National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

December 6, 2013

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

On June 27, 2013, the Director of Los Alamos National Laboratory (LANL) paused programmatic operations at the LANL Plutonium Facility (PF-4), as a precautionary measure, due to shared laboratory and federal concerns with the criticality safety program. The National Nuclear Security Administration (NNSA) has been fully engaged with LANL in development and execution of the resumption process and path-forward. The enclosure provides updated information on status, causal analyses and other reviews, corrective action planning, and the path-forward, as committed by the Acting Administrator's letter to you of August 15, 2013.

The Department of Energy, NNSA and LANL are committed to improving the LANL nuclear criticality safety program to be a world-class, standard-based program. This will be a multi-year effort. The initial actions will improve the foundations of the program and the interface between operations and the criticality safety organizations, while working towards safely resuming about 300 fissile material operations. These actions will be conducted using a collaborative, open, transparent and cooperative approach and with visible and sustained senior management attention (both federal and laboratory leaders) designed to improve the safety culture.

Recognizing the significance of the criticality safety issues at LANL and the importance of safely resuming vital operations, the Secretary of Energy, the Acting NNSA Administrator and the LANL Director agreed to send a senior NNSA subject matter expert, Dr. Jerry McKamy, on detail to Los Alamos to provide direct technical assistance on criticality safety and resumption of PF-4 activities to the LANL Director. This technical assistance is expected to continue for the next few months. This cooperation exemplifies the problem solving partnership we are working towards re-building between NNSA and the NNSA-owned national laboratories, and continued effort to establish more transparent lines of communication between the field, headquarters, and the laboratory which will aid in improving our overall safety culture.

NNSA will continue to strengthen its oversight and management by completing training of management and staff and qualifying additional staff to conduct criticality safety oversight. In addition, we will be conducting a causal analysis of why the decline of criticality safety staffing and inadequate criticality safety performance persisted for so long before NNSA and LANL took definitive action to address the situation. The root-cause analysis will be led by NNSA headquarters and the Los Alamos Field Office

and is expected to be completed in spring, 2014. The insights gained from the root-cause analysis will be used to develop a corrective action plan to strengthen federal oversight and to ensure sustained resolution of the criticality safety issues at Los Alamos and other sites.

By June 1, 2014, NNSA will provide you a report on the updated status of progress. In the interim, NNSA management will brief the DNFSB on the progress of the laboratory and federal efforts by March 2014.

Sincerely,

James J. McConnell
Acting Associate Administrator
for Infrastructure and Operations

Enclosure

cc: D. Poneman, Deputy Secretary of Energy
B. Held, Acting Administrator, NNSA
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TA-55 Conduct of Operations and Criticality Safety Programmatic Pause: Status and Path Forward

November 22, 2013

On June 27, 2013, based on reviews with facility operations staff and findings from recent assessments, the Director of Los Alamos National Laboratory (LANL) decided to temporarily pause programmatic activities in the Plutonium Facility (PF-4) at Technical Area 55 (TA-55) to allow the senior management team to look closely at the way work is being executed, determine where there is need to update processes and procedures, and set a path forward for continuous improvement in conduct of operations and criticality safety.

This document summarizes the process and status of the programmatic resumption activities, as well as the planned improvements in conduct of operations and the criticality safety program. Specifically, LANL is pursuing two closely linked improvement plans: one focused on the institutional criticality safety program, and the second focused on facility-specific improvements in PF-4 conduct of operations and criticality safety. The Laboratory's ultimate goal is to improve the LANL Nuclear Criticality Safety Program (NCSP) to be a world-class, standards-based program.

The activity-by-activity resumption process is heavily linked to progress in the elements identified in the two improvement plans. In order to more fully inform the improvement initiatives, the Director chartered an external review team to perform a review of the LANL NCSP and appointed a causal analysis team to analyze a series of recent criticality safety infractions. The results of these studies were incorporated into the improvement plans. The two improvement plans are living documents, and will be updated as a result of new information extracted from detailed crosswalks of the past assessment and review reports.

Sections 1 and 2 of this report are focused on PF-4 programmatic resumption: Section 1 summarizes the resumption process; Section 2 reviews the resumption status and the operational path-forward. Sections 3 and 4 summarize the conclusions of the external review and the causal analysis review chartered by the Director. The outcomes of these assessments and prior assessments have been used to develop the two improvement plans, which are discussed in Sections 5 and 6. Section 7 discusses the nexus of these improvement plans with the LANL contractor assurance system.

