

MEMORANDUM FOR: Mart J. Steindler, Chairman  
Advisory Committee on Nuclear Waste

June 27, 1994

FROM: James M. Taylor  
Executive Director for Operations

SUBJECT: REVIEW OF THE HIGH-LEVEL RADIOACTIVE WASTE PERFORMANCE  
ASSESSMENT CAPABILITY OF THE U.S. NUCLEAR REGULATORY  
COMMISSION STAFF

I am responding to your letter dated May 27, 1994, to the Chairman. The U.S. Nuclear Regulatory Commission staff appreciates the Advisory Committee on Nuclear Waste's (ACNW's) acknowledgment of the progress made in developing a staff capability in high-level waste (HLW) performance assessment (PA), as demonstrated in Phase 2 of the Iterative Performance Assessment Program.

The staff also appreciates the comments and recommendations provided by ACNW regarding: 1) progress in improving PA capability; 2) actions to continue this improvement; and 3) the PA Strategic Plan. Responses to these comments and recommended actions are provided in the enclosure.

The NRC staff welcomes ACNW's support in the HLW PA program. As recommended by ACNW, it intends to continue strong support for this program, as the way to ensure timely and effective interaction, with the U.S. Department of Energy, on the adequacy of site characterization and the resolution of issues related to performance. The staff will be pleased to continue keeping ACNW apprised of the program's progress.

Sincerely,

Original signed by  
James M. Taylor  
Executive Director  
for Operations

Enclosure: NRC Staff Responses to ACNW  
ltr. dtd. 5/27/94, Comments and Recommendations  
cc: The Chairman  
Commissioner Rogers  
Commissioner Remick  
Commissioner de Planque  
SECY

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NRC/WASTE MGMT

TEL:301-415-7070

Jun 16 '94

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Executive Director  
for Operations

Enclosure: ~~As stated~~  
cc: The Chairman  
Commissioner Rogers  
Commissioner Renick  
Commissioner de Planque  
SECY

*NRC Staff Response to ACNW May 27, 1994,  
Comments and Recommendations*

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**NRC STAFF RESPONSES TO ACNW LETTER, MAY 27, 1994,  
COMMENTS AND RECOMMENDATIONS**

1. The NRC staff appreciates the Advisory Committee on Nuclear Waste's (ACNW's) acknowledgment of improvements in Performance Assessment (PA) capability, including computer modeling, many of which specifically address ACNW comments of December 2, 1991. Continued improvements in these areas are planned. The staff intends to periodically review its goals, to ensure that the PA program remains properly focused. As part of these improvements, computer hardware and software capabilities have been significantly upgraded since October 1991. Near-future improvements are expected to include the U.S. Nuclear Regulatory Commission staff access to the U.S. Department of Energy (DOE) site characterization data bases and staff training in the use of the UNIX operating system, file management, communications, programming (FORTRAN, C++), and applications (GIS, Mathematica, S-Plus). In addition, the staff is presently reevaluating its resource needs, based on the June 1, 1994, DOE presentation to the Commission. Adequate resources will be provided for future personnel and equipment needs, to ensure that PA remains an integral part of the prelicensing and licensing program.
  
2. The staff agrees with the ACNW that the computer models and technical data base are not sufficiently developed to allow PA to serve as the exclusive basis for programmatic decisions. It also agrees that PA is still an indispensable aid in research, technical investigations, and site characterization. The staff is presently using Iterative Performance Assessment (IPA) experience, in development of the license application review plan, to identify new key technical uncertainties (KTUs) or confirm KTUs identified through Systematic Regulatory Analysis, to provide a technical basis for technical assistance or research user needs related to these KTUs. PA models and codes developed or employed during Phases 1 and 2 will be used for technical investigations that may be necessary to evaluate DOE's approach in addressing uncertainties, as it continues its iterative total system performance analyses and its approach to important repository issues, such as specification of multi-canister designs and selection of a hot or cold repository concept. Through review of Site Characterization Plan Progress Reports, the staff intends to ensure that DOE is using the results of its PAs, to guide site characterization activities to the extent practicable. Regarding the development of the technical data bases, the Division of Waste Management (DWM) is well aware of the limitation noted by ACNW and has efforts underway to electronically access and obtain the needed technical data, to begin to improve the situation. A further need is the management of these data as they are obtained by DWM. There is ongoing planning for the staff resources and systems needed to manage such information and ensure user-friendly staff access to the data.

