

**Site Visit Report
Lawrence Livermore National Laboratory
Safety Basis Assessment**

INTRODUCTION

This site visit report documents the collective results of the review of Lawrence Livermore National Laboratory (LLNL) safety basis processes and discusses its scope, objective, results and conclusions. Appendix A provides lists of the documents, interviews, and observations and Appendix B includes the plan for the review. This combined assessment was sponsored by the National Nuclear Security Administration (NNSA) Livermore Site Office (LSO) and conducted jointly by staff from the Office of Health, Safety and Security (HSS) and LSO. The review was conducted in late 2010 and included site visits from November 29 - December 3, 2010 and December 13-17, 2010. Overall, the LLNL programs and implementing procedures adequately govern development and implementation of safety basis documentation and execution of the unreviewed safety question (USQ) process.

SCOPE

The scope of this assessment includes the plans, procedures, and processes used by LLNL to establish and maintain the safety basis for its nuclear facilities and activities and to establish and implement the USQ process at LLNL consistent with the requirements of 10 CFR 830.

OBJECTIVE

The first objective is to verify that the Laboratory has established and implemented plans, procedures, and mechanisms to ensure that hazards associated with nuclear facilities and activities are formally and appropriately analyzed, actions are taken to prevent or eliminate hazards, and controls are developed, implemented, and verified. The second objective is to verify that procedures and processes ensure that a USQ process has been developed, approved by the LSO, and adequately implemented. Criterion 1 and 2 address the first objective and criterion 3 the second objective; criterion 4 and 5 apply to both objectives.

DISCUSSION of RESULTS

- 1. LLNL procedures and mechanisms address and implement 10 CFR 830 Subpart B requirements, including development and implementation of fully compliant documented safety analyses (DSAs) and technical safety requirements (TSRs) for hazard category 2 and 3 nuclear facilities and activities.**

Document 51.1, *Documented Safety Analysis Program Plan*, in the Environment, Safety, and Health (ES&H) Manual establishes the overarching requirements for development of the safety basis for LLNL nuclear facilities. It describes the method for categorizing nuclear facilities and summarizes the resulting requirements for the contents of the DSA. It discusses the requirements for both new and existing facilities, as well as those for facilities with a limited life expectancy and those undergoing decommissioning. The document provides an overview of the safety basis development, including

references to the more detailed implementing procedures, and briefly describes the contents of the completed DSA. The discussion is augmented by a process flowchart and a table containing detailed activity descriptions.

To support the development process, LLNL has a complete set of procedures governing development and implementation of DSAs and TSRs for its nuclear facilities. A procedure (AB-002) developed in 2009 as part of the process improvement initiative establishes a structured process with clear roles and responsibilities for the personnel principally responsible for preparing the safety basis submittals. The procedure treats the effort as a formal project with appropriate project controls. One of the new key documents prepared in this process is the Scope and Key Issues Statement, which is used to establish the project baseline with LSO. The procedure also contains a detailed process for managing resolution of review comments, guidance for resolving any differences arising from the safety evaluation report (SER), and instructions for managing changes resulting from the SER and/or conditions of approval.

A graded-approach implementation procedure, which follows the U.S. Department of Energy (DOE) “safe harbor” guidance in DOE-STD-3009, provides initial guidance for determining the contents of the DSA for hazard category 2 and 3 nuclear facilities. LLNL has also prepared and implemented detailed procedures for conducting hazard and accident analyses, performing and documenting supporting calculations, selecting control items, and preparing TSRs. The hazard analysis includes a formal process of hazard identification, including facility walkdowns, and hazard evaluation. The procedure provides detailed instructions for completing the hazard evaluation, preparing the hazard evaluation table (though it does not discuss conducting a “what-if” analysis), and selecting the accidents for analysis. The accident analysis procedure provides a similarly detailed set of instructions for completing the analyses, evaluating the consequences, and comparing those consequences to the evaluation guidelines. The procedure identifies evaluation guidelines for assessing the consequences to the general public and includes a table of “consequence evaluation levels” for the general public and for workers, though the table does not distinguish between facility and co-located workers. Control item selection is also governed by a specific, detailed procedure for identifying the safety-class and safety-significant functions and the associated controls to maintain those functions, either through structures, systems, and components (SSCs) or specific administrative controls (SACs). It also contains instructions for designating equipment important to safety. Control items are to be selected for those events that challenge radiological guidelines or result in a ranking of high or moderate for unmitigated worker consequences. The procedure also uses the guidance in DOE-STD-1186 for selecting SACs. Finally, the TSR document is prepared according to a procedure that contains direction for preparation of each of the key sections of the document, including operating limits, administrative controls, design features, and bases. Overall, the procedures provide appropriate guidance to the preparers, following the guidance provided in the DOE safe harbor standards.

