



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

ACNWR-0225

August 3, 2005

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

SUBJECT: REPORT ON SELECTED NRC-SPONSORED TECHNICAL ASSISTANCE PROGRAMS AT THE CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

Dear Chairman Diaz:

During the past 16 months the Advisory Committee on Nuclear Waste (ACNW) has written five letters to the Commission describing results of the ACNW's continuing oversight of the Nuclear Regulatory Commission's (NRC's) regulatory technical assistance and research programs. The topics discussed were selected programs of the Center for Nuclear Waste Regulatory Analyses (CNWRA) (March 4, 2004), radionuclide transport (May 5, 2004), uranium dioxide solubility (July 6, 2004), model uncertainty (August 4, 2004), and groundwater recharge (April 27, 2005). The ACNW also briefed the Commission on the research program on March 16, 2005.

As part of the Committee oversight, three members of the ACNW led a focused discussion of selected technical assistance topics on April 13-15, 2005 at the CNWRA in San Antonio, Texas. Two ACNW consultants supported these members. The Technical Director of the CNWRA had previously provided the ACNW team an overview of the accomplishments of the CNWRA and future projects during the 157th ACNW meeting in February 2005. The team focused its April 2005 discussions on activities addressing topics likely to be important in evaluating a license application for a potential repository at the Yucca Mountain site and of particular interest to the ACNW.

This letter, the first of two addressing topics discussed during the April 2005 visit, deals with the CNWRA work on corrosion, radionuclide mobility, and performance assessment modeling. A second letter will address analysis of a potential igneous event at Yucca Mountain and its possible consequences.

Summary of the team's Yucca Mountain-related observations:

- (1) The presentations on container life, the radionuclide source term, the near-field environment, radionuclide retardation, and the published versions of the Department of Energy's Total System Performance Assessment were comprehensive and illustrated the strength of the CNWRA in these areas.
- (2) The CNWRA has made significant progress in ongoing work directed at understanding the controls and the processes involved in container corrosion. Laboratory corrosion studies include stress corrosion cracking resistance of Alloy 22, high-level waste glass dissolution processes, mechanical properties of the waste package, and the relationship between in-package chemistry and package corrosion. The laboratory studies show that corrosion by chloride-containing solutions can be inhibited by appropriate ratios of certain anion concentrations. Studies of Yucca Mountain dust within the waste emplacement drifts indicate that nitrate and sulfate are present in sufficient

concentration to potentially inhibit corrosion. The results of corrosion rate studies are expressed as distributions that incorporate uncertainty in corrosion rates. The CNWRA's humidity deliquescence studies show that, although chloride deliquescence could form corrosive brine, other components of this dust can inhibit such corrosion. The CNWRA is abstracting these results for incorporation in the ongoing model development activities.

- (3) Regarding spent fuel dissolution studies in support of the total-system performance assessment, the CNWRA staff is using parameter values from the technical literature and results from laboratory experiments to model the dissolution of radionuclides from spent fuel. These studies have shown that fuel burnup does not significantly influence dissolution of the uranium dioxide matrix.
- (4) The CNWRA has been responsive to the suggestions made during the ACNW's Geosphere Transport Working Group meeting (ACNW letter to Chairman Diaz dated August 3, 2004). Potential spatial water chemistry impacts on sorption have been evaluated. Additional experiments are underway to determine neptunium sorption in the alluvium. Retardation in the alluvium can provide a barrier to radionuclide migration, and understanding the spatial variability of retardation reduces uncertainty.
- (5) The CNWRA is currