

August 5, 2002

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

SUBJECT: PERFORMANCE OF WASTE PACKAGES AT THE PROPOSED YUCCA
MOUNTAIN REPOSITORY

Dear Chairman Meserve:

The Advisory Committee on Nuclear Waste (ACNW) has been following the issues associated with the container life and source term (CLST) key technical issue (KTI) for several years. Our reviews have included a variety of briefings by staff from the U.S. Nuclear Regulatory Commission (NRC), the Center for Nuclear Waste Regulatory Analyses (CNWRA), the U.S. Department of Energy (DOE), and by the consultants to the State of Nevada. We also conducted two ACNW working-group meetings that included national and international experts. We have written several letters and reports on issues related to long-term corrosion, the physical and chemical environment affecting waste package performance, and other topics dealing with engineered barriers (references 1-4). In addition to work in this area by the NRC and DOE, the State of Nevada has hired consultants who have carried out a limited experimental program and prepared several papers on the subject. The Nuclear Waste Technical Review Board has also reviewed the subject. This level of activity is commensurate with the importance of the CLST issues to repository performance.

During our 135th meeting on June 16–18, 2002, the NRC staff presented material on assessing the performance of the waste package compared to other barriers, and understanding the relative importance of different corrosion processes. The staff also discussed the status of issue resolution for the waste package. In the remainder of this letter, we provide observations and recommendations that we believe will help the staff to prepare for a review of a license application (LA) for the proposed Yucca Mountain repository.

OBSERVATIONS AND RECOMMENDATIONS

Observation

The protection against radionuclide releases to the environment provided by the integrity of the outer Alloy 22 waste package container for 10,000 years is expected to be an important component of the DOE case for demonstrating the safety of the proposed HLW repository. The NRC's CLST issues and the relevant agreements with DOE are intended to ensure that an LA contains sufficient information and technical bases to support performance claims for the waste

package. The staff has used its Total-system Performance Assessment (TPA) computer code to assess the importance to dose risk of various CLST agreements.

Recommendation 1

The staff should prioritize the various CLST agreements with DOE on the basis of importance to risk. CLST agreements that are most important to protecting health and safety should receive the most attention. Agreements that require additional information, but are not essential to LA review (in light of the risk), should be given a lower priority compared to agreements that provide information essential for DOE to substantiate its safety case. For example, additional work on a particular agreement may not be needed prior to LA if analyses can show that the impacts on risk are not significant or if reasonable bounding analyses can provide sufficient information to demonstrate compliance with the regulations. Long-term experiments and analyses might be continued under performance confirmation to provide additional confidence in the technical basis for the decision.

Recommendation 2

The staff should extend to other KTIs the risk-based evaluations of data, information, and analyses that it is carrying out for CLST. In this process, staff should prioritize all the KTI agreements on the basis of risk. These analyses must evaluate repository systems collectively as well as individually. This is especially important since DOE is “rebaselining” some KTI agreements, which may not be “closed” by the time of an LA submittal as originally contemplated. The staff needs to have clear bases for determining whether DOE’s proposed treatment of agreements will provide sufficient information for the staff to review the LA in terms of all of the performance objectives in the Yucca Mountain Regulation (10 CFR Part 63).

Observation

The ACNW was very pleased to see the NRC and CNWRA make use of simplified, first-principle models to help understand complex processes described in the performance analyses for CLST issues. The ACNW has long advocated such a practice to make it possible for audiences lacking the time or expertise to follow the much more complex models, and to verify the credibility of the analyses used in the performance assessment.

Simplified models based on first principles could be used to provide a good test of overly conservative models, which do not generally lead to a risk-informed analysis of repository safety. The NRC can better ascertain uncertainties and margins of safety provided by various features of the repository and its environs by using analyses with appropriately realistic models and parameters. Ongoing refinement and improvement of the NRC’s TPA computer code can incorporate these insights to better understand the uncertainties associated with the performance of waste packages and other barriers. This will improve the ability of the NRC and CNWRA to evaluate the results of DOE’s Total System Performance Assessment (TSPA) computer code.

Recommendation 3

The staff should continue to push for more realism based on evidence in DOE's modeling. We recommend using simplified models wherever practical to check the results of the TSPA and TPA computer codes. Development of the NRC's TPA code, especially as it provides better insights into the effects of coupled processes, should be continued.

Sincerely,

/RA/

George M. Hornberger
Chairman

References:

1. ACNW Letter dated August 13, 2001, to Richard A. Meserve, Chairman, U.S. Nuclear Regulatory Commission, from George M. Hornberger, Chairman, ACNW, Subject: ACNW Review of Chemistry Issues and Related NRC Staff Capability for the Proposed High-Level Waste Respository at Yucca Mountain.
2. ACNW Letter dated December 6, 2000, to Richard A. Meserve, Chairman, U.S. Nuclear Regulatory Commission, from B. John Garrick, Chairman, ACNW, Subject: Alloy C-22 Corrosion Studies.
3. ACNW Letter dated January 11, 2000, to Richard A. Meserve, Chairman, U.S. Nuclear Regulatory Commission, from B. John Garrick, Chairman, ACNW, Subject: Comments on the Importance of Chemistry in the Near Field to DOE's Yucca Mountain Repository License Application.
4. ACNW Letter dated September 9, 1998, to Shirley Ann Jackson, Chairman, U.S. Nuclear Regulatory Commission, from B. John Garrick, Chairman, ACNW, Subject: Issues and Recommendations Concerning the Near-Field Environment and the Performance of Engineered Barriers at Yucca Mountain.