



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

AUDIT REPORT

Follow-up on Nuclear Safety: Safety Basis and
Quality Assurance at the Los Alamos National
Laboratory

DOE/IG-0941

July 2015



Department of Energy
Washington, DC 20585

July 16, 2015

MEMORANDUM FOR THE SECRETARY

FROM: 
Gregory H. Friedman
Inspector General

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

BACKGROUND

A primary mission of the Department of Energy's Los Alamos National Laboratory (LANL) is to ensure the safety, security, and reliability of the Nation's nuclear stockpile. As such, LANL employees and subcontractors work closely with special nuclear materials, explosives, and hazardous chemicals. To protect its employees, the public, and the environment, LANL is required to identify site hazards and controls, and to update formal documentation as its work processes change (activities collectively known as "safety basis"). It is also required to develop and implement an institutional Quality Assurance Program over work processes.

Our report *Nuclear Safety: Safety Basis and Quality Assurance at the Los Alamos National Laboratory* (DOE/IG-0837, August 2010) identified problems in fully implementing a number of critical nuclear safety management measures. National Nuclear Security Administration management generally agreed with the report and stated that work was underway to address the concerns raised in the report. In addition, a May 2012 external corporate review identified the need to ensure core skills and competencies for the safety basis analysts and improve the alignment between LANL and the Los Alamos Field Office during safety basis development. In response to the corporate review, LANL developed a Safety Basis Improvement Plan to build upon lessons learned and assessment findings. It revised the Plan in January 2014 to incorporate corrective actions from an October 2013 Field Office assessment. Given the importance of nuclear safety, we initiated this follow-up audit to determine whether LANL had effectively implemented required nuclear safety management measures.

RESULTS OF AUDIT

LANL had acted to improve nuclear safety, including seismic-related risks, at its Plutonium Facility (PF-4); established a Safety Basis Quality Review Board; and implemented an institutional Quality Assurance Program to assign responsibilities and authorities, define policies

and requirements, and provide for the performance and assessment of laboratory work processes. However, LANL continued to have problems in fully implementing a number of critical nuclear safety management requirements. This contributed to multiple safety basis iterations and lengthy update, review, and approval processes. Specifically, LANL had not always:

- Developed safety basis documents that met NNSA's expectations to ensure that nuclear hazards had been fully identified and that mitigation controls had been implemented. As such, LANL operated nuclear facilities under safety bases that did not fully reflect changes in the facility, its operations, and related analysis and controls. As of February 2015, major safety basis document revisions to update hazards and controls for 3 of its 13 nuclear facilities—PF-4, the Weapons Engineering Tritium Facility (WETF), and the Radioassay and Nondestructive Testing Facility—had gone through multiple iterations, sometimes lasting years and remained incomplete at the time of our review;¹
- Resolved issues identified in the annual updates to the safety bases for two nuclear facilities: the WETF and the Waste Characterization, Reduction, and Repackaging Facility (WCRRF). These facilities experienced numerous delays in resolving the issues identified in the annual updates because draft documents did not meet the Los Alamos Field Office's quality expectations and, as a consequence, required the resolution of extensive review comments. As of February 2015, the annual safety basis update issues for these two facilities had been in the comment resolution process for 22 and 34 months, respectively; and
- Resolved significant and long-standing nuclear safety deficiencies. For example, a number of safety basis issues had not been resolved at WETF. As a consequence, the facility had been unable to perform gas processing operations since July 2011. In addition, long-standing issues had not been fully resolved at the PF-4 nuclear facility. These involved noncompliance with established criticality safety controls to prevent fissile materials, such as plutonium, from causing a nuclear chain reaction. Specifically, LANL's inability to effectively address criticality safety concerns, first identified in 2005, resulted in the LANL Director temporarily suspending programmatic activities at PF-4 in June 2013. As of February 2015, LANL had not been able to fully resume programmatic operations and those activities in shutdown will require a formal assessment of the facility's readiness to resume operations.

Safety basis documents did not meet NNSA's expectations. We found that LANL had not effectively implemented its Safety Basis Improvement Plan, which was designed to enable LANL to build upon lessons learned and assessment findings. In addition, nuclear safety deficiencies were not always resolved because corrective actions were not effectively designed to prevent recurrence. In some instances, implementation was ineffective and there was no assurance that high risk issues had been adequately screened and identified to receive the proper

¹ LANL has one common safety basis document for its five nuclear environmental sites, for a total of nine safety basis documents.

management attention. Further, LANL lacked sufficient qualified staff to resolve certain safety issues. Finally, LANL's Performance Feedback and Improvement Tracking System did not always document evidence to support the completion or closure of corrective actions.

