assessments for all operations, both existing and historical, identified in the baseline inventory. Livermore, however, could not demonstrate, through documented reports of results, that facility-based hazard assessments had been performed for the 94 legacy facilities identified in its baseline inventory. The Department pointed out in its 2009 report that without conducting the hazard assessments Livermore could not identify, analyze or control hazards associated with potential exposure to airborne and surface beryllium.

Access to Beryllium Information

Additionally, Livermore had not fully implemented corrective actions needed to address a 2008 NNSA finding that Livermore needed to effectively communicate the current status of the baseline inventory so that employees could determine whether their work activities placed them at risk for beryllium exposures. While Livermore took some actions to utilize facility maps, signs and labels, it did not update the intranet website that is used to communicate information about changes in the beryllium inventory to workers in a timely manner. Specifically, the website did not include information such as specific locations of contamination and the current status of beryllium facilities.

To illustrate, although the website is used by Livermore to communicate information about changes in the beryllium inventory to workers, we noted that the website was not updated for more than a year. Also, we observed that the website does not indicate the specific locations of beryllium contamination within a facility, a best management practice at other Department sites. In addition, Livermore's website did not accurately reflect the current status or changes to the location of beryllium work. For example, beryllium work performed in a room located in Building 151, previously identified as a beryllium work area, was moved to a new location. However, Livermore's website did not reflect the changes made within this room. During a discussion with the SME, he stated that the website would be updated to include the current status of the baseline inventory. Accordingly, a corrective action was revised in August 2010, to include posting of the beryllium inventory records to the website. The update was completed in November 2010.

Beryllium Controls

We concluded that the Site Office's oversight efforts during the implementation of Livermore's corrective actions were not completely effective. Neither the Site Office's nor Livermore's corrective action verification and closure process ensured that actions were always fully implemented.

Site Office Verification and Closure Process

The Site Office had not ensured that Livermore's corrective actions were actually implemented. Specifically, the Site Office had not always applied useful tools, such as walk-through examinations and field observations, as contained in its work instruction for verifying the implementation of corrective actions. For example, a Site Office official stated he did not verify that the facility maps were posted in the facilities. Rather, Site Office personnel told us that they primarily reviewed documents in Livermore's Contractor Assurance System, specifically Livermore's corrective action tracking system. Site Office officials explained that inspections, such as walk-throughs, are only one tool to verify implementation of a corrective action and that they are not always necessary and are not required by work instructions. Rather, Site Office officials said they rely on the judgment of SME to determine whether an inspection is required. Site Office officials also told us that an effectiveness review is scheduled to be performed in 2011, which will provide an opportunity to verify implementation of corrective actions and their effectiveness. Based on the results of our review, we concluded that more timely inspections would have alerted Site Office management that further improvements were needed in Livermore's Prevention Program.

Livermore Verification and Closure Process

Livermore did not always perform timely inspections of the implementation of corrective actions prior to closing them in the corrective action tracking system. According to Livermore's procedure, *Issues and Corrective Action Management*, after an action owner completes a corrective action, a verifier reviews information entered into the corrective action tracking system to confirm that the action taken is consistent with the proposed action. However, Livermore closed actions based on review of documentation in the corrective actions tracking system without inspecting the implementation of the actions. For example, the corrective action for the facility maps was closed based on creation of the

maps, but without the field inspections to determine whether the maps were actually posted. In another example, the corrective actions related to training were closed based on the establishment of training requirements, but without determining whether all employees were actually trained. By not performing field inspections, Livermore did not have adequate assurance that these corrective actions were implemented.

Site Office and Livermore officials pointed out that actual field inspections occur 6 to 12 months after corrective action closure as part of effectiveness reviews to allow sufficient time for implementation. We found, however, that inspections had not been performed for corrective actions that had been closed for over six months. Specifically, the Site Office and Livermore had not planned to perform an effectiveness review to inspect the implementation of corrective actions, such as the use and posting of facility maps, until March 2011, or approximately 19 months after closing the facility map and other corrective actions.

Beryllium Exposure

By not fully addressing previously identified weaknesses, Livermore did not always mitigate employees' risk of exposure to beryllium. The Department's 2009 investigation of Livermore's Prevention Program stated that without effective safety controls, Livermore was still not adequately protecting its workers from beryllium exposure. In October 2010, NNSA and the Department issued a consent order to Livermore's management and operating contractor for the deficiencies identified in the Department's 2009 investigation. Under the terms of the consent order, Livermore agreed to perform an evaluation of all deficiencies identified in the report, implement corrective actions, and remit a \$200,000 remedy to the Department. As part of the consent order, Livermore has agreed to correct a number of outstanding findings from the 2009 investigation.