1. Summary of Programmatic Resumption Process

The resumption of programmatic activities is following a rigorous activity-by-activity process:

- Operations review of the associated criticality safety basis documents and controls, and verification that the process descriptions are accurate, and controls are clear and able to be implemented. Any needed changes are submitted into the TA-55 document control process for revision.
- Operations validation that the procedure can be performed as written.
- Revision of the procedure to implement the new requirements for flow-down of criticality controls into procedures and item labeling, and any changes stemming from the validation from item 2.
- Review of the revised procedure by NCS as part of the standard document review cycle.
- Development of a resumption notebook for review and approval.

The release process is built around meeting the seven commitments in an National Nuclear Sucurity Administration (NNSA) letter to the Defense Nuclear Facility Safety Board on August 15, 2013:

1. Review and include in PF-4 procedures those controls and limits significant to nuclear criticality safety.
2. Evaluate criticality-safety related procedures for designation as "Use Every Time."
3. Validate procedures function as written.
4. Ensure criticality safety documents and procedures are available to the operators.
5. Validate postings against criticality safety limits, eliminate unclear or inconsistent presentation on postings, and place postings under configuration management.
6. Ensure appropriate fissile material labels that specify material identification and parameter limits that are subject to procedural criticality controls.
7. Provide criticality safety refresher training for fissionable material handlers.

The Director or his senior management designee are reviewing and releasing each unit operation.

The activities to be approved for resumption are being prioritized by mission importance and criticality safety risk. Within each mission set, activities are being prioritized to allow initial resumption of limited activities, to be followed by additional activities leading to full resumption.

2. Resumption Status and Summary of Path Forward

LANS has proposed and the Field Office has concurred in the level-of-confidence for the analysis/controls/limits in greater than 200 fissile material operations (about half of PF-4's fissile material operations). Higher risk solution and high-metal-mass operations are not included in this set.

LANS has a war-room, metrics, and a documented resumption process that was developed during previous restart activities for Pu-238 operations. The recent focus has been general plant procedures (e.g., material move, airlock operation); these are about half complete. Operators are taking more ownership of processes and procedures: all of the PF-4 procedures needed for mission activities in the foreseeable future (~300) have been through the validation walkdowns to assure that they can be performed as written and revisions have been submitted into the document control process. The validation process identified changes that are required or desired in ~280 Criticality Safety Limit Approval documents that have been submitted into the document control process. This is resulting in a large document action request (DAR) backlog in procedures and criticality safety documentation. Criteria have been developed to establish which of these changes could be deferred as post-resumption actions.

On November 20, 2013, the Director delegated release of some low-mass unit operations (up to 520 g) after a thorough review of the criticality safety basis for this limit and a walk-down of several work locations that operate under this limit. The release of individual activities under this delegation will still require meeting the seven commitments. This delegation includes activities such as small sample dissolution activities and Pu-238 aqueous operations. Operational release of bulk aqueous operations will be retained by the Director.

LANS is pursuing a reduced metal limit that will have higher confidence; LANS is also pursuing a simplified limit set for the operators. These are time-consuming actions.

Criticality safety staff workload is generally rate-limiting resumption. LANS is aggressively working qualification of new staff, hiring experienced staff, borrowing qualified staff from other sites (LLNL, PNNL), and bringing back retirees to mentor new staff.

3. External Review of Criticality Safety Program

Shortly after the Director paused programmatic operations in PF-4, he commissioned a corporate-board external review of the criticality safety program. This review was chaired by the former Associate Director for Nuclear and High Hazard Operations at LANL, which is the role responsible for criticality safety. The three external review team members are criticality safety experts drawn from the DOE Criticality Safety Support Group (the expert group, chartered and funded by DOE to provide criticality safety advice and troubleshooting for the Department).

The external review team traveled to LANL on three occasions over a thirty day period during August and September, 2013, to review documents, conduct interviews, and develop a first-hand judgment of the situation regarding nuclear criticality safety at LANL. Resumption plans were reviewed, but observations of work activities were limited because operations were paused.

The conclusion of the external review was that the weaknesses within the NCSP fell into three broad areas: organization and management; adequacy of the documents setting NCS limits and controls; and field-implementation of the NCS limits and controls. Several areas of identified weakness have corrective actions that were still in development or planning stage during the on-site review, and as such, the external review team could not comment on their effectiveness, only their completeness. The external review noted, however, that there had been substantial progress in resolving some weaknesses in a number of areas.

