

CSSG TASKING 2013-02,
CSSG Assessment of Scope of Operations and Criticality
Safety Staff Capacity and Review of Los Alamos National Laboratory
CAP and Metrics for the Nuclear Criticality Safety Program

May, 2013

Prepared by:

Mr. Kevin D. Kimball, CSSG Member, B&W Y-12, LLC, Team Lead
Mr. Calvin M. Hopper, CSSG Member
Dr. Robert Wilson, CSSG Member, DOE, EM-41

Table of Contents

<u>Section</u>	<u>Page</u>
Executive Summary and Key Recommendations	1
Background and Scope of Assessment	4
Assessment Team.....	5
Review of Los Alamos National Lab Operations	6
Operational Capacity	6
LANL Self-Imposed Restrictions	6
Establishment of a Safe Envelope for Operations.....	7
Actions to date	8
Staffing Actions	8
Oversight Actions	10
LANL Management Challenges	13
Ongoing Trust Issues	13
CSA Staffing.....	15
Review of Los Alamos Field Office Oversight Capability.....	17
Management of Risk.....	17
Staffing Resources Available for Oversight	17
Conclusion	18
Attachments	19
Attachment 1 – CSSG Tasking 2013-02.....	19
Attachment 2 – List of References Reviewed.....	22
Attachment 3 – Los Alamos National Security, LLC and Los Alamos Field Office Personnel Interviewed	25
Attachment 4 – Assessment Out Brief Slides	28
Attachment 5 – Assessment Team Professional Biographies.....	35

CSSG TASKING 2013-02,
***CSSG Assessment of Scope of Operations and Criticality
Safety Staff Capacity and Review of LANL CAP and Metrics
for the Nuclear Criticality Safety Program***

Executive Summary and Key Recommendations

A subgroup Assessment Team from the US DOE Nuclear Criticality Safety Support Group performed the titled assessment during 11 – 14 March 2013 at Los Alamos, NM. The tasking included the assessment of current operations and nuclear criticality safety (NCS) needs and the capabilities and capacity of the Los Alamos National Security, LLC (LANS) criticality safety staff. The assessment was performed via reviews of documents and interviews with LANS and Los Alamos Field Office (NA-00) personnel. An Assessment Team slide presentation exit briefing was provided the afternoon of 14 March to NA-00/LANS Senior Management at the NA-00 Field Office.

Interviews with Operations and Safety Basis Criticality Safety (SB-CS) staff and managers indicated that High Hazard (i.e., Program Improvement Plan (PIP) risk category “C”) operations with recently upgraded criticality safety analyses (i.e., specific operations upgraded post PF-4 stand down) have been reviewed and presently have an adequate safety envelope defined (e.g., limits and controls) for NCS. Furthermore, interviews with operating personnel from the fissile material handlers up through the organization to the LANS senior management indicated satisfactory implementation of the NCS safety envelope. No evidence was observed by the review team to the contrary. However, LANS has limited resources to perform nuclear criticality safety evaluations (NCSEs) for the authorization of needed new or modified fissile material operations because of the exodus of most of the senior criticality safety staff and operations support demands.

The Team observed positive steps that have been taken by LANS since the 13 April 2012 reported CSSG 2011-06 Tasking Response for the *Focused Criticality Safety Review at LANL Plutonium Facility (PF-4)*. The Team also identified safety issues that include restrictions and challenges that need to be addressed to safely develop the LANS NCS program to a mature and flexible state. The Team also provided recommended steps and metrics for LANS and NA-00 to consider for safely expediting the development of the LANS NCS program and increasing capabilities for LANS operations.

The observed positive steps include:

- the implementation of a greater in-depth and upgraded fissile material handler training program,
- the prioritization and completion of upgraded and revised NCS evaluations for PIP risk category “C” operations with significant quantities of fissile materials,
- the thoughtful development of an aggressive Corrective Action Plan,
- the development of a nuclear criticality safety analyst (CSA) Staffing Plan,
- the enhancement of a CSA training and qualification program with the “Boot camp” training program,
- the operations supervision approval as part of the CSA qualification process,
- the development of a financially based CSA Retention Plan,
- the recognized need to curtail the production of Level 2 and Level 3 NCSEs,

- the initiation of an evaluation of the LANS Criticality Safety Officer (CSO) qualifications and program,
- the close management of exceptions for the performance of Level 2 and Level 3 NCSEs, and
- the evolution of a NCS program metric.

The safety issues include:

- the significant paucity of LANS experienced and qualified CSAs thereby adversely impacting the ability to develop and maintain new or modified safe operations with significant quantities of fissile material,
- the increasing risk as time passes due to possible “workarounds” for static limits and controls, and
- the anticipated 3 – 5 year delay in establishing a NCS staff and program that is fully capable to manage the capacity of work anticipated at LANL.

Recommendations in the following areas are provided in this assessment regarding the above safety issues:

- 1) Continued curtailment of Level 2 and Level 3 NCSEs
- 2) Tight management of exceptions for performing Level 2 and Level 3 NCSEs to ensure CSAs are not distracted from performing operations support
- 3) Development and submission of the bases for all PIP Risk Category “C” operations to allow continued operation, and submit to NA-00 for concurrence.
- 4) Modification of the LANS metrics from production-based (e.g., infraction count) to diagnostics-based metrics with established goals, trending, and identification of behaviors to be improved (e.g., CSA development and applied time, infraction reporting, self-reporting)
- 5) Effective utilization of CSA staffing, including
 - a. the use of existing “senior” CSAs for mentoring LANS and subcontractor CSAs,
 - b. the use of qualified CSAs for operational support and review of NCSE revisions,
 - c. additional training areas for CSAs,
 - d. the assignment of subcontractors to handle lower priority work, and
 - e. the improvement of the CSA Retention Plan to include the non-financial aspects of managing people (e.g., professional development, LANS and community recognition)
- 6) Incorporation of the CSSG Tasking 2009-01 guidance into the composition of the LANS Nuclear Criticality Safety Committee (e.g., add senior, seasoned NCS experts from outside LANL as voting members)
- 7) Enhancement of the Criticality Safety Officer (CSO) program
- 8) Addressing the significant “trust issues” that exist in horizontal and vertical management and communication chains that impact
 - a. the ability to improve the current LANS criticality safety program,
 - b. the independence of the criticality safety organization and fissile material operations, and
 - c. the ability to achieve the Corrective Action Plan end points.

Challenges also exist for NA-00 in that only NNSA can accept and approve risks at LANL. Those risks must be well understood and documented with limits and controls that have been developed, communicated, and implemented with adequate oversight (e.g., Integrated Safety Management). An additional NA-00 challenge is the potentially insufficient number of federally qualified NCS staff to provide oversight of the LANS evolving program and necessary adjustments for continued or modified LANL operations.

Recommendations for NA-00 include:

- 1) Review and concurrence that the LANS bases for all PIP Risk Category “C” operations are sufficient to allow continued operation,
- 2) Review and concurrence with the LANS use of CSAs regarding initiation of specific new or modified Level 2 and Level 3 NCSEs,
- 3) Maximizing use of Facility Representatives along with NCS staff to give additional oversight capability,
- 4) Training of Facility Representatives to provide enhanced NCS observations of LANL operations (e.g., US DOE NCSP T&EP *One-week Manager's Course (criticality safety program supervisors and managers, fissile material operations managers/handlers)*),
- 5) Review of the need to augment the federally qualified NCS staff person at the Los Alamos Field Office with additional federally qualified NCS staff member(s).

Background and Scope of Assessment

In December, 2011, the Department of Energy (DOE) Nuclear Criticality Safety Program Manager tasked (Task 2011-06) the Criticality Safety Support Group (CSSG) with performing a focused review of the Los Alamos National Laboratory (LANL) Plutonium Facility (PF-4) in regards to the four topic areas: Management, Supervisory, Operating Procedures, and Material Control. ANSI/ANS-8.19-2005 Sections 4, 5, 7, and 9 were used to develop the essential review criteria and the associated lines of inquiry (LOI) were taken from corresponding sections of DOE-STD-1158-2010. The results of the review were documented in a tasking report, issued in April, 2012.

The CSSG 2011-06 task report noted several positive attributes of the NCS program, but also noted several significant issues that needed to be addressed. In particular, the report noted several issues that indicated that criticality safety at the laboratory was not being managed with the necessary attention commensurate with the risk. The report also noted that the team was particularly concerned with evidence that the criticality safety group at the laboratory had lost trust in their line management, and a large fraction of the group was seeking alternative employment. It was noted that, should a large attrition of the group occur, an impact to both safety and the ability of LANL to support the NNSA missions would be realized. Furthermore, it was the judgment of the assessment team that such a significant loss of expertise could reduce productivity by more than 70% and take three or more years to recover. The CSSG 2011-06 task report noted several findings and opportunities for improvement.

On May 14, 2012, the National Nuclear Security Administration (NNSA) Los Alamos Field Office formally transmitted the CSSG Task 2011-06 task report and directed LANS to develop a corrective action plan (CAP) within 60 days of receipt of the letter. On November 8, 2012, LANS transmitted a corrective action plan to address the CSSG's findings and concerns. The corrective action plan has since been revised to address Field Office comments.

Since the issuance of the CSSG 2011-06 tasking report, the attrition of experienced CSAs occurred as predicted, leaving LANS with only two junior LANS employee qualified CSAs in the Criticality Safety Group (two other senior qualified CSAs remain with LANS, but transferred out of the Business and Operations group). This severe attrition, along with other signs that LANS management was being slow to respond, raised concerns regarding the ability of LANL to manage ongoing operations safely. Such a small cadre of qualified CSAs for the extent of LANL high risk operations could lead, over time, to a degradation of adherence to the NCS safety envelope of limits and controls, in addition to the inability to support changes to existing or the addition of new operations.

As a result, the CSSG, under tasking 2013-02 (Attachment 1), was directed to perform an additional assessment of current operations and NCS needs along with the capabilities and capacity of the LANS criticality safety staff. The purpose of the review was to assess the capacity of the current criticality safety cadre to support fissile material operations at LANL. A subgroup Assessment Team from the US DOE Nuclear Criticality Safety Support Group performed the titled assessment during 11 – 14 March 2013 at Los Alamos, NM. The 2013-02 tasking requested:

- An assessment of the scope of current operations and criticality safety needs in light of the capabilities and capacity of the criticality safety staff
- Recommendations on the criticality safety work scope and resource commitment that is required to support full nuclear operations identified by operation, area, or facility. The criticality safety resources should be identified by the experience and qualification needed to perform the task.

- An assessment on whether the existing LANL criticality safety cadre can support the full scope of nuclear operations identified above and, if not, recommendations on what level and types of work can be supported by the existing staff.
- Recommendations, as applicable, for NA-00-LA consideration as directed modifications to the CAP and associated metrics, as well as recommendations for consideration by NA-00 (Note: NA-00 includes both the Field Office and Headquarters Elements).
- Recommendations for how NA-00 could assess acceptability of an increase in work scope from LANS as additional criticality safety staff achieve appropriate qualifications.
- Recommendations for NA-00 on how to conduct effective oversight of the program in the interim (i.e., NNSA approvals, reviews, etc.).

The assessment was performed via reviews of documents (Attachment 2) and interviews with LANS and Field Office personnel (Attachment 3). The limited duration of the assessment affected the ability to accomplish all of the tasking items. Specifically, recommendations on the criticality safety work scope and resource commitment that are required to support full nuclear operations identified by operation, area, or facility were not able to be performed. This tasking element would require a detailed operational review along with an evaluation of resource capabilities and future planned work. Instead, a recommendation was made for LANS to submit to the Field Office (for approval) the high risk operations allowed to be performed and the basis for the risk acceptance.

The overarching goal of the assessment was to ascertain if the NCS program could adequately support safe operations. The characteristics of “safe operations” for the purpose of this review are:

- Operational risks are well understood and documented,
- Limits and controls are developed properly, communicated, and implemented, and
- Adequate oversight (e.g., Integrated Safety Management) is established to assure that the NCS program is effective.

The CSSG assessment team acknowledges the high degree of cooperation received from LANS and the Field Office during the performance of this review. An Assessment Team slide presentation (Attachment 4) exit briefing was provided the afternoon of March 14, 2013 to NA-00/LANS Senior Management at the NA-00 Field Office.

Assessment Team

The assessment team was comprised of:

- Mr. Kevin D. Kimball, CSSG Member, B&W Y-12, LLC, Team Lead,
- Mr. Calvin M. Hopper, CSSG Member, and
- Dr. Robert Wilson, CSSG Member, DOE, EM-41.

Dr. Wilson was a member of the Task 2011-06 assessment team. Professional backgrounds of the team members are provided in Attachment 5.

Review of Los Alamos National Lab Operations

Operational Capacity

LANL Self-Imposed Restrictions

In recognition of the risks created by having a limited number of qualified CSAs, LANL has curtailed some operations and limited work utilization of the NCS staff. In a March 6, 2013 letter from the Principal Associate Directorate for Business and Operations (PADOPS) to the NNSA Los Alamos Field Office, and in a March 12, 2013 memorandum from the Associate Directorate for Nuclear and High Hazard Operations, LANL established that the highest priority for the criticality group staff is the support of floor operations to ensure that the safety envelope with regard to criticality safety is maintained. This includes, in order of importance, the following priorities:

- 1) Emergency Response,
- 2) Event Response (infractions/potential infractions),
- 3) Field Support to respond to questions or uncertainties around criticality safety evaluations and process controls,
- 4) Procedure reviews to ensure processes remain within evaluation parameters,
- 5) Annual process walk-downs to ensure that processes are not experiencing drift that would stray from criticality safety evaluation assumptions and controls, and
- 6) Curtailment of Level 2 and 3 criticality safety evaluations.

The CSSG assessment team concurred with the prioritization of tasks for qualified CSAs. Of particular note is that the majority of CSA time will be spent supporting floor operations to ensure that NCS limits and controls are understood and being followed, and that operational “work arounds” to NCS limits and controls do not creep into processes over time. Furthermore, it was noted that the letter specified that:

“If a field support request results in the need for a Level 2 or 3 Criticality Safety Evaluation, the fissile material process is suspended until priorities and resources allow qualified staff to complete the evaluation. This provides for appropriate suspension of fissile materials operations should floor support be unable to maintain the current operational posture.”

The above restriction, considered appropriate by the CSSG assessment team, will impact the ability to incorporate operational changes and implement new operations, which may likely affect the ability to meet mission requirements.

In addition to the above work priorities, management committed to the following compensatory measures:

- Establish and communicate expectations monthly that the highest priority for criticality safety staff is the support of floor operations.
- Establish and communicate expectations monthly that the highest priority for operations personnel is to report any potential criticality safety concerns promptly to the SB-CS organization and to follow approved procedures.
- Update event response protocols to require a peer-check by a senior qualified criticality safety analyst before providing guidance to operations; mandate the use of more experienced resources outside of SB-CS for off-normal criticality situations; and require a formal critique before work is resumed to ensure all participants understand the path forward, lessons learned, and impacts of the process upset.
- Establish and implement a formal schedule for criticality safety analysts (staff and experienced subcontractors) to spend time-in-field in addition to annual process walk-downs.

Establishment of a Safe Envelope for Operations

Although the above actions are good actions to perform, the CSSG assessment team was concerned that the envelope of safe operations was not well defined. To assist in making a determination regarding safe operations, the CSSG assessment team explored the following elements comprising safe operations:

- Documented Operational Risks
- Limits and controls are developed properly, communicated, and implemented
- Adequate oversight is established to assure that the NCS program is effective.

The CSSG assessment team interviewed approximately 30 personnel, including representation from fissile material handlers, criticality safety officers, CSAs, operations and production management, and Los Alamos Field Office personnel. The interviews consistently reported the following positions:

- The NCS limits and controls associated with criticality safety evaluation upgrades performed since the 2007 PF-4 stand down adequately cover the applicable PIP risk category “C” operations;
- The floor level operations and production personnel know and understand the basis for the NCS limits and controls; and
- The NCS limits and controls are implemented properly in the field.

The CSSG assessment team did not have sufficient time to conduct in the field observations of operations or to review upgraded criticality safety evaluations to make a true independent check of the above positions. However, the CSSG assessment team did find that for operations with upgraded Level 2 and 3 NCSEs (i.e., specific operations upgraded post PF-4 stand down), all personnel interviewed were knowledgeable of the hazards and the NCS safety envelope, and that no evidence to the contrary was observed. Therefore, there is a moderate degree of confidence that these operations can be safely performed and monitored by the existing CSAs. The limitations of the available CSAs do, however, impact the ability to operate safely should changes to these operations or new operations be required.

To this end, the CSSG assessment team did not find any documentation that defined the operational envelope within which safe operations could be conducted. The documented understanding of associated risk is considered essential to understanding the safety envelope of operations. Therefore, the following recommendations are made:

Recommendation: LANS needs to develop a list of the operations considered to be acceptable for continued operation along with their bases, considering factors such as maturity of the NCS evaluations, knowledge and capabilities of the floor level operators, and the availability of qualified personnel to provide effective support and oversight of those high risk operations.

Recommendation: LANS needs to manage closely the time utilization of qualified CSAs to ensure support of existing operations is maintained as the priority as noted in the March 6, 2013 letter from the PADOPS to the NNSA Los Alamos Field office. In particular, given the limited number of qualified CSAs, the development of Level 2 and 3 criticality safety evaluations should be restricted to only those changes necessary for assuring ongoing safe operations until such time that adequate resources are available to manage both field support and development of Level 2 and 3 evaluations.

Actions to date

As noted earlier, in November 2012, LANS submitted to the NNSA Los Alamos Field Office a corrective action plan to address the CSSG's findings and concerns related to the assessment performed for Tasking 2011-06. In February, 2013, LANS submitted a revision to the corrective action plan to address comments received from the NNSA Los Alamos Field Office. Periodic status updates (bimonthly) are to be provided to the Field Office regarding the progress of completion of the action items, with the most recent status update provided to the CSSG assessment team dated February, 2013. In the various update transmittals, LANS reported the following specific actions:

- Hired a new safety basis division leader, a new criticality safety group leader, and a work planning professional;
- Revised the charter and composition of the LANL NCS Committee;
- Established initial NCS programmatic and facility-specific metrics;
- Developed an NCS staffing plan and retention plan; and
- Created a full immersion (9-12 week) criticality safety "boot camp" for newly hired NCS technical staff.

In addition, LANS has also revised and upgraded the Fissile Material Handler (FMH) qualification program and initiated an independent assessment of the Criticality Safety Officer Program. Both actions are considered by the CSSG assessment team as positive steps.

The review identified some observations and recommendations with respect to the above completed actions. These are noted in the following sections.

Staffing Actions

Line Management Changes

Recent changes have been made to the line management organization to replace managers that have departed. These changes include a new safety basis division leader and a new criticality safety group leader. Although the management change was unavoidable, it is another change in leadership adding to what appears to be a history of unstable management within facility safety and criticality safety. Consistent, effective management is an absolute necessity for improvement from the current NCS staffing issues.

Interviews were conducted with the individuals filling both roles, and it was noted that the hiring of the new criticality safety group leader included, as a key qualification requirement, proven history in establishing and leading teams. It was also noted that the new criticality safety group leader has no experience in the field of nuclear criticality safety, but that efforts were underway to provide training in this specialized field. The CSSG assessment team endorses the need to provide comprehensive training in the area of nuclear criticality safety for the new group lead, and considers the training essential for the long term health of the program. While specific training venues were not discussed, examples of available training are presented on the DOE Nuclear Criticality Safety Program website at <http://ncsp.llnl.gov/ncspMain.html>. In addition to formal training, it is encouraged that the new criticality safety group lead be provided the opportunity to network with other NCS managers via avenues such as attendance at meetings of the American Nuclear Society Nuclear Criticality Safety Division and working groups for ANSI/ANS-8 standards.

Staffing Plan

A positive action taken was the development of a staffing plan and a retention plan. The staffing plan evaluates the operations and the staffing levels needed to maintain operations. A few observations were noted on the staffing plan. First, the staffing plan as noted in the March 6, 2013 letter from the PADOPS to the Field Office indicates that the FY2013 projected need is for about two Full Time Equivalent (FTE) engineers. This projection does not include staffing resources to perform Level 2/3 criticality safety evaluations because the development of these NCSEs is currently limited by LANL. Also, it neglects other activities necessary to maintain an NCS program infrastructure. The CSSG assessment team considers a staffing level of two FTEs to be borderline inadequate when considering the NCS experience levels of existing staff and management. The CSSG assessment team recognizes that there are two additional senior CSAs in other parts of the LANL organization, and that subcontractors have been added as a stop-gap measure. Nevertheless, the staffing plan should not convey or imply that two FTEs are satisfactory. Other minor observations that may change the staffing levels include:

- The plan assumes 1744 productive hours for the activities noted, yet this appears inconsistent with the February 2013 metric report that notes that 10% of the time is allotted to holiday/vacation and 35% of the remainder time is allotted to professional development, operations training, and administrative activities.
- The plan identifies no administrative time allotted for Level 1/2 CSAs, which is considered unrealistic
- The plan is based on 80% of the criticality safety evaluations taking four weeks (including two weeks of peer review) and 20% of the evaluations taking six weeks. This is aggressive scheduling with senior experienced CSAs. It may not be realistic for new or junior CSAs and is not representative of the time needed to develop evaluations for new operations.

LANS CSA Retention Plans

LANS has developed a progressive CSA retention plan including retention incentives, a career ladder with definitive action points, addition of level 5/6 engineers, and a qualification bonus. Many retention plans or employee development programs recognize the need for human elements, such as employee recognition, involvement in professional organizations, exchange programs, and participation in process operation development. Although the retention plan is sound as far as it goes, it neglects those human elements of worker satisfaction.

Although the retention plan is a good start to recognizing career needs of CSAs, it would not have addressed the mass exodus of the CSAs that occurred. The staff interviewed gave no indication that pay or corporate level was an issue. Later in this report in the section titled “LANL Management Challenges”, it is noted that trust issues still exist with senior management. One of the recommendations provided in that section involves performing a causal analysis for the reasons that the CSAs left. The results of that causal analysis need to be reviewed against the retention plan to ensure that a future exodus does not occur.

Recommendation: LANS Management should expand the retention plan policy to include human elements.

Improvement of Fissile Material Handler Qualification Program

After a recent, major handling infraction, the fissile material handler qualification program was overhauled and all FMH personnel were retrained/requalified. The CSSG assessment team notes this as a positive action, and explicitly credits the fissile material handler knowledge and experience as a

significant part of the basis for allowing continued floor operations. Any degradation of this program could constitute a condition that jeopardizes the ability of LANL to continue fissile handling operations.

Criticality Safety Analyst Qualification Process

The CSA qualification process was upgraded for new engineers, to include a training “boot camp” on the basic tenets of nuclear criticality safety. This training, in conjunction with the “hands on” training provided by the DOE Nuclear Criticality Safety Program forms a good foundation for new engineers. The CSSG assessment team interviews with line managers conveyed that it was understood by line managers that these training activities by themselves do not constitute qualification. The CSSG assessment team reaffirms that these activities are good foundational training, but extensive experience as an NCS practitioner is necessary for qualification. The CSSG assessment team did not have sufficient time to review the content of the “boot camp” training, but a review of the training agenda yielded the following recommendation:

Recommendation: The review identified some training elements that should be reviewed for appropriate depth of training that are often weak in content throughout the DOE complex.

- Foundational training in hazard evaluation techniques (e.g., What-if, HAZOPS, Parameter Analysis) is crucial for CSAs to be able to evaluate processes and establish NCS limits and controls.
- Training in Non-destructive Assay techniques is important for the CSA so that he/she will understand the limitations of this often-used method for estimating fissile masses.
- Unreviewed Safety Question Determination (USQD) is useful for the CSA to obtain an understanding of the potential interactions between the NCS evaluations and the facility safety basis. This is not meant to qualify the CSA to perform USQDs, but rather to provide insight on the Documented Safety Analysis. This can also be accomplished in other ways, including training on facility safety hazard evaluation methods for the DSA.

Oversight Actions

LANL Nuclear Criticality Safety Committee

In November, 2012 the charter for the LANL Nuclear Criticality Safety Committee (NCSC) and its membership changed. Voting membership now consists of managers from Operations, Security, Weapons, and ES&H. The Safety Basis Lead and the NCS group lead are *ex officio*, non-voting members. With the recognition that the Committee oversees the health of the NCS program and reports the results to the Lab Director, it is notable that voting membership from independent (outside of SB-CS) NCS SMEs are not voting members on the Committee. If independence from the NCS program is desired, outside experts¹ could be used to fill that advisory need.

¹ Some resident NCS SMEs outside of the SB-CS group may still be available to fill this need. The availability of such individuals was not determined during this assessment. In addition, there could be expertise available within the corporate businesses that make up LANS.

In addition, the Charter notes that the NCSC is responsible for:

- Performing an annual review of facilities and NCS programs within the Laboratory involving significant quantities of fissile/fissionable materials.
- Performing periodic review of a sampling of operations, focusing on the NCS implementation including CSO and FMH programs.
- Performing periodic review of the capabilities and performance of the Criticality Safety Group (SB-CS) regarding level and quality of criticality safety support.
- Identifying and involving subject matter experts (SMEs) as necessary to assist in reviews and other short-term assignments for the committee.

The membership does not appear to have the expertise to perform such reviews without NCS SMEs involved. With the lack of NCS SMEs at LANL, it is not clear how these Charter requirements will be met. For that reason, the following recommendation is made:

Recommendation: The NCSC Charter should incorporate CSSG guidance (i.e., CSSG Tasking 2009-01) in the formulation of the purpose and membership. Senior, seasoned NCS SMEs from outside LANL¹ should be considered as voting members.

NCS Metrics

In February, 2013, LANL issued a new set of metrics (report SB-CS-ASMT-13-001-R0) designed to measure effectiveness around the established priorities for CSAs, namely:

- Emergency Response
- Event Response (infractions/potential infractions)
- Field Support to respond to questions or uncertainties around criticality safety evaluations and process controls
- Procedure reviews to ensure processes remain within evaluation parameters
- Annual process walk-downs to ensure that processes are not experiencing drift that would stray from criticality safety evaluation assumptions and controls.

Other metrics are also provided with regard to staffing and resources and some performance improvements. The development of good metrics is a difficult, but necessary evolution because they form the foundation for establishing proper corrective actions and for monitoring the effectiveness of those corrective actions. The metrics reported show a good first effort, but the analysis of the metrics and the type of metrics need improvement if they are to be useful in determining if the operations are starting to move outside the safety envelope. The following example comments illustrate this point:

- Most of the metrics are production based metrics and not diagnostic based metrics. While production based metrics are useful for some applications, diagnostic based metrics are needed to determine if a change in condition is occurring. Examples include metrics on the raw number of infractions, the number of walk-downs performed, etc.
- The metrics contain data on infractions, and from the infractions reported there appears to be an inconsistency in how infractions are graded. One infraction was graded as a Level 1-NC because no evaluation existed for the operation, yet the other three infractions involved situations where the evaluation did not evaluate the condition and those were graded as Level 4 and 5 infractions. Consistent application of the grading levels is necessary or the metrics may mis-represent the state of the program.

- One metric shows a three month rolling average of potential CS infractions. This metric is good in that it shows if patterns exist. For this report, there is a clear pattern of increased infractions every nine months or so, and from the timing it would be expected that we are entering a time of increased infractions with minimal staff. No evaluation of the cyclical nature of the metric or the potential impact with reduced NCS staff is contained within the metric report. (There is a mention of a “reactionary trend”, but the evaluation stops there.)
- Figure 3 of the metric report (SB-CS-ASMT-13-001-R0) is stated to include the number of infractions identified by LANL personnel and the number of infractions identified by non-LANL personnel for 4Q FY12 and 1Q FY13. A percentage basis may be more appropriate than a “number of infractions” basis. It would also be useful to know what percentage of infractions is reported by operations and what percentage is identified by the NCS organization. As a note, it was reported in interviews that a significant percentage of infractions in 2Q FY13 were identified by the Field Office. If this is the case, the analysis of the metric needs to be presented in the next metric report.
- Section 3.3 of the metric report notes that it is important that infractions are analyzed thoroughly so that follow-up actions can be established to prevent repetitive mistakes. However, the metrics provided do not contain information that will allow for discerning repetitive infractions. The cause categories of infractions (e.g., human error, equipment malfunction, legacy issue, failure to analyze) should be tracked so that directed improvements can be made.
- Section 4.0 of the metric report notes that the metrics demonstrate that resources of the criticality safety group are not sufficient to respond to all field support requests (e.g., procedure reviews). The report further states that process walk-downs are a higher priority. This is inconsistent with the priorities established for CSA support and the future detrimental impact on operations is not presented. In other words, how long can the backlog of field support requests continue to grow before the operations are no longer safe to perform? The data indicates a problem, but the evaluation does not result in an action. It is noted that insufficient data may be available at this point in time to draw the conclusion, but if more data or different data is needed, that should be stated in the evaluation.
- The metrics do not have established performance goals to determine if they are in an acceptable range. If a performance goal cannot be established for a particular metric, the metric needs to be re-evaluated with regards to its benefit on improving performance.
- Several of the metrics do not lend themselves to trending. For example, the metric on the time span for closure of PFITS² Issues will not show if improvement on closing issues is occurring over time. Without trending, the effectiveness of a process improvement cannot be determined.
- Some metrics are on the right track for the situation that exists today. For example, Figure 13 of the metric report shows fractional workload of the criticality safety staff. This gives an indication that time is being spent on floor operational support rather than criticality evaluations, which supports the priorities established. The addition of a trending curve on evaluation time would add the diagnostic needed to see if that time is increasing to levels beyond those desired.

From the observations, the following recommendation is made:

Recommendation: Metrics need to be continually reviewed to ensure that they provide data useful in modifying processes for improvement. The existing metric set needs to be reviewed for: (1) the suitability of the data for the identification and measurement of process improvements; (2) the ability to trend the data and analyze the basis for trends; and (3) the establishment of goals so that acceptable performance is defined.

² The LANL institutional corrective action system is known as “PFITS”, but the acronym text was not available in provided documentation.

Floor Level Support – Criticality Safety Officers

The main, immediate oversight activity that will catch potential infractions before they occur is active in-the-field support. Clearly, the number of qualified CSAs is insufficient for comprehensive coverage of all operations, and if the staff were increased, there would still likely be a short-fall. That is why many facilities have gone to the Criticality Safety Officer concept. It puts more trained people on the floor to be the eyes and ears for the CSAs. At present, the CSO responsibility is a collateral duty for production operations and process engineers. LANS has commissioned an assessment of the CSO program that is near completion. A substantial boost to this program will likely yield as much benefit as the upgrade to the FMH training and qualification and it could be accomplished far quicker than it will take to recover the CSA staffing to adequate levels of numbers and experience. Accordingly, the following recommendation is made:

Recommendation: Review the recommendations from the CSO program assessment and give strong consideration toward implementing changes such as establishing a dedicated CSO program and enhancement of training and qualifications to include a requirement to complete the DOE NCSP hands-on training classes.

LANL Management Challenges

Ongoing Trust Issues

It is understood from the 13 April 2012 CSSG 2011-06 Tasking Response and the fallout from the “photo-op” event and subsequent CSA departures from LANL that there has been a significant lack of trust among the LANS organizations both horizontally and perhaps predominantly vertically from the SB-CS organization. The lack of trust is attributed to various LANS management actions and employee reactions, including CSA departures from LANL in the last year or so.

According to Operations and Business line management, the exodus of ten of the twelve qualified CSA employees since the 2006 contract change from the University of California is not inconsistent with LANS non-research employment history. However, six of those ten employees departed the CSA organization in the last year. Line management asserted various reasons for the rapid departure from the SB-CS organization. Those reasons cited were that:

- there were two opposing “cliques” within the SB-CS organization causing internal conflict,
- the SB-CS Manager was not effective in resolving employee conflicts and communicating employee concerns and needs to higher levels of management,
- there were unresolved personality conflicts between LANS management and the SB-CS organization and manager,
- periodically employees seek alternative employment for professional advancement and personal satisfaction,
- organizational changes are hard for some people to adapt to, and
- following the contract change (~ 2006) employees were required to choose between a pared down retirement plan or a 401k savings plan thereby making it easier to change employment without losing retirement savings in their 401k plan.

Though some or all of the cited reasons for the CSA attrition may be valid to some degree, it must be noted that at least one CSA employee left LANL for much less pay and cost of moving. Others uprooted their families to take employment elsewhere with no particular gain in salary and less managerial

responsibilities. One individual left LANL without having employment elsewhere. These responses are not the typical responses of a moderately dissatisfied or unproductive staff.

The CSSG assessment team interviews identified that the trust issues continue to exist with not only the CSAs, but with other parts of the organization and the Field Office. This is problematic because management decisions that are being made without adequate communication of the basis for the decisions, are being viewed in a negative light that contributes to a continuing building of distrust. For example, the following actions/decisions that were made with good intent and bases are being viewed as negative actions among interviewees because of the lack of communication:

- The recent addition of the SB Division Leader and the SB-CS Deputy Division Leader has created a line management chain above the CSA without any NCS expertise. This leaves the image that there are no senior managers that will advocate the positions of the NCS staff.
- The LANS management response dated July 16, 2012 to the post PF-4 stand down review that was performed by the extant Chair of the LANL Laboratory Director's NCSC and other assigned Nuclear Criticality Safety Advisory Team members, adopted all but one of the Advisory Team's recommendations (i.e., return the CSA organization to the ES&H directorate). The LANS CAP included disbanding the pre-November 2012 LANL NCSC and reconstituting the committee in November 2012 with voting membership consisting only of managers from Operations, Security, Weapons, and ES&H. The Safety Basis lead and the SB-CS group lead are *ex officio* non-voting members. These decisions appear to support the contention that line management is isolating itself from NCS and putting the organization into a position where NCS issues can be dismissed without NCS involvement.
- The creation of a CSA retention plan (see previous section for additional discussion) that is focused on monetary/career path incentives implies that management only thinks that the issue with the CSAs was financial.
- The addition of subcontractor NCS staff without communicating short term and long term goals is being viewed as simply increasing head count to demonstrate that the NCS program is viable.

Of particular note is that LANS Operations & Business management stated that they did not recognize the gravity of the CSA employee dissatisfaction, and perhaps distrust, until just before or just after the CSSG Tasking 2011-06 report of 13 April 2012. The current CSSG assessment team judges that this delay in management oversight, involvement, and organizational support has contributed to an impression that line management does not take the current staffing situation seriously. Additionally, LANS Operations & Business management stated that they had not done a formal independent causal analysis to identify how and why LANL is now understaffed. It is judged that without a sound and independent causal analysis to identify and implement corrective actions to regain employee trust LANS will remain in their understaffed, under experienced predicament. The execution of the February 14, 2013 revision to the CAP (AD-NHHO:13-042) and the monetarily based employee retention plan (SBCS-CAP-12-265) likely will not provide LANL with long-term, committed CSAs without a management cultural or organizational change.

Both the above explanations for the staff attrition and the failure to recognize and/or investigate the festering situation within the SB-CS organization are demonstrative of poor people management skills within LANS.

Though somewhat intangible, the very real challenges for LANS management are;

- to be introspective about the circumstances that drove all of the senior qualified CSAs to leave LANS employment or to transition away from the LANS Operations & Business Safety Basis organization, and

- to develop trust among existing and new CSA employees and LANS management.

Clearly, this trust issue will be one of, if not the largest, issue impacting the successful implementation of the LANS CAP and the maturing of a nuclear criticality safety program at LANL.

Recommendation: LANS Management should execute a formal, independent causal analysis for the extreme attrition of senior and other qualified SB-CS personnel and should perform an extent of condition evaluation to ensure that similar attrition issues do not exist in other parts of the organization. In addition, the results of the causal analysis should be factored into the retention plan or other management actions, as appropriate.