Enclosure

3. The NRC staff generally agrees with the ACNW's recommendations for improving its PA capability, and has the following responses:
- The staff intends to place considerably more emphasis on the model abstraction process (producing a simplified model from a more complex model, while keeping the desired traits of behavior of the complex model), during the next phase of IPA. In the staff's opinion, these abstracted models must be capable of simulating the system with enough fidelity to distinguish compliance from non-compliance. At this stage of the IPA process, where very large uncertainties in important variables exist, it is also important that the abstracted model maintain approximately the same sensitivity to these important variables as exists in the more complex model. It is expected that the simplification of the modeled representation of processes and the reduction of the number of variables, to the extent that the behaviors of the system and subsystems are not radically changed, may result in more meaningful calculations of sensitivity and uncertainty. To the extent that the staff's present analysis tools can provide an importance ranking of issues for different repository durations and performance indicators, the staff expects its abstracted models to produce the same ranking. Also, the propagation of uncertainty arising from model abstraction will be addressed, as part of the broader issue of model abstraction and simplification.
  - The staff, in conjunction with the Center for Nuclear Waste Regulatory Analyses (CNWRA), is in the process of developing guidance to DOE in the area of expert judgment. Presently, the CNWRA staff is developing a background report on expert judgment (due to NRC at the end of August 1994), that will form the basis for staff guidance to DOE on the conduct of formal expert elicitation (scheduled for publication in a NUREG format, in November 1994). The conclusions determined by the staff, and whether they are likely to be modified after further research or experience, will, to a large part, determine whether the staff conclusions will be issued as guidance or form the basis for rulemaking. Budgetary considerations may influence this decision, as well.
  - The term "confidence building," as a qualifier for model validation, helps to portray the practical aspects of model validation. The staff considers "confidence building" to be a process that may include, but is not limited to, comparison with laboratory results, comparison with field data (including natural analogs), and comparison with field tests. The staff is continuing to work on this concept jointly with Swedish Nuclear Power Inspectorate and will brief the ACNW when the concept has matured.
  - The staff did compare the Phase 2 total system complementary cumulative distribution function (CCDF) with the total system results from Phase 1. It found the major discernable differences to be the addition of the gas pathway in Phase 2, and the use of a significantly different probability for the pluvial scenario in Phase 2 than was used in Phase 1. The staff intends to continue to

compare results between iterations, and with other PA results. However, comparison of bottom-line results have limited utility. The staff plans to supplement overall comparison of results for specific scenarios, pathways, radionuclides, subsystems, or processes. Significant insights into the behavior of the repository system are anticipated to be obtained from such focused comparisons. The staff intends to use CCDFs from various stages of the IPA program to monitor trends in compliance, uncertainty, and other issues.

- The iterative nature of the staff's PA program ensures that the results of the analyses (including sensitivity and uncertainty), as well as the insights of the analysts from each iteration, are used to identify critical issues, which, to the extent practicable, are incorporated with a greater level of model sophistication (or robustness) in the next iteration. Also, as "critical issues," the staff includes not only those issues that are major contributors to poor repository performance, but also those issues that contribute significantly to uncertainty in the performance analysis.
4. The staff responses to the ACNW recommendations on the HLW Postclosure PA Strategic Plan (PASP) are as follows:
- The staff agrees completely with the ACNW that the PASP should lay out the tasks necessary for development of an appropriate license application review capability before receipt of the application. That was the intent in developing the PASP. An initial draft of the NRC staff's PASP was developed in March 1994, in a collegial effort between NRC and CNWRA staff involved in PA. This draft is currently undergoing technical review within DWM.
  - With regard to prioritization of PA activities, the staff agrees that this is an important and necessary activity. As part of the ongoing technical review, one of the questions that is being addressed is the appropriate mechanisms and possible schedule for completing this. It is essential that the various disciplines contributing to PA participate in the establishment of priorities. Every effort is being made to ensure that this is being accomplished.