Further improvements in nuclear safety are essential if the Department is to be in a position to ensure workers and the public that safety risks associated with nuclear facility operations have been effectively mitigated. Furthermore, the restart of activities at critical facilities, such as the WETF and PF-4 nuclear facilities, will be delayed pending effective mitigation of safety concerns, thus impairing NNSA's ability to accomplish its mission. Therefore, we made recommendations to ensure that continued management attention is focused on addressing the identified weaknesses.

MANAGEMENT RESPONSE

Management concurred with our recommendations and indicated that corrective actions had been initiated or were planned to address the issues identified in this report. We consider management's comments and corrective actions, both taken and planned, to be responsive to our recommendations.

Management's comments are included in Appendix 3.

Attachment

cc: Deputy Secretary
Chief of Staff
Administrator, NNSA

AUDIT REPORT: FOLLOW-UP ON NUCLEAR SAFETY: SAFETY BASIS AND QUALITY ASSURANCE AT THE LOS ALAMOS NATIONAL LABORATORY

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FOLLOW-UP ON NUCLEAR SAFETY: SAFETY BASIS AND QUALITY ASSURANCE AT THE LOS ALAMOS NATIONAL LABORATORY

NUCLEAR SAFETY BASIS AND QUALITY ASSURANCE

Although Los Alamos National Laboratory (LANL) had taken significant actions to address nuclear safety issues since our prior report on *Nuclear Safety: Safety Basis and Quality Assurance at the Los Alamos National Laboratory* (DOE/IG-0837, August 2010), it continued to have problems in fully implementing a number of nuclear safety management requirements designed to protect against nuclear accidents. To their credit, LANL and the National Nuclear Security Administration (NNSA) took action to address seismic-related risks at LANL's Plutonium Facility (PF-4), including installing significant structural upgrades, removing combustible material, and repackaging or disposing of plutonium. In addition, LANL established a Safety Basis Quality Review Board to provide management oversight and an essential quality check prior to selected document submissions to the Los Alamos Field Office (Field Office). LANL also implemented an institutional Quality Assurance Program in accordance with Department of Energy (Department) Order 414.1D Administrative Change 1, *Quality Assurance*, that was fully approved by the Field Office.

However, LANL had not consistently provided quality safety basis documents that satisfied NNSA's expectations, in accordance with Department regulations. Additionally, LANL had not resolved significant and long-standing nuclear safety deficiencies for the restart of the Weapons Engineering Tritium Facility (WETF) and the PF-4, despite incurring safety basis expenditures for these facilities of \$17 million and \$9.9 million, respectively, during fiscal years (FY) 2010 through 2013.

Quality and Consistency of Safety Basis Submittals

LANL had not always developed safety basis documents that met NNSA's quality expectations. NNSA follows 10 Code of Federal Regulations (CFR) 830, *Nuclear Safety Management*, which requires contractors to identify hazards associated with work processes, design and implement controls over those hazards, and update identified hazards and controls as work processes change (activities collectively known as "safety basis"). Because safety basis documents are the product of a joint interaction between the Field Office and LANL, problems could lie on either side of the interface. However, the problems identified in our review generally reflected LANL's inability to consistently develop quality safety basis documents. This contributed to multiple safety basis iterations and lengthy update, review, and approval processes. Consequently, LANL operated nuclear facilities under safety bases that did not fully reflect changes in the facility, its operations and related analysis and controls.

Safety Basis Revisions

Safety basis document submittals did not always meet Field Office quality expectations, and some underwent multiple revisions prior to approval. LANL maintains 9 safety basis documents for its 13 nuclear facilities, including 5 Material Disposal Areas addressed by a common safety basis document. Safety basis revisions are performed to revise hazard and accident analyses, and

to identify any needed changes to controls for nuclear facilities. A facility safety basis is produced by developing a thorough understanding of a nuclear facility, the work to be performed, the hazards, and the controls that are indispensable for the integration of safety into all levels of work. To maintain a facility safety basis, a contractor must update the safety basis to keep it current and to reflect changes in the facility, the work, the hazards, and the needed controls. We observed the following issues related to the update and maintenance of safety basis at LANL:

- Although LANL had made significant safety basis improvements with the PF-4 seismic upgrades and had addressed post seismic fire hazards, the safety basis revision had not been completed despite more than 6 years of effort. The Field Office approved the safety basis for PF-4 in December 2008 with conditions for LANL to reevaluate and revise the hazard analysis, accident analysis, and control selection. New, additional requirements were introduced in October 2009, when the Defense Nuclear Facilities Safety Board (DNFSB) recommended that the Department execute immediate and long-term actions at PF-4 to address hazard and accident analyses and, more specifically, to reduce the risk of off-site exposure posed by a seismic event and resulting fire scenario. The Department accepted the recommendation and in December 2014, LANL requested additional time to perform revisions, technical editing, and a quality review. In February 2015, the accident analysis and controls selections to address the safety issues, including seismic, was submitted to the Field Office for review;
- The safety basis revision for the WETF had been ongoing for more than 7 years. Lacking resolution of safety basis concerns and operational issues, LANL has been unable to fully resume operations at WETF. Hazard analyses and controls for the facility were established in 2002. LANL initially submitted the revised safety basis to the Field Office for review in September 2007, but due to issues identified by the Field Office, LANL had to submit additional iterations in February 2009, and again in July 2012. The issues identified by the Field Office included lack of clarity in the hazards analysis, inadequate accident analysis development, and the preference for administrative controls at the expense of more robust engineered controls. In April 2013, the Field Office provided 453 comments, including 416 (92 percent) for LANL to address within 180 days. However, as of February 2015, LANL had not submitted responses to the comments. A Field Office official informed us that there had been higher safety-related priorities.

Notably, officials told us that LANL was working to mitigate potential hazards and had submitted a safety basis revision for a limited-scope tritium reduction process, which was approved by the Field Office in December 2013. LANL had suspended tritium processing operations since July 2011 for several reasons, including the recognition of deficiencies in the existing safety basis. LANL officials informed us that they plan to submit a revised safety basis strategy with reduced amounts of material-at-risk², an action which would result in the reduction of required safety controls; and

² Material-at-risk is the amount of radionuclides available to be acted on by a given physical stress.

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- The Field Office rescinded its prior approval of the safety basis for the Radioassay and Nondestructive Testing Facility (RANT) in December 2014. LANL initially submitted the safety basis to the Field Office for review in August 2012 commensurate with RANT's transition from a limited life facility to an enduring facility. Resubmissions were required, however, because of issues identified by the Field Office, such as inconsistent safety administrative controls and inadequately addressed hazards. In a July 2013 memorandum to LANL, the Field Office concluded that 12 of 66 original comments could not be closed and further changes to the safety basis were required. LANL resubmitted the safety basis in November 2013, which the Field Office finally approved in July 2014. However, DNFSB issued a report in December 2014 that identified issues with the RANT safety basis, including incorrect assumptions for the seismic analysis. In response, the Field Office removed its approval of the safety basis. LANL submitted an "Evaluation of the Safety of the Situation" to evaluate the safety impact of the seismic information to the Field Office for approval in January 2015.

In addition, we identified a safety basis document where approval was significantly delayed. Specifically, the safety basis for the Radioactive Liquid Waste Treatment Facility (RLWTF) was approved in December 2013, more than 18 years after the last safety basis was approved and more than 4 years after the Field Office had identified issues with a revision of the safety basis. While NNSA stated that the safety basis was updated with interim technical safety requirements that reflected operations and controls, LANL submitted multiple safety basis iterations for the RLWTF that required repeated revisions. For example, LANL initially submitted the revised safety basis to the Field Office for review in September 2009, but due to issues identified by the Field Office, LANL had to submit additional iterations in December 2010, September 2012, and July 2013. The issues identified by the Field Office included over-reliance on safety management programs over more robust engineered controls such as safety systems and failure to identify significant worker hazards. Although the Field Office approved the revised safety basis in December 2013, the RLWTF had been operating with a safety basis that was developed and approved in 1995, despite transitioning from a limited life facility (i.e., less than 5 years for limited operational life) to an enduring facility in 2011. This transition required that the safety basis be revised to incorporate more extensive and thorough hazard analysis and control selections.

Annual Safety Basis Updates

In addition to the problems with safety basis revisions, we identified numerous delays in the resolution of issues identified in the annual updates to the safety bases for two facilities because draft documents did not meet the Field Office's quality expectations. *Nuclear Safety Management*, 10 CFR 830 requires that contractors submit annual updates to the Department 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 stating there have been no changes to the safety basis. A Field Office official noted that the regulation does not mention review or approval timeframes. As of February 2015, annual safety basis update issues for two nuclear facilities had been in the review process for 22 to 34 months. Specifically:

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- LANL submitted the 2013 annual update for WETF to the Field Office in April 2013. Although the Field Office provided comments in August 2013, LANL did not respond to the comments until April 2014, when the comments were combined and submitted along with the 2014 annual update. The Field Office returned additional comments in July 2014 and concluded that approval was not possible until comments were resolved. The Field Office specifically identified the need for LANL to provide justifications and references to support changes to the safety basis. LANL resubmitted comment responses in September 2014; and
 - A June 2011 Field Office assessment found issues with LANL's fire suppression hydraulic calculations for the Waste Characterization, Reduction, and Repackaging Facility (WCRRF) and required they be resolved when LANL completed the annual update of the safety basis. LANL initially submitted the 2012 annual update for WCRRF in April 2012, and additional iterations in July 2012 and October 2012, without providing the required fire hydraulic calculations as directed by the Field Office. The hydraulic calculations were subsequently submitted and revised multiple times in May and September 2013, and February and June 2014, to address the issues raised by the Field Office.