To gain additional insight into the implementation of the LLNL and LSO processes for developing the safety basis documents, the assessment team briefly reviewed the DSAs and TSRs from three facilities. The DSA and TSR at building 332, a hazard category 2 facility, are comprehensive and detailed, reflecting significant developmental effort over a number of years. The hazard and accident analysis are well documented and described. Fault trees are used in a number of instances to provide insight into the events. The discussions of the safety SSCs and their safety functions adequately support development of the control item set. The descriptions of the SACs provide an adequate level of information, although the evaluations of the SAC function’s ability to provide adequate control often do not specifically address the effectiveness of the control. A detailed table connects the SSC or control to the applicable hazard or accident event, functional requirements and implementing TSR(s). The TSRs are similarly comprehensive and detailed.

The DSA and TSR for the Waste Storage Facility (WSF), also a hazard category 2 facility, were

reviewed. The DSA follows the format from STD-3009 and addresses both Area 625 and the Decontamination and Waste Treatment Facility storage areas. The hazard analysis was performed using a process hazard analysis technique that is based on storage and the limited processing that takes place at the facility. Consistent with DOE-STD-5506, the DSA sets consequence thresholds for workers outside the facility (often called co-located workers) – a depth of analysis that was not used for B332. The hazard analysis table is thorough and includes spills, fire, deflagration, criticality, and natural phenomena hazards for events in both the building and in the yard. The accident analyses consider an appropriate set of events, including deflagration, a spill in the building, flammable liquid fires involving transuranic (TRU) waste and tritium, a spill in the yard from a high speed vehicle crash, and airplane crash. The identified control items, primarily passive design features (particularly the waste drums) and administrative (inventory) controls, are adequately described and evaluated. The derivation of TSRs discusses both the SSCs and administrative controls briefly and provides a tabular presentation of the controls. Administrative controls and design features are accurately transcribed from the DSA to the TSRs.

During review of the WSF safety basis documents, the assessment team identified the following five issues:

- [Observation] The spectrum of analyzed accidents seems appropriate, except that there is no explanation for omitting analysis of a seismic event as a design basis accident and not, for example, examining the failure of the bridge crane (with and without a subsequent fire of lower sensible heat than the aircraft crash event).
- [Observation] The DSA discusses the use of the TRUPACT container and includes it in some events in the hazard evaluation table, but not all the potential upsets during the loading process are apparent. As a result, no clear, specific controls are identified in the DSA or TSR related to the payload inventory being loaded into the container (facility personnel indicated that the storage array limit is used), and the importance of crane operations during loading is examined only briefly.
- [Observation] An assumption in the accident analysis is that the TRU waste inventory meets both the 50 plutonium equivalent curie limit per container and the National Environmental Policy Act (NEPA) “bounding consequences,” but the specific requirements for meeting the NEPA inventory and configuration requirements are never fully discussed in the DSA or the TSR and its Bases.
- [Observation] The waste container maintenance program is discussed in Chapter 4 of the DSA, but the processes and procedures for procuring, accepting, and packaging the TRU waste containers are not. In addition, Chapter 5 of the DSA makes no reference to the interfacing TSRs from Packaging and Transportation or the Plutonium Facility that ensure that the waste containers meet all the assumptions that are used in this accident analysis.
- [Observation] The directed SACs, such as those used in the TSRs, result in responses to violations of the TSR (governed by Section 5.10.5) without a specified time limit for response or correction of the condition, as would be the case with a limiting condition of operation-style SAC.

The DSA and TSRs for the Tritium Facility, a hazard category 3 facility, were also reviewed; however, these documents are being significantly modified and are currently in the review process at LSO.

2. Laboratory procedures and mechanisms verify the effective implementation of each approved DSA, TSR, and associated controls, including Specific Administrative Controls (SACs). Procedures provide for continued maintenance of all approved DSAs and TSRs for nuclear facilities/activities.

Document 51.1, *Documented Safety Analysis Program Plan*, contains requirements for maintaining and implementing the safety basis documents and establishes overall responsibilities for the program. LLNL has two procedures designed to ensure that the commitments in the DSA, TSR, and SER are effectively

implemented. The first, AB-011, *Safety Basis Implementation*, provides instructions to the facilities to link the controls, requirements, and limits in the safety bases to the implementing procedures and documents. It applies to new, modified or updated safety basis documents and assigns overall responsibility to the facility manager. The procedure requires that the facility establish an implementation plan to complete the necessary procedures, including new or revised procedures, modifications, and training, and to identify and revise, as necessary, any “flowdown” documents. The activity includes preparation of a crosswalk document to capture the linkages to the flowdown documents. Each action item is verified to be complete, and LSO is notified in writing when the plan is implemented. The procedure also requires periodic re-verification of the controls through complete verification of the flowdown matrix at each annual update, and it contains an example implementation checklist.

The second procedure, newly approved in 2010, establishes a verification review process, independent of normal line management, to confirm effective implementation of the safety basis controls. AB-009, *Independent Verification Review Procedure*, applies to both hazard category 2 and 3 nuclear facilities, and the verification is conducted under the auspices of the Associate Director for Nuclear Operations. It establishes several types of graded reviews: a comprehensive review for initial implementation, periodic re-verification reviews (three years for safety-class controls and five years for safety-significant controls), and reviews focused on specific changes from, for example, an annual update. The procedure discusses each type of review and gives instructions for completing the reviews, including (for example) preparation of a review plan and checklist. The review is documented through a report. During fiscal year 2010, three verification reviews were completed (two using a full review plan and one using a checklist), and one full review has been completed in fiscal year 2011.