Beryllium exposure causes a significant concern as research has shown that it can cause sensitization and potentially lead to Chronic Beryllium Disease. In fact, since 2007, Livermore has had at least seven reportable events, two of which occurred within the last year. In addition Livermore has had 27 beryllium sensitization cases and 2 Chronic Beryllium Disease cases. Livermore stated that since 2007, it has increased voluntary enrollment in its medical surveillance program. Thus, the increase in the number of personnel being tested has

resulted in the increase of cases reported. While Livermore had taken some positive corrective actions to strengthen controls, ineffective implementation and inadequate oversight of corrective actions have resulted in deficiencies going unresolved, potentially allowing for similar events to recur such as the most recent potential exposure of a technician which occurred in September 2010. Such recurrence could have a significant impact on worker safety and increase the risk of beryllium sensitization and disease.

Livermore officials told us that the rate of beryllium sensitization is consistent with, and in the case of Chronic Beryllium Disease is significantly lower than, comparable data across the Department. Livermore also noted that there is good reason to believe that the increase in reported cases may be attributable to the fact that it had improved its program by increasing surveillance testing of workers. We are unable to affirm or dispute Livermore's assertions in this area, but continue to believe that sustained, aggressive action is necessary to ensure that the incidence of sensitization and disease are eliminated or kept to the minimum number possible.

RECOMMENDATIONS

We recommend that the NNSA Administrator strengthen the Site Office's oversight role by regularly performing evaluations of completed actions to ensure the full implementation of corrective actions.

Additionally, we recommend that the Site Office Manager ensure that Livermore:

1. Performs timely inspections to verify the implementation of corrective actions prior to the closure of an action;
2. Posts maps and standardized signs and labels in beryllium facilities and work areas;
3. Samples equipment for potential beryllium contamination;
4. Implements required beryllium training;
5. Documents and completes hazard assessments at legacy facilities; and,
6. Updates the beryllium information on its intranet website as operations and activities change.

MANAGEMENT COMMENTS

Management partially concurred with the findings and recommendations. Management did not agree with our conclusion and recommendation regarding Site Office oversight during the implementation of Livermore's corrective actions. Although management stated our review was valuable in identifying how the Site Office inadvertently combined the verification process with effectiveness reviews, they did not believe insufficient oversight caused the situation; rather, they stated that this procedural problem led to some confusion among Federal staff when performing oversight activities. In addition, management also stated that the Site Office actively pursued improving Livermore's Prevention Program and their corrective action process; a process which included over 90 corrective actions and touched hundreds of facilities. Management further noted that it was not possible to verify and judge effectiveness of every single corrective action taken by Livermore. With a small staff available to monitor progress on a wide front, some corrective actions received less prompt attention than others.

According to management, their effectiveness review process met the standards of Department Guide 414.1-5, *Corrective Action Program Guide* (Guide). Management stated that it was inappropriate to characterize the Site Office's compliance with the Guide as ineffective implementation or inadequate oversight and requested that those characterizations be removed from the report. Additionally, management stated that the report inaccurately suggested that worker exposure to beryllium and/or incidence of beryllium disease has increased, despite all of the corrective actions taken or in progress by Livermore. Further, management reported that a joint federal and contractor effectiveness evaluation of Livermore's improvements was successfully completed in March 2011, in accordance with the Guide.

Finally, management indicated that our report presented an incomplete characterization of progress and accomplishments under Livermore's corrective action program and that, in one case, overstated the characterization of an Office of Enforcement finding.

Management agreed with the remaining recommendations as opportunities for continuous improvement and stated they had already taken corrective action or will take additional corrective action. Management comments are included in their entirety in Appendix 3.

AUDITOR COMMENTS

While management's comments were, for the most part, generally responsive to the recommendations, we disagree with management's assertion that our conclusion was inaccurate and should be removed from the report for the reasons provided below.

We concluded that the Site Office's oversight efforts were not always effective in that its verification and closure processes did not ensure that corrective actions were actually implemented. While the Site Office has taken positive steps to update their work instructions and make them more clear; it is our opinion that action must be taken to ensure that corrective actions are implemented prior to closure. For example, in some situations, a walk through or field observation should be conducted to verify the action was executed and that the action taken was consistent with the planned action.

