

August 7, 2002

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

SUBJECT: HIGH-LEVEL WASTE PERFORMANCE ASSESSMENT SENSITIVITY
STUDIES

Dear Chairman Meserve:

The Advisory Committee on Nuclear Waste (ACNW) was briefed at its 133rd meeting on March 19-21, 2002, concerning the development of methods by the U.S. Nuclear Regulatory Commission (NRC) staff for performing sensitivity analyses as part of their total systems performance assessment review capability. Consistent with its prelicensing responsibility to develop an independent license application review capability, the staff plans to use sensitivity analyses, in addition to uncertainty analyses, to assess the degree to which a performance assessment for the Yucca Mountain repository is risk-informed. In particular, the staff's stated goals are to: (1) gain risk insights and risk-inform the program, (2) understand the factors important to repository performance, (3) understand the repository system as a whole, and (4) improve staff capabilities to review a potential license application.

DISCUSSION

The development work presented to the ACNW involved analysis methods that address the sensitivities of parameters that are important to such performance measures as radiation dose to a reasonably maximally exposed individual (i.e., an average member of the critical group). Preliminary applications of the methods were presented to describe the distributions and sensitivities of some of the most important parameters. The desire is to be able to assess both data and modeling uncertainties in the performance assessment results. The ACNW was informed that different methods, both statistical and non-statistical, are to be considered.

We generally agree with the goals of the methods development process and encourage the staff to continue to enhance its capability to employ quantitative risk-assessment methods. Nevertheless, we have some concerns about the form of the results, in terms of being assured that the effort is properly focused. The goal of risk assessment is not only to assess the risk, but also to build confidence in the results. An important question is whether the methods contribute to increasing our confidence, and the confidence of the public, in the assessment of overall repository performance. The staff's briefing was very analytically oriented at the parameter level (e.g., drip shield failure times, well pumping rates), without a clear roadmap to bottom-line results or specific physical systems. As a consequence, we are unable to assess the effectiveness of the analysis methods under consideration. In particular, in the context of the total scope of performance assessment, there is a question of whether parameter uncertainty is the real issue, or whether we should pay more attention to the model abstraction

process and its contribution to uncertainty and sensitivity. One must also wonder whether we are so focused on parametric uncertainty and sensitivity that we are masking more important contributors, such as the uncertainty of the modeling abstraction process.

The Committee is on record as urging the staff to develop the capability to quantify the performance of individual repository barriers (References 1-3). Considering that the driver of the risk is uncertainty, having the ability to quantify the contribution to performance of individual barriers, both natural and engineered, and having the ability to display the uncertainties involved, provides the risk insights necessary to evaluate the importance of barriers. For example, such an approach could help identify the importance of the drip shield, components of the waste package (canister), the waste package itself, or specific geological units relative to the bottom line risk measures of the repository. Until the parameter uncertainties are aggregated into the performance of specific physical systems, it is difficult to assess the value of the analysis approach presented by the staff.

RECOMMENDATION

The ACNW recommends that methods development work on parametric sensitivity and uncertainty analysis establish clear linkages to the performance of individual barriers. The contribution to uncertainty of individual barriers must be put in context with other contributors to uncertainty, such as modeling uncertainty, especially in relation to the modeling abstraction process, which is the fundamental basis for the performance assessment models. The ACNW further recommends that the methods development work should emphasize an approach to uncertainty analysis that embraces sensitivity.

Sincerely,

/RA/

George M. Hornberger
Chairman

References:

1. ACNW Letter dated March 31, 2000, to Richard A. Meserve, Chairman, U.S. Nuclear Regulatory Commission, from B. John Garrick, Chairman, ACNW, Subject: Comments and Recommendations on the Draft Final Rule, 10 CFR Part 63, "Disposal of High-level Radioactive Waste in a Proposed Geologic Repository at Yucca Mountain, Nevada."
2. ACNW Letter dated July 29, 1998, to Shirley Ann Jackson, Chairman, U.S. Nuclear Regulatory Commission, from B. John Garrick, Chairman, ACNW, Subject: Comments on NRC's Total System Sensitivity Studies for the Proposed High-Level Radioactive Waste Repository at Yucca Mountain, Nevada.
3. ACNW Letter dated October 31, 1997, to Shirley Ann Jackson, Chairman, U.S. Nuclear Regulatory Commission, from B. John Garrick, Chairman, ACNW, Subject: Application of Probabilistic Risk Assessment Methods to Performance Assessment in the NRC High-Level Waste Program.