The 2010 review of WSF was conducted by a four-person team and covered administrative controls, SACs, and design features in the WSF safety basis. The comprehensive review used a criteria and review approach document to guide the reviewers and examined documentation of controls and their implementation. The review is thoroughly documented and shows evidence of a systematic, critical evaluation. It identified eight observations for tracking, one strength, and several recommended improvements.

3. The Laboratory has submitted, and LSO has approved, a compliant USQ process. LLNL has effectively implemented the USQ program and integrated it with other Laboratory programs, as appropriate.

The current revision of the LLNL USQ procedure was submitted to LSO in June 2009 and was approved by LSO in a memorandum sent to LLNL in August 2009. The memorandum also directs that facility-specific USQ processes be revised to clarify their use as “guidance” (only) and to specify that conflicts will default to the Laboratory procedure. A review of the current USQ administration procedures for the Nuclear Materials and Technology Program (NMTP), Radioactive and Hazardous Waste Management, and Packaging and Transportation revealed that all the procedures specify clearly that USQ evaluations are performed in accordance with the institutional procedure. The latest revision of the institutional USQ procedure has been submitted and is awaiting LSO review and approval (pending completion of the current assessment of the LLNL program).

Document 51.3 in the ES&H Manual establishes the institutional procedure for implementing the USQ process. It identifies the roles and responsibilities of key personnel, delineates the training and qualification requirements for participants, and identifies entry conditions into the process. General entry conditions to the USQ process are defined: changes to facilities, changes to procedures, and new activities (tests, experiments, or operations). The procedure provides appropriate instructions to implement categorical exclusions, USQ screening, and USQ determinations. Approved categorical exclusions are included in an appendix to the procedure. The procedure also contains instructions governing the

response to potential inadequacies in the safety analysis (PISAs). Though this section does not address the additional guidance for response to PISAs that is specified in the April 2010 revision to the DOE USQ Guide, this guidance is included in the next revision to the procedure, which is pending LSO approval.

Although the institutional procedure is complete, the discussion of administrative procedures has some potential ambiguities in its description of the applicability of the process to these procedures. For example, the definition of administrative documents indicates they are “non-technical documents that define organization policy and structure” and do not “define or describe activities or controls over the conduct of work.” The definition goes on to say that they are not subject to the USQ process. The first paragraph of Section 6.1 indicates that the USQ process does not apply to “administrative procedures unrelated to the safety basis of the operations,” but does not describe a process for determining whether a procedure is “related” to the safety basis. Section 6.2.2 indicates that documents that implement “specific administrative controls” must enter the process, though this statement is clarified with a note that reiterates the statements in the definition. Neither the definition nor the small sample of procedure types presented as examples in the document is sufficient to describe those procedures to which the USQ process “does not apply.” In addition, the USQ procedure indicates that procedures “explicitly or implicitly identified in the safety basis” shall enter the process. This statement reasonably applies to a number of “administrative” procedures that describe safety management programs described in the DSA or implement important administrative controls (at both the institutional and facility level), such as the criticality safety program implementing procedures, procurement procedures, receipt and inspection procedures, and quality assurance procedures.

In 2009, LLNL conducted a comprehensive self-assessment of the USQ program, followed by an independent assessment by LSO that was led by a representative from the NNSA Service Center. One deficiency identified during both reviews was the failure to evaluate programmatic operating procedures in the B332 USQ program. Subsequently, LLNL prepared and submitted a corrective action plan that addressed both the Laboratory self-assessment and the LSO assessment. LSO reviewed and approved the corrective action plan, but the transmittal letter notes that the corrective actions would not resolve the underlying deficiencies. Consequently, as conditions of approval for the corrective action plan, LSO directed further actions by LLNL to define the boundaries of the USQ program and improve control over both programmatic and facility procedure changes. In January 2010, LLNL developed and submitted a formal list of document categories to which the USQ process applies, along with justifications for the full or partial inclusion or exclusion of many document categories from the process. LLNL has also developed formal lists of documents and document categories at the Superblock and WSF to which the USQ process applies. LLNL also committed to a briefly described plan, including modifications to all the “relevant” procedures, for implementing these document categories. These actions have been completed and are awaiting approval by LSO. However, the actions did not include preparation of formal procedures or processes for preparing and maintaining the lists that define the USQ program boundary, including appropriate justification, such as categorical exclusions, for excluding documents from the process.

USQ review of procedures, including administrative procedures, is further described in AB-014, *Institutional Review of Select ES&H Manual Documents via the USQ Process for Hazard Category 2 and 3 Nuclear Facilities*. This procedure establishes roles, responsibilities, and processes for ensuring that institutional ES&H procedures are appropriately reviewed before being changed. The procedure includes a process for identifying revisions to “select” ES&H procedures and to manage their review so that USQ reviews are completed at each of the affected nuclear facilities before the revision is implemented. The process is based on facility-specific lists of referenced ES&H documents. The initial list of ES&H Manual documents was approved by LSO in 2005. The overall process for managing USQ reviews of the selected ES&H procedures is sound. However, as noted above, there is no formal, LSO-approved process for maintaining and updating the list.

