



Results in Brief



Audit Report on "Nuclear Safety: Safety Basis and Quality Assurance at the Los Alamos National Laboratory"

DOE/IG-0837
August 12, 2010

Why we performed this review

The Department of Energy's (Department) Los Alamos National Laboratory (Los Alamos) is a government-owned, contractor-operated facility that is part of the National Nuclear Security Administration's nuclear weapons complex. Los Alamos' primary mission is to ensure the safety, security, and reliability of the Nation's nuclear deterrent force. To meet its mission, Los Alamos employees and subcontractors operate in close proximity to or in contact with special nuclear materials, explosives and hazardous chemicals. We initiated this audit to determine whether Los Alamos had fully implemented the required nuclear safety management regime.

Background

The Department considers safety an integral part of its mission, operating in compliance with nuclear safety requirements of Title 10 of the Code of Federal Regulations, Part 830, *Nuclear Safety Management*. The Regulation, among other things, requires contractors to complete, and update as conditions change, Documented Safety Analyses (DSA) that identify hazards associated with relevant work processes and to design and implement controls over such hazards. Further, under DOE Order 414.1C, *Quality Assurance*, contractors are required to develop and implement a Quality Assurance Program to prevent or detect safety or other problems in the workplace. The DSA and Quality Assurance requirements are critically important and are designed, when properly implemented, to protect workers, the public, and facilities from the potentially devastating effects of nuclear-related accidents.

What we found...

Los Alamos, one of the most storied institutions of its kind, has had a long history of concerns related to nuclear safety management. Our review disclosed that the Laboratory continues to have problems in fully implementing a number of critical nuclear safety management measures. For example, Los Alamos had not:

- Updated or fully implemented Documented Safety Analyses (DSAs) for 5 of its 14 nuclear facilities to ensure that hazards had been fully identified and controls implemented to mitigate nuclear hazards;
- Maintained adequate design information about safety systems to ensure that they met technical requirements;
- Demonstrated that operational tests of nuclear safety systems were completed to verify operability after modifications were made to the systems;
- Demonstrated that it had validated the efficacy of corrective actions; and,
- Fully resolved long-standing issues involving noncompliance with established hazard controls.

We concluded that management had not focused sufficient attention in the past on implementing the nuclear safety Quality Assurance Program throughout the Laboratory. Further, officials acknowledged that they had underestimated the level of work necessary to complete required hazard analyses to update the DSAs for some of its nuclear facilities. Additionally, Los Alamos stated that a lack of staff with needed technical expertise to update the DSAs contributed to problems with out-of-date DSAs. Compounding the problem, the Los Alamos Site Office, the Federal entity charged with administering the Los Alamos contract, had not always taken the actions necessary to ensure that nuclear safety at the Laboratory was improved.

Management generally concurred with the report.

To view the full report, click on the following link:
<http://ig.energy.gov/documents/IG-0837.pdf>

For more information, contact felicia.jones@hq.doe.gov





U.S. Department of Energy
Office of Inspector General
Office of Audit Services

Audit Report

Nuclear Safety: Safety Basis and
Quality Assurance at the Los Alamos
National Laboratory



Department of Energy
Washington, DC 20585

August 10, 2010

MEMORANDUM FOR THE SECRETARY

FROM:


Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Audit Report on "Nuclear Safety: Safety Basis and Quality Assurance at the Los Alamos National Laboratory"

BACKGROUND

The Department of Energy's Los Alamos National Laboratory is a government-owned, contractor-operated facility that is part of the National Nuclear Security Administration's (NNSA) nuclear weapons complex. Los Alamos' primary mission is to ensure the safety, security and reliability of the Nation's nuclear deterrent force. To meet its mission, Los Alamos employees and subcontractors operate in close proximity to or in contact with special nuclear materials, explosives and hazardous chemicals. NNSA's Los Alamos Site Office is responsible for overseeing the operations of Los Alamos. Since June 1, 2006, Los Alamos National Security, LLC, has managed and operated Los Alamos under contract with NNSA.

The Department considers safety an integral part of its mission, operating in compliance with nuclear safety requirements of Title 10 of the Code of Federal Regulations Part 830 (10 CFR 830), *Nuclear Safety Management*. The Regulation, among other things, requires contractors to complete, and update as conditions change, Documented Safety Analyses (DSA) that identify hazards associated with relevant work processes and to design and implement controls over such hazards. Further, under DOE Order 414.1C, *Quality Assurance*, contractors are required to develop and implement a Quality Assurance Program to prevent or detect safety or other problems in the workplace.

The DSA and Quality Assurance requirements are critically important and are designed, when properly implemented, to protect workers, the public and facilities from the potentially devastating effects of nuclear-related accidents. We initiated this audit to determine whether Los Alamos had fully implemented the required nuclear safety management regime.