Management further stated that their effectiveness review process followed the Guide. According to the Guide, managers should continuously direct, prioritize, and sufficiently staff activities to ensure planned corrective actions are implemented. However, in our opinion, the Site Office did not meet the intent of the Guide in providing oversight of Livermore's Prevention Program since, as the Site Office indicated, it had a small staff for this activity. We acknowledge that the Site Office has faced reduced personnel levels in the last few years, including the loss of its Industrial Hygienist in 2009. While the Site Office has since hired a new Industrial Hygienist; this person has been on intern assignments for the last year. We are encouraged that the Site Office plans on hiring a full-time Industrial Hygienist to help address safety concerns. Additionally, we found that the Site Office did not prioritize verification and determination of effectiveness for certain corrective actions to ensure that they were implemented as suggested by the Guide.

Management also stated our report suggested that every single action taken by Livermore to correct systemic shortcomings must be individually verified and judged for effectiveness which was not practically possible. According to the Guide, upon implementation of a corrective action, the next step is to verify the successful completion of each corrective action and determine its effectiveness. Further, the Guide stated that a corrective action effectiveness review should be initiated as soon as practical. As corrective actions for each finding are completed, the effectiveness review for that finding should be

conducted. Further, a specified time for completion of the corrective action effectiveness review should also be determined by the corrective action effectiveness review manager (i.e., six months after all corrective actions for all findings have been completed). The Site Office and Livermore, however, had not planned to perform an effectiveness review until March 2011, 19 months after the completion date of some corrective actions. In our opinion, timely verification of completed actions and a determination of effectiveness would have alerted the Site Office that further improvements were needed in Livermore's Prevention Program.

Further, management stated that the report inaccurately suggests that worker exposure to beryllium and/or incidence of beryllium disease has increased, despite all of the corrective actions taken or in progress by Livermore. As noted previously, we are unable to affirm or dispute Livermore's assertions in this area, but agree with management that beryllium safety is a top priority and aggressive actions to correct identified problems are necessary to ensure that such cases are eliminated or kept to the minimum number possible.

To that end, a joint federal and contractor effectiveness review of issues identified with Livermore's Prevention Program was completed in March 2011. The effectiveness review found that Livermore has made significant improvements in achieving the objectives of the Regulation, but had concerns about whether the changes would be enduring. Of the 44 deficiencies reviewed, the Review Team found that 20 percent of the actions taken to resolve the deficiencies were partially effective. Thus, improvements still need to be made in Livermore's Prevention Program.

Finally, we clarified sections of our report to more fully recognize Livermore's progress in implementing its corrective action program.

Appendix 1

OBJECTIVE

The objective of the audit was to determine whether Lawrence Livermore National Laboratory (Livermore) had implemented effective beryllium controls to resolve previously identified weaknesses.

SCOPE

We conducted the audit from April 2010 to December 2010 at Livermore and the Livermore Site Office, both located in Livermore, California; the National Nuclear Security Administration's (NNSA) Headquarters, in Washington, DC; and, the Department of Energy's (Department) Office of Health, Safety, and Security, in Germantown, Maryland. Our audit focused on Livermore's beryllium controls and efforts in resolving previously identified weaknesses from Fiscal Year 2007 to December 2010.

METHODOLOGY

To accomplish the audit objective, we:

- Reviewed applicable Codes of Federal Regulations, internal policies and related prior reports;
- Reviewed 91 closed actions in the Corrective Action Plan and supporting documentation;
- Toured various beryllium facilities to observe warning signs and labels; and,
- Interviewed key Departmental and contractor personnel.

The audit was conducted in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. The Department established performance measures regarding the beryllium program as required by the Government Performance and Results Act of 1993. 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 solely rely on computer-generated data to satisfy our objective. Instead, we performed other procedures to satisfy ourselves as to the reliability and competence of the data by performing facility tours to observe postings of beryllium signs. In addition, we confirmed the validity of other data, when appropriate, by reviewing supporting source documents.

We held an exit conference with management on June 14, 2011.

RELATED REPORTS

National Nuclear Security Administration (NNSA) Report

- *Final Report of the NNSA Independent Review of the Lawrence Livermore National Laboratory Chronic Beryllium Disease Prevention Program* (October 2008). NNSA concluded that there were several areas of the Lawrence Livermore National Laboratory Chronic Beryllium Disease Prevention Program (CBDPP) that did not adequately address the requirements and intent of the Rule. Further, NNSA noted that the deficiencies in the documented CBDPP may be contributing to the overall program weaknesses, such as minimizing the number of beryllium workers and subsequent cases of beryllium sensitizations and/or disease.