[Weakness] Formal procedures and processes for developing, maintaining, and updating the lists of documents subject to the USQ process have not been developed and approved by LSO.

To verify that facility procedures appropriately require entry into the USQ process, WSF procedure ADM-105, *Control of Nonconformances*, and Packaging and Transportation procedure PATS – P004, *Preparing and Processing a PATS Nonconformance Report*, were reviewed. These procedures do not refer to the need for a USQ evaluation for items that are dispositioned as “use-as-is” or “repair,” even though these dispositions do not fully return a component to its intended design function. The NMTP facilities have been utilizing a safety bulletin to mitigate nonconformances, but the bulletin does not specify the threshold for entry of the nonconformance into the USQ process. NMTP is in the process of developing a procedure to replace the safety bulletin, so this is an opportune time to appropriately integrate nonconformance reporting with the USQ process.

[Observation] The LLNL nonconformance reporting procedures are not clearly integrated with the LLNL USQ process.

A sample of USQ determinations, USQ screens, and categorical exclusions from the Tritium Facility, Plutonium Facility, and WSF was reviewed to evaluate the implementation of the USQ program. Overall, the USQ determinations were found to be well documented. The aspects of the change are described well, and each question is answered sufficiently to follow the logic of the preparer in arriving at the conclusion. Each USQ determination and categorical exclusion was properly reviewed and approved. In some cases, the USQ determination was also reviewed by responsible line personnel to verify concurrence with the conclusion. Although the USQ determinations and categorical exclusions were found to be mostly well-written, the following issues were noted:

- [Observation] The USQ determination for changes to the WSF in-service inspection program (WSF-10-107-D) does not discuss the relation of the crane seismic restraints to the building seismic structure, even though the building is a safety-significant structure and Section 2.4.4 of the DSA indicates that the crane support columns and restraints are important to the seismic rating of the building.
- [Observation] A baseline evaluation of the fire protection discipline action plan for B331 (USQD B331-10-003-D) referenced the 2006 DSA and TSR, which had been superseded by the 2008 revisions of those documents.
- [Observation] A categorical exclusion (WSF-10-086-X) was used to evaluate revision 7 to ADM 126, even though this revision removed the reference to “on-the-spot” changes and inserted the applicability of the USQ process to this procedure; this change was not administrative in nature and presumably was not covered by a previous USQ determination.

4. Laboratory processes require appropriate competence through education, training, experience, and qualification for those personnel responsible for preparing DSAs, TSRs, and USQ documents.

The Laboratory’s Documented Safety Analysis Program Plan procedure establishes some expectations and requirements for training and qualification of personnel involved in preparing DSAs and TSRs. The procedure recommends that participants in the process complete the “Safety Basis Process” course and the “Safety Basis Calculations Process” course, which is a required course for safety analysts and those who perform supporting calculations. Employees who conduct the formal safety analysis are also required to complete courses in “Hazard Analysis,” and those who develop, write, or review TSRs are required to complete “Control Item Selection and Development of TSRs. The Safety Basis Division Leader is charged with maintaining the training program for the safety analysts. The facility manager

assigns the safety analyst, team members (program personnel and analysts), and internal facility reviewers for safety basis preparation and revision. Although the DSA leader is a trained safety analyst and DSA team members will likely be subject matter experts either in operations or their functional area, there is no requirement in the procedures for DSA team members to complete any specific training or required reading related to the safety basis process or selection of control items.

The LLNL USQ procedure contains specific requirements for both the qualification and training of personnel involved in the preparation, review, and approval of USQs. Initial qualification requirements are established for preparers and reviewers, including education, experience in a nuclear or radiological facility, and experience at LLNL (for reviewers). Management personnel are expected to meet the qualification requirements established in the institutional procedure for selection and qualification of personnel at nuclear facilities. The USQ procedure establishes both initial and refresher training requirements. Initial training includes a minimum three-day course on the “Unreviewed Safety Question Process” and a one-time course covering “Unreviewed Safety Question (Facility-Specific) – OJT (on-the-job training).” The procedure also establishes expectations for facility-specific knowledge based on walkthroughs, required reading of important safety basis documents, and discussion of completed USQ determinations. In addition, the NMTP also requires the analyst to satisfactorily complete a number of USQ evaluations as part of the training. Finally, the procedure requires completion of “USQ Refresher” and USQ Facility/Activity-Specific Refresher” courses every two years. The required documentation for the training and qualification is captured in a “facility specific checklist” [LLNL course “Unreviewed Safety Question (Facility-Specific) – OJT”] that is completed by the facility manager for each facility where an analyst performs USQ evaluations.

A review of the training records for a sample of the preparers, reviewers, and approvers revealed that all the individuals had completed “USQ Refresher” training and either initial OJT or refresher OJT through completion of the “facility specific checklist.”