RESULTS OF AUDIT

Los Alamos, one of the most storied institutions of its kind, has had a long history of concerns related to nuclear safety management. Our review disclosed that the Laboratory continues to have problems in fully implementing a number of critical nuclear safety management measures. For example, Los Alamos had not:

- Updated or fully implemented DSAs for 5 of its 14 nuclear facilities to ensure that hazards had been fully identified and controls implemented to mitigate nuclear hazards. The five DSAs were at various stages of development, approval and implementation. In three cases, the DSAs dated back to the mid to late 1990s, and had not been updated until recently despite significant changes to the facilities' processes and structures. The updated DSAs have not been fully implemented;
- Maintained adequate design information about safety systems to ensure that they met technical requirements. Los Alamos, for example, did not have design information needed to know at what point containers used to store plutonium, a special nuclear material, would over-pressurize and release their contents into the atmosphere;
- Demonstrated that operational tests of nuclear safety systems were completed to verify operability after modifications were made to the systems. For example, Los Alamos had not verified the operability of 6 of 11 safety systems after they were modified including a fire suppression system in Technical Area 55, a high-hazard nuclear facility;
- Demonstrated that it had validated the efficacy of corrective actions. Specifically, Los Alamos could not provide evidence that it had validated the efficacy of actions taken to resolve 11 significant safety issues, including actions to prevent the contamination of workers involved in decontaminating facilities; and,
- Fully resolved long-standing issues involving noncompliance with established hazard controls. For example, as recently as September 2009, Los Alamos determined that, despite corrective actions in this area, it continued to have a systemic problem with worker noncompliance with established procedures.

Despite repeated efforts by the Laboratory to address nuclear safety issues, past actions had not been successful in ensuring that all nuclear safety management requirements were fully implemented. We concluded that management had not focused sufficient attention in the past on implementing the nuclear safety Quality Assurance Program throughout the Laboratory. Further, officials acknowledged that they had underestimated the level of work necessary to complete required hazard analyses to update the DSA's for some of its nuclear facilities. Additionally, Los Alamos stated that a lack of staff with needed technical expertise to update the DSAs contributed to problems with out-of-date DSAs.

Compounding the problem, the Los Alamos Site Office (LASO), the Federal entity charged with administering the Los Alamos contract, had not always taken the actions necessary to ensure that nuclear safety at the Laboratory was improved. For example, LASO had not established performance measures requiring Los Alamos to submit updates of DSAs. Further, although LASO had identified expectations for Los Alamos to continually improve its Quality Assurance Program since 2008, it had not established metrics requiring the Laboratory to correct all identified systemic quality assurance weaknesses.

We noted that Los Alamos has recently taken some positive steps designed to address weaknesses in nuclear safety. For example, Los Alamos established a Quality Implementation

Council (Council), in March 2010, composed of senior Laboratory managers to, among other things, "drive" implementation of the Quality Assurance Program throughout the Laboratory and to correct systemic weaknesses in quality assurance. Although it has not completed its work, the Council has identified a number of actions needed to fully implement an appropriate Laboratory quality assurance culture. This included, as of June 2010, the need to increase quality assurance resources, increase training and use of resources to identify and correct quality assurance problems. Los Alamos had taken a number of actions to address systemic quality assurance weaknesses. Yet, it had not developed and approved a corrective action plan establishing milestones and identifying the resources needed to address enhanced processes and procedures issues identified by the Council.

Until Los Alamos corrects weaknesses in the analysis of hazards, establishes compensating internal controls, identifies and addresses all unresolved quality assurance issues and completes implementation of its ongoing initiatives, there is no assurance that safety risks associated with work processes are minimized. These corrective actions are critical to maximizing the reliability and performance of Laboratory safety systems.

During the course of our audit, both contractor and NNSA management stressed the point that Los Alamos is safe. As evidence, they cited the fact that the Laboratory had not lost a single work day attributable to a nuclear safety injury for over one year as of June 2010. While the work-day performance is admirable, our audit identified outstanding nuclear safety issues that need to be addressed to prevent nuclear safety-related accidents in the future. As such, our report contains several recommendations designed to help improve the safety and quality assurance programs at Los Alamos.

Finally, during the course of our audit, a Laboratory employee complained that he had suffered retaliation because he had disclosed what he believed to be nuclear safety violations and had cooperated with the Office of Inspector General. In response, we performed a separate review of these allegations. We were unable to substantiate the allegations of retaliation or the specific nuclear safety violations described by the complainant. Nonetheless, as noted in this report, there are a number of long-standing nuclear safety issues at Los Alamos that require management attention.

MANAGEMENT REACTION AND AUDITOR RESPONSE

NNSA management generally agreed with the report and stated that although the operations at Los Alamos are safe, continued improvement is needed to meet expectations for NNSA's nuclear facilities. Management further stated that work is underway to pursue those expectations and address the concerns raised in the report. Management expressed concern that our report could be construed to suggest that Los Alamos is operating in violation of 10 CFR 830, *Nuclear Safety Management*, and pointed out that Los Alamos has self-identified and reported its deficiencies and is actively working on closing gaps in implementation. Finally, management stated that the recommendations were somewhat general and could be more specific to improve the effectiveness of the report.

Management's comments were generally responsive.

