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June 6, 1989

Dr. Dade W. Moeller, Chairman
Advisory Committee on Nuclear Waste
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Moeller:

The purpose of this letter is to report to the Committee on my recent discussions with the NRC Staff and on my own assessments on matters relating to the Performance Assessment (PA) portion of the Draft Site Characterization Analysis (SCA) dated 22 May 1989. I would like also to offer two comments that relate broadly to the overall SCA.

1. Performance Assessment

There are several areas of concern relating to the PA program outlined in the Site Characterization Plan (SCP). In particular, these involve:

- A. Scenario and Scenario Class Selection
- B. Alternative Conceptual Models
- C. The Use of Expert Judgement
- D. The Use of Waiting Times for Initiating Events
- E. Models for Water Pathway Release
- F. Human Intrusion
- G. Timing of Performance Assessment

A. Scenario and Scenario Class Selection - The development of scenario and scenario classes is a key initial step in Performance Assessment particularly performance allocation. It is not clear how the five scenario classes were selected for use in development of the performance allocation tables nor is it clear that they include all significant scenarios. There is no clear cut statement of how the scenario classes relate to the construction of the Complementary Cumulative Distribution Function (CCDF). In NAE/COM/4, it is stated that "the approach to scenarios analysis and how it is being employed to guide the site characterization program must be clarified or redone." Moreover, ... "the methodology for scenario development and screening should (1) by systematic and (2) provide assurance of completeness." There are many additional comments that could be made with regard to choices of scenarios and scenario classes in the SCP. A complete rework of the sections in Performance Assessment dealing with scenarios and scenario classes and the derivative work may be indicated.

B. Alternative Conceptual Models - In the PA program the intention is that alternative conceptual models are evaluated by studies carried out under the SCP. There are two problems in the SCP associated with this concern; namely, missing models and non-integrated models. In NAE/COM/21, the NRC Staff notes that no alternative conceptual model is postulated for different coupling between fractures and matrix; (sic) even though this coupling is cited as a very significant

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significant determinant of transport. In other cases (KIM/COM/1) the alternative conceptual models "do not appear to be fully integrated into the site characterization plan and as a result alternatives are apparently not considered in the preliminary performance allocations ..." These alternative models, either missing or not considered should be included in performance allocation. There is a further statement in this Staff comment which may be applicable in other sections of the SCA as well; namely, "the site characterization program appears to be directed toward providing data that confirm the preferred tectonic model rather than determining what the 'preferred model' should be."

C. The Use of Expert Judgement - We all recognize that expert judgement is used throughout the scientific and engineering process and, in most cases, that judgement is used correctly in both deterministic and probabilistic studies. However, expert judgement should not be used as a substitute for experimental data but rather as a valuable adjunct to it. In the SCP, expert judgement is sometimes apparently used in a faulty manner e.g., the weighting of alternative conceptual models according to the judgement of how likely they are to be correct. One could envision a later point in the site characterization where, for expedience, the use of expert judgement would be put forth as a substitute for additional experimental data.

D. The Use of Waiting Times for Initiating Events - In the SCP, credit has been taken for waiting times (time, after closure, before the first occurrence of an initial events). For many geologic processes, the "waiting time" may be zero (e.g., if the site is in a state of incipient faulting, faulting may occur tomorrow). Waiting times should be carefully evaluated and then used in a judicious, prudent manner.

E. Models for Water Pathway Release - There appear to be significant problems in the Water Pathway Release models. I assume that these will be discussed in the analysis of hydrology issues. My concerns include the estimates of transport times in the unsaturated and saturated tuffs, the proposed use of modified matrix flow models to simulate fracture flow and the lack of alternative conceptual models for different coupling between matrix and fracture flow.

F. Human Intrusion - In discussions with the NRC Staff, it was noted that, apparently, the intent of DOE is not to include human intrusion scenarios in the calculation of the CCDF directly but rather to treat it separately because it may dominate the calculations. Any such separation could call into question the qualification of the site under the Performance Assessment program.

G. Timing of Performance Assessment - Although the SCP indicates that the Performance Assessment (presumably partial) will be performed iteratively, the schedule appears to indicate that the first total system Performance Assessment will be carried out in 1993 at a very late stage in the site characterization process as well as in the design process. Total system Performance Assessment should be carried out several times during the site characterization program to determine at the earliest possible time any required design changes, any possible site disqualifiers, and/or required changes or additions to the site characterization program. Performance Assessment should guide the site characterization program rather than be simply the final step in that program.

In addition to the above, there are several other points (of lesser importance in my estimation) that have been identified as areas of concern by the NRC

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Staff or by myself.

At the June 13, 1989 meeting, I would like to review with the NRC Staff each of the above areas for the benefit of the Committee. Justifiably, the Staff is concerned about these issues. I share that concern particularly when all of the concerns are considered together. The Committee might wish to consider recommending a course of action that would insure that a more logical, more complete documented plan, taking into account the above concerns, is in place in a timely manner. Any such revised plan should place clear priority on studies to determine site qualifications and should provide an executable plan for repeated application during the site characterization process. However, any course of action recommended by the Committee probably should not interrupt or delay preliminary site characterization studies currently underway or planned for the immediate future.

2. General Comments

I would like to bring to the Committee's attention two more general points regarding the Site Characterization Plan, namely, integration and priority.

A. Integration - I recognize that the question of integration has been treated earlier by the Committee and by the NRC Staff, and that, in response to the earlier concern, an integration function has been included in the SCP. Nevertheless, in the reading which I have done, the plan for an ongoing overall integration of the characterization studies was not apparent. At the same time, it does seem clear that there are not one but several entities in the system that might competitively perform the integration function. The plan should spell out where the responsibility and authority for the integration function lies as well as a detailed plan for the performance of that function.

B. Priority - This concern relates to the order in which the characterization studies discussed in the SCP are carried out. It is cogently expressed in the recommendation contained in SCP/YUCCA/KIM/COM/1 which states "consideration should be given to prioritizing investigations giving high priority to those investigations associated with tectonic features, events or processes that could lead to the site being considered unlicensable or to a substantial change in the site characterization program" I believe that that statement may apply more generally to several areas of the SCP where very comprehensive lists of studies are presented without priority.

I trust that the above information will be useful to the Committee in its review of the NRC Staff's SCA.

Sincerely yours,


Paul W. Pomeroy
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