5. Issues identified during previous reviews [e.g., the most recent Chief, Defense Nuclear Safety (CDNS) Biennial Review and selected NNSA readiness assessments and Defense Nuclear Facilities Safety Board Staff Issue Reports] have been appropriately resolved, and adequate corrective actions have been completed or a clear path to completion is indicated.

Following the October 2008 review of LSO by the CDNS, LSO developed a corrective action plan for each of the findings and weaknesses identified in the report. The corrective actions were based on an apparent root cause analysis, and each issue was assigned an action owner and due date. Subsequently, the actions were completed and independently verified. In at least two cases – field changes to procedures and control of the LLNL USQ procedures – follow-up of the effectiveness of the corrective actions was performed and issues were re-opened when the LLNL corrective actions did not effectively address the issue. LSO has provided direction and oversight of LLNL to identify procedures that are subject to the USQ program and to ensure that these procedures are not subject to a field change process. LSO also directed LLNL to make sure that actions to ensure that facility USQ procedures are and remain administrative only were complete and that changes to these procedures were adequately controlled (through review and concurrence of the Safety Basis Leader) to ensure long term compliance. Steps to incorporate Safety Basis Leader concurrence with facility USQ procedure changes are included in revision 9 of the institutional USQ procedure, which is currently being reviewed by LSO.

In a Staff Issue Report (SIR) issued in November 2009, the DNFSB identified issues relating specifically to the analysis and control of hazards relevant to the Tritium Process Station and, more broadly, to the Tritium Facility safety basis. (Some of these issues had been identified earlier during the management and readiness assessments for the startup of the Process Station.) Subsequently, LLNL prepared a report that addresses each of the issues identified in the SIR. LLNL also prepared, and LSO approved, a

justification for continued operations (JCO) to address worker safety in the facility while the safety basis documents are revised. The LLNL JCO identified the use of tritium room monitors and the conduct of deliberate operations as compensatory measures. In its approval letter, LSO directed that the use of the tritium monitors be treated as an SAC and added, as an additional SAC, the operability of the fire detection and alarm system. LSO also directed LLNL to strengthen the safety basis development, review, and approval processes. In responding to the identified issues, LLNL implemented a process improvement initiative for the safety basis activities in fiscal year 2009. LLNL is in the process of revising the full Tritium Facility DSA, including a new hazard analysis, and developing a new set of controls. The documentation has undergone review and comment resolution by the project team, and the updated DSA and TSRs were recently delivered to LSO.

CONCLUSION

LLNL has established a program and a set of implementing procedures that adequately govern the development and implementation of safety basis documentation for its hazard category 2 and 3 nuclear facilities. LLNL revised its safety basis review processes in response to a DNFSB SIR, and overall the program includes sound procedures and processes for preparing DSAs and TSRs and for verifying their implementation. Nonetheless, the effectiveness of some of the changes cannot be evaluated until the ongoing revisions to the B331 DSA and TSR are complete. In addition, the review identified a few potential opportunities to improve the WSF documents. The Laboratory has also prepared an institutional procedure that satisfactorily governs the performance of USQ evaluations. Overall, this procedure, which has been reviewed and approved by LSO, is compliant with DOE guidance and provides a solid foundation for the USQ program; however, procedures that formally document the processes for developing and maintaining the institutional and facility lists of documents subject to the USQ process are incomplete. Review of a sample of USQ evaluations indicated that with a few minor exceptions the program is satisfactorily implemented. Finally, LLNL has developed and implemented an adequate training program to ensure the competence of its analysts and has implemented corrective actions to address the issues identified in the last CDNS review.

ITEMS FOR FOLLOW-UP

The review identified one weakness and nine observations, which should be further evaluated by LSO in accordance with LSO Work Instruction (WI) 226.1.1, *Writing and Managing Contractor Assessments, Issues and Corrective Action Plans in Pegasus*, dated June 6, 2009. Consistent with WI 226.1.1, observations are minor problems or conditions that are of concern to the inspector and may or may not involve a failure to meet a DOE, contractual, or regulatory requirement. These observations are not deemed significant, but should be communicated to the contractor to facilitate correction, if required, and to contribute to continuous process improvement. A weakness is an apparent failure to meet a DOE, contractual or regulatory requirement, or a significant management issue that must be corrected by the contractor.

The review also identified two items for potential future HSS follow-up. First, formal procedures and processes for developing, maintaining, and updating the lists of documents subject to the USQ process have not been developed by LLNL and approved by LSO. Second, the effectiveness of corrective actions for a November 2009 Defense Nuclear Facilities Safety Board Staff Issue Report could not be evaluated during this assessment because the update to the affected safety basis documents is not complete.