The external review's recommendations are being rolled into improvement plans summarized below, including but not limited to: cross-walking corrective actions against internal and external review findings, going back to the 2005 Criticality Safety Support Group review; improving the flow-down of NCS controls into procedures, equipment configuration management and procurement systems; benchmarking against Y-12 and LLNL with respect to glovebox posting, container labeling and other criticality safety practices; improving the interface between operations and criticality safety staff; reviewing institutional criticality-safety-related policies; increasing criticality safety staffing; consideration of standardization of criticality safety limits; and reviewing analysis upset conditions, including evaluating reflectors and moderators (e.g., fire-fighting).

4. Causal Analysis of Recent Criticality Safety Infractions

The Director appointed a causal analysis team to analyze a series of criticality safety infractions at TA-55 which occurred in calendar year 2013. The criticality safety program, the nuclear safety culture and associated management systems had been evaluated on more than one occasion in the recent past to include reports by the Criticality Safety Support Group in 2012 and by the Defense Nuclear Facilities Safety Board in 2013.

The team evaluated documents, conducted interviews and walk-downs, and recognized that many of the current underlying problems were not new: instead, the 2013 criticality infractions were symptoms of problems previously identified. Common themes over time included challenges developing and implementing clear roles and responsibilities; problems with identification and rigorous management of issues; and problems developing and following procedures. The causal analysis team expanded upon the previous insights with their conclusions regarding performance assurance issues and factors that affected procedure adherence.

The team initially reviewed a set of criticality safety infraction critique reports from TA-55. The initial set was comprised of 40 critique reports, spanning a period of time from January 1st to August 26, 2013. Each critique report described potential process deviations, some of which were also criticality safety infractions. The team determined that eleven of those reports provided more substantive content on more significant criticality safety issues; thus, they were selected for more in-depth analysis.

The team examined documentation to determine whether problems in work planning and work execution were being identified, articulated, and corrected from the review of potential process deviations in critiques or the evaluation of conditions from annual walk-downs. The team then developed an initial set of potential contributing factors that were derived from interviews, reading documents, and walking down infraction-related work processes. These initial potential contributing factors were compared to critique report content and the themes that recurred from previous documentation. A working matrix was used to evaluate evidence related to the potential factors and analyze how it created negative impacts on criticality safety processes, the program, or management of either or both. The team used the analytical tools to understand vulnerabilities and causes of ongoing criticality safety infractions or process deviations. The team identified more than 20 contributing causes that derived from five initial root causal factors listed below:

- **Management Commitment**: Management has not yet fully embraced its commitment to criticality safety, self-discovery, communication to the worker, and continuous improvement.
- **Roles, Responsibilities, Authorities and Accountabilities (R2A2s):** R2s are not yet clearly documented, flowed down, or understood. A2s are not yet clearly defined or implemented.
- **Conduct of Operations**: Improvement has not kept pace with expectations and the rigor necessary to compensate for reduced criticality safety analyst resources.
- **Performance Assurance**: Processes are not effective at identifying discrete problems in order to drive enduring improvements.
- **Criticality Safety Resources**: Losses in personnel and corporate knowledge continue to challenge the viability of the criticality safety management program.

These initial root causes may be modified or expanded based on new information gained as NNSA and LANL continue to work to improve operations.

5. Nuclear Criticality Program Improvements

An institutional NCSP improvement plan has been developed to define the target of how LANL wants the Nuclear Criticality Safety Program to function. This plan is based on the 1999 Department of Energy Self Improvement Workshop, *Your Mission...and Nuclear Criticality Safety*. The ultimate goal of this plan is to improve the LANL NCSP into a world-class, standards-based program. The intermediate goal is to upgrade the NCSP by addressing identified deficiencies, non-compliances, causal factors, and systemic problems that underlie those deficiencies. Once all of these issues are addressed, LANL will be on a footing to continually improve the NCSP so that realization of the ultimate goal can be achieved.

The Institutional NCSP is broken into five focus areas that contribute to a fully-functioning, mature NCSP. The five focus area are:

1. Nuclear Criticality Safety Division
2. Nuclear Criticality Safety Committee
3. Operations and Program Management
4. NCSP Execution
5. Performance Assurance

These five focus areas correlate to addressing the root causes of Management Commitment, R2A2, Conduct of Operations, Performance Assurance, and Criticality Safety Resources. Upgrades in each of these five areas will be managed as subprojects. An overall project plan is being finalized to specifically define the scope for each subproject. The scope is being defined by addressing the findings, recommendations, opportunities for improvement, and lessons learned from all of the reviews that have

been conducted on the NCSP since 2005 including the most recent causal analysis and external review. This includes reviews conducted by the Defense Nuclear Facilities Safety Board, the National Nuclear Security Administration, the Criticality Safety Support Group, and LANL. This thorough review of all past reviews ensures a comprehensive plan that addresses all issues.