Regarding management's specific comments, our report does not state, nor did we find evidence to confirm, that Los Alamos is operating in violation of the Code of Federal Regulations. In fact, we note that the Department's Office of Enforcement, which is responsible for enforcing 10 CFR 830, had not issued any Notices of Violation to Los Alamos since the current contractor began managing and operating the Laboratory. Rather, our report is intended to bring to management's attention forward looking improvements in safety measures needed to further reduce risks. While we modified one recommendation to provide more specificity, we believe the remaining recommendations, as provided, give management the flexibility to determine specific corrective actions that need to be taken to address the issues identified in the report. If management wants to suggest another course of action or a different set of recommendations that would be more effective in remedying the underlying concerns raised during the audit, we would welcome such an initiative.

Management's comments and our response are summarized in the body of the report and management's verbatim comments are attached in Appendix 3.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Chief of Staff
Manager, Los Alamos Site Office
Director, Office of Risk Management

REPORT ON NUCLEAR SAFETY: SAFETY BASIS AND QUALITY ASSURANCE AT THE LOS ALAMOS NATIONAL LABORATORY

TABLE OF CONTENTS

Nuclear Safety at Los Alamos National Laboratory

Details of Finding	1
Recommendations and Comments.....	10

Appendices

1. Objective, Scope, and Methodology.....	12
2. Related Reports.....	13
3. Management Comments	15

SAFETY BASIS AND QUALITY ASSURANCE

Nuclear Safety at Los Alamos National Laboratory

Los Alamos National Laboratory (Los Alamos) had not fully implemented Nuclear Safety Management requirements designed to ensure adequate protection from nuclear safety accidents. Specifically, Los Alamos had not fully implemented Department of Energy (Department) regulations requiring contractors that operate nuclear facilities to identify hazards associated with work processes, design and implement controls over those hazards, and to update identified hazards and controls as work processes change (activities collectively known as "safety basis"). Additionally, Los Alamos had not fully implemented quality assurance requirements to control the reliability and integrity of nuclear safety systems and components.

Safety Basis Requirements

Los Alamos had not updated or fully implemented updated Documented Safety Analyses (DSA) for 5 of 14 nuclear facilities. In three cases, the DSAs dated back to the mid to late 1990s, and had not been updated until recently despite changes to the facilities' processes and structures. The updates had not been fully implemented. The DSAs describe hazards and the controls established over those hazards. Contractors responsible for nuclear facilities are required to submit annual DSA updates to the National Nuclear Security Administration (NNSA) for approval when significant changes to conditions and structures of the facilities have been made. If no updates are necessary, contractors are required to submit a letter to NNSA stating that there have been no changes to the safety basis of the nuclear facility. NNSA contractors rely on the DSAs to record identified hazards and to establish hazard controls for each nuclear facility.

To tailor its nuclear facility DSAs to the current conditions and to address a self reported noncompliance regarding DSA updates, Los Alamos developed a Safety Basis Improvement Plan in November 2006. Los Alamos planned to have all DSA upgrades completed by Fiscal Year (FY) 2007, except for the Chemistry and Metallurgy Research Facility (CMR), which they planned to complete by FY 2008. The plan was revised multiple times and the due dates for the DSAs were extended, with projected completion dates ranging from the second quarter of 2008 through the second quarter of 2009. Los Alamos, however, had yet to meet its revised plans for updating DSAs.

Los Alamos had five facilities with DSAs that were at various stages of development, approval and implementation. Specifically, as of June 2010, the:

-
- CMR and the Technical Area 55 (TA-55) Plutonium Facility, both high hazard facilities, had updates to their 1998 and 1996 DSAs approved in 2010 and 2008, respectively; however, they had not been implemented;
 - Weapons Engineering Tritium Facility DSA was approved in 2002, but had not been updated; and,
 - Waste Storage and Disposal Facility and the Radioactive Liquid Waste Treatment Facility had updates to its 2003 and 1996 DSAs, respectively, pending NNSA approval as of June 2010.

Los Alamos officials pointed out that hazards and mitigating controls are identified during the intervening periods when DSAs were not updated. In such cases, Los Alamos submits to NNSA's Los Alamos Site Office (LASO), which is responsible for overseeing the Laboratory, its determination that a safety question has been identified that needs to be mitigated and proposes action to mitigate the hazards. NNSA then approves a Justification for Continuing Operations (JCO) which details the hazard and the required mitigation measures. We noted, however, that according to Departmental guidance in Los Alamos' contract, JCOs are intended to be temporary measures until an updated hazard analysis can be completed and hazard controls established on a permanent basis. In 2007, the Defense Nuclear Facilities Safety Board (DNFSB), which provides oversight of the Department's nuclear facilities, raised concerns that the Department was operating its nuclear facilities under JCOs for "excessive durations" of up to four years. According to the Department's Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements (DOE G 424.1-1B), JCOs should be reviewed and included, as appropriate, in annual updates to the DSAs. In response to the draft of this report, Los Alamos stated that it currently did not have any JCOs that are four years old, all of which have expiration dates of less than one year.