Appendix A – Documents, Interviews, and Observations
Appendix B – Assessment Plan

Appendix A

Documents, Interviews, and Observations

Documents Reviewed:

- AB-002, Preparation of Major Safety Basis Submittals to DOE, Rev. 0, July 2009
- AB-003, Graded Approach Implementation Procedure for Documented Safety Analyses for LLNL Hazard Category 2 and 3 Facilities, April 2002
- AB-004, Hazards Analysis Process, Rev. 4, June 2008
- AB-005, Accident Analysis Procedure, Rev. 2, March 2009
- AB-006, Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities (ESH-V.51-0006), Rev. 1, January 2007
- AB-007, Control Item Selection, Rev. 2, March 2009
- AB-008, Technical Safety Requirements Development Procedure, Rev. 2, March 2009
- AB-009, Independent Verification Review Procedure, Rev. 0, April 2010
- AB-011, Safety Basis Implementation Procedure, Rev. 1, July 2009
- AB-012, Document Control and Records Management Procedure, Rev. 0, May 2005
- AB-014, Institutional Review of Select ES&H Manual Documents via the USQ Process for Hazard Category 2 and 3 Nuclear Facilities, December 2005
- AB-015, Level of Detail Guidance for USQ Determinations, April 2006
- AB-016, Justification for Continued Operations (JCO), December 2006
- AB-017, Procedure for the Nuclear Operations Directorate Review and Concurrence of Safety Basis Documents for LLNL Hazard Category 2 and 3 Nuclear Facilities, Rev. 0, July 2009
- ES&H Manual Document 51.1, Documented Safety Analysis Program Plan, Rev. 8, November 2009
- ES&H Manual Document 51.3, LLNL Unreviewed Safety Question (USQ) Procedure, Rev. 8, 8/09
- LLNL-TR-425142, Documented Safety Analysis for the Waste Storage Facilities, March 2010
- LLNL-TR-425143, Technical Safety Requirements for the Waste Storage Facilities, March 2010
- LLNL-JCO-(B331)-10-001, Justification for Continued Operations for Building 331 (B331) Tritium Facility, 3/5/10
- NMTP09-194, Memorandum from Lawrence Livermore National Laboratory to Livermore Site Office, Subject: Facility Manager's Evaluation of the Safety of the Situation Related to the Potential Inadequacy of the Safety Analysis (PISA) on the Tritiated Oil in Building 331, 9/19/10
- Report to the Defense Nuclear Facilities Safety Board in Response to DNFSB Letter Concerning the Tritium Process Station at the LLNL, 3/20/2010
- USQ No. 695-10-078-D, Baseline Review of ADM-165, B695 Radiological Control, Rev. 2, and ADM-167, Radiological Inventory Control for B696S, Rev. 2, Rev. 0, 6/9/10
- USQ No. RWQM-10-007-D, Baseline Evaluation of the Fire Protection Discipline Action Plan (DAP) for RHWM (except 612A and 693) Rev. 7.4, Rev. 0, 1/14/10
- USQ No. RHWM-10-011-D, Use of HalfPACT Containers in Addition to TRUPACT Containers, Rev. 0, 1/25/10
- USQ No. RHWM-10-020-D, Baseline Review of ADM 106, Container Holds and Releases Rev. 6, Rev. 0, 2/10/10
- USQ No. RHWM-10-034-D, Baseline Evaluation of ES&H Manual Document 15.3, Crane, Hoist and Rigging Safety, Rev. 0,
- USQ No. RHWM-10-044-D, Baseline Review of WCP-20, Management of TRU Waste by TRU Waste Generators Rev. 8, Rev. 0, 4/3/10
- USQ No. RHWM-10-073-D, Changes to ADM 105, Control of Nonconformances Rev. 6, Rev. 0, 6/3/10

