## JUN 2 0 2007

MEMORANDUM TO:   J.O. Low (RW-5)

FROM:   J.N. McKamy
Nuclear Criticality Safety Program Manager, NA-17

SUBJECT:   RESULTS OF CRITICALITY SAFETY SUPPORT
GROUP (CSSG) TASKING 2007-03

The purpose of this memo is to forward the official response resulting from CSSG Tasking 2007-03 to perform a review you requested of specified Yucca Mountain Project (YMP) documents. The National Nuclear Security Administration (NNSA) Nuclear Criticality Safety Program (NCSP) Manager developed the following formal tasking (2007-03) to the CSSG at your request:

> Task Statement:  The CSSG is requested to review two documents: "Preclosure Criticality Analysis Process Report, Rev.1 [dated – March 8, 2007]" and Yucca Mountain Repository License Application (LA) Safety Analysis Report section 1.14 [Story Board Draft D]. Given the timetable for the response and the fact that CSSG members are not experts on NRC regulations relative to the Yucca Mountain Project, the review should be performed relative to the expectations of the ANSI/ANS-8 National Consensus Criticality Safety Standards. The review should also evaluate the adequacy of resolution of CSSG identified issues contained in reference (1) memorandum.
>
> The primary reference document for the "Preclosure Criticality Analysis Process Report, Rev.1" is Ref. 2, "Criticality Model" (September 14, 2004) which is provided in order to support the review of the Process Report, Rev.1. Please note that the LA Section 1.14 contains numerous "placeholder" texts which is planned discussion for the "interim draft" to be issued later this Spring 2007.

The CSSG Chair formed a four person sub-committee to perform the review. Time constraints placed on the review by the YMP prevented participation by the full CSSG. The comments and recommendations represent the technical consensus of the CSSG sub-committee which were reviewed and concurred with by a quorum of the CSSG.

The NNSA NCSP has neither a technical nor a regulatory position relative to the comments and recommendations developed by the sub-committee. Please note that the Tasking specifically restricted the conduct of the review to the scope covered by the ANSI/ANS-8 National Consensus Criticality Safety Standards. The sub-committee comments and recommendations directly related to, or derived from, these Standards are attached.

Transmittal of this memorandum concludes NNSA NCSP and CSSG activities relative to this Tasking.

Attachment

cc:
M. Thompson, NA-17
A. Garcia, DOE NE-ID
J. Morman, ANL

# ATTACHMENT

## General Comments and Recommendations

1. The YMP pre-closure criticality analysis process, as described, appears consistent with ANSI/ANS-8 Criticality Safety Standards.
2. The latest version of the pre-closure criticality analysis, Rev-01, dated March 2007, is a significant improvement over the Rev-00 version, dated August 2006. The concerns identified previously by an earlier CSSG review documented in the DOE-ID Memorandum, A.Garcia to J. McKamy, "CSSG Comments," dated August 17, 2006, have been addressed.
3. The definitions of 'abnormal' and 'not-credible' should be clearly documented and consistently applied throughout the analyses and documents.
4. It is recommended that the process by which acceptable margins of subcriticality are determined be based on and, conform to, ANSI/ANSI-8.24, *Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations.*
5. The need for and use of Criticality Accident Alarm Systems should be clearly described and in conformance with, ANSI/ANS-8.3, *Criticality Accident Alarm System.* The material provided has been developed for 'Defense in Depth' but does not address the ANSI/ANS-8.3 requirements.
6. "Identification of Criticality Event Sequences" (Section 3.3 of the Preclosure Criticality Analysis Process Report) is an essential component of a criticality safety program. This section discusses the objective of this activity, but not how it will be accomplished or the criteria for success; how one assures all credible scenarios are identified. Information about the process for identifying the sequences should be added. The process should be a disciplined team oriented approach. DOE has promulgated guidance in this regard in DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-reactor Nuclear Facilities.* (Note: DOE-STD-3007-2007 provides a framework for generating criticality safety evaluations that are compliant with the ANSI/ANS-8 series of criticality safety standards.)

## Specific Technical Comments and Recommendations

*Disposal Criticality Analysis Methodology Topical Report*

1. Computer codes used for developing margins of subcriticality should be validated in conformance with ANSI/ANS-8.24 and maintained under a Software Quality Assurance Program meeting DOE requirements.

*Attachment VI of CAL-DSO-NU-000003-Rev 00A*

2. The team recommends that a review be conducted of the most current version of the *International Handbook of Evaluated Criticality Safety Benchmark*

2. The team recommends that a review be conducted of the most current version of the *International Handbook of Evaluated Criticality Safety Benchmark Experiments* to identify applicable benchmarks that have more recently been documented. Sub-critical measurements made with arrays of tubular LEU at various enrichments have been performed that may prove useful in validation efforts.

*Pre-closure Criticality Analysis Process Report*

3. It would be clearer to the reader if an example analysis showing all the analysis steps were included in the report.
4. An evaluation of the need for a criticality accident alarm system complying with ANSI/ANS-8.3 will be needed for the fissile material facility.
5. The potential accident scenario resulting from damage to metallic fuel cladding that leads to oxide formation and sludge accumulation in a storage pool should be addressed.
6. For future reference, ANSI/ANS-8.5 will become part of ANSI/ANS-8.21 by 2009.
7. For future reference, a new standard on burn-up credit (ANSI/ANS-8.27) is very close to being released.
8. The statement on page 18 that ANSI/ANS-8.19 is not used for pre-closure criticality analysis is not adequately defended since a major section of this standard deals with process analysis.
9. A clear mention of the Double Contingency Principle as written in ANSI/ANS-8.1 would be helpful on page 9. Whatever method(s) is(are) chosen to implement the DCP should be clearly described.
10. Neither the text on page 13 or page 17 explains how the 75% value meets the expectations of ANSI/ANS-8.1 or 8.17, respectively.
11. Given that moderation control will be used at YMP for pre-closure an additional discussion relative to how ANSI/ANS-8.22 will be applied should be included in the discussion on page 18.

*Yucca Mountain Repository SAR, Draft D&E, Section 1.14*

12. The document has too many 'placeholders' and missing references to be reviewed.