

February 5, 2001

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

SUBJECT: UPDATE TO ADVISORY COMMITTEE ON NUCLEAR WASTE REPORT
ON NUCLEAR WASTE-RELATED RESEARCH

Dear Chairman Meserve:

The Advisory Committee on Nuclear Waste (ACNW) is charged with reviewing the NRC's safety research and development activities in the Nuclear Waste Safety Arena. The Office of Nuclear Material Safety and Safeguards (NMSS) handles work related to the disposal of spent fuel and high-level waste (HLW). NMSS contracts with the Center for Nuclear Waste Regulatory Analyses (CNWRA) for HLW technical assistance. Part of the \$15.5M in FY 2000 funding allocated for HLW technical assistance is for work that the Committee considers to be "research." The Office of Nuclear Regulatory Research (RES) conducts and contracts for research in all areas not related to the disposal of HLW at Yucca Mountain. The waste-related research program in RES is small, \$2.3M for research on radionuclide transport and decommissioning and \$1.5M for radiation protection and health effects (including clearance work).

Observations and Recommendations

- ! The ACNW judges CNWRA's work on Yucca Mountain to be of very high quality. The RES-supported research that the ACNW reviewed this year involves excellent scientists, is timely, and of high quality.
- ! Although the partitioning of the HLW work in NMSS and the non-HLW work in RES generally causes no major problems, more coordination between the two offices is needed on issues that overlap the HLW and non-HLW areas.
- ! The HLW program needs to be expanded to have a modest long-term, "anticipatory" research component, perhaps through collaboration between NMSS and RES.
- ! The Analytical Hierarchy Program used by RES to prioritize projects fails to account properly for the importance of waste-related research; the prioritization method should be revised to overcome this failure.

- ! The RES waste-related program is not large enough to support the full spectrum of NRC needs. The RES staff should develop a comprehensive plan, including realistic budget estimates, to support the case for either increasing the size of the program and/or focusing the program. Strong leadership will be needed to ensure that the program is coherent and integrated.

Discussion

The ACNW reviewed specific projects and obtained general information on the Radionuclide Transport program in RES at its 118th, 120th, and 123rd meetings. We heard presentations on the leaching of radionuclides from slag, on the treatment of uncertainty in modeling radionuclide transport in the unsaturated zone, and on strategic planning for waste-related research in RES. We are favorably impressed with the research, which engages some of the best people in the field outside the NRC. We view the work as timely and of high quality. The ongoing planning process for waste-related research in RES is also encouraging. We understand that the staff will soon have a Research Program Plan available for public comment.

We are well aware of the work done by NMSS because our charge to advise on matters related to Yucca Mountain leads us to frequent interactions with the NMSS staff. We visited CNWRA during the 123rd ACNW meeting and observed some of the work being done on the coupled flow of water and heat in partially saturated rocks, on radionuclide sorption in alluvium, and on corrosion of Alloy 22. All of this work, done within relatively tight budget constraints, significantly improves the ability of the NRC staff to evaluate the Department of Energy's (DOE's) Yucca Mountain work.

We have concern about the partitioning of high-level waste work in NMSS and non-HLW work in RES. In general, we have found no major problems with this arrangement, but more coordination is necessary. An example is the area of sorption of radionuclides on mineral surfaces. An understanding of sorption is important to assessments of the performance of Yucca Mountain. The CNWRA has done and continues to do work on this topic. Understanding sorption is also important for analyzing a host of non-HLW issues, and RES has a major effort under way on the topic. We believe that it is essential to coordinate these two programs to obtain the most value for the NRC.

Another aspect of the partitioning of HLW and non-HLW issues is the potential for ignoring anticipatory research needs in the HLW area. NMSS focuses on the relatively short-term goal of analyzing what the DOE is doing. RES, on the other hand, is prohibited from doing any work on HLW, even if it is anticipatory and arguably focused on the long term. There is a potential for a gap in the NRC program because of the separation of the NMSS and RES programs. For example, work on secondary phases¹ at Yucca Mountain may be

¹Secondary phases are mineral precipitates, such as uranium oxides, that form after percolating water reacts with spent fuel and other materials in the repository environment. The main issue is the potential for secondary phases to incorporate certain radionuclides in their molecular structure as they precipitate out of solution.

very important to demonstrating compliance. Quantitatively, the process of radionuclide incorporation into secondary phases is poorly understood, but it could be a significant factor in retaining key radionuclides in close proximity to the repository. Recognizing the potential importance of the issue, the ACNW strongly recommended that work to collect the data necessary for understanding the process continue (letters dated September 9, 1998, and January 11, 2000). The CNWRA has done considerable work on this topic.

This work has now been suspended because DOE does not currently plan to take credit for radionuclide incorporation in its performance assessment. This may be a sensible decision for the short term, given the amount of work that NMSS needs to accomplish to be ready for a license application, but it is not necessarily a good decision for assessing long-term safety nor is it a good decision in the spirit of defense in depth. If DOE changes its approach and credits the incorporation of radionuclides into secondary minerals in its analyses, NRC may not have time to develop its own confirmatory data. It may be useful to introduce a long-term, "anticipatory" perspective into the HLW program, perhaps by improved coordination between NMSS and RES.

In past years we have been critical of the RES program in three areas: (1) lack of sound methods of prioritization, (2) the smallness of the program, and (3) the need to focus the program sharply because of its smallness. We continue to be concerned about these issues.

The Analytical Hierarchy Process devised for RES favors research projects on reactor safety. The process should be revised to reflect the importance of waste-related research. We understand that NRC staff has proposed modest changes to the prioritization process to address our concern. We support this effort by the staff.

The research program is too small to accomplish all NRC needs in the waste arena. The staff should develop a plan, including a realistic budget, to address the critical needs of the NRC so it will be prepared if funding is increased. A plan will also help determine priorities within the current resource-limited environment. Strong leadership should be exercised to ensure that a coherent, integrated program evolves. In our report for FY 1998 (NUREG-1635, Vol. 1), we cited the small, tightly focused, and successful program run by the Electric Power Research Institute as an example of what can be done with limited funding.

Summary

In summary, we think that the agency's research activities for the Nuclear Waste Safety Arena are fundamentally sound. We remain concerned about the adequacy of the resources available to the programs in RES and NMSS. We believe the staff should carefully design research and implementation plans to efficiently use available

resources. The staff should address coordination issues. We think that the staff should also address anticipatory research needs in HLW.

Sincerely

/RA/

B. John Garrick
Chairman

References:

1. 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.
2. 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.