Further, the importance of performing a systemic, disciplined approach to performing hazard analyses such as required to complete a DSA was demonstrated by a recent DNFSB finding regarding a nuclear-related hazard at TA-55. According to an October 2009 DNFSB report, the "in use" hazard analysis failed to consider a scenario where unsecured ignition sources inside glove boxes may topple over, causing a fire, even if the glove boxes themselves do not topple over. According to the DNFSB, while upgrades to stabilize the seismic qualified glove box stands may

help prevent the toppling of the glove box, it does not prevent the toppling of ignitable material inside the glove box. The DNFSB report identified the need for Los Alamos to execute immediate and long-term actions that can reduce the risk posed by a seismic event at TA-55. The importance of fully identifying hazards in nuclear facilities was evident by the hazard controls Los Alamos subsequently implemented or planned to implement in response to the DNFSB findings. Specifically, Los Alamos removed 11 tons of combustible material from the facility to mitigate the immediate hazards and planned to add ignition source controls; install automatic seismic shutdown of nonessential electrical loads; use a new safety-class storage system and new plutonium control limits; and, reduce first-floor plutonium inventory.

According to NNSA officials, the hazard analysis supporting the update to the TA-55 DSA identified nearly two dozen accident scenarios, and, with one exception, all of the scenarios were evaluated to be adequately mitigated. The one accident scenario that was not adequately mitigated was the one of most concern to the DNFSB regarding a seismic event and a resulting fire. However, NNSA officials pointed out that they judged that the nuclear safety advantages of approving the updated DSA in 2008, the first update in 12 years, and initiating nuclear safety improvements outweighed the disadvantages presented by the accident scenario given the low probability of an earthquake. As of June 2010, NNSA had not fully implemented hazard controls needed to address the DNFSB concerns, some of which LASO plans to secure funding for in 2012.

Quality Assurance Requirements

Los Alamos had not fully implemented its quality assurance program to ensure adequate protection from nuclear safety accidents. Specifically, Los Alamos had not:

- Maintained adequate design information to ensure that nuclear hazards were adequately controlled;
- Demonstrated that operational tests of nuclear safety systems were completed to verify operability after modifications were made;
- Demonstrated that it had validated the efficacy of corrective actions; and,
- Fully resolved long-standing issues involving employees not performing work in accordance with established hazard controls.

Safety System Design and Configuration Management

Contrary to Department requirements that all nuclear activities have adequate design information, Los Alamos did not always have sufficient design information available to ensure that equipment met technical requirements. Specifically, Los Alamos had insufficient design information on about 40 "vault water bath" containers at TA-55 used to store plutonium, a special nuclear material. Los Alamos relied on the vault water bath system to keep the containers from over pressurizing. The containers are used to dissipate heat generated by the decay of plutonium. However, the DNFSB determined that design information did not sufficiently describe the temperature and pressure parameters of the containers. As a result of insufficient design information, Los Alamos did not know the point at which any of the containers would over pressurize and release their contents into the atmosphere. An April 2009 DNFSB report stated that failure of one or more containers and the unmitigated offsite consequences could result in what the Board termed a "high consequence accident." LASO officials told us that the risk posed by the containers and vaults was mitigated by multi-stage air filtration systems that exist between the vault and the public, and that the containers have been vented to improve the safety posture.

Los Alamos also operated TA-55 without knowing the exact configuration of its safety systems. Los Alamos relied on Design Change Packages (DCPs) to control and document temporary and permanent configuration changes to structures, systems, and components. According to TA-55's Configuration Management Division's information, 29 of the 351 DCPs that Los Alamos initiated for critical safety systems, structures, and components since 1995 were not available for review. Further, according to Configuration Management Division officials, 16 DCPs were lost, and the remaining 13 did not have any records. Furthermore, additional DCPs were reported as checked out to individuals throughout TA-55 but Los Alamos had not confirmed whether these DCPs still existed. To its credit, Los Alamos acknowledged that a DCP control problem exists, and has drafted a plan to address the issues for legacy DCPs; however, the plan had not been approved as of the end of our audit work. Until all DCPs are accounted for and testing and validation of modifications are made, Los Alamos will continue to operate high-hazard, nuclear facilities at TA-55 without knowing the exact configuration of its safety systems. Recognizing that a valid legacy configuration issue exists, NNSA officials indicated that the DSAs establish off-setting controls that include surveillances and processes on safety systems to ensure operability.

Finally, Los Alamos officials pointed out that there are approximately 1,700 engineering drawings that the Laboratory has identified as out-of-date and a priority for update. Los Alamos had a performance expectation for FY 2010 that required it to update 200 engineering drawings; however, the expectation was reduced to 100 drawings because of the need to respond to the previously discussed DNFSB finding about inadequate design information for the TA-55 vault water bath containers. Until Los Alamos can update its engineering drawings, it has instituted a procedure that requires engineers to "walkdown" systems or structures before any work is performed on systems and structures that have outdated engineering drawings. While "walkdowns" mitigate risks associated with outdated engineering drawings, Los Alamos officials pointed out that they recognize that it is inefficient and that the drawings need to be updated.

Operational Tests

Although its Quality Assurance Plan requires tests to ensure the functionality of safety systems, we found that Los Alamos had not always performed or documented the tests after modifications were made to the facility for 6 of the 11 DCPs we reviewed. In particular, Los Alamos did not always know whether it had conducted operational tests of the safety systems to verify their conformance to specified requirements. Los Alamos officials did not know whether tests were conducted because many of the records supporting test results were nonexistent. Without documentation of tests and their results, Los Alamos could not demonstrate that modifications to safety systems met the requirements contained in the DCPs. For example, one DCP that we reviewed related to modifications performed in FY 2006 to a fire suppression system in TA-55. Los Alamos, however, did not have documentation to show that it had performed tests after the modification to verify that the system performed as required.