Office of Enforcement Investigation Report

- *Chronic Beryllium Disease Prevention Program, Lawrence Livermore National Security, LLC* (July 2009). The investigation concluded that violations of the Rule appear to have occurred. Specifically, the potential violations were in the areas of baseline inventory, hazard assessment, exposure monitoring, protective clothing and equipment, release criteria, medical surveillance, training, and performance feedback.

Office of Inspector General Reports

- [*Beryllium Surface Contamination at the Y-12 National Security Complex*](#) (DOE/IG-0783, December 2007). The audit found that BWXT Y-12, LLC (BWXT Y-12) had not consistently implemented key controls in non-beryllium areas as required by its CBDPP. Specifically, BWXT Y-12 had not always posted signs alerting workers to the potential for beryllium surface contamination; and performed or documented hazard assessments for beryllium contamination, although documented assessments were vital to identifying potential exposure risks.
- [*Beryllium Controls at the Oak Ridge National Laboratory*](#) (DOE/IG-0737, September 2006). The audit found that the Oak Ridge National Laboratory did not properly manage activities related to beryllium contaminated equipment in building 9201-2, which is located at the Y-12 National Security Complex. In particular, beryllium contaminated equipment was transferred to non-beryllium areas; employees working with contaminated equipment were not fully identified and notified; transferred equipment was not labeled appropriately; and, the building was not posted as a potential contamination area.

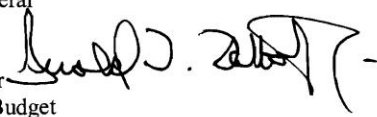


Department of Energy
National Nuclear Security Administration
Washington, DC 20585

MAY 4 2011



MEMORANDUM FOR: Rickey R. Hass
Deputy Inspector General
for Audits and Inspections
Office of Inspector General

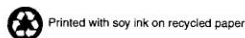
FROM: Gerald L. Talbot, Jr. 
Associate Administrator
for Management and Budget

SUBJECT: Comments to the IG Draft Report on Beryllium Controls at LLNL;
Project No. A10LL006; IDRMS No. 2011-00716

The National Nuclear Security Administration (NNSA) appreciates the opportunity to review the Inspector General's (IG) draft report, *Continuing Problems with the Implementation of Beryllium Controls at Lawrence Livermore National Laboratory*. I understand that the IG wanted to determine whether the Laboratory had fully implemented corrective actions to resolve previously identified weaknesses in the Chronic Beryllium Disease Prevention Program (CBDPP).

The IG's review was valuable in identifying how the Livermore Site Office (LSO) inadvertently combined the verification process with effectiveness reviews, which led to some confusion among Federal staff when performing oversight activities. We plan to use these insights to create updated, clearer work instructions.

We do not agree with the IG's conclusion that LSO had not provided sufficient oversight during the implementation of Lawrence Livermore National Laboratory's (Livermore) corrective actions. LSO has been actively pursuing improving the CBDPP. The draft report, with no explanation disregards important realities LSO and all Site Offices face in day-to-day field operations. The corrective action process at Livermore included over 90 corrective actions that touched on hundreds of facilities. The language throughout the report goes on to suggest that every single action taken by Livermore to correct systemic shortcomings must be individually verified and judged for effectiveness. This is not a practical possibility. With a small staff available to monitor progress on a wide front, some corrective actions necessarily receive less prompt attention than others. Even with these constraints, the joint federal/contractor effectiveness evaluation of the multi-year effort associated with the Livermore improvements was successfully completed in March 2011. Moreover, the effectiveness review process met the promulgated standards of DOE's Guide 414.1-5's "Corrective Action Program Guide." Accordingly, it was endorsed by the NNSA Albuquerque Service Center; the DOE Office of Health, Safety and Security; and the DOE Office of Enforcement. We believe it is inappropriate to characterize LSO's compliance with DOE guidance as ineffective implementation or inadequate oversight and request that those characterizations be removed from the draft audit report.



Appendix 3 (continued)

Additionally, some references or statements in the report inaccurately suggest that, despite all of the corrective actions taken or in progress by Livermore, worker exposure to beryllium and/or incidence of beryllium disease has increased. Attached is Livermore's response to the draft report. Management agrees with that response. NNSA has received some specific comments from the Office of Health, Safety and Security which are also attached for your consideration.

