

Lawrence Livermore National Laboratory

History of Criticality Safety Advisory Committee at the Lawrence Livermore National Laboratory



**Charles Barnett, David Heinrichs, Song
Huang and Brian Koponen**

November 7, 2010

Lawrence Livermore National Laboratory, P. O. Box 808, Livermore, CA 94551

This work performed under the auspices of the U.S. Department of Energy by
Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344

History of Criticality Safety Advisory Committee

- **Introduction**
- **The Early Years**
- **A long Road to Maturity**
- **Criticality Safety Advisory Committee (CSAC) Roles and Responsibilities**
- **Peaks and Valleys**
- **Conclusion**



Introduction

- To present the history of the Criticality Safety Advisory Committee (CSAC) as an important element of the Criticality Safety Program at the Lawrence Livermore National Laboratory (LLNL)
- The LLNL was established in 1952 at the height of the Cold War to meet urgent national security needs. LLNL has a long history of carrying out research and development involving the use of fissionable materials.



Introduction (continued)

- The first meeting of CSAC was conducted on March 22, 1972. As of the end of 2009, the CSAC has conducted its 102nd meeting.
- It is the evolution of CSAC and the LLNL Criticality Safety Program during last 37 years that provides an interesting legacy and lessons to be shared.



The Early Years

- Criticality safety evaluations were assigned to a few technical personnel on a part- time basis
- Several members of CSAC actually provided criticality safety evaluation support to meet various programmatic needs
- Criticality safety was not a recognized technical discipline
- No centralized CS organization



The Early Years (continued)

- The Laboratory had the Lawrence Livermore Laboratory (LLL) Criticality Safety Committee and the Weapon Criticality Committee to deal with non-weapon and weapon criticality safety issues respectively
- As a response to the 1972 AEC appraisal, the Laboratory formally established the Criticality Safety Advisory Committee which consolidated the responsibilities of the LLL Criticality Safety Committee and the Weapon Criticality Safety Committee



A Long Road to Maturity

- In early 1970s, an expert-based ad hoc setting
- Prior to ANSI/ANS 8 National Consensus Standards
- Prior to DOE, DOE Orders, and Standards
- A long road to today's regulatory-based, safety-based, and procedure-based setting



CSAC Roles and Responsibilities

- In 1970's, an ad hoc criticality safety committee with all inclusive R&R (i.e., doing assessment, reviews, expert consensus in “approving and recommending the controls to the programs”)
- The 1980 was a pivotal year in the development of the criticality safety program at LLNL due to the formation of the criticality safety organization



CSAC Roles and Responsibilities (continued)

- The CSAC as the focused entity for overseeing criticality safety at the Laboratory but, without the necessary infrastructural support, did not work well.



What were the issues

- 1) Fragmented approaches in carrying out different parts of criticality safety functions by different organizational elements in LLNL,
- 2) Steady deterioration of the criticality safety capability at LLNL including approximately two significant criticality safety incidents per year, and deficiencies in support to criticality alarm system update,
- 3) Lack of a single criticality safety organization responsible for criticality safety and its associated funding resource.



CSAC Roles and Responsibilities

- CSAC played a crucial role in forming the criticality safety organization in 1980s
- After coordination with programs, CSAC formed a draft idea in 1978 for creating a Criticality Safety Office (CSO)
- More consultations on the scope and functions of the proposed organization to arrive at a proposal in January of 1979
- Criticality Safety Organization was organized in FY 1980 and became fully staffed in September of 1980



Peaks and Valleys

- CSAC held 4 meetings in 1981 but then went dormant for two years. The reason was that CSO had enough resource to handle most of the independent reviews and the role of CSAC in performing that function was no longer required
- Steady deterioration of the criticality safety capabilities from 1980 to 1996. Why?



What are the Main Causes?

- Failure to recognize the national consensus CS standards and the special public and regulatory sensitivity of criticality mishaps.
- Several reorganizations, the criticality safety organization, which in 1980 reported to an associate director level, was reassigned to report to a lesser and lesser management level after each reorganization.
- By 1993, criticality safety engineers were reassigned to multi-disciplined teams and there was no longer adequate criticality staff resource to function effectively. Without an effective criticality safety organization, the influence of CSAC was also severely limited.



Peaks and Valleys (continued)

- The Criticality Safety Group was reconstituted in 1996 as a result of severe concerns expressed in the assessment of the LLNL nuclear criticality safety program by the DOE Oakland Operations Office.



Peaks and Valleys (continued)

- A Decade of Consolidated Effort to Build a Mature Criticality Safety Program
 - Migration from an earlier “expert basis” approach to the “procedure basis” operations
 - Migration to emphasize the operational floor support
 - Emphasis on Staff Qualification and CS Training for Operations personnel
 - Emphasis on regulatory compliance



Main Contributors to a Stable Criticality Safety Program

- The Operations own the CS program
- Integration of CS personnel to the Floor Support Activities
- Adequate Qualified CS Personnel and Funding Resources
- CSAC provides surveillance and support
- Periodic Internal and External Reviews



Concluding Remarks

- In any large organization, evolution of any safety program is inevitable
- Long history of CSAC at LLNL shows the need for a strong CS advisory group to oversee health of the criticality safety program
- Effectiveness of CSAC depends on its leader and members
- Appraisals by both internal and external agencies are required to ensure maintenance of an effective CS program.