CSA Staffing

Use of Senior-Qualified CSAs

The only remaining two senior qualified CSAs at LANL have departed the SB-CS organization and are administratively located within the Global Security Directorate. Both individuals have acknowledged an interest and commitment to assist LANS in the mentoring and qualification of newly hired and junior qualified CSAs. One of the individuals has chosen a separate career path at LANL and the other individual stated they will leave LANL employment if assigned to the SB organization.

Interviews with these two individuals revealed that their recent assignments have been to review NCSEs that have been drafted by CSAs-in-training/qualification. The two senior qualified CSAs view the process of reviewing draft NCSE text as not instructive or productive of their time. The cycling of reviews, edits, comments, and corrections to the logic of drafted NCSE text is not effective mentoring. The Assessment Team concurs that the better use of the senior qualified CSAs would be as mentors in the usual sense of the word (i.e., to shadow and guide the CSA in qualification by leading the CSA through fissile material process floor investigations of proposed and current operations, interviews with operations personnel, reviews of engineering drawings/specifications, identification of normal and abnormal process conditions, performance of a formal hazards analysis, and development of NCSEs). Such mentoring would yield a reviewed NCSE while minimizing repeated turnarounds of drafted, commented, and corrected text with limited instruction to the CSA-in-training.

Recommendation: LANS SB-CS Management should use the two remaining senior-qualified CSAs³ as mentors for CSAs-in-training/qualification. The role of the mentor should be to shadow and guide the CSA-in-training and qualification by leading the CSA through fissile material process floor investigations of current and proposed operations, interviews with operations personnel, reviews of engineering drawings/specifications/operating procedures, participation with operations personnel in the identification of normal and abnormal process conditions, performance of a formally defined hazards analysis, and development of NCSEs. Use of the senior-qualified CSAs as NCSE text reviewers should be minimized to the extent possible.

³ Additional senior CSAs may be available within the organization that were not identified or are available through “corporate reach back” through LANS corporate partners.

Use of Junior-Qualified CSAs

Presently, LANS has two junior-qualified CSAs within the SB-CS organization. Their availability is important to the maintenance of the safety basis envelope for continuing operations at LANL. LANS recognizes that additional qualified and senior qualified CSAs are necessary for the evolution of new or changing fissile material work at LANL. Seven new LANL staff CSAs and numerous contractors have been added to the SB-CS group recently. The new SB-CS employees are in the LANL training and qualification program. The involvement in the newly established “Boot Camp” should help to accelerate the qualification of new SB-CS staff but qualification as a qualified CSA will require substantial education, training and familiarity with LANL process operations. It is recognized that the two senior-qualified CSAs in the Nuclear Engineering and Nonproliferation (NEN-2) organization (within the Global Security Directorate) and the two extant qualified CSAs in the SB-CS organization have very limited time to perform the full suite of job responsibilities of a CSA that include:

1. Emergency Response
2. Event Response (infractions/potential infractions)
3. Field Support – request from floor personnel for clarification of existing criticality safety documentation and/or to provide technical guidance – Level 1 evaluations
4. Procedure Reviews
5. Annual Process Walk-downs
6. Requests for New Criticality Safety Evaluations – Level 2 and 3 evaluations.

Apart from the above (6) priority job responsibilities, mentoring and qualification of the newly acquired staff places an additional burden on the junior- and senior-qualified CSAs. The challenge for LANS is to utilize the availability of the qualified CSAs in an effective manner.

Recommendation: To relieve the burden on junior and senior CSAs, LANL Safety Basis – Division Office (SB-DO) and Safety Basis – Criticality Safety (SB-CS) should enlist the aid of the X-Division in the training and mentoring of CSAs in the performance of computational validations, and simple/complex code applications for use in NCSEs and review of SB-CS computational analyses. Junior-qualified CSAs, in concert with process engineers/operations personnel and CSAs-in-training, should define the normal and abnormal process conditions to be considered for computational safety analyses that are reviewed by senior CSAs. NEN-2 personnel could be involved in mentoring of junior CSAs and CSAs-in-training/qualification in the computational process.

Use of SB-CS Subcontractors

Numerous contractors have been added to the SB-CS group. Though many of the contractors have had varied experiences throughout the US nuclear complex, they typically have not experienced the complexity of research and production with fissionable materials having the highly reactive nuclear properties of plutonium in forms that span pure alpha- and delta-phase metal, compounds, concentrated and dilute solutions, and contaminated waste forms. Because contractor personnel are essentially transients through LANL, training and qualifying the numerous subcontractors to become proficient, qualified CSAs in those varied operations may create a dependence on subcontracting staff in lieu of developing employees to fill this role. Alternatives need to be considered for long-term sustainability of a NCS program at LANL.

Recommendation: LANS SB-DO and SB-CS management should, to the extent possible, utilize the SB-CS contractor staff for performance of mundane work such as routine on-the-floor surveillance of process operations and conditions for consistency with procedures and NCSE limits and controls.

Recommendation: LANS SB-DO and SB-CS management should continue the training and qualification of LANS SB-CS personnel by using their senior- and junior-qualified CSAs as mentors but with a secondary focus on the qualification of contractor personnel.

Review of Los Alamos Field Office Oversight Capability

Management of Risk

The exodus of the most experienced contractor CSAs has altered the risk profile of LANL's fissile material operations and experiments. As NNSA is the risk acceptance authority for these operations and experiments, they need to increase their understanding and involvement with these activities.

It is important that allowed operations and experiments have an analysis of the risk and commensurate limits and controls that meet NNSA expectations. An earlier recommendation in this report was made for LANS to document a list of the operations considered to be acceptable for continued operation considering factors such as maturity of the NCS evaluations, knowledge and capabilities of the floor-level operators, and the availability of qualified personnel to provide effective oversight of those operations. In this regard the Field Office needs to communicate their expectations to LANS and then review and concur with the proposed limited set of operations.

Recommendation: Maintain positive control of the allowed operations by review and concurrence of the proposed allowed operations submitted by LANS.

Staffing Resources Available for Oversight

The second concern is to assure that this set of operations complies with the limits, controls and core assumptions of the criticality safety analysis (or evaluation). This involves increased oversight. As the (sharply reduced) contractor NCS staff will be a significant part of the operational oversight, they should not be overly burdened with production of new or revised evaluations. In this regard, the Field Office needs to review and concur with the LANS use of the contractor's criticality safety staff regarding initiation of specific new or modified Level 2 and Level 3 Nuclear Criticality Safety Evaluations.

The federal Facility Representative staff should increase their attention to fissile material operations and their limits and controls. Those Facility Representatives who have yet to do so should attend the US DOE NCSP T&EP One-week Manager's Course or comparable training

It is noted that the Field Office NCS staff person reported finding a criticality safety deviation on about half of the weekly operational walkthroughs. This indicates that the contractor's oversight is insufficient. The Field Office should consider augmenting the federally qualified Field Office NCS staff person with additional federally qualified NCS staff member(s).

- Recommendation:** The Field Office needs to review and concur with the LANS use of the contractor's criticality safety staff regarding initiation of specific new or modified Level 2 and Level 3 Nuclear Criticality Safety Evaluations.
- Recommendation:** The Field Office should maximize the use of other available staff to augment the one federally qualified Field Office NCS person. The use of NCS-trained Facility Representatives is encouraged.

Conclusion

This assessment evaluated the state of operations and the NCS program health through a series of interviews and review of programmatic documents. The assessment concluded that limited operations could continue with tight oversight by both the LANS management and the NNSA Los Alamos Field Office. The situation will take years to resolve, and this may impact the ability to meet future mission objectives. Therefore it is important that other resources (e.g., Criticality Safety Officers) be used to supplement the CSA staff so that they are able to produce NCS evaluations necessary to support ongoing operations.

Attachments

Attachment 1 – CSSG Tasking 2013-02

CSSG Tasking 2013-02
Date Issued: March 7, 2013

CSSG TASKING 2013-02
Date Issued: March 7, 2013

Task Title: *CSSG Assessment of Scope of Operations and Criticality Safety Staff Capacity and Review of LANL CAP and Metrics for Nuclear Criticality Safety Program*

Task Statement:

The CSSG is directed to assess the scope of current operations and criticality safety needs and contrast that with the capabilities and capacity of the criticality safety staff. The purpose is to assess the capacity of the current criticality safety cadre to support nuclear operations at LANL. The CSSG is also directed to review the LANL *Corrective Action Plan Response to Assessment From DOE Criticality Safety Support Group on the Los Alamos Nuclear Criticality Safety Program*; SBCS-CAP-12-265, Revision 1, and the associated *IQ FY13 Assessment of the Nuclear Criticality Safety Program Metrics* relative to their efficacy in addressing the known deficiencies and ensuring continued safe operations going forward. The CSSG should craft observations and recommendations with a view towards the lessons learned documented in the Handbook from the 1999 DOE Nuclear Criticality Safety Self Improvement Workshop.