Although not fully implemented, and as such not fully effective, we found that Los Alamos has initiated a number of actions to improve its confidence that safety systems function as intended and satisfy their specified function. For example, Los Alamos initiated its Vital Safety System Assessment Program in 2007 to assess the functionality of its safety systems and established procedures to determine the operability of systems that are found to have degraded or not conform with safety basis requirements. However, these initiatives will take time to fully implement. LASO pointed out that Los Alamos completed 55 of 56 of the Vital Safety System Assessments expected in 2009; however, 6 of the 26 that LASO sampled were noncompliant with guiding

principles for performing the assessments such as not including required operability determinations. In addition, we noted that the procedures used for performing the assessments between 2007 and 2009 did not include all quality assurance requirements, such as determining whether safety systems components were procured in accordance with specifications. Los Alamos revised its procedures for performing the assessments in April 2009 and brought them more in line with quality assurance requirements. According to Los Alamos, 32 safety systems have not been assessed under the revised procedures.

Corrective Actions

Los Alamos had not demonstrated the validation of the efficacy of corrective actions designed to resolve significant safety deficiencies. Specifically, neither Los Alamos nor LASO could confirm that any of the nuclear safety issues associated with Preliminary Notices of Violations (PNOV) issued by the Department's Office of Price-Anderson Enforcement (Office) had been effectively resolved. The Office conducts site investigations when there have been repetitive, significant safety issues reported in its Noncompliance Tracking System (NTS). The Office issues PNOVs when it believes that there has been a safety rule violation based upon the findings of such investigations. Specifically, we reviewed 11 NTS reports associated with 3 PNOVs that Los Alamos had reported as corrected and closed. Los Alamos files, however, contained no evidence to support that effectiveness reviews were performed for any of the reported non-compliances that were closed. For example, Los Alamos could not provide evidence that it had validated the efficacy of actions taken to prevent the contamination of workers decontaminating facilities. In another instance, Los Alamos could not provide evidence that it had validated the efficacy of actions taken to ensure that degraded TA-55 nuclear materials containers were in seismically qualified storage racks. According to Los Alamos, procedures are now in place and in use for performing effectiveness evaluations. LASO pointed out, and we confirmed, that the Laboratory had not received any PNOVs related to nuclear safety since the current contractor assumed responsibility for managing the Laboratory in June 2006. We reviewed the supporting documentation, however, for 3 of the 11 NTS reports associated with 2 of the PNOVs that were closed by the current contractor and found that there was no evidence that it had validated the effectiveness of the corrective actions. This is in spite of the fact that the Department's quality assurance management systems guide recommends that a determination be made about the effectiveness of corrective actions as part of a sound quality assurance program. Los Alamos

indicated that the PNOVs and NTS Report closures referenced above occurred prior to the development of the current effectiveness evaluation process. Los Alamos' implementation of its effectiveness evaluation process is necessary to ensure the efficacy of future corrective actions.

Work Processes

Los Alamos had not fully resolved long-standing issues involving noncompliance with established hazard controls. For example, as recently as September 2009, Los Alamos determined that, despite corrective actions in this area, it continued to have a systemic problem with worker noncompliance with established procedures. Historically, Los Alamos has experienced problems with noncompliance with established work processes. In 2008, NNSA issued a special report to Los Alamos stating that nuclear safety performance at Los Alamos over the past several years was inadequate. Specifically, NNSA noted that safety related incidents resulted because required hazard controls were either ineffective or not implemented. The Department deferred enforcement action to enable Los Alamos to focus management attention on identifying the broad deficiencies which led to these events. Our review and Los Alamos' recent self assessments, however, indicate that worker compliance with established hazard controls continue to be a systemic problem within the Laboratory. For example, our review disclosed the following recent incidents related to noncompliance with established work processes in nuclear and radiological facilities:

- A subcontractor employee failed to use established procedures intended to prevent accidents during maintenance operations while working on a ventilation system in TA-55 in November 2009. Los Alamos' root cause analysis determined that the subcontractor had not been provided with the current standard operating procedures;
- Los Alamos accepted nonconforming parts for a fire alarm control panel at the CMR in August 2009. Los Alamos' root cause analysis determined that, among other things, workers had rushed the procurement and had not ensured the vendor would provide parts meeting specifications and that workers had also not performed required inspections prior to accepting the parts; and,
- Three employees were contaminated while performing decontamination at the Los Alamos Neutron Science

Center, a radiological facility, in March 2010. Los Alamos' root cause analysis determined that employees were not properly surveyed after contamination was detected on them that resulted in contamination being released outside the radiological control area. Los Alamos also determined that the employees had not worn the proper clothing when working in the radiological area.

