CHEMISTRY & METALLURGY RESEARCH REPLACEMENT

CMRR Project
Los Alamos National Laboratory

Evaluation of DOE-STD 1189,

Integrating Safety Into the Design Process

April 5, 2008

Outline

- Summary Recommendation
- Background & Status of STD 1189
- CMRR Project “GAP” Analysis
- Major Differences in Std 1189 and Current Project
- Seismic Impact
- Impact of PDSA Changes

Summary

The CMRR Project has reviewed the requirements of STD 1189. The Project can implement the majority of the requirements in the near term. The project will incorporate these requirements into PDSA Draft, Rev. 2.

Requirements that will be implemented in conjunction with Rev. 2 PDSA in 2008

- Safety Design Strategy – update current Nuclear Safety Design Strategy (NSDS) document in conjunction with Rev. 2 PDSA
- Prepare Chapters 5 (TSR Derivation) and 6 (Criticality Safety)
- Include co-located worker in hazard and accident analysis
- Unmitigated analysis – Appendix A changes
  - Utilize new ICRP dose conversion factors & 5 rem threshold for SC control consideration
- PDSA change control

Seismic design criteria changes (Appendix A) are less certain and have the potential for major project impact

- Under NNSA direction, the project is reviewing the final STD 1189 and will provide an impact analysis to NNSA for decision purposes

Status of STD 1189 & CMRR Evaluation

LASO requested CMRR Evaluation of Draft STD-1189

- CMRR deliverable, dated 12/19/07, Comparison of Draft Std 1189 to the Status of CMRR NF Project at Preliminary Design Completion
- Identified ‘gaps’ and provided recommendations

Potential impacts are in two primary areas

- Seismic design
- PDSA methodology

CMRR '1189' Evaluation -- Input Documents

1. Draft STD 1189, Sept 2007
   - March 2008 draft reviewed more recently
2. Draft CMRR NF PDSA, Rev. 1, November 2007
3. ANSI/ANS 2.26-2004 and ASCE/SEI 43-05 {Seismic}
4. DMJM H&N position paper, Implementing ANSI/ANS 2.26-2004 and ASCE/SEI 43-05 on the CMRR NF Preliminary Design Project, August 2006
5. Updated Seismic Hazard Analysis at the LANL Site, May 2007, URS Corporation.

Major Differences

- Seismic Design Criteria
  - Adopts 2 national Stds to specify Seismic Design Criteria (SDC) & Limit States (LS) rather than Std 1020 Performance Criteria (PC)

- PDSA changes (only those that are major impact listed)
  - Collocated worker – include calcs for worker @ 100 m
  - New Chapters for Final Design PDSA
    - Chap 5 (Derivation of TSRs) and 6 (Criticality)
  - Change Control
  - PDSA consequence analysis and control selection method
    - Dose conversion factor updated
    - 'unmitigated' offsite dose threshold for SC control consideration

Details on Seismic

Two new stds to specify Seismic Design Critiera

- ANSI 2.26 Categorization of NF SSCs for Seismic Design and ASCE 43-05, Seismic Design Criteria for SSC's in Nuclear Facilities
- Reliance on STD 1020 series no longer required for seismic, but applies for other natural phenomena

Requires use of Seismic Design Category (SDC) and Limit States (LS) rather the Performance Categories (PC).

- 5 x 4 array (5 SDC and 4 LS) to characterize SSCs & components
- 2006 Draft 1189 would have required SDC 4 or SDC 5 for CMRR structure and some SC SSCs based on public dose.
- 2007 Draft truncates the SDC table at SDC-3 but states that SDC-4 should be considered on a case by case basis based on public consequence criterion

Comments on Seismic Classification

NF Seismic Design changes are potentially design and cost prohibitive for the CMRR project which has concluded preliminary design

- Current PC-3 (Safety Class) peak ground acceleration (PGA) has already been elevated 'significantly' due to new site seismic HA results
- SDC-4 category could further increase substantially
- Cost and design impacts increase significantly as design progresses
- Design at these PGA levels not a 'certainty'

Comments on PDSA Changes (non-seismic)

Co-located worker

- Evaluate worker at 100 m
  - Past practice resurrected, will need to be included in HA
- Recommend including in Rev 2 PDSA
- Could drive Safety Significant control changes

Add Chapter 5 and 6 to PDSA Rev 2

Change control

- Appropriate to begin change control starting with Rev. 2
- Recommend a CCB through ISC (designers and safety analysts)

Dose Conversion Factor Changes

DOE memo, 2/22/08, Ostendorf, directs use of new DCFs.

Per STD 3009 methodology, the offsite 50 year radiological dose is:

Dose (rem TEDE) = ST (g) * X/Q (s/m3) * BR (m3/s) * DCF (rem/g), where

ST = source term of material released from the NF
X/Q = atmospheric dispersion
BR = breathing rate
DCF = dose conversion factor

DCF is extracted from an international committee publication, ICRP, based on biological effects data.

- Converts the radiological 'uptake' to a dose

STD 1189 & approved STD 5506 have adopted the more recent ICRP value for DCF which is considered to be the most accurate.

- Some DOE sites and DOE STD 5506 (TRU waste) have already adopted the most recent ICRP 68/72 DCF.

New DCFs will reduce the offsite doses for CMRR and therefore could affect the selection of SC SSCs.