Specific Expectations:

- The CSSG shall recommend what criticality safety work scope and resource commitment is required to support full nuclear operations identified by operation, area, or facility. The criticality safety resource should be identified by the experience and qualification needed to perform the task.
- The CSSG shall assess whether the existing LANL criticality safety cadre can support the full scope of nuclear operations identified above and, if not, recommend what level and types of work can be supported by the existing staff.
- The CSSG shall provide specific recommendations, as applicable, that NA-00-LA can send to LANS as directed modifications to the CAP and associated metrics, as well as recommendations for consideration by NA-00 (Note: NA-00 includes both the Field Office and Headquarters Elements).
- The CSSG should include recommendations for how NA-00 could assess acceptability of an increase in work scope from LANS as additional criticality safety staff achieves appropriate qualifications.
- The CSSG should provide recommendations on how NA-00 can conduct effective oversight on the program in the interim (i.e., NNSA approvals, reviews, etc.).

Period of Performance:

The on-site assessment and review is scheduled for the week of March 11, 2013. The team will perform reviews as available prior to the onsite portion of the assessment and report writing after. The CSSG Team shall deliver an exit briefing with draft results to NA-00 and LANS management as requested prior to site departure (March 14th).

Resources:

Contractor CSSG members of the team will use their FY13 NCSP CSSG support funding as appropriate; DOE CSSG members of the team will utilize support from their site offices.

CSSG Tasking 2013-02 Subgroup Review Team Members: Kevin Kimball (Y-12, Team Lead), Dr. Bob Wilson (EM), Mr. Calvin Hopper (ORNL)

The assessment team will visit Los Alamos and conduct interviews as necessary to understand the scope of current operations and support needs from the criticality safety staff as well as the capability and capacity of the criticality safety staff to support operations. When a draft is ready for review, the entire CSSG will be provided an opportunity to review the draft and provide comments to the CSSG Subgroup Team Lead, who will address/resolve the comments and forward the resulting response to CSSG Chair for transmittal to the NCSP Manager.

Task Deliverables:

1. CSSG Subgroup on-site March 12 – 14, 2013
2. CSSG Subgroup exit briefing to NA-00/LANS Sr. Management March 14, 2013
3. CSSG subgroup draft Executive Summary and Key Recommendations, and provide to full CSSG for comments by March 22, 2013. At a minimum, the Executive Summary and Key Recommendations shall be provided to NCSP Manager and other designated recipients (NA-00-LA/LANS) for a factual accuracy review.
4. CSSG subgroup draft full report and provide to CSSG for comments by March 29, 2013.
5. CSSG to provide comments on the draft response to the CSSG Subgroup Team Lead by April 5, 2013
6. CSSG Subgroup Team Lead to consolidate comments and provide revised draft to the CSSG for concurrence, and NA-00-LA/LANS for factual accuracy review, by April 9, 2013
7. NA-00-LA/LANS provide factual accuracy comments by April 15, 2013
8. CSSG provides concurrence by April 16, 2013
9. CSSG Chair transmits the CSSG response to NCSP Manager by April 18, 2013.

Task Due Date: April 18, 2013

Signed: _____

**Dr. Jerry N. McKamy, Director
Office of Environment, Safety, and Health, NA-00-10
DOE Criticality Safety Program Manager**

Attachment 2 – List of References Reviewed

Documents Reviewed

1. LANS letter PADOPS-12-031, from Carl A. Beard, PADOPS, LANS, to Juan L. Griego, Deputy Manager, LASO, Subject: *Transmittal of a Corrective Action Plan and Compensatory Measures to Strengthen the LANL Nuclear Criticality Safety Program*, dated November 8, 2012 (LASO COR-S0-11.14.2012-479883).
2. LASO letter from C. H. Keilers to Charles E. Anderson, Associate Director, Nuclear and High Hazard Operations, Los Alamos National Security, LLC, Subject: *Los Alamos National Laboratory- Improving the Criticality Safety Program* dated December 21, 2012 (U1300336).
3. LANS letter from Charles E. Anderson, ADNHHO to Charles H. Keilers NA-00-LA, Subject: *Transmittal of Closed Action from the Corrective Action Plan for Nuclear Criticality Safety Program* dated February 1, 2013 (AD-NHHO:13-031).
4. LANL System Description, *Nuclear Criticality Program*, dated September 30, 2009 (SD130).
5. LANS letter from Charles E. Anderson, ADNHHO to Charles H. Keilers NA-00-LA, Subject: *Transmittal of a Revision to the Corrective Action Plan (CAP), and Compensatory Measures to Strengthen the LANL Nuclear Criticality Safety Program* dated February 14, 2013 (AD-NHHO:13-042).
6. LANL Memorandum from James H. Miller, Jr., SB-DO, to Charles E. Anderson, AD-NHHO, Subject: *Nuclear Criticality Safety Program Metrics* dated November 30, 2012 (SB-DO:12-012)
7. 1Q FY13 Assessment of the Nuclear Criticality Safety Program Metrics dated February 2013 (SBCS-ASMT-13-001-R0).
8. LANL Nuclear Criticality Safety Committee Charter, authorized by Charles F. McMillan, Laboratory Director dated November 30, 2012.
9. LANS letter from Dave Costa, Nuclear Material Management Group, to James Miller, Jr., Safety Basis Division Office, Subject: *Nuclear Criticality Safety Advisory Team* dated July 16, 2012 (NPI-1-12-024).
10. LANL letter from James H. Miller, Jr., Safety Basis – Division Office, to Safety Basis Criticality Safety Staff, Subject: *Launch of Criticality Safety ‘Bootcamp’* (SB-DO:13-002).
11. LANL letter from Charles E. Anderson, AD-NHHO, to Distribution, Subject: *Safety Basis-Criticality Safety (SB-CS) Support to Operations* dated November 28, 2012 (AD-NHHO:12-328).
12. LANL letter from Charles E. Anderson, AD-NHHO, to Distribution, Subject: *Safety Basis-Criticality Safety (SB-CS) Support to Operations* dated March 12, 2013 (AD-NHHO:13-060).
13. LANL *Procedure For Qualification of Non-LANL Criticality Safety Personnel* dated November 30, 2012 (P-NCSG-01).
14. LANL *Retention Plan For Nuclear Criticality Safety* approved by C. A. Beard, PADOPS, dated November 30, 2012 (SBCS-CAP-12-265).
15. LANL NHHO Standing Order 12-003, R0 dated June 26, 2012 (NHHO-SO:12-003, R0).

16. Email from James H. Miller to SB-CS, Subject: *Extended Work Week* dated October 30, 2012.
17. LANL SB-CS Staffing Plan, Attachment 1, dated November 30, 2012.
18. LANL letter from James H. Miller, Jr., SB-DO to Charles B=E. Anderson, AD-NHHO, Subject: *Nuclear Criticality Safety Training and Qualification Standard* dated December 19, 2012 (SB-DO:12-015).
19. LANL Memorandum from James H. Miller, Jr. to Distribution, Subject: *Management's Expectations for the Timely Entry and Closure of Criticality Safety Items in PFITS* dated December 18, 2012 (SB-DO:12-016).
20. Letter from Charles E. Anderson, AD-NHHO, to Charles H. Keilers, Assistant Manager Safety Operations Los Alamos Field Office, Subject: *Complete Current PFITS Criticality Safety Action for the Nitric Acid Backflow in TA-55* dated January 31, 2013 (AD-NHHO-13-029).
21. LANL System Description, *Los Alamos National Laboratory Quality Assurance Program* dated October 10, 2012 (SD330).
22. LASO letter from C. H. Keilers to Charles E. Anderson, Associate Director, Nuclear and High Hazard Operations, Los Alamos National Security, LLC, Subject: *Los Alamos National Laboratory – Improving the Criticality Safety Program* dated December 21, 2012 (SO:26CK-486666).

**Attachment 3 – Los Alamos National Security, LLC and Los Alamos Field Office
Personnel Interviewed**

Los Alamos National Security, LLC (LANS) and Los Alamos Field Office (NA-00) Personnel Interviewed

Tuesday, 3/12/13

- 1:00 James Miller, SB-DO
David Solms, SB-CS
- 2:30 FMH Workers
Chastity Kolar, NPI-1
Vince Garcia, NPI-3
Harvey Decker, MET-1
Leo Archuleta, NCO-2
- 3:30 Facility Reps
Randi Allen
Dan Carter
David George
David Stewart
- 4:15 Stu McKernan, TA55-DO
Chuck Tesch, TA55-OPS

Wednesday, 3/13/13

- 8:00 Bob Margevicius, NEN-DO
- 9:00 Jessie Walker, SB-CS (Qualified Analyst)
- 9:30 Jeff Yarbrough, ADPSM
- 11:00 Carl Beard, PADOPS
Will Bivens, PADOPS
- 1:00 Bob Little, XCP-DO
- 2:00 Mary Beth Lujan, CT-ITS (Training)
- 2:30 Dave Costa, MET-DO, and CSOs
Bill Crooks, C-IIAC (CMR)
Georgiana Vigil, CMR-OPS
Rich Morley, PMFS-DO (Area G)
Chastity Kolar, NPI-1 (TA55)
- 3:30 Charlie Anderson, ADNHHO
Chris James, ADNHHO

Thursday, 3/14/13

- 8:00 LANS Subcontractors (in Qualification)
Steve Van Volkinburg
Sean Gough

Kevin Schwinkendorf
Gay Fussell

8:30 Senior LANS Qualified Criticality Safety Analysts
Mark Mitchell, NEN-2
Jennifer Alwin, NEN-2