Although Los Alamos implemented corrective actions to address the specific causes of each of the above individual examples, a September 2009 self assessment by the Laboratory showed that worker noncompliance with established work processes was a systemic problem. Specifically, the self assessment found, among other things, that a systemic weakness significantly adverse to quality existed in ensuring that work processes were performed in accordance with established procedures. Although not fully developed, Los Alamos initiated actions in 2010 to promote quality assurance implementation throughout the Laboratory. While these actions hold promise for improved implementation of the Quality Assurance Program, Los Alamos and LASO will need to maintain sufficient management attention on quality assurance issues given that past actions have not been fully successful in correcting weaknesses in the past.

**Safety Basis
Requirement and
Quality Assurance
Implementation**

Despite repeated efforts by Los Alamos to address nuclear safety issues, past actions have not been successful in ensuring that the Laboratory fully implemented nuclear safety management requirements. We concluded that management had not focused sufficient attention in the past on implementing the nuclear safety Quality Assurance Program throughout the Laboratory. Further, Los Alamos told us that it had underestimated the level of work necessary to complete required hazard analyses to update the DSA's for some of its nuclear facilities. Additionally, Los Alamos stated that it lacked employees with the technical expertise needed to update the DSAs. Exacerbating these problems, LASO had not always taken the actions necessary to improve Los Alamos' nuclear safety. Specifically, LASO had not established specific performance metrics for Los Alamos to submit and implement DSA updates. LASO had established expectations for Los Alamos to continually improve its Quality Assurance Program since 2008; however, it had not established measures for the Laboratory to correct all systemic quality assurance weaknesses.

As discussed above, Los Alamos initiated actions to "drive" quality assurance implementation throughout the Laboratory. Specifically, Los Alamos established a Quality Assurance Implementation Council (Council) composed of senior Laboratory managers from

each of its major operations organizations to focus on quality assurance issues in March 2010. Among other things, the Council will focus on correcting issues raised by the 2009 self assessment which identified systemic weaknesses in 6 of 12 quality assurance areas.

Although it had not completed its work, the Council had identified a number of actions needed to fully implement quality assurance throughout the Laboratory. Specifically, in June 2010, the Council identified the need to increase quality assurance resources, training and use of trending resources to identify and correct quality assurance problems. While Los Alamos had taken a number of actions including developing new procedures for records management, it has not developed and approved a corrective action plan establishing milestones and resources to address specific areas of needed improvement identified by the Council.

Safety Impacts

Although quality assurance requirements have existed since 1986, Los Alamos had, in effect, operated its nuclear facilities for more than 15 years without a fully implemented Quality Assurance Program. Los Alamos management pointed out that, since assuming responsibility for managing and operating the Laboratory, it had created and implemented a full suite of safety management programs. However, as previously discussed, Los Alamos also recognizes that it continues to have systemic problems associated with fully implementing nuclear safety management programs. Until Los Alamos fully updates hazards analyses, and fully implements hazard controls and its quality assurance program, it cannot be assured that safety risks associated with work processes are minimized while maximizing the reliability and performance of its safety systems. Continuing to operate facilities and perform programmatic work at facilities that do not meet quality assurance and safety basis standards results in increased exposure to safety risks.

RECOMMENDATIONS

To help ensure that Los Alamos National Laboratory is operating safely, we recommend that the Administrator, NNSA, take action to ensure that Los Alamos:

1. Develops a corrective action plan establishing milestones and dedicating resources needed to implement quality assurance improvements identified by the Quality Implementation Council;
2. Develops the technical resources to perform the hazard analyses needed to support the updates of DSAs;

-
3. Verifies that applicable quality assurance requirements are included in assessments of vital safety systems and takes action to include requirements where voids in Los Alamos' instructions are found to exist; and,
 4. Validates the effectiveness of corrective actions for significant weaknesses as recommended in the Department's quality assurance management systems guide.

We further recommend that the Manager, Los Alamos Site Office, develop specific performance metrics for Los Alamos to:

- a. Update and implement updated DSAs; and,
- b. Correct systemic weaknesses identified in the Los Alamos self assessments.

**MANAGEMENT AND
AUDITOR COMMENTS**

NNSA management generally agreed with the report and stated that although the operations at Los Alamos are safe; continued improvement is needed to meet expectations for NNSA's nuclear facilities. Management further stated that work is underway to pursue those expectations and address the concerns raised in the report. Management expressed concern that our report implied that Los Alamos is operating in violation of 10 CFR 830, *Nuclear Safety Management*, and pointed out that the Laboratory had self-identified and reported its deficiencies and is actively working on closing gaps in implementation. Finally, management stated that the recommendations were somewhat general and could be more specific to improve the effectiveness of the report.

Management's comments were generally responsive. We appreciate management's acknowledgement that continued improvement is needed and that corrective actions are underway. Regarding management's specific comments, our report does not state that Los Alamos is operating in violation of the Code of Federal Regulations. In fact, we note that the Department's Office of Enforcement, which is responsible for enforcing 10 CFR 830, had not issued any Notices of Violation to Los Alamos since the current contractor began managing and operating the Laboratory. Rather, our report is intended to bring to management's attention improvements in safety measures needed to further reduce risks. While we modified one recommendation to provide more specificity, we believe the remaining recommendations, as written, give management the flexibility to determine specific corrective actions that need to be taken to address the issues identified in the report. Management's verbatim comments are attached in Appendix 3.