For these reasons, NNSA does not concur with the IG recommendation to "strengthen" the Site Office's oversight role. As stated above we do not believe that insufficient oversight caused the situation; rather, it was procedural problems that inadvertently combined the verification process with effectiveness reviews. LSO regards beryllium safety as a top priority. It is taking aggressive action within the context of its role as a contract overseer to correct this problem.

With regards to the second recommendation ensuring Livermore perform various actions, NNSA agrees and will take the appropriate actions in coordination with LSO. However, the Site Office Manager has the responsibility to oversee and address these issues and we recommend that the IG revise the recommendation to say "Additionally, we recommend that the Site Office Manager ensures..."

If you have any questions concerning this response, please contact JoAnne Parker, Director, Office of Internal Controls, 202-586-1913.

Attachment

cc: Alice Williams, Manager, Livermore Site Office

Appendix 3 (continued)

Lawrence Livermore National Security, LLC (LLNS) comments to the IG's draft report, *Continuing Problems with the Implementation of Beryllium Controls at Lawrence Livermore National Laboratory*

Lawrence Livermore National Security, LLC (LLNS) has reviewed the Office of Inspector General's (IG) draft report, "Continuing Problems with the Implementation of Beryllium Controls at Lawrence Livermore National Laboratory" and provides the following comments on the facts presented, conclusions reached and appropriateness of the recommendations.

Our comments should be considered in the context of the exhaustive internal and external substantive reviews that we've undertaken in the past two-plus years – including the Independent Assessment conducted by the National Nuclear Security Administration (NNSA) in October 2008 and the investigation conducted by the Department of Energy (DOE) Office of Enforcement in 2009 – and the measures taken over that same period to identify and remedy identified deficiencies and weaknesses in LLNL's beryllium safety program, culminating in a Consent Order between the DOE Office of Enforcement and LLNS signed in November 2010.

Since even before the 2008 NNSA assessment and the 2009 Office of Enforcement investigation, LLNS has been working aggressively to upgrade the LLNL Chronic Beryllium Disease Prevention Program (CBDPP), bringing to bear substantial resources and significantly increasing management involvement to improve and sustain a strong and responsive CBDPP. The best evidence of that improvement, and of the sustained commitment of LLNS to maintaining a best-in-class beryllium safety program, can be found in the results of the recent "Beryllium Program Effectiveness Review" mandated by the Consent Order and completed less than one month ago in March 2011. The conclusion of that review, which was conducted by a joint cross-functional team of eight subject matter experts from DOE headquarters, the NNSA Livermore site office and LLNL, was that LLNS had undertaken and completed corrective actions to address the vast majority of the issues identified in previous reviews, significantly improved the LLNL CBDPP, and implemented those program changes in an effective manner. A relatively small number of issues identified as not being fully effective were acknowledged as being "in process" and are being resolved under LLNL procedures.

We understand the importance of mitigating exposure to hazardous materials and continue to work diligently to clarify, amend, and continuously improve our program. We accept the IG recommendations as an opportunity for continuous improvement and have already taken corrective action or will take additional corrective action.

We note that certain references or statements contained within the report convey a tone that, despite all of our corrective actions taken or planned, worker exposure and/or disease has increased. We strongly disagree. Specifically we request the IG final report clarify three main themes to present a more current and balanced view of LLNL:

1. Repetitive references to the number of beryllium sensitization and Chronic Beryllium Disease (CBD) cases since 2007.

LLNL's cumulative rate of beryllium sensitization (2.64%) and CBD (0.28%) are consistent with, and in the case of CBD, significantly lower than, roughly comparable data from across the DOE Complex (as reported in the DOE Be Registry). LLNS acknowledges, as noted by the NNSA in its 2008 Independent Review and by the DOE Office of Enforcement in its 2009 investigation, that there was an upswing in the number of sensitization and CBD cases identified at LLNL since 2007. There is good reason to conclude that the primary cause of the increase in the number of cases reported was a dramatic increase in the number personnel being tested, not an increase in exposure events or beryllium contamination generally. Since contract transition in 2007, LLNS has greatly increased communication and outreach about beryllium and LLNL's CBDPP to the entire LLNL workforce, supplemented by targeted communications to work groups most likely to have potential exposure to beryllium in the workplace. These efforts have increased voluntary enrollment in LLNL's Beryllium Medical Surveillance Program and generated more demand for testing. LLNL has more than 1800 workers enrolled in the program, of which 60% were enrolled in 2009 and 2011.. Beryllium Medical Surveillance Program comparative information from all DOE sites, including LLNL, is readily accessible to IG and the general public at: http://www.hss.doe.gov/HealthSafety/WSHP/be/bery_wr.html.