An October 2013 Field Office assessment of the LANL safety basis program concluded that significant improvement was needed with development and maintenance of safety basis documentation. Specifically, the assessment identified findings related to LANL's lack of processes or ineffective processes for reviewing documents prior to submission, ensuring deliverables met NNSA expectations, and documenting adequate comment resolution. The Field Office noted that while progress had been made with LANL's safety basis program, further improvement was needed, particularly in disseminating and applying lessons learned from safety basis reviews and submissions.

Corrective Actions

LANL had not always effectively implemented corrective actions to resolve significant and long-standing nuclear safety deficiencies that impact the restart of nuclear facilities. Both WETF and PF-4 experienced delays in restarting activities that are vital to LANL's national security missions. Our review determined that as of February 2015 LANL had not done the following:

- Resolved facility and operational deficiencies necessary before it could restart gas processing activities at WETF, efforts that had been suspended since July 2011; and
- Resolved PF-4 safety issues identified by facility operations staff, the Department's Criticality Safety Support Group, and the DNFSB. These safety issues had to be addressed before the resumption of programmatic activities at PF-4, which have been suspended since June 2013.

Our review identified a long history of operational issues that had not been resolved at WETF. In November 2012, the Field Office noted that WETF operations continued to be undermined by issues related to safety basis implementation and operational readiness. While the Field Office

commended WETF facility operations management for being transparent in reporting issues, it noted that the number and repetitive nature of the events indicated that past extent of condition reviews and corrective actions had been less than adequate. We found that despite LANL's efforts to resolve the issues, WETF continued to experience delays that have affected the restart. For example, gas processing operations have not been performed since July 2011 due to safety basis and operational deficiencies. The resumption of gas processing operations was to occur in phases and the Department directed a Federal Readiness Assessment prior to the resumption of the second phase of operations. Although NNSA had scheduled to begin the Federal Readiness Assessment in April 2013, as of February 2015 it had not begun due to issues regarding management systems, safety culture, and conduct of operations, such as a failure to demonstrate proficiency in procedure performance. LANL issued a causal analysis report in February 2015 and released a corrective action plan in March 2015 to address the issues identified in the causal analysis. In its response to our draft report, NNSA stated that delays attributed to technical complexity should be evaluated based upon proper issue closure and not be viewed as inadequate performance without such evaluation.

Also, LANL's expert-based Criticality Safety Program for PF-4 was not compliant with Department requirements due to a lack of documentation and formal processes, as found in a 2005 NNSA assessment and confirmed by a July 2013 DNFSB report. As a precautionary measure, LANL's Director temporarily suspended programmatic activities at PF-4 in June 2013, based on the results of self-assessments and reviews that showed problems persisted. The suspension was intended to allow senior management to determine needed updates to processes and procedures and to establish a path forward for continuous improvement in the conduct of operations and criticality safety. Although LANL has taken actions to resume programmatic operations at PF-4, there have been challenges to resolving the issues which led to the suspension. Field Office officials believed the resumption effort was going poorly and there were concerns that implementation issues could invoke the requirement for a Federal Readiness Assessment if PF-4 was unable to perform operations for 12 months. Department Order 425.1D, *Verification of Readiness to Start Up or Restart Nuclear Facilities*, requires a Federal Readiness Assessment for the restart of activities in Hazard Category 2 nuclear facilities, such as WETF and PF-4, to be conducted after an extended shutdown of 12 months or more. While LANL released a resumption schedule in February 2014, according to a Field Office official, there were nine groupings of operations that are in extended shutdown and require formal Federal Readiness Assessments. As of February 2015, NNSA and LANL were developing the scope and schedule for these assessments.