A key aspect of the Institutional NCSP is the Performance Assurance subproject. This subproject will put in place metrics, reporting, assessments, and lessons learned to monitor the program health leading to creation of a learning organization, driving management attention, and providing continuous improvement.

A summary of what will be accomplished by executing each subproject is described below.

1. **NCS Division** – This subproject focuses on the staffing, training, and qualification of the criticality safety staff and the development of sound criticality safety policies and procedures. This subproject will first revise the criticality safety program document to address outstanding issues. This revision will require NNSA approval. Following this activity, NCS Division implementing procedures and guidance documents will be revised to align with the program document and improve guidance on how to conduct criticality safety work, including the annual walkdown process and the analytical evaluation development process. A new staffing plan will be developed that increases the number of fully qualified Criticality Safety Analysts (CSAs) to support the full range of criticality safety activities, including event response, floor presence, conduct procedure reviews, and criticality safety evaluations. This subproject also includes the CSA training and qualification program. This program is functioning in that several new analysts are completing this process; the subproject will look at lessons learned and make corresponding improvements to the program. Lastly, this subproject includes formalization of the Criticality Safety Officer (CSO) program within LANL's programmatic organizations, to include roles and responsibilities, standardization of functions, and training.

2. **Nuclear Criticality Safety Committee** – This subproject seeks to ensure that organizations and mechanisms are in place to provide effective oversight of the NCSP. This subproject will revise the charter and membership of the committee and set expectations that the committee shall monitor the program through assessments, issues management evaluation, and corrective action development. Membership will be modified to bring in more technical expertise from the criticality safety field. One of the major goals of the committee will be to provide the necessary oversight to ensure issues are properly addressed and provide continual improvement of the program.

3. **Operations and Program Management** – This subproject focuses on the implementation of criticality safety requirements. This subproject will revise applicable facility-specific procedures to align with the revised criticality safety program. Additional guidance will be provided for implementation of criticality safety controls. It will implement the CSO program discussed above and include Fissionable Material Handler training & qualification and criticality safety training for supervisors.

4. **NCSP Execution** – This subproject focuses on day-to-day execution of the NCSP and full compliance with the requirements. In this subproject, all criticality safety evaluation documents will be revised based on new guidance. It is acknowledged that this evolution will take several years to complete and a continuing effort to maintain. In the interim, the maturity level of all evaluation documents will be re-evaluated, and necessary documentation upgrades will be performed to support the plutonium facility resumption process. This will include reduction of fissile material metal limits, addressing the validation report issues raised by external reviews, and clarification of controls when required for conduct of operations. Also in the interim, operating procedures will be revised to implement criticality controls, criticality postings will be revised and placed under configuration management, and labeling of nuclear material containers will be reevaluated.

5. **Performance Assurance** – This subproject will put in place a formal Performance Assurance process following DOE and LANL standards. A performance assurance plan will be developed that will include reporting requirements, metrics, issues management, lessons learned, assessments, and causal analysis. Performance assurance activities will be conducted by both the NCS Division and operating organizations with oversight provided by the Nuclear Criticality Safety Committee.

6. TA-55 Criticality Safety and Conduct of Operations Improvements

A TA-55 criticality safety and conduct of operations plan has been developed to describe the facility-specific improvements to be made on the implementation of criticality safety and conduct of operations at TA-55. This plan, combined with the specific activities associated with the resumption process described in Section 1 will provide a robust and sustainable basis for criticality safety for ongoing programmatic activities in PF-4. The TA-55 criticality safety and conduct of operations plan covers the following root causes: Management Commitment, Conduct of Operations, R2A2, and Performance Assurance. The improvement plan outlines the following goals and objectives:

Goal 1: Reduce Material Limits

Reduce and standardize material limits in PF-4 in order to provide more criticality safety margins and to reduce the complexity of the controls for the operators:

- Validate Fissionable Material Operation (FMO), glovebox, and storage location operational criticality safety controls;
- Implement operational criticality safety controls for PF-4 FMOs requiring ≤520g plutonium to support normal operations;
- Implement an operational criticality safety control set for PF-4 FMOs, process locations, and storage locations that require ≥520g and ≤3000g of plutonium metal (which will specify allowable amounts of other material forms and material types) to support normal operations;
- Develop and implement an operational and attended process criticality safety control set, including engineered features, for PF-4 FMOs, process locations, dropboxes, and storage locations that require single items of plutonium metal that are ≤4500g and ≥3000g.

Goal 2: Improve Material Labeling

Benchmark other Sites recognized as having robust and reliable item and material labeling processes and incorporate into operational procedures to ensure compliance with ANSI/ANS guidance.

