

December 6, 2002

The Honorable Richard A. Meserve
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: CAPABILITIES OF ENGINEERED AND NATURAL BARRIERS

Dear Chairman Meserve:

During the 137th meeting of the Advisory Committee on Nuclear Waste (ACNW) on September 25-26, 2002, the U.S. Nuclear Regulatory Commission (NRC) staff briefed the Committee on the "Public Comments Received on the Yucca Mountain Review Plan (YMRP)," NUREG-1804. During that presentation, a discussion was directed as to how best to provide insights on the relative contributions of engineered and natural barriers to the performance of the proposed high-level waste repository at Yucca Mountain, Nevada.

The Committee was impressed with the staff's attempts to improve its understanding regarding how the barriers perform in relation to specific radionuclides that are important to the calculated radiation dose to a hypothetical receptor. We strongly encourage the staff to continue this work. We also encourage the practice that the Committee has long advocated of keeping the results in context with the total system and linking the analysis to the supporting evidence. We believe that the results obtained using realistic models provide the needed reference for making the right decisions about conservatism.

The Committee urges continued use of simplified models abstracted from detailed performance assessment work to better expose important contributors to performance. Such an approach is greatly facilitated by the relatively small number of radionuclides that contribute to the dose. Several possibilities exist. For example, one would be to tailor the existing analyses to individual radionuclides and trace them from the calculated point of dose at the hypothetical receptor location back to the original inventory in the waste package. The idea would be to select critical points in time (such as the end of the compliance period and the time of maximum dose) for receiving the dose and discuss the radionuclide's history, including mobilization and transport through the unsaturated zone, saturated zone, and biosphere (dose). The discussion would focus on such issues as how the radionuclide becomes mobile; its chemical characteristics of solubility and retardation; the impact of specific engineered and natural barriers; and the uncertainties associated with the various phases of mobilization, transport, and biological uptake. This uncertainty discussion by pathway could be very revealing.

By explicitly tracing three or four of the dominant contributors to dose and specifically addressing their mobilization, transport, and uptake, barrier by barrier and process by process, it should be possible to clearly identify the primary contributors to the performance of the repository. In so doing, the role of the barriers, including the associated uncertainties, should also become apparent. Tracing selected radionuclides in detail that do not contribute to dose may reveal additional information regarding barrier performance. The Committee recommends that the staff consider such an approach.

The Committee would like to receive future briefings on the progress being made to better understand the containment capability of both natural and engineered barriers of the proposed repository.

Sincerely,

/RA/

George M. Hornberger
Chairman