Management of Safety Basis and Quality Assurance

These problems occurred because LANL had not effectively addressed safety basis issues, including revising training requirements for safety basis analysts, disseminating and applying lessons learned, and creating a Management Review Team to address technical safety basis issues with the Department. In addition, nuclear safety deficiencies were not always resolved because corrective actions were not effectively designed to prevent recurrence of deficiencies or not effectively implemented to ensure that high risk issues had been adequately screened and identified to receive the proper management attention. Further, LANL lacked sufficient qualified

staff to resolve certain safety issues. Finally, LANL's Performance Feedback and Improvement Tracking System did not always document evidence to support the completion or closure of corrective actions.

Safety Basis Improvement Plan

Issues with quality and consistency of safety basis submittals persisted in part because LANL had not made significant progress in the implementation of its Safety Basis Improvement Plan (Plan). The purpose of the Plan was for LANL to build upon lessons learned and respond to assessment findings in a May 2012 external corporate review, which identified the need to ensure core skills and competencies for the safety basis analysts and to improve the alignment between LANL and the Field Office during safety basis development. Although LANL revised the Plan in January 2014 to incorporate corrective actions from the October 2013 Field Office assessment discussed earlier, we noted that LANL:

- Had not completed 11 of 12 Plan milestones with 2013 target completion dates. These planned actions were designed to ensure the continuing improvement of the quality of safety basis documents and the completion of milestones, such as the creation of staffing and retention plans. To address the findings from the 2013 Field Office assessment, LANL revised the Plan in January 2014. The revised Plan consisted of 32 actions, including milestones from the 2013 Plan that had not been completed, such as developing a safety basis staffing strategy, providing training courses for safety basis analysts to improve analytical capability, coordinating with the Field Office, and updating various safety basis procedures; and
- Delayed the completion for 14 of 29 corrective actions with due dates by September 2014. For example, the Plan proposed the creation of a Management Review Team to address technical safety basis issues and interact with regulatory officials by April 2014, but LANL extended the due date to January 2015. In addition, two actions to update safety basis procedures were extended at least four times due to increased staff workload and staff reorganization. Further, we noted that the corrective action to provide training to support a revised training and qualification standard for safety basis analysts was closed without action in September 2014. A LANL official informed us that the qualification standard had to undergo another revision as a result of a job and task analysis that was completed by LANL. LANL officials stated that the delays in implementing Plan actions were attributed to funding limitations and expressed concerns that the dates will continue to slip without the resources to implement the Plan.

As previously noted, an October 2013 Field Office assessment found that LANL had not developed or executed a lessons learned program to distribute lessons learned from safety basis submittals to NNSA and to improve aspects of the safety basis program, such as hazard analysis/control selection and technical issue resolution. We noted that in August 2014, LANL had formalized and begun implementing a lessons learned program.

Resolution of Nuclear Safety Deficiencies

Nuclear safety deficiencies at WETF and PF-4 were not always effectively resolved because corrective actions were not effectively designed to prevent recurrence of deficiencies or effectively implemented to ensure that high risk issues had been adequately screened and identified to receive the proper management attention. In addition, LANL lacked sufficient qualified staff to resolve certain safety issues.

Corrective Actions at WETF

Corrective actions taken by LANL to address operational issues at WETF did not effectively address technical issues and were ineffective in preventing recurrence of deficiencies. Specifically, the revisions of the surveillance procedures for the WETF Oxygen Monitoring System (OMS) failed to resolve operability issues. The OMS is used to detect elevated oxygen levels in tritium processing systems and prevent possible combustion events. According to LANL, the OMS must be operable in order for other systems, such as glove boxes, to be operable. Vital safety system assessments performed by LANL in 2007, 2009, and 2012 repeatedly identified that the surveillance procedures did not ensure the operability of the OMS. A LANL official stated that the surveillance procedure had been revised six times since 2009. Nonetheless, the 2012 vital safety system assessment found that the surveillance procedure still did not fully ensure the operability of the OMS because of calibration issues. Furthermore, OMS system health reports have identified aging degradation issues since August 2011, such as the electronics starting to drift and resulting in calibration difficulties.

To its credit, LANL initiated work to resolve technical issues affecting the restart at WETF. In March 2014, LANL upgraded the OMS with modern digital equipment to address instrumentation problems and resolve the OMS operability issues. However, funding issues delayed the final upgrade of the system. Subsequently, in August 2014 the OMS was declared operable. According to a Field Office official, these issues were partly attributed to prior leadership's difficulty in recognizing issues and their importance.

Corrective Actions at PF-4

Long-standing nuclear criticality safety issues also continued to persist, in part, because LANL lacked sufficient qualified staff to effectively implement corrective actions. For example, to address criticality issues identified in a 2005 NNSA assessment of PF-4, LANL developed a Nuclear Criticality Safety Program Improvement Plan in 2006, but LANL asserted that the plan's corrective actions were not completed for various reasons, including a lack of qualified staff required for performing over 400 fissile material operations. Although a major aspect of the Improvement Plan was to upgrade the criticality safety evaluations and criticality safety limit approvals, recent assessments continued to identify issues with these technical documents.

