

OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC.

WM DOCKET CONTROL
CENTER

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37831

August 6, 1984

'84 AUG 23 A9:12

Dr. K. C. Chang
Engineering Branch
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
623-SS
Washington, D.C. 20555

WM Record File
B0288
ORNL

WM Project 10,11,16
Docket No. _____
PDR /
LPDR (2,0,5)

Distribution:

Chang

(Return to WM, 623-SS)

✓

We have briefly reviewed the draft interim report entitled, "Methodologies for Assessing Long-Term Performance of High-Level Radioactive Waste Packages," by the Aerospace Corporation. Based on this review, we would like to offer a few comments on the report.

The report constitutes an excellent beginning to the task of defining the methods the NRC might consider using in its independent assessment of waste package performance. The review of other methodologies and approaches was quite thorough, although occasionally somewhat academic. Most of our comments center on the recommendations that Aerospace is making concerning the independent NRC methodology. These recommendations are scattered throughout the report and occasionally implied in the text. We assume that these thoughts will be gathered together in a "Recommended Approach" section in the final report.

1. The report indicates that discrete, low-probability events need to be considered in the assessment of waste package performance (p. 2-3, 2-9, 4-3, 6-2). Unless the NRC has recently made significant changes to 10 CFR 60, this is not correct. Section 60.113(a) clearly states that the package shall be designed so that the containment and release rate requirements are satisfied ". . . assuming anticipated processes and events . . .". In addition, discrete events such as intrusion, which may be considered to be unanticipated, only begin at a discrete point in time; their ramifications are, in effect, a process that persists for an extended time. If unexpected events are to be considered for some reason not evident to me, I strongly recommend that their inclusion be deferred until the expected event methodology is in place and operating satisfactorily since two challenges of this magnitude would be very difficult to meet.
2. The word "model" is used frequently in this draft report. It appears that it is used to mean only the form of one or more equations in some places, whereas it includes both the form of the equations as well as its numerical coefficients in other places. The definition of "model" needs to be clarified and used consistently.

8409040272 840806
PDR WMRES EXIORML
B-0288 PDR

1434

It is implied in the report (p. 2-2, 4-22) that determination of the environmental parameters in and around the waste package is considered to be external to the methodology being considered here and that the effect of the parameters will be taken into account by suitably broadening PDFs and/or using time-dependent input parameters. The determination of the environmental parameters is a very large and difficult challenge in the analysis of waste package performance. If the Aerospace work will not address this area, then there is a major gap in the NRC effort to implement an independent methodology to assess waste package performance. Additionally, we do not believe that a credible waste package performance analysis will be possible unless the determination of the environmental parameters comprises an integral part of the analysis. It is anticipated that water chemistry will be a function of the initial water composition, temperature, radiation, the chemicals introduced by the waste package itself (degraded and undegraded), and time. Thus, an enormous multi-dimensional environmental parameter data base would be required by the waste package performance analysis to accommodate the changing conditions during the duration of a single trial and the probabilistic variation of parameters from trial to trial. We believe that the environmental parameters affecting waste package performance must be viewed as the responsibility of the waste package performance analysis contractor and an integral part of the methodology if a successful result is to be forthcoming.

4. The statement on p. 4-19 that barrier interactions are unlike the degradation of a waste package. We would expect that the degradation products would have a substantial effect on water chemistry which would, in turn, have an effect on the performance of previous and subsequent barriers.
5. It is important to remember that the degree of failure of a barrier is very important in the analysis of waste package performance. A barrier will most likely be penetrated only in a very small area initially, with subsequent enlargement of the penetration while (a) other penetrations are formed in that barrier and (b) the next barrier is being penetrated. Thus, initial failure of all barriers may only expose a few square centimeters of waste to water, resulting in a very low release rate. This would gradually increase as the penetrations are enlarged. The sequential barrier failure approach will have great difficulty accommodating this type of failure, which is critical in determining the radionuclide release rate from the package.

In summary, we believe that the attempt to simplify the methodology, as implied in the subject report, is a highly desirable objective. However, the

August 6, 1984

current state of knowledge in this area does not support some of the major approximations that are implied in the report. Implementation of the implied methodology would most likely result in an indefensible assessment or the need to make assumptions so conservative that the result would be meaningless.

We would suggest that the methodology to be proposed later in 1984 should account for all of the scope, interactions, and feedback that might be significant in the analysis of waste package performance. This proposed methodology should then be examined before full implementation to determine (a) where approximations can be made that have an insignificant impact on the final results and (b) where additional studies are needed to determine whether a beneficial approximation is valid.

If you or Aerospace have questions concerning the above, give me a call.

Sincerely,



Allen G. Croff, Manager
Planning and Waste Management Analysis
Chemical Technology Division

AGC:nyw

cc: H. C. Claiborne
S. K. Whatley
AGC File

K. W. Stephens, Aerospace Corp.