- RHWB Work Permit #B693-10-W-007, B693 High Expansion Foam System Annual Inspection and Testing, 1/21/10
- RHWB Work Permit #A625-10-W-099, Replace Hydraulic Line to Crane
- USQD No. WSF-10-084-D, Baseline Review of the Waste Storage Facilities Facility Safety Plan July 2010, Rev. 0, 7/6/10
- USQD No. WSF-10-107-D, Changes to In-Service Inspection & Test and Maintenance Program September 2010, Rev. 0, 9/14/10
- WSF-10-086-X, Changes to ADM 126, RHWB Administration of the USQ Process Rev. 7, 6/3/10
- NMTP Work Permit B693-10-C-158, Remove and Replace End of the Line Capacitor B693 Fire Alarm Panel
- USQD No. B331-10-003-D, Baseline Evaluation of the Fire Protection Discipline Action Plan (DAP) for B331, Rev. 0, 1/21/10
- USQD No. B331-10-018-D, Titanium Tritide Capsule Gas Recovery and Disposal in Tritium Science Station (Room 153), Rev. 0, 3/5/10
- USQD No. B331-10-026-D, Baseline Evaluation of OOPF-B331-002, Tritium Facility Daily Inspections Rev. AA, Rev. 0, 3/23/10
- USQD No. B331-10-033-D, Baseline Evaluation of ACP-B331-004, Combustible Loading Limit for Hydrogen Species Rev. AD, Rev. 0, 4/6/10
- USQD No. B331-10-047-D, Baseline Review of NIF-5031375-AA, NIF Target Gas Fill in the Tritium Science Station, Rev. 0, 7/31/10
- USQD No. B331-10-049-D, Evaluate Changes to OPP-B331-001, Operating the Tritium Grinder System (TGS) in R131 of B331, Rev. 0, 5/27/10
- USQD No. B331-10-071-D, Evaluate OSP 331.099-2, Tritium Process Station (TPS) Changes Reflecting the Use of the Modified Load/Unload Manifold Rev. 0, Rev. 0, 9/20/10
- USQD No. B331-10-078-D, Baseline Evaluation of OPP-B331-002, UC-609 Loading Procedure Rev. AA, Rev. 0, 10/2/10
- USQD No. B331-10-082-D, Replace Air Supply Lines to the PTPS Solenoid Banks Located on the Gas Analysis Cart, Cleanup Cart, and the Gas Pump Transfer Cart in Room 150. Rev. 0, 10/21/10
- USQ-B332-10-009-D, Changes to ACP-B332-007, Administrative Control Procedure Quarterly Test of Glovebox Exhaust System Operation and Redundant Fan Controls, Rev. AE, 1/14/10
- USQ-B332-10-012-D, Baseline Evaluation of Fire Protection Discipline Action Plan (DAP) for B332, Rev. 0, 1/28/10
- USQ-B332-10-017-D, Baseline Evaluation of WCP-68 Rev. 1, Packaging/Repackaging TRU Waste by TRU Waste Generators, Rev. 0, 2/08/10
- USQ-B332-10-028-D, Install Accelerometers and/or Automatic Greasers on ACU-1A, 2, 3, 4, 7, 8, 11, & 15, FHE-11, 1000, 2000, & 3000, FFE-2, 1000, & 2000, FGBE-1000, 2000, 3000, 4000, 7000, & 8000, BLV-3, 4, 5, & 6, Rev. 0, 3/31/10
- USQ-B332-10-041-D, Install Additional Programmatic Material Testing Equipment in Room 1361, Glovebox Workstation (WS) 6101 in Support of Pu Corrosion Studies, Rev. 0, 5/15/10
- USQ-B332-10-057-D, Baseline Review of OSP 332.176, Sintering and Cold Press Operations and Uranium Casting, Rev. 0, 4/08/10
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- USQ-B332-10-087-D, Baseline Review of, ES&H Manual Document 52.2 Rev. 0, LLNL Nuclear Facility Configuration Management Program Description, Rev. 0, 5/27/10
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- USQ-B332-10-124-D, Changing Four Differential Pressure Gauges Across the Increment 1 RVS Final HEPA Filtration Stages (PDI-1009, 1012, 1008A, & 1011A, Rev. 0, 9/27/10
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- ITS (Event Occurrence) 25728, Discrepant As-found Condition in B331, 6/26/08
- ITS 20931, LLNL PAAA Commitments, 10/06
- ITS (Event Occurrence) 19362, USQ of ES&H Manual Documents, 6/05
- ITS (External – LSO PIR/MAR) 30457, Periodic Issues Report (PIR), February 2010
- ITS (External – MAR) 25648.1, Monthly Assessment Report (MAR), June 2008
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- LTRAIN Records for Seven Individuals, 12/15/10
- Independent Verification Review LLNL Waste Storage Facilities, 11/10
- FSP- Waste Storage Facilities, July 2010
- PATS – P004, Preparing and Processing a PATS Nonconformance Report, Rev. 3, July 2010
- Superblock Facilities Safety/QA Bulletin, No.05-02, Rev. 0, Subject. Problem Reporting, dated Sept. 28, 2005
- RHWM Procedures Applicable to the USQ Process (Waste Storage Facilities), 9/8/2010
- KLFsjb-1357, List of Superblock documents to which the USQ process is applicable, Rev. 0, 10/16/09
- NMTP10-005, LLNL Memorandum to LSO, Subj: LLNL Response to LSO Direction on the Corrective Action Plan for Unreviewed Safety Question (USQ) Process Issues and Deficiencies, 1/10
- March 2010 Waste Storage Facilities Technical Safety Requirements Implementation Crosswalk – Procedures, 10/10

Interviews:

- Operations Team Lead/Review Team Leader
- Facility Representative
- NMTP Authorization Basis Manager
- LLNL Safety Basis Division Leader

Observations:

- Walkdown of WSF

Appendix B
Assessment Plan
Lawrence Livermore National Laboratory Safety Basis Assessment

SCOPE

The scope of this assessment includes the plans, procedures, and processes used by the Lawrence Livermore National Laboratory (LLNL) to establish and maintain the safety basis for its nuclear facilities and activities and to establish and implement the unreviewed safety question (USQ) process at LLNL consistent with the requirements of 10 CFR 830.

OBJECTIVE

Verify that the Laboratory has established and implemented plans, procedures, and mechanisms to ensure that hazards associated with nuclear facilities and activities are formally and appropriately analyzed, actions are taken to prevent or eliminate hazards, and controls are developed, implemented, and verified. Verify that procedures and processes ensure that a USQ process has been developed, approved by the Livermore Site Office (LSO), and adequately implemented.