Similarly, the Department's Criticality Safety Support Group (CSSG) determined that implementation of corrective actions was also ineffective because LANL lacked nuclear criticality staff necessary to identify and correct criticality safety problems. The CSSG supports the Department's Nuclear Criticality Safety Program by providing operational and technical

expertise involving criticality safety evaluations. The Department's 2012 and 2013 assessments identified concerns with LANL's investigation and correction of criticality safety problems and the limited number of experienced Criticality Safety Analysts. The assessors noted that there was a significant shortage of Criticality Safety Analysts, thereby adversely impacting the operations involving significant quantities of fissile material. They also noted there was an anticipate 3 to 5 year delay in establishing a Nuclear Criticality Safety staff and program that was fully capable of managing the capacity of work anticipated at LANL. A May 2013 DNFSB review identified similar issues.

To its credit, LANL has taken several actions to address the criticality safety concerns. For example, corrective actions included revising the Nuclear Criticality Safety Program to strengthen line management ownership and responsibilities, performing quarterly internal assessments via metric review, and developing a detailed staffing plan. In addition, LANL performed a causal analysis of criticality safety infractions that occurred in 2013 and submitted a path forward plan to NNSA for reopening PF-4 for operations. The November 2013 causal analysis noted that many of the underlying problems were not new and that additional management attention is necessary to achieve consistent and acceptable work performance. Finally, LANL has incorporated the issues and recommended corrective actions from the prior assessments, as far back as 2005, into their 2014 Nuclear Criticality Safety Program Upgrades Project Management Plan.

Issue Management System Corrective Actions

In addition to the issues with criticality safety, our review disclosed that LANL's official issues management system, the Performance Feedback and Improvement Tracking System (PFITS), did not contain documented evidence to support the completion or closure of many PF-4 corrective actions. Our review of 98 actions associated with high risk records in PFITS for criticality safety and conduct of operations from January 2010 to February 2014 determined that 11 actions (11 percent) lacked documented evidence to support the completion of the action. For example, one PFITS action from November 2011 was for LANL to perform an effectiveness review of the revamped certification requirements for Fissile Materials Handlers. The PFITS description stated that the action was administratively closed and that the effectiveness assessment would be "moved out a ways." However, there was no record that the assessment was ever rescheduled or performed.

Similarly, our review of 39 actions that were associated with lower risk records in PFITS determined that 14 actions (36 percent) lacked documented evidence to support the completion of the action. For example, a February 2012 LANL assessment identified that process changes for two procedures were not being adequately evaluated from a criticality safety standpoint. However, the PFITS action was closed without any evidence that a review of the procedures was performed.

LANL conducted its own internal review of actions at PF-4 in response to previous assessments and Department comments from August 2008 through January 2013. It concluded that 103 of 247 Department comments (42 percent) listed as closed in the criticality safety database should be reopened due to insufficient evidence that the required changes to technical documents, such as criticality safety evaluation documents, were made. Furthermore, a Field Office official informed us that LANL's use of PFITS to address corrective actions is in need of improvement,

such as screening for issues and effectiveness of the actions. We noted that a September 2012 Field Office assessment found that LANL's Performance Feedback and Improvement process did not ensure complete and accurate issue screening and categorization. Specifically, the assessment stated that risk levels were inconsistently assigned due to nonspecific definitions and inadequate grading criteria, with the potential result that high risk issues may not be given the appropriate level of management attention to ensure corrective actions are effectively implemented. To address the PFITS documentation and screening issues, LANL has initiated an Issue Resolution Project that includes reviewing closed PFITS records for evidence of supporting actions and improving issue resolution.

Safety Impacts

While LANL has taken significant actions to address nuclear safety issues, continued efforts are needed to ensure effective implementation of all nuclear safety management requirements, activities which are critical to sustaining public trust and confidence. Until LANL fully updates the safety basis of nuclear operations to address hazard and accident analyses, including addressing the seismic analysis issues for the RANT safety basis, and demonstrates effective implementation of corrective actions for nuclear safety issues, there is limited assurance that safety risks associated with nuclear facility operations are effectively mitigated for the safety of workers, the public, and the environment.

