UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555

May 27, 1994

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: REVIEW OF THE HIGH-LEVEL RADIOACTIVE WASTE PERFORMANCE ASSESSMENT CAPABILITY OF THE NRC STAFF

In its November 10, 1993 Program Plan, the Advisory Committee on Nuclear Waste (ACNW) recognized the importance of Performance Assessment (PA) to the Commission's responsibilities related to licensing a high-level radioactive waste (HLW) repository. The purpose of this letter is to advise the Commission of the progress made by the NRC staff in developing a capability in high-level waste PA. The Committee is pleased with the progress as demonstrated in Phase 2 of the PA. This evaluation is based on presentations by the NRC staff during the ACNW Working Group meeting held on May 16, 1994, and on discussions during the 64th ACNW meeting held May 17-18, 1994. The following comments are provided:

1. The Committee was impressed with the progress the NRC staff has made in improving its PA capability including computer modeling. The improvements have been in most of the key areas where specific needs were identified in the ACNW letter of December 2, 1991. These needs included the detailing of program goals and means to achieve the goals, the upgrading of the NRC staff's computer hardware, resolution of limitations on key software and data, and assurance of adequate resources to meet future personnel and equipment needs as the PA program evolves.

2. With the completion of Phase 2 of the PA, the NRC staff has taken a major step forward in its capability to review effectively PAs submitted in support of DOE's prelicensing activities such as site characterization and for the licensing application. Despite the advances made by the NRC staff in HLW PA, the computer models and technical data base are not sufficiently developed to allow PA to serve as the exclusive basis for programmatic decisions. However, the PA, even in its present state, is still an indispensable aid in research, technical investigations and site characterization. The Phase 2 effort involved increased sophistication in model and

computer code development, the use of a much more mechanistic and detailed source term model and computer code, more refined modeling of flow and transport in both saturated and unsaturated media, the inclusion of seismic and magmatic disruptive scenarios, and the addition of a dose assessment capability. Specific improvements were observed in such areas as the structuring of scenarios, the treatment of uncertainties and, in Phase 2.5, the eliciting of expert judgment.

3. In order for the NRC staff to continue improving its PA capability, the Committee recommends the following actions:

- Continue to develop simple models that provide an efficient platform to test changes in parameters, subsystem modeling, quality of input data, etc., with respect to the impact on bottom-line results including release rates, dose calculations and health effects. Such models should accommodate the importance ranking of issues for different repository durations and performance indicators. Particular attention should be paid to the propagation of the full range of uncertainties and the transition from the complex to the simple model.

- There needs to be a continued effort to more clearly define the disposition of results obtained from expert judgment panels. The process for eliciting expert judgment was greatly improved during Phase 2.5 of the PA program. An acceptable process for implementing elicitation results by the NRC staff, as well as by the general regulatory community, remains uncertain. This Committee continues to advocate rulemaking on the elicitation and application of expert judgment in order to resolve this issue before submittal of the license application.

- The concept presented by the NRC staff of "confidence building" in the models as a process in model validation, while philosophically appealing, needs clarification with respect to its technical bases.

- The staff is encouraged to anticipate the need to compare performance assessment results between iterations and with other PA results. The comparison of results does not appear to be a major consideration in the performance assessment modeling strategy. The ability to make these comparisons greatly enhances the regulatory review process. In particular, the scoping of the PA needs to be such that the boundary conditions, logic models and parameter values are visible and easily changed. The

important benefit is the ability to efficiently benchmark the results with other assessments.

- There needs to be a clearer indication of how the method of successive approximations is applied to the screening process and the identification of "critical issues," i.e., those issues contributing to poor repository performance.

The Committee was pleased to hear of the NRC staff's increased interaction with other agencies, institutions, and especially with the international community.

4. In the NRC staff's PA Strategic Plan, the Committee urges the staff to:

   - clearly delineate tasks that should be completed to ensure a fully developed capability prior to receipt of a license application, and

   - complete the plan for prioritization of PA activities (including the development and weighting of criteria for prioritization) in order to ensure optimum utilization of resources in future PA activities.

The Committee considers a performance assessment capability as key to the carrying out of the regulatory responsibilities of the Commission. Properly performed, PA is essential to giving perspective to technical issues associated with the licensing of the HLW repository. The NRC staff has made impressive progress in improving its PA capability and the Committee recommends continued strong support to obtain results in a timely manner. The Committee intends to keep the Commission advised on the continuing progress to develop this capability.

Sincerely,

Martin J. Steindler
Chairman