- Review documents and conduct site visits to benchmark item and material labeling processes at LLNL and Y-12.
- Revise operational procedures to comply with ANSI/ANS guidance.
- Train Fissionable Material Handlers (FMHs) to new item and material labeling procedure requirements.

Goal 3: Revise Approach to Procedure Detail Level/Execution

Revise approach to procedure format (Use-Every-Time vs. Reference) and execution to ensure consistency and ability to execute as written.

- Determine the applicability of Use-Every-Time vs. Reference procedures for NCS related operations to ensure that FMHs can execute as written.
- Develop and deploy an improved electronic procedure capability.
- Reduce the administrative burden of procedure approvals and changes.
- Evaluate implementation of PF-4 operating procedures.

Goal 4: Improve Criticality Safety Requirements Flow-down/Postings

Direct the flow down of criticality safety requirements into documents and systems in compliance with the requirements of ANSI 8.19 and the LANL institutional criticality safety procedure.

- Improve criticality requirements flow down into work authorizing documents.
- Improve clarity and consistency of postings and place postings under configuration control.
- Strengthen the flow-down of criticality controls for structures and equipment.

Goal 5: Revise Approach to Worker Training and Qualification

Improve the robustness and reliability of its worker training and qualification program in support of criticality safety and conduct of operations.

- Improve criticality safety training for FMH personnel.
- Strengthen core qualification requirements for FMH and Glovebox Worker so that general plant procedures can be streamlined.

- Complete implementation of core functional programmatic qualifications for the major PF-4 programmatic work areas.

Goal 6: Improve the Nuclear Criticality Safety Program Implementation

Simplify the operator requirements by standardizing limits and requirements and improve the quality and consistency of process descriptions.

- Develop plans for establishing unified criticality safety limits in PF-4.
- Evaluate the use of engineering controls and standardized containerization approaches to reduce the scope of criticality safety analyses.
- Document clarifications and definitions of standard criticality safety terms.
- Evaluate/modify process descriptions in Criticality Safety Evaluation Documents to ensure that they accurately reflect material quantities, forms, controls, and sequencing of in process operations.

Goal 7: Ensure the Sustainability of NCS Improvements

Develop and implement processes to ensure that the improvements enabled by this strategy are sustained.

- Document all NCS and conduct of operations corrective actions in the institutional action tracking system.
- Redefine and assign R2A2s to clarify work authorization in PF-4 at the room and glovebox levels.
- Develop and communicate expectation for line management engagement and oversight of procedure adequacy and compliance.
- Develop and implement an Independent Verification Review like process to independently verify the proper implementation of criticality controls for processes utilizing >3000g Pu-in-metal and for all 400 AREA aqueous solution operations.
- Develop the TA-55 Nuclear Criticality Safety Board assessment protocol and schedule.
- Evaluate effectiveness of NCS related critiques and communication of lessons learned.

7. Contractor Assurance Improvements

A consistent theme in analysis of assessment reports is the need to be more effective at implementing corrective actions to assure sustainable improvements. This concern is addressed in both improvement plans summarized above. However, given the importance of improvements in this area, these initiatives are highlighted in this section of this document.

The fifth area discussed in Section 5 deals with Performance Assurance for the NCSP. The objective of this area is to assure that the NCSP is performing as expected and safety requirements are being met, following processes that follow DOE and LANL standards. A performance assurance plan will be developed that will include reporting requirements, metric, issues management, lessons learned, assessments, and causal analysis. Performance assurance activities will be conducted by both the NCS Division and operating organizations with oversight provided by the Nuclear Criticality Safety Committee.

The intent of the performance assurance plan is to provide the information needed for all levels of workers and oversight personnel to monitor the overall program, including safety, security, efficiency, and effectiveness. In the near-term the Performance Assurance activities will be tailored to monitor the progress through the implementation of program improvements as well as the enduring activities to monitor a mature and sustainable program.

The 7th goal outlined in Section 6 addresses the improvements at TA-55 that are important to sustaining improvements and providing management with the ability to better monitor the implementation effectiveness and self-identify program deficiencies in the future. The objectives in Goal 7 include clarifying R2A2, verifying implementation of nuclear criticality safety controls for higher-risk activities, increasing management engagement and oversight, strengthening assessments and critiques, improved communication of lessons learned, and strengthening issues management. Coupled with the implementation of the full set of initiatives in two improvement plans outlined in Sections 5 and 6, the LANL NCSP and its implementation at TA-55 will be much more robust, the improvements will be sustainable, and the Laboratory will be well along the path to a world-class, standards-based program.