Furthermore, the restart of activities at critical facilities, such as the WETF and PF-4 nuclear facilities, will be delayed pending effective mitigation of safety concerns. WETF's mission is to perform research and development and to process tritium to meet the requirements of the present and future stockpile stewardship program. As the only fully operational, full capability plutonium facility in the Nation, LANL's PF-4 nuclear facility plays an indispensable role in the Stockpile Stewardship Program, including pit production and surveillance activities. Delaying the restart of activities at these facilities impairs NNSA's ability to accomplish its mission.

RECOMMENDATIONS

To improve the effectiveness of the implementation of nuclear safety requirements, we recommend that the Administrator, National Nuclear Security Administration take action to ensure that LANL:

1. Develops the technical resources needed to meet the Safety Basis Improvement Plan requirements, as well as continuing to disseminate and apply lessons learned from safety basis reviews and submissions;
2. Ensures effective implementation of corrective actions for long-standing issues that impact the restart efforts at WETF and PF-4, including addressing the shortage of experienced Criticality Safety Analysts to assess and correct nuclear criticality issues; and
3. Corrects the weaknesses identified in the Field Office assessments of PFITS, including providing documented evidence to support the completion of PFITS actions in the future and using the Performance Feedback and Improvement process for improving risk categorization for identified issues.

MANAGEMENT RESPONSE

NNSA management concurred with the report's recommendations and indicated that corrective actions had been initiated or were planned to address the issues identified. Specifically, NNSA's Los Alamos Field Office is working closely with Los Alamos National Security, LLC (LANS) to accelerate efforts to identify and obtain the technical resources to fully implement its Safety Basis Improvement Program. In addition, management stated that LANS is conducting a functional management review to evaluate program weaknesses and make recommendations for improvements. Furthermore, LANS has developed a project plan for PF-4 resumption that targets the end of FY 2016 for full resumption and is implementing an approved schedule for WETF restart by the end of calendar year 2015. Finally, progress in addressing the weaknesses identified will be evaluated through future readiness assessments of the LANS Contractor Assurance System, which will include additional focus on processes for documenting effective completion of actions and risk categorization.

AUDITOR COMMENTS

Management's comments and corrective actions, both taken and planned, are responsive to our recommendations. We appreciate management's general and technical comments that were provided, and those comments were taken into consideration to further enhance the clarity of our report by adding additional information where applicable.

Management's comments are included in Appendix 3.

OBJECTIVE, SCOPE, AND METHODOLOGY

Objective

The objective of this audit was to determine whether Los Alamos National Laboratory (LANL) has effectively implemented required nuclear safety management measures.

Scope

This audit was conducted between July 2013 and July 2015, at LANL and the Los Alamos Field Office (Field Office), located in Los Alamos, New Mexico. Our scope included LANL's Safety Basis Program and the resumption efforts for activities at LANL's Weapons Engineering Tritium Facility and Plutonium Facility during calendar years 2010 to 2014. The audit was conducted under the Office of Inspector General Project Number A13AL046.

Methodology

To accomplish the audit objective, we:

- Reviewed regulations, policies, and procedures pertaining to the Department of Energy's nuclear safety requirements;
- Held discussions with LANL and Field Office officials;
- Reviewed reports on LANL's Safety Basis Program, Nuclear Criticality Safety, and vital safety systems;
- Reviewed the status of safety basis revisions and annual updates; and
- Reviewed corrective actions in LANL's Performance Feedback and Improvement 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 objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Accordingly, the audit included tests of controls and compliance with laws and regulations necessary to satisfy the audit objective. In particular, we assessed compliance with the *GPRA Modernization Act of 2010* and found that performance measures had been established for nuclear safety and high hazard operations. 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 rely on computer-processed data to satisfy our audit objective.

Management waived an exit conference.

PRIOR REPORT

- Audit Report on [*Nuclear Safety: Safety Basis and Quality Assurance at the Los Alamos National Laboratory*](#) (DOE/IG-0837, August 2010). This review found that Los Alamos National Laboratory (LANL) continued to have problems in fully implementing a number of critical nuclear safety management measures. LANL had not, among other things, updated or fully implemented documented safety analyses (DSAs) for its nuclear facilities to ensure that hazards had been fully identified and controls implemented to mitigate nuclear hazards, demonstrated that operational tests of nuclear safety systems were completed to verify operability after modifications were made to the systems, and fully resolved long-standing issues involving noncompliance with established hazard controls. Despite repeated efforts by LANL to address nuclear safety issues, past actions had not been successful in ensuring that all nuclear safety management requirements were fully implemented. The audit concluded that management had not focused sufficient attention in the past on implementing the nuclear safety Quality Assurance Program throughout LANL. Officials acknowledged that they had underestimated the level of work necessary to complete required hazard analyses to update the DSAs for some nuclear facilities. In addition, LANL stated that a lack of staff with needed technical expertise to update the DSAs contributed to problems with out-of-date DSAs.

