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Summary of Progress

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5/15/87 -- 5/28/87

Methodology Demonstration Report

Most of my recent activities have been devoted to the revised Methodology Demonstration Report.

The revised draft of the portions prior to the appendixes was delivered to NRC on May 20. In the revised report, we have made the important findings much more explicit. They include:

- o Probabilistic performance assessment can be accomplished with the recommended methodology.
- o The cascade and modular/convolution approaches give essentially identical results.
- o The particular corrosion models chosen will significantly affect the calculated waste package lifetime.
- o None of the dissolution/transport models examined have all the desired attributes.
- o Performance assessment modeling in general should be approached with caution, because of uncertainties in existing data.

The NRC staff is reviewing the draft. Preliminary comments received from K. Chang, J. Vogelwede, and T. Jungling have been most helpful. Concurrently with further revisions to this front-end portion, we are proceeding with final revisions to the appendixes, as well as the logistics of producing the overall document--figure revisions, editorial corrections, etc.

Invited Paper

I have been asked to deliver an invited paper at the Boston meeting of the Materials Research Society in November of this year. The session chairman has asked me to discuss some of the technical challenges associated with assessment of long-term materials performance. I plan to address issues such as the degree to which long-term extrapolation of short-term data is justified and other issues of interest to NRC. I look forward to discussions with the NRC staff regarding items that may be suitable to include in the paper.

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Future Activities

Now that the current phase of my work with the Methodology Demonstration Report is almost complete, it is appropriate to consider follow-on activities of NRC and its consultants.

The overall methodology we have proposed is suitable for NRC performance assessment, and it permits efficient utilization of the models and data that are available. However, implementation in actual, formal assessments will require continuing improvements in process models and input data.

Certain aspects of the overall methodology were not fully implemented in the demonstration (e.g., incorporation of discrete events such as earthquakes in the probabilistic analysis). These refinements should be pursued.

Another area that should be considered is the modifications necessary to implement the methodology for tuff and salt. The demonstration was based on the basalt waste package design. Although much of the methodology is generic, certain aspects of it require further media-specific development. A sizeable portion of this work is intertwined with the continuing search for good process models and input data.

During the past year, we have also considered what is necessary to extend our waste package work to include the repository as a whole, i.e., all the engineered barriers. I recently reviewed the state-of-the-art in repository-scale modeling, as well as the specific approaches being pursued by DOE. Modeling of realistic conditions within the repository is in its infancy. This fact, coupled with a paucity of input data, means that the approaches used by DOE essentially homogenize the conditions within the repository and include assumptions that are believed to be conservative with respect to the actual conditions. So far, DOE has not taken credit for any engineered barriers other than the waste packages themselves.

Thus, a natural and relatively straightforward extension of our current work would be to model the collective effect of all the waste packages using a Poisson statistical process, as is done by BWIP. By appropriately conservative choice of input parameters, the effect of the repository can be calculated.

It may be desirable for the NRC strategy to include a limited amount of contingency work in the event DOE later wants to claim additional credit for protection provided between the waste packages and the periphery of the repository. However,

under the current NRC interpretation of the engineered barriers boundary, there may be little incentive for DOE to pursue such an approach. Accordingly, the contingency work mentioned above should probably receive lower priority than the basic performance assessment activities.