2. Incomplete characterization of progress and accomplishments under LLNS's corrective action plan.

The statement in the report "Livermore had developed some positive corrective procedures to strengthen controls in its Prevention Program" (page 3) understates the scores of concrete improvements LLNL has made to strengthen its CBDPP since the development, refinement and implementation of its corrective action plan beginning in 2009. LLNS has analyzed all of its events, internal and external audits, and worker feedback, and has developed and, for the most part implemented, comprehensive corrective actions to improve worker safety. LLNL continues to work with the NNSA, the DOE Office of Enforcement, LLNL employees, and external stakeholders (e.g., other DOE sites and the Beryllium Health and Safety Committee) to improve worker health and safety. IG's six recommendations for improvement should be evaluated in the context of the accomplishments reflected in over 90 closed corrective actions and the hundreds of pages of supporting documentation for our revamped program that were made available to the auditors. LLNS notes that the IG recommendations are associated with the communication, documentation and handling of equipment or materials with the potential for low levels of beryllium surface contamination, rather than the identification of newly discovered or previously unaddressed hazardous operations or conditions creating the potential for far more potentially serious airborne exposure. These are kinds of situations that LLNS continues to identify and remedy across the institution, as do other DOE sites.

3. Overstated characterization of previously identified weaknesses relating to exposure monitoring.

The report states, “by not addressing previously identified weaknesses, Livermore did not always mitigate employees’ risk of exposure to beryllium....” (page 2) and references the 2009 Office of Enforcement report, adding the statement “the lack of sufficient detail and completeness of documentation did not allow for accurate calculations [of worker exposures].” This section overstates Office of Enforcement’s conclusions, which dealt only with documentation from less-than-full-shift monitoring to attempt to justify the post-facto extrapolation of an 8-hr Time Weighted Average exposure from the short-term exposures. LLNL has consistently performed exposure monitoring in accordance with regulatory and industry standards and the accuracy of its measurements and calculations have never been in doubt. In FY2011, Livermore collected over 1750 personal air samples for various operations onsite. 97% of those samples indicated no detectable airborne beryllium. The remaining 3% were associated with acknowledged beryllium activities for which LLNL had instituted appropriate controls, including respiratory protection, to minimize worker exposure to beryllium.

Finally, considering the extensive corrective actions completed or in process to improve the Laboratory’s Beryllium program developed by LLNL and reviewed by LSO, the IG report title, “Continuing Problems with the Implementation of Beryllium Controls at Lawrence Livermore National Laboratory” has the potential to mislead the casual reader. A more descriptive title would be, “Implementation of Beryllium Controls at Lawrence Livermore National Laboratory,” and we respectfully request that the title be so revised.

Appendix 3 (continued)

Office of Health, Safety and Security (HS-40) Comments to the IG's draft report
*Continuing Problems with the Implementation of Beryllium Controls at
Lawrence Livermore National Laboratory*

General Comments:

- (1) The draft cover letter and report repeatedly refer to a "consent decree" issued by the Office of Enforcement. For worker safety and health matters such as the case at hand, the correct term is a Consent Order. A decree is typically issued by an administrative law judge and is not akin to an agency settlement agreement.
- (2) The draft cover letter and report refer the Office of Enforcement's investigation as a "review." The Office of Enforcement conducted an enforcement investigation into potential noncompliances with 10 C.F.R. Parts 850 and 851 pursuant to 10 C.F.R. § 851.40(a).

Specific Comments:

- (1) Cover letter, first paragraph, last sentence: The sentence states that 10 C.F.R. Part 850 was established to reduce the number of workers exposed to beryllium. While this statement is accurate, it provides a limited characterization of the rule. Most of the rule requirements are designed to minimize the levels of and potential for worker exposure to beryllium.
- (2) Cover letter, page 2, second bullet and report, page 1, third bullet: Both of these items refer to a "procedure that Department officials told us was expected." An assessment of whether DOE and its contractors are meeting Departmental safety requirements and expectations should be based on facts and authoritative documents, not on what is conveyed in interviews or discussions.

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3. What format, stylistic, or organizational changes might have made this report's overall message more clear to the reader?
4. What additional actions could the Office of Inspector General have taken on the issues discussed in this report which would have been helpful?
5. Please include your name and telephone number so that we may contact you should we have any questions about your comments.

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