MANAGEMENT COMMENTS



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



June 29, 2015

MEMORANDUM FOR GREGORY H. FRIEDMAN
INSPECTOR GENERAL

FROM: FRANK G. KLOTZ *F. Klotz 6/29/2015*

SUBJECT: *Comments on the Office of Inspector General Draft Report Titled
Follow-up on Nuclear Safety: Safety Basis and Quality Assurance
at the Los Alamos National Laboratory*

Thank you for the opportunity to review and comment on the subject draft report. The National Nuclear Security Administration (NNSA) concurs with the auditor's recommendations, and actions are already underway to address the issues identified.

The attachment to this memorandum details the specific actions planned and taken to address the recommendations, as well as timelines for completion. In addition, we have provided general and technical comments for your consideration to enhance the clarity and factual accuracy of the report. If you have any questions regarding this response, please contact Dean Childs, Director, Audit Coordination and Internal Affairs, at (301) 903-1341.

Attachment



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IG recommends that the NNSA Administrator take action to ensure that LANL:

Recommendation 1: Develop the technical resources needed to meet the Safety Basis Improvement Plan requirements, as well as continuing to disseminate and apply lessons learned from safety basis reviews and submissions.

Management Response: Concur

The National Nuclear Security Administration's (NNSA) Los Alamos Field Office (NA-LA) is working closely with Los Alamos National Security, LLC (LANS) to accelerate efforts to identify and obtain the technical resources to fully implement its Safety Basis Improvement Program (SBIP). LANS is also conducting a functional management review to evaluate program weaknesses and make recommendations for improvements, including the area of technical resources. Completion of the functional review is anticipated by the end of fiscal year (FY) 2015.

Progress and accountability of LANS in deploying the requisite expertise to meet the plan requirements will be evaluated through: a) close monitoring of SBIP milestone status; b) tracking of functional management review corrective actions; and c) the annual Contractor Performance Evaluation Process (PEP). In addition, NA-LA will disseminate lessons learned with safety basis reviews. NA-LA will also conduct periodic workshops to promote more efficient and effective preparation, approval and implementation of safety basis documents. The Office of the Associate Administrator for Safety, Infrastructure, and Operations (NA-50) will participate in these workshops as needed.

Closure of this recommendation will be linked to the broader implementation of the SBIP, with a targeted completion date of September 2017. However, progress on the specific action of developing technical resources will be evaluated on an on-going basis through technical monitoring and quarterly reporting through the Departmental Audit Report Tracking System (DARTS).

Recommendation 2: Ensure effective implementation of corrective actions for long-standing issues that impact the restart efforts at the Weapons Engineering Tritium Facility (WETF) and PF-4, including addressing the shortage of experienced Criticality Safety Analysts to assess and correct nuclear criticality issues.

Management Response: Concur

LANS has developed a project plan for PF-4 that targets the end of FY 2016 for full resumption of operations. Similarly, LANS is implementing an approved schedule for WETF restart by the end of calendar year 2015. As parts of these restart efforts, NA-LA has directed LANS to

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improve Nuclear and High Hazard Operations in areas including, but not limited to, Conduct of Operations, safety basis development and implementation, fire protection, and preparation and conduct of readiness reviews.

Other actions taken to support effective implementation of restart efforts include:

- NNSA has convened monthly PF-4 resumption status meetings between the NNSA Administrator, LANS, and NA-LA senior management to track progress in accordance with the approved schedule.
- LANS has implemented a Management Review Board process to evaluate the readiness of all Functional Areas prior to entering into the formal readiness review process.
- LANS has made management changes in senior and mid-level positions to affect a culture change that is needed to address systemic weaknesses.
- NA-LA is tracking progress against the LANS Nuclear Criticality Safety Program Upgrades Project Management Plan, which includes actions to address staffing issues.

Recommendation 3: Correct the weaknesses identified in the Field Office assessments of the Performance Feedback and Improvement Tracking System (PFITS), including providing documented evidence to support the completion of PFITS actions in the future and using the PFIT process for improving risk categorization for identified issues.

Management Response: Concur

Progress in addressing the weaknesses identified will be evaluated through future readiness assessments of the LANS Contractor Assurance System. These assessments will include additional focus on processes for documenting effective completion of PFITS actions and risk categorization. The effectiveness of the LANS Contractor Assurance System, including consideration of PFITS performance, will also be evaluated annually as part of the PEP process. The initial estimated completion date for these actions is September 2016 pending finalization of readiness review schedules.

FEEDBACK

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