9:00 W. Scott Gibbs, ADTIR

9:30 LANS Criticality Safety Analysts
Erik Eifert, SB-CS (Qualified)
Ryan Hedrick, SB-CS (in Qualification)
Ning Zhang, SB-CS (in Qualification)

Attachment 4 – Assessment Out Brief Slides

3/28/2013

CSSG Assessment of Scope of Operations and Criticality Safety Staff Capacity

12 – 14 March 2013

CSSG Subgroup
Kevin Kimball (Team Lead)
Bob Wilson
Calvin Hopper

Introduction

- Acknowledgments
- Tasking
 - Assess current operations and NCS Needs
 - Assess capabilities and capacity for the NCS staff
- Limitations of Assessment

3/28/2013

Safe Nuclear Operations

- What constitutes “safe operations”
 - Risks well understood and documented
 - Limits and controls developed, communicated, and implemented
 - Adequate oversight (e.g., Integrated Safety Management) to assure rules followed
- Issue
 - Lack of experienced Criticality Safety Analysts (CSA) impacts the ability to develop and maintain safe operations
 - Risk increases as time goes on because it promotes “workarounds” to limits and controls
 - 3-5 year impact

LANL Operations

- Positive steps have been taken
 - FMH upgrade
 - Revised Evaluations for High Hazard Operations
- Consistent feedback from the Fissionable Material Handler (FMH) to the CSA to Management indicates that all high hazard operations have been reviewed, have adequate limits & controls, and are properly implemented.
 - We have no evidence to the contrary for these continued safe operations.
 - LANL has limited resources to change these operations or assess new ones.

3/28/2013

Self-Imposed Restrictions

- LANL Initiated curtailment of Level 2 & 3 NCSEs
- Exceptions for the performance of Level 2 and Level 3 will be closely managed

LANL Oversight

- Documentation of Risk
 - Recommendations
 - Formalize the identification of High Hazard Operations allowed to continued with current staffing limitations
 - Ensure consistency of grading infractions
 - all infractions need a summary descriptions
- Metrics
 - Good first step in developing metrics
 - Existing metrics are production based
 - Recommendations
 - Make diagnostic based
 - Establish Goals
 - Develop Trending
 - Identify Key Behaviors to Improve (for example)
 - CSA development
 - CSA applied time
 - Infraction Reporting
 - Self Reporting

1

3/28/2013

LANL Oversight

- Nuclear Criticality Safety Committee
 - Recommendation – NCSC composition incorporate CSSG guidance (e.g., CSSG Tasking 2009-01)
 - Add Senior, seasoned NCS experts from outside LANL as voting members
- Floor level oversight
 - FMH Program – good thing – keep up
 - Criticality Safety Officers
 - Give serious consideration to recommendations of current ongoing LANL assessment – involves a major upgrade to program.
 - Enhanced CSO Program can provide quicker assurance of maintaining limits and controls on High Hazard Operations
 - Quicker implementation and support to CSAs than bucking up newbie NCSAs
 - Consider sending to DOE NCSP T&EP Supervisor Training

Los Alamos Field Office Oversight

- Approval of Risk
 - NNSA only entity that can accept risk
 - Recommendation:
 - LANL document basis for specific High Hazard Operations (i.e., specific operations upgraded post PF-4 stand down) allowed to continue and submit to LA Field Office for concurrence
 - Concurrence of resources and initiation of Level 2 & 3 NCSE development and operations activities
 - Lack of current LANL NCS resources
 - Need to ensure existing resources are focused on High Hazard Operations
- Staffing Resources Available for Oversight
 - Staff numbers suspected to be insufficient (i.e., Federal NCS qualified staff members)
 - Recommendation
 - Maximize use of Facility Reps along with NCS Oversight Staff
 - Train Facility Reps to provide enhanced NCS background (e.g., DOE NCSP T&EP Supervisor Training)

1

3/28/2013

LANL Management Challenges

- Positive steps taken
 - Thoughtful development of an aggressive Corrective Action Plan
 - Development of Staffing Plan
 - Enhancing CSA training and qualification program
 - Upgrade of FMH training and qualification
 - Development of proposed CSA Retention Plan
- Significant “trust issues” exist
 - Impacts ability to recover from current situation
 - Independence
 - Ability to achieve Corrective Action Plan
 - Recommendation – The lines of communication between CSAs and Responsible Associate Directors need to be direct and reinforced

LANL Management Challenges

- CSA Staffing
 - Effective use of existing Senior CSAs
 - CSA mentoring LANL and Subcontractor CSA
 - Effective use of Qualified CSAs
 - Utilization of Subcontractors
 - Retention Plan
 - Financially based incentives only but needs to include positive aspects of managing people (e.g., professional development, Laboratory and community recognition)
 - No Root Cause Analysis for CSA Group Exodus
 - No Extent of Condition Review

3/28/2013

LANL Management Challenges

- Training and Qualification
 - NCS “Boot Camp” training is positive action, particularly for new inexperienced hires
 - Acknowledged Caution: Not the panacea for qualification
 - Operations approval as part of qualification process is a positive
 - Recommendations – additional training in
 - NDA & Formalized Hazard Evaluation
 - USQD

Follow On CSSG Actions

- Develop formal report
- Submit for factual accuracy
- Review by full CSSG
- Issuance of final reviewed Report

Attachment 5 – Assessment Team Professional Biographies

Mr. Kevin D. Kimball, B&W Y12, LLC, CSSG Member, Team Lead

Mr. Kevin D. Kimball is the Director of the Safety Analysis Engineering Organization for the Department of Energy (DOE) National Nuclear Security Administration (NNSA) Y-12 National Security Complex. In this capacity, Mr. Kimball is responsible for the management of all safety analysis including nuclear criticality safety, facility safety, and fire protection analysis for the Y-12 Site as well as the design of the new Uranium Processing Facility. Mr. Kimball has 20 years of experience with DOE nuclear facilities in the management of safety analysis engineering including nuclear criticality safety and nuclear safety (facility safety basis) and has experience at over 20 commercial and DOE nuclear facilities. Mr. Kimball received his Masters of Science in nuclear engineering from the University of Illinois at Urbana-Champaign (1982) and his Bachelors of Science in nuclear engineering from the University of Virginia (1976).

Mr. Kimball began his career with the United States Navy in surface warfare, with his last assignment as the associate professor of naval engineering for the Naval Reserve Officer Training Center at the University of Illinois. In 1981, he joined Impell Corporation; a large engineering services firm that provided engineering services to the commercial nuclear industry. His last position at Impell Corporation was as the Manager of Systems Analysis for the southeast region of the United States where he was responsible for areas such as licensing, safety analysis (e.g. fire protection, environmental equipment qualification, reliability/Probabilistic Risk Assessments, configuration management, design basis services), and systems analysis (e.g. thermal-hydraulic analysis, safe shutdown analysis). In 1991, Mr. Kimball joined Science Applications International Corporation as a Deputy Operations Manager responsible for development of external events analyses for commercial nuclear facilities. In 1992, Mr. Kimball started up NISYS Corporation; a small business specializing in safety analyses including nuclear criticality safety to both the commercial and government nuclear facilities. The company was acquired in 2008 by Enercon Services, Inc. and he continued with Enercon until 2011.

Mr. Kimball's areas of expertise include nuclear criticality safety and facility (nuclear) safety. Prior to his current position, Mr. Kimball was the nuclear safety manager and engineering manager for the 3019 Building U-233 Dissolution and Downblend Project at the Oak Ridge National Laboratory and also served as the Nuclear Criticality Safety manager for the Oak Ridge TRU-Waste Facility. Mr. Kimball served on the senior criticality safety review boards for Bechtel Jacobs Company, LLC and for the Y-12 National Security Complex. During his career, he qualified as a nuclear criticality safety engineer at:

- All DOE-EM Oak Ridge Facilities
- Rocky Flats Environmental Technology Site
- USEC's Portsmouth Gaseous Diffusion Plant in Piketon, Ohio, and
- Nuclear Fuels Services' Erwin Plant in Erwin, TN

Some of Mr. Kimball's accomplishments include:

- Authored a paper for the American Nuclear Society on integrating the nuclear criticality safety and safety basis disciplines that became the foundation for DOESTD- 3007-2007.
- Developed the statistical methodology for determining criticality code biases for the Savannah River Site that formed the foundation for NUREG-CR-6698.
- Developed the processes for the nuclear analysis of Criticality Accident Alarm System design at the East Tennessee Technology Park, 3019 Facility at ORNL, and the American Centrifuge Plant in Piketon, OH, and initiated a new process for integrating Emergency Planning, the Documented Safety Analysis and the immediate evacuation zone strategy for criticality events.
- Performed nuclear criticality experiment reviews for the International Criticality Benchmark Evaluation Project

- Developed a guidance document on establishing the range of applicability of critical benchmark experiments for the Savannah River Site.

Mr. Kimball is a professional engineer registered in the state of Georgia and is a member of the Nuclear Criticality Safety Division (NCSD) of the American Nuclear Society (ANS). He has served as the Chair, Vice Chair, Treasurer, Secretary, and Member of the Executive Committee of the NCSD. He is also involved in the ANS-8 series of national standards including serving as Working Group Chair of ANS-8.7, "Guide for Nuclear Criticality Safety in the Storage of Fissile Materials," and is a working group member of ANS-8.24, "Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations."

