



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, DC 20555 - 0001

August 4, 2004

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: RESEARCH ON MODEL UNCERTAINTY

Dear Chairman Diaz:

The Advisory Committee on Nuclear Waste (ACNW) has been briefed periodically on work supported by NRC's Office of Nuclear Regulatory Research (RES) on the treatment of uncertainties in hydrogeological models. At its 150th meeting in May 2004, the ACNW was briefed on recent results from this research program.

Performance assessments typically evaluate the uncertainty associated with the parameters of one or more conceptual models. Parameter uncertainties are evaluated by probabilistic methods, sensitivity studies, and bounding analyses. The main question addressed in the May briefing was how the NRC might include conceptual model uncertainty in their analyses, i.e., how competing conceptual models for a hydrogeological system may be included in an analysis.

The research team sponsored by RES developed a method referred to as "Maximum Likelihood Bayesian Model Averaging" (MLBMA) to deal with the problem of incorporating model uncertainty into assessments. Part of the briefing package was a very recent paper published in *Water Resources Research*. The methodology is rigorous, elegant, and (necessarily) not simple to apply. The ACNW judges the research to be of very high quality.

A question that arises is how NRC staff in its regulatory role may actually apply such cutting edge research. Following the ACNW briefing, the research team held a training course for the NRC staff to outline the MLBMA and its application. The staff reported to the Committee that this training went well. Although the rigorous details of the MLBMA may prevent its use by NRC staff in all but very selected instances, the staff believes that the insights derived from such work are important in themselves for dealing with the difficult problem of treating model uncertainty.

The ACNW agrees with the staff assessment that the research on the MLBMA is important and has been of great value. It is essential that NRC staff have discussions with researchers who are at the frontiers of the field so they can formulate their approach to vexed problems important to regulatory assessment using the best information available. RES is to be commended for maintaining a part of their research portfolio to recognize excellent research that may not be applied until sometime in the future when it becomes more "routine" and yet has definite indirect benefits in the present.

Sincerely,

/RA/

B. John Garrick
Chairman