Appendix 1

OBJECTIVE	The objective of our audit was to determine whether Los Alamos National Laboratory (Los Alamos) has fully implemented the required nuclear safety management regime.
SCOPE	The audit was performed between December 2008 and July 2010 at Los Alamos and the Los Alamos Site Office (LASO), located in Los Alamos, New Mexico.
METHODOLOGY	<p>To accomplish the audit objective, we:</p> <ul style="list-style-type: none">• Reviewed applicable Laws, Department of Energy (Department) orders, other Departmental guidance, and the Los Alamos contract;• Analyzed prior reports from the Office of Inspector General, the Defense Nuclear Facilities Safety Board, Government Accountability Office (GAO), LASO, and Los Alamos;• Reviewed and analyzed internal Los Alamos guidance;• Interviewed key Department, National Nuclear Security Administration, and contractor personnel; and,• Reviewed noncompliances reported in Los Alamos' management tracking system and the Department's Noncompliance Tracking System.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for findings and conclusions based on our audit objective. The audit included tests of controls and compliance with laws and regulations necessary to satisfy the audit objective. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We assessed performance measures established under the Government Performance and Results Act of 1993 and found that Los Alamos did not have specific performance measures to fully implement quality assurance and safety basis requirements. Finally, we did not rely on computer-processed data to satisfy our audit objective. Management waived an exit conference.

RELATED REPORTS

Office of Inspector General Reports

- *Procurement of Safety-Class/Safety-Significant Items at the Savannah River Site* (DOE/IG-0814, April 2009). The report noted that the Department of Energy (Department) had procured and installed safety-class and safety-significant structures, systems, and components that did not meet NQA-1 quality standards. Based on examination of relevant internal controls and procurement practices, the Office of Inspector General (OIG) concluded that these failures were attributable to inadequate attention to quality assurance at Savannah River. Basically, Department controls were not adequate to prevent and/or detect quality assurance problems. The procurement and installation of these nonconforming components resulted in cost increases. Although the Department and Savannah River took positive steps to remedy the problems, weaknesses remained and the OIG made several recommendations to strengthen quality assurance at Savannah River.
- *Implementation of Integrated Safety Management at Lawrence Livermore National Laboratory* (DOE/IG-0797, July 2008). The audit disclosed that Lawrence Livermore National Laboratory (Livermore) had not fully implemented an Integrated Safety Management (ISM) system to improve its safe conduct of work. Through examination of safety incidents, the OIG found that Livermore had not always developed and implemented controls to eliminate hazards; performed work within defined controls; and, provided feedback to managers about identified hazards or aggressively pursued continuous improvement in safety. Specifically, Livermore did not always analyze safety issues to determine their extent of condition and root causes. Furthermore, the National Nuclear Security Administration's (NNSA) Livermore Site Office (LSO) did not ensure that performance measures associated with safety encouraged improvement in Livermore's implementation of ISM. While LSO and Livermore took some positive steps to resolve the reported issues, the report included additional actions to improve safety at Livermore.

Other Reports

- *Actions Needed to Determine the Effectiveness of Safety Improvement Efforts at NNSA's Weapons Laboratories* (GAO-08-73, October 2007). The report noted that the nuclear weapons laboratories have experienced persistent safety problems including accidents and violations of nuclear safety rules. Examples include worker exposure to radiation, inhalation of toxic vapors, and electrical shocks. No deaths have occurred, but many of the accidents caused serious harm to workers or damage to facilities. Long-standing management weaknesses including relatively lax laboratory attitudes toward safety procedures, laboratory inadequacies in identifying and addressing safety problems with appropriate corrective actions, and inadequate oversight by NNSA site offices. The Government Accountability Office made several recommendations to strengthen management and oversight of laboratory safety.

Appendix 2 (continued)

- *Design, Functionality, and Maintenance of Safety Systems at Los Alamos National Laboratory*, (Defense Nuclear Facilities Safety Board [DNFSB], October 16, 2007). The DNFSB reported that it has become increasingly concerned in the overall lack of progress with respect to safety improvements at the Los Alamos National Laboratory. A number of significant and systemic deficiencies exist at Los Alamos related to assuring the design, functionality, and maintenance of safety systems. The deficiencies included: (1) incomplete or inadequate descriptions of system safety functions, (2) weak or missing fundamental design information and calculations, (3) failure to verify credited safety functions through periodic surveillance and testing, (4) failure to implement appropriate maintenance activities to ensure that safety systems can continue to perform their credited function, (5) lack of adequate normal and abnormal operating procedures to govern the operation of safety systems, (6) lack of formal setpoint calculations for critical system operating parameters, and (7) outdated and, in some cases, inadequate safety bases. The report stated that development and implementation of a formal, systematic approach to ensuring the functionality and operability of safety systems that includes robust design calculations, relevant, system testing, fundamental maintenance practices, and adequate system operating procedures is an essential element of sustainable safe operations. Los Alamos, however, relied more on expert judgment, operational awareness, and informal guidance to ensure the operability of safety systems. Safety Basis issues – None of the facilities assessed was operating under a safety bases that fully complied with 10 CFR 830. The Lab's Safety Basis Improvement Plan includes updates for WETF and PF-4 by the end of FY 2007 and the following year for CMR. The contractor (LANS) and LASO are not providing the level of oversight required to identify the types of issues reflected in the DNFSB report. The widespread nature of these deficiencies warrants immediate attention. Consequently, additional focused actions of an immediate nature are necessary to identify and resolve these issues and to improve confidence in credited safety systems.
- *Inspection of ES&H Programs at Los Alamos National Laboratory*, (Department of Energy, Office of Health, Safety and Security, January 2008). The report noted that, with few exceptions, NNSA and LASO have made little progress in addressing the longstanding deficiencies in their oversight programs. The same problems identified in 2005 by Independent Oversight and other inspections are still evident. The deficiencies in NNSA and LASO oversight are contributing to the continued weaknesses in Los Alamos ES&H programs. Los Alamos has made progress in a number of areas, but deficiencies are still evident in many aspects of Los Alamos ES&H and safety management programs and processes. The identified deficiencies in essential safety system functionality demonstrate that nuclear safety at Los Alamos is still a concern that warrants increased management attention and timely additional actions.



