

November 5, 2001

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SUBJECT REPOSITORY DESIGN AND THERMAL-MECHANICAL EFFECTS KEY
TECHNICAL ISSUE INTERMEDIATE MILESTONE NO.20-01402.671.130:
LETTER REPORT

Dear Dr. Chowdhury,

We have reviewed the Center's Progress Report entitled: "PCSA Tool Development," dated September 26, 2001. The report documents the development to date, of the preclosure safety analysis review methodology and Version 1.0 of the PCSA Tool. The report presents Center's approach to conducting a risk-informed, performance-based safety evaluation of Department of Energy's (DOE's) preclosure safety assessments. The following are some of the comments generated by the staff of the preclosure team. Please consider them as appropriate in your future revisions.

General Comments:

The report presents a methodology for Preclosure Safety Analyses (PCSA) of the Yucca Mountain Project Geologic Repository Operations Area (GROA) using the PCSA Tool, which is a code to assist the staff in the review of a potential License Application (LA). The following comments should be addressed in the next progress report. It should be noted that the staff has not yet used the tool. Therefore, additional comments based on actually using the tool may be forwarded later as they become available.

(1) The overall presentation seems to be logical and the PCSA Tool seems to work as designed. However, the Center should consider the following suggestions which may help improve the Tool in the future revisions: (a) Overall user-friendliness may be improved; (b) It would be useful if a User Manual (including manuals for RSAC, MELCOR, SAPHIRE and other codes used in the Tool) were developed; (c) Clear statements are needed describing the input to be provided by the user; (d) Details of how to import data, information from drawings, and other information from the LA or other DOE reports into this Tool without actually typing and entering the data (for example, can they be electronically transferred into the Tool, and would there be an issue of compatibility of format, etc.)

(2) The report needs to be revised to reflect the language of the final Part 63 in terms performance objectives and dose limits, etc.

(3) The report assumes a preclosure period of 100 years in stating the frequencies associated with Category 1 event sequences (Page 3-8). The language in the rule does not specify a certain duration for the preclosure period and therefore, the report must be made consistent with the language of the rule. (The assumed period of 100 years for preclosure can be used in the report after stating that it is an assumption.)

Detailed Comments:

- (1) Section 3.0 First paragraph. Suggest stating "...and identify *potential or suspected* areas of vulnerability in the DOE Analysis." We do not want to appear to be prejudging the DOE's PCSA to have "areas of vulnerability" prior to our review (even though this may be the case).
- (2) Section 3.1 "The PCSA evaluates..." And, the last half of paragraph three appears to be somewhat redundant when compared to the previous two paragraphs. Consider revising the first three paragraphs to reduce repetition.
- (3) Section 3.1 Fourth full paragraph: "...NRC staff anticipates independently checking **and verifying** the DOE's results,... Also in the last sentence, suggest mentioning something about the fact that the staff will be using this tool to confirm, verify or test the adequacy of analyses DOE is using to screen events out by probability.
- (4) Section 3.1 Fifth full paragraph: This paragraph is difficult to follow. Suggest removing multiple references to SSCs and only using where necessary. Suggestions are as follows: "The flow chart in Figure 3-1 shows that the structures, systems, and components important to safety are identified by ~~analyzing/comparing~~ **the consequences of the events— sequences involving SSCs** with acceptable dose limits."
- Also, "If the frequency and consequences from the event **sequences involving SSCs** are within the acceptable limits,..." And "On the other hand, if the frequency **or and** consequences from the events ~~involving SSCs~~,..."
- Also, "Finally, if the frequency **or and** consequences from events ~~involving SSCs~~,..."
- (5) Section 3.2.2.1: The Tool document uses several terms when discussing Hazard Analysis, as seen in Section 3.2.2.1, Site-Specific Hazard Analysis Review (and Figure 3-2); Figure 3-7, Int. Hazard Analysis; 3.2.2.3, Facility Hazard Analysis. Consider standardizing terminology in the above referenced sections and in the remainder of the document.

- (6) Section 3.2.2.3 The Internal Hazard Analysis tab shows an option for Energy Analysis method. The Energy Analysis method is not discussed as an option for hazard assessment in 3.2.2.1 Site-Specific Hazard Analysis, Figure 3-2(a), Section 3.2.2.3 Facility Hazard Assessment, or anywhere else in the hazard analysis discussion. If the energy method is an option than that should be discussed in the in section 3.2.2, for completeness.
- (7) Section 3.2.4: Should the title of this section be: Categorization of Event Sequence Frequencies, Instead of Categorization of Events. Same heading also in Figure3-2(b).
- (8) Section 3.2.4: Categorization of Events. Suggest using beyond design basis category (BDBC) instead of BCFL. This draws a clearer parallel to the more commonly used BDBE.
- (9) Section 3.2.6: Is there a reason that the term “performance measures” (as identified in 10 CFR 70) was used instead of “performance objectives” as identified in 63.111? Suggest using “performance objectives.”
- (10) Section 3.2.6 At the end of the paragraph we should also discuss the approaches to Category 2 event sequences safety assessment (i.e., not annualized, per event limits, single events vs. the sum of single or multiple events,...)
- (11) Section 4.1: Table 4-1 presents DOE position on hazards at the Yucca Mountain site. The staff has questioned the thickness of volcanic ash fall used by DOE (item 44 in the table). Where NRC and DOE have not reached an agreement, it should be indicated in the table by a footnote.
- (12) Section 4.1 Page 4-1, second full paragraph, first sentence on fires. It was addressed in the PPSA, CRWMS 2000e.
- (13) Section 10.4: The last paragraph needs to be expanded and clarified. It is not immediately obvious from page D-25 how CNWRA calculates a yoke drop frequency of 1.9×10^{-4} . It is also not obvious how this new yoke drop frequency results in a more severe Category_1 event sequence.
- (14) Section 11: Future work should specifically include an assessment of hazards due to transportation accidents from the site boundary to the repository surface facilities. The Savannah River reports might be a useful starting point for such an assessment.
- (15) Section 13: References, the Sapphire technical manual is for Version 5.0, whereas the PCSA tool uses Version 7.0

A. Chowdhury

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If you have any questions regarding the comments, you may contact me at (301) 415-6695 or via e-mail (msn1@nrc.gov). No written response to this letter is required and the subject report is considered to fulfill the Center's contractual obligations for this Intermediate Milestone. If there are additional comments from other staff reviewers on this report, or any recommendations for future work by other reviewers, I will forward them to you as and when they become available.

Sincerely,

/RA/

Mysore Nataraja,
Program Element Manager

A. Chowdhury

-4-

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Sincerely,

/RA/

Mysore Nataraja,
Program Element Manager

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