Mr. Calvin Hopper, CSSG Member

Mr. Calvin M. Hopper retired from the Oak Ridge National Laboratory in 2008 as a Distinguished Development and Design Engineer in the Radiation Transport and Criticality Group within the Nuclear Science and Technology Division. In his continuing consultancies he performs part-time on-going work for ORNL contracts to the US DOE and US NRC and three years of consulting to the Oak Ridge Y-12 National Security Complex.

Over the past 45 years, following his receipt of a B.S. in Physics from Southern Colorado State College Hopper has held various technical and administrative positions within the Oak Ridge, Tennessee contractor facilities. In 1968 he worked at the Oak Ridge Critical Experiments Facility as the staff Radiation Protection Officer. Following his interests in nuclear criticality experiments, he was employed in 1970 as a Nuclear Criticality Safety (NCS) Engineer with responsibilities for the Development, Metal Preparation, and Assembly Divisions at the Oak Ridge Y-12 Plant. Also, during this 10- year period he served on two personnel rotations to the Oak Ridge Gaseous Diffusion Plant, provided NCS support to the developing gas centrifuge enrichment project, and provided NCS consulting services to the US NRC SNM-1315 Licensee US Nuclear, Inc. facility in Oak Ridge, TN. In 1978 he moved to Attleboro, Massachusetts to work at the Texas Instruments, Inc. HFIR Project that fabricated all US DOE research reactor fuel elements. He was the Head of the HFIR Project US NRC Licensing, Nuclear Safety (i.e., Criticality Safety and Health Physics), and Nuclear Materials Accountability organizations. In that capacity, he prepared the first general license submittal to the US NRC for the HFIR Project license SNM-23 thereby replacing the 13-year old US NRC specific license and strings of amendments. Upon the 1980 completion of the general licensing process, he returned to the Oak Ridge Y-12 Plant as the Technical Manager of the Oak Ridge Y-12 Plant Health Physics Department. In 1981, he became the Oak Ridge Y-12 Plant NCS Department Head, served on the US DOE Albuquerque Weapons Criticality Safety Committee, and identified issues resulting in a DOE Special Access Program (SAP) currently managed by the Government Program Manager, Dr. J. N. McKamy. In 1985, he transferred to the Oak Ridge National Laboratory (ORNL) to become the first Laboratory Criticality Safety Officer and assisted Joseph T. Thomas in the development and management of the US DOE sponsored Nuclear Criticality Technology and Safety Program (NCT&SP) that was dissolved in 1990. In 1990, Hopper assisted ORNL in developing a NCS section and in 1994 served as the ORNL NCS Section Head. In 1995, he transitioned to full time within the ORNL Nuclear Science and Engineering Directorate providing services and technical support to ORNL, US NRC, and US DOE projects. In 1997 he assisted the US DOE in the development and establishment of the US DOE Nuclear Criticality Safety Program including its Criticality Safety Support Group for which he is a Charter Member, Deputy Chair, and Chair. He has addressed numerous CSSG Taskings during his 15-year membership. He co-authored a report that subsequently was responsible for altering IAEA standards regarding nuclear material accountability at the natural uranium purification product stage as opposed to the previous accountability stage for purified UO₂ – a significant alteration for international nuclear materials safeguards. In his capacity as the ANSI/ANS N16 Consensus Committee on criticality safety he was a member of the ANS Standards Board. Internationally, he is the convener (chair) of Working Group 8 on Criticality Safety within ISO TC85/SC5 since 1998. He has participated in OECD-NEA Expert Groups on MOX critical experiment needs and reference critical values and is a contributor and peer-reviewer for the OECD-NEA International Handbook of Evaluated Criticality Safety Benchmark Experiments. His recent publications have focused on the use and benefits of sensitivity and uncertainty analyses as applied to NCS problems and critical experiment design. Upon retirement from ORNL in 2008 he has provided technical and administrative NCS consulting services to ORNL, the Oak Ridge Uranium Processing Facility, and the Oak Ridge Y-12 National Security Complex. In his continuing work for ORNL he planned the development of the US DOE Hands-On Subcritical and Critical Training and Education Project for which he is the Project Coordinator. He continues supporting the US DOE Office of Health, Safety and Security Organization by summarizing national and international standards activities in the general area of nuclear

safety. Throughout his career he has provided both training and NCS analysis consulting services to industries in the US and Canada. Additionally, he has provided educational services through the University of Tennessee – Nuclear Engineering Department graduate classes and Tennessee Industries Week programs and lectured for the US DOE Prevention of Significant Nuclear Events and Potential Safety Impacts of New Technologies on the Operation of DOE Nuclear Facilities.

Some of Mr. Hopper's activities and accomplishment include being the Over-all Advisor to ANSI for ISO (International Organization for Standardization) Technical Committee 85 (Nuclear energy, nuclear technologies, and radiological protection) / Subcommittee 5 (Nuclear fuel cycle). Also, he is the international Convener (Chair) of Working Group 8 on nuclear criticality safety within Subcommittee 5 and Technical Committee 85 for ISO. He is a Fellow Member of the American Nuclear Society (ANS) and is a Member of its Nuclear Criticality Safety Division (NCS). In 1974 he co-authored the first publicly released nuclear criticality safety computer code validation and authored the seminal Nuclear Criticality Accident Slide Rule while employed at Y-12. He has been the Program Chair, Treasurer, and Co-Chair/Chair of the ANS Nuclear Criticality Safety Division, Chair of ANSI/ANS-8.7 storage standard and Member of ANSI/ANS-8.1, 8.19, 8.23, 8.26 standards working groups. He is a Member and recent past Chair of the ANSI/ANS N16 Consensus Committee on Nuclear Criticality Safety. He was the past manager of the US NRC Criticality Computer Code Sensitivity and Uncertainty Project at ORNL and the past manager of the US DOE NCSP ORNL tasking for the development of sensitivity and uncertainty analysis tools (AROBCAD and TSUNAMI) that have been incorporated into the internationally recognized comprehensive modeling and simulation suite for nuclear safety analysis and design, SCALE. He coauthored the Updated Nuclear Criticality Accident Slide Rule that is internationally recognized as a useful emergency training and response tool. He was the General Chair of the ANS NCS 2005 Topical Meeting. He has provided several consultancies to the International Atomic Energy Agency Nuclear Safety and Security in the topical areas of emergency management and nuclear safety guides.

Some of Mr. Hopper's professional recognitions include the advancement to the position of Fellow Member in the American Nuclear Society, US DOE Under Secretary of ES&H citation for successfully managing the US DOE Plutonium ES&H Vulnerability Assessment for the US DOE Oak Ridge Operations Site Assessment and Team Report, ANS Standards Service Award, NNSA Certificate of Appreciation for the TRUPACT-II and HalfPACT systems criticality safety analysis, American Nuclear Society Nuclear Criticality Safety Division Distinguished Service Award, Outstanding Achievement Award from Colorado State University – Pueblo.

Dr. Robert Wilson, CSSG Member, DOE, EM-41

Dr. Robert Wilson is the Criticality Safety Program Manager for the DOE Office of Environment Management. He obtained a Bachelor and Masters of Science degree in Engineering Physics from the University of California at Los Angeles and a PhD in Nuclear Engineering from the University of Washington.

Dr. Wilson completed a dissertation in Critical Mass Physics at the Plutonium Critical Mass Laboratory in Richland, Washington and post doctoral work in safety analysis for the FFTF Reactor. Following academia he assumed responsibility for the Criticality Safety Program at the Idaho Chemical Processing Plant (ICPP). While at the ICPP he managed the safety response to a criticality accident in 1978 and managed the rebuilding of the criticality safety program. Following ICPP, he worked as the senior criticality safety specialist for the U.S. Nuclear Regulatory Commission. In 1995, he assumed responsibility for the criticality safety program at the Rocky Flats Environmental Technology Site and instituted the program manual, the Criticality Safety Officer Program and safety analysis methods. He is currently the Criticality Safety Program Manager for the DOE Office of Environmental Management.

He was appointed a Westinghouse Advisory Scientist in 1987, a Fellow of the American Nuclear Society in 1994, and earned a Meritorious Service Award for Engineering Excellence from the NRC in 1992. He has served as a member of the Argonne National Laboratory Nuclear Facility Safety Committee, the DOE Nuclear Criticality Technology and Safety Panel (1989 - 1993), and the DOE Criticality Safety Support Group (1997 - present). He is the convener of the committee of federal employees with Criticality Safety responsibilities. He has been the General Chairman and Program Chairman for ANS topical meetings in criticality safety. He has twice served as vice chair and chair of the ANS Nuclear Criticality Safety Division. He is currently chair of the Colorado Section of the ANS. He has served as an Affiliate Professor of Nuclear Engineering for the University of Idaho and has lectured at dozens of University of New Mexico Short Courses on Nuclear Criticality Safety.

He is a member of several ANSI writing groups for criticality safety related standards and is a member of N-16, the Nuclear Criticality Safety Consensus Committee for the American National Standards Institute.