Contract No:

This document was prepared in conjunction with work accomplished under Contract No. DE-AC09-08SR22470 with the U.S. Department of Energy.

Disclaimer:

Criticality Safety Controls and the Safety Basis at PFP

Stephen F. Kessler
SRNS/Fluor Government Group
Bldg. 707C, Room 120
Aiken, SC 29808
(803) 557-6364 / (803) 557-9780
stephen.kessler@srs.gov

Evaluation of Criticality Safety Controls for Inclusion in the Safety Basis

Initial Implementation

With the implementation of DOE Order 420.1B, *Facility Safety*[1], and DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*[2], a new requirement was imposed that all criticality safety controls be evaluated for inclusion in the facility Documented Safety Analysis (DSA) and that the evaluation process be documented in the site Criticality Safety Program Description Document (CSPDD). At the Hanford site in Washington State the CSPDD, HNF-31695, *General Description of the FH Criticality Safety Program*[3], requires each facility develop a linking document called a Criticality Control Review (CCR) to document performance of these evaluations. Chapter 5, Appendix 5B of HNF-7098, *Criticality Safety Program*[4], provided an example of a format for a CCR that could be used in lieu of each facility developing its own CCR.

Since the Plutonium Finishing Plant (PFP) is presently undergoing Deactivation and Decommissioning (D&D), new procedures are being developed for cleanout of equipment and systems that have not been operated in years. Existing Criticality Safety Evaluations (CSE) are revised, or new ones written, to develop the controls required to support D&D activities. Other Hanford facilities, including PFP, had difficulty using the basic CCR out of HNF-7098[4] when first implemented. Interpretation of the new guidelines indicated that many of the controls needed to be elevated to TSR level controls. Criterion 2 of the standard, requiring that the consequence of a criticality be examined for establishing the classification of a control, was not addressed. Upon in-depth review by PFP Criticality Safety staff, it was not clear that the programmatic interpretation of criterion 8C could be applied at PFP. Therefore, the PFP Criticality Safety staff decided to write their own CCR.

PFP implementation

The PFP CCR provides additional guidance for the evaluation team to use by clarifying the evaluation criteria in DOE-STD-3007-2007[2]. In reviewing documents used in classifying controls for Nuclear Safety, it was noted that DOE-HDBK-1188, *Glossary of Environment, Health, and Safety Terms*[5], defines an Administrative Control (AC) in terms that are different

than typically used in Criticality Safety. As part of this CCR, a new term, Criticality Administrative Control (CAC) was defined to clarify the difference between an AC used for criticality safety and an AC used for nuclear safety. In Nuclear Safety terms, an AC is a provision relating to organization and management, procedures, recordkeeping, assessment, and reporting necessary to ensure safe operation of a facility. A CAC was defined as an administrative control derived in a criticality safety analysis that is implemented to ensure double contingency.

According to criterion 2 of Section IV, "Linkage to the Documented Safety Analysis", of DOE-STD-3007-2007[2], the consequence of a criticality should be examined for the purposes of classifying the significance of a control or component. HNF-PRO-700, *Safety Basis Development*[6], provides control selection criteria based on consequence and risk that may be used in the development of a Criticality Safety Evaluation (CSE) to establish the classification of a component as a design feature, as safety class or safety significant, i.e., an Engineered Safety Feature (ESF), or as equipment important to safety; or merely provides defense-in-depth. Similar logic is applied to the CACs.

Criterion 8C of DOE-STD-3007-2007[2], as written, added to the confusion of using the basic CCR from HNF-7098[4]. The PFP CCR attempts to clarify this criterion by revising it to say "Programmatic commitments or general references to control philosophy (e.g., mass control or spacing control or concentration control as an overall control strategy for the process without specific quantification of individual limits) is included in the PFP DSA". Table 1 shows the PFP methodology for evaluating CACs.

Table 1: PFP CAC Evaluation Methodology.

Table 2. Control Selection for Criticality Administrative Controls & Program Requirements at PFP for CSER/ACF XXX		
Question	**Answer**	
Criticality Administrative Controls & Program Requirements	**Yes** (Control or requirement becomes AC or SAC)[1]	**No** (No impact on DSA or TSR)
1. Could credible violation of the control or failure of the program requirement directly lead to a criticality accident?		
2. Could credible loss of the control directly result in a singly contingent condition, for those cases where documented double contingency is required?		
3. a) For CSERs or ACFs that demonstrate incredibility, does the failure of the control result in a scenario where a criticality is credible? b) If the answer to a above is yes, does failure of the control represent conditions that are not included in the general references to control philosophy or SMPs that are presently in the DSA, (e.g., does an SMP or other institutional program provide control of the same parameter as the CAC)?		

[1] For question 3, the answers to both a) and b) must be yes for the CAC to become either an AC or SAC.

Conclusion

This evaluation process has been in use since February of 2008 and has proven to be simple and effective. Each control identified in the applicable new/revised CSE is evaluated via the table. The results of this evaluation are documented in tables attached to the CCR as an appendix, for each CSE, to the base document.

References

1. *Facility Safety*. DOE Order 420.1B, U.S. Department of Energy, Washington DC.
2. *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Nonreactor Nuclear Facilities*. DOE-STD-3007, U.S. Department of Energy, Washington, DC.
3. *General Description of the FH Criticality Safety Program*, HNF-31695, Rev. 1, Fluor Hanford, Inc., Richland, Washington.
4. *Criticality Safety Program,* HNF-7098, 2007, Rev.16, Fluor Hanford, Inc., Richland, Washington.
5. *Glossary of Environment, Health, and Safety Terms*, DOE-HDBK-1188-2006, U.S. Department of Energy, Washington, DC.
6. *Safety Basis Development*, HNF-PRO-700, Rev. 15, Fluor Hanford, Inc., Richland, Washington.