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NOTE TO: Seth Coplan, Section Leader  
Performance Assessment Section, WMRP

FROM: Mysore S. Nataraja, Section Leader  
Rock Mechanics Section, WMEG

SUBJECT: REVIEW COMMENTS ON SANDIA'S DRAFT PROBABILITY REPORT

As requested by you, my staff has reviewed Section 3, "Thermomechanical Effects" and Section 4, "Tunneling and Mining Engineering" of the Draft Probability Report submitted to the NRC by the Sandia National Laboratories under Task III of FIN A-1165 Technical Assistance for Performance Assessment.

Our comments on Section 3, "Thermomechanical Effects" were previously provided to you verbally in early April 1986. Comments on Section 4, "Tunneling and Mining Engineering" are enclosed. In summary, we find that the draft write-up of this Section is too generalized to be of significant use to the NRC staff. We recommend that Sandia be asked to revise the Section to include specific details on the identification and analysis of techniques for assigning probabilities to potentially disruptive events which may affect repository performance (associating the specific events with the affected 10 CFR 60 performance requirements).

If you have any questions on this review, please contact Dinesh Gupta on X74742.

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Mysore S. Nataraja, Section Leader  
Rock Mechanics Section, WMEG

Enclosure:  
As stated

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WMEG COMMENTS ON SECTION 4, "TUNNELING AND MINING ENGINEERING"  
OF SANDIA'S DRAFT PROBABILITY REPORT

1. Although the format and the outline of the Section appear to be well thought out, very little substantive discussion is presented in the entire Section. Most of the statements are too generalized and do not seem to be directly relevant to repository performance. Discussion of specifics is lacking for the most part. The Section should address the "repository" related issues more specifically.
2. The Section does not relate to 10 CFR 60 performance objectives in any direct or indirect manner. The role of "Tunneling and Mining Engineering" in meeting the pre-closure and post-closure performance objectives has not been clearly explained. The Section should address meeting the 10 CFR 60 pre-closure and post-closure performance objectives much more directly. For example, the effects of deformation of underground opening on meeting the performance objectives should be discussed clearly, explaining the scenarios that could affect specific performance objectives and the mechanism by which the repository performance (specific 10 CFR 60 objectives) could be influenced. Also, it is essential that the Section specifically address 10 CFR 60 retrievability requirements in evaluating repository performance.
3. Many of the engineering related potentially disruptive events which could affect performance of a repository have not been addressed in the Section. A much more detailed and thorough list of engineering related potentially disruptive events need to be considered and should be discussed in this Section (e.g. see GA Technology's report for BWIP pre-closure list of disruptive events). In preparing a preliminary list of such events, many of the available DOE publications on the subject should be consulted.
4. Some of the potentially disruptive events affecting repository performance that have not been addressed but should have been addressed in the Report are as follows:
  - (a) long-term functional problems with borehole and shaft seals,
  - (b) flooding of repository,
  - (c) failure of ventilation and filters,
  - (d) fall of canisters in shaft due to cage failure or other reasons,
  - (e) canister breach accidents during mining, emplacement, and/or retrieval,
  - (f) failure of support system and reinforcements provided for the repository openings,

- (g) transportation accidents.
  - (h) inadequate design due to variety of reasons, e.g., error in assumptions, error in modeling, rock bolts design error, size of emplacement opening design error,
  - (i) inadequate exploration consequences, e.g., undetected brine pockets in salt, undetected faulting or fractures in Tuff and, undetected rock burst zones in BWIP.
5. The Section has divided mechanisms (disruptive events, page 4-2 to 4-4) into groups called 'direct' and 'indirect', which seems to be confusing. It would be more useful to divide the disruptive events into 'pre-closure' group of disruptive events and 'post-closure' disruptive events, where pre-closure events are important for exploration, construction, operation and retrieval and post-closure events are those that are important to isolation.
6. As mentioned above, the list of the potentially disruptive events should be organized in a systematic way based on the time period during which the corresponding performance objective is required to be met. An example of suggested breakdown is as follows:
- (i) mainly pre-closure events
    - Instability (failure) of underground openings
    - Damage to emplacement liners
    - Mine gas (basalt, salt), and
    - Rock burst (basalt, salt).
  - (ii) Pre-closure and post-closure (both)
    - Damage to canisters (due to rock movement-shear)
    - Failure of Plugs or Seals (especially for Salt and Basalt sites)
    - Pressure water or brine (Basalt, Salt), and
    - Subsidence and heaving
  - (iii) mainly post-closure
    - dissolution (Salt),
    - groundwater travel disruptive changes, and
    - other T-H-M-C coupled disruptive events.
7. There is inadequate coverage of identification and analysis of techniques for assigning probabilities to potentially disruptive events. Available methods for assigning probabilities for such events should be summarized and recommendations should be made to adequately quantify the

probabilities. Attempt should be made to illustrate the application of these methods using specific examples of some of the potentially disruptive events.

8. There is some discussion of uncertainties, but it does not seem to be applicable to the problems at hand. The said discussion in the report is likely to be of little use to the NRC staff. Attempt should be made to make this discussion applicable to the probabilities of specific disruptive events for repositories.

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REMARKS <i>Action closed 6/5 note to Coplan</i>				