Department of Energy
National Nuclear Security Administration
Washington, DC 20585



July 23, 2010

MEMORANDUM FOR: George W. Collard
Assistant Inspector General
for National Security and Energy Audits

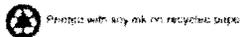
FROM: Gerald L. Talbot, Jr. *Gerald L. Talbot, Jr.*
Associate Administrator
for Management and Administration

SUBJECT: Comments to the IG Draft Report on Nuclear Safety at LANL:
Project No. A09AL033; IDRMS No. 2008-03576

The National Nuclear Security Administration (NNSA) appreciates the opportunity to review the Inspector General's (IG) draft report, *Nuclear Safety: Safety Basis and Quality Assurance at the Los Alamos National Laboratory*. I understand that the IG wanted to determine whether the Laboratory is providing assurance that workers, the public, and the environment are adequately protected from nuclear safety accidents.

NNSA generally agrees with the report. NNSA has been actively pursuing nuclear safety improvements at Los Alamos National Laboratory (Los Alamos) for many years and has made significant progress. Although the operations at Los Alamos are safe and are effectively controlled, continued improvement is needed to meet modern expectations for NNSA's nuclear facilities. Work is underway to pursue those expectations and address the concerns raised in the IG report. Issues discussed in the IG report (for example, the status of safety basis documents and storage of material in unqualified containers) are already the focus of several programs designed to make the needed improvements in a timely manner that balances competing improvement priorities and available resources. NNSA is concerned with your statement in the safety impacts paragraph that Los Alamos is operating in violation of the requirements of 10 CFR 830 Subpart A and B. NNSA points out that the Laboratory has self identified and reported the deficiencies in the Noncompliance Tracking System data base and is actively working on closing the gaps in implementation. Attached for your consideration are technical comments, which we believe will improve the accuracy of the report.

As for the recommendations, we believe they are somewhat general. Making the recommendations more specific may improve the effectiveness of the report if there are specific activities not already underway that need to be initiated. Given the general nature of all of the recommendations and the ongoing efforts that are in place, the IG may want to consider replacing some or all of the recommendations with a recommendation



Appendix 3 (continued)

that the Administrator receive periodic briefings from the contractor and site office on the progress made in the areas covered in the report, so that he can more directly track improvements made and direct additional appropriate action or resources where necessary.

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

Attachment

cc: Donald L. Cook, Deputy Administrator for Defense Programs
James McConnell, Assistant Deputy Administrator
for Nuclear Safety & Operations
Roger Snyder, Acting Manager, Los Alamos Site Office
Don Nichols, NNSA Chief, Defense Nuclear Safety

CUSTOMER RESPONSE FORM

The Office of Inspector General has a continuing interest in improving the usefulness of its products. We wish to make our reports as responsive as possible to our customers' requirements, and, therefore, ask that you consider sharing your thoughts with us. On the back of this form, you may suggest improvements to enhance the effectiveness of future reports. Please include answers to the following questions if they are applicable to you:

1. What additional background information about the selection, scheduling, scope, or procedures of the inspection would have been helpful to the reader in understanding this report?
2. What additional information related to findings and recommendations could have been included in the report to assist management in implementing corrective actions?
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.

Name _____ Date _____

Telephone _____ Organization _____

When you have completed this form, you may telefax it to the Office of Inspector General at (202) 586-0948, or you may mail it to:

Office of Inspector General (IG-1)
Department of Energy
Washington, DC 20585

ATTN: Customer Relations

If you wish to discuss this report or your comments with a staff member of the Office of Inspector General, please contact Felicia Jones (202) 586-7013.

This page intentionally left blank.

The Office of Inspector General wants to make the distribution of its reports as customer friendly and cost effective as possible. Therefore, this report will be available electronically through the Internet at the following address:

U.S. Department of Energy Office of Inspector General Home Page
<http://www.ig.doe.gov>

Your comments would be appreciated and can be provided on the Customer Response Form attached to the report.