CRITERIA

1. LLNL procedures and mechanisms address and implement 10 CFR 830 Subpart B requirements, including development and implementation of fully compliant documented safety analyses (DSAs) and technical safety requirements (TSRs) for hazard category 2 and 3 nuclear facilities and activities. (DOE-STD-1104-2009, DOE O 226.1A, NNSA FRAM, and NA-1 SD 226.1A)
2. Laboratory procedures and mechanisms verify the effective implementation of each approved DSA, TSR, and associated controls, including specific administrative controls (SACs). Procedures provide for continued maintenance of all approved DSAs and TSRs for nuclear facilities/activities. (10 CFR 830 Subpart B)
3. The Laboratory has submitted, and LSO has approved, a compliant USQ process. LLNL has effectively implemented the USQ program and integrated it with other Laboratory programs, as appropriate. (10 CFR 830 Subpart B, NNSA FRAM)
4. Laboratory processes require appropriate competence through education, training, experience, and qualification for those personnel responsible for preparing DSAs, TSRs, and USQ documents. (10 CFR 830 Subpart B)
5. Issues identified during previous reviews [e.g., the most recent Chief, Defense Nuclear Safety (CDNS) Biennial Review and selected NNSA readiness assessments and Defense Nuclear Facilities Safety Board staff issue reports] have been appropriately resolved and adequate corrective actions have been completed or a clear path to completion is indicated. (DOE O 226.1A, NA-1 SD 226.1A)

REFERENCES

- 10 CFR Part 830, *Nuclear Safety Management*, Subparts A and B

- DOE O 226.1A, *Implementation of DOE Oversight Policy*
- DOE O 420.1B, *Facility Safety*
- DOE-STD-1104-2009, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*
- NA-1 SD 411.1-1C, *NNSA Safety Management Functions, Responsibilities and Authorities Manual (FRAM)* (NNSA FRAM)
- NA-1 SD 226.1A, *NNSA Line Oversight and Contractor Assurance System Supplemental Directive*

APPROACH

Document Reviews:

1. Review LLNL plans and procedures for developing, submitting, implementing, and maintaining nuclear safety basis documentation and programs for nuclear facilities and activities. Review DSA and hazard control development documents and records from recent submittals. Determine whether:
 - The process:
 - Properly covers the hazards associated with the work
 - Adequately traces the hazards identified to the control selected to address the hazard
 - Identifies adequate safety functions, performance characteristics, and functional requirements to ensure an adequate degree of safety
 - The criteria for evaluating the classification of nuclear safety structures, systems, and components are appropriate and utilized during the development of DSA submittals.
2. Review LLNL plans and procedures governing the continued implementation of approved DSAs, including any conditions of approval in safety evaluation reports (SERs). Examine whether:
 - Laboratory personnel are assigned responsibility for assessing continued effective implementation of all approved DSAs and TSRs for nuclear facilities, including all associated controls and initial conditions.
 - LLNL personnel are assigned responsibility for preparing and submitting DSA annual updates and implementing change control processes for DSA and TSR changes, including annual summaries of completed USQ determinations (USQDs).
 - LLNL properly reviewed and responded to any potential inadequacies in the safety analysis or positive USQDs.
3. Review the Laboratory's submittal of USQ program documents for LSO review and approval. Review plans, procedures, and documents that result from the implementation of the Laboratory's USQD program.
 - Review a sample of completed USQDs from the nuclear facilities; verify that the conclusions of the USQD are adequately supported by the discussion and logic.
 - Review a sample of completed reviews of activities under categorical exclusions; verify that the

conclusions are adequately supported by the information provided.

- Review the Laboratory's procedures and processes for implementing design changes either to structures, systems, or components (SSCs) or to processes; engineering changes; nonconformance reporting; and maintenance. Verify whether the USQ process is appropriately integrated.
 - Review a sample of engineering change notices and verify that the change notices have been appropriately screened for inclusion in the USQ process.
 - Review a sample of nonconformance reports and verify that the reports have been appropriately screened for inclusion in the USQ process.
 - Review a sample of change packages (either SSC or process) and verify that the change packages are appropriately screened for inclusion in the USQ process.
4. Review the Laboratory's process for assigning trained and qualified personnel to develop and/or revise safety basis documentation and perform USQ reviews. Review training and qualification records pertaining to the competence and assignment of personnel who implement processes and oversee activities associated with nuclear safety basis implementation.
 5. Review the corrective action plan and closure files or action plans from the previous CDNS review, selected readiness assessments, and DNFSB Staff Issue Reports. Verify that issues have been resolved and corrective actions implemented, validated, and verified or that a clear path to resolution is in place.

Interviews:

As appropriate, interview:

1. LLNL personnel responsible for developing and reviewing DSA and TSR documentation.
2. LLNL managers who review and/or approve safety basis documents, including DSA and TSR submittals.
3. LLNL personnel responsible for preparing, reviewing, and approving categorical exclusions, USQ screens, and USQ determinations.
4. LLNL personnel responsible for responding to potential inadequacies in the safety basis or positive USQDs.
5. LLNL personnel responsible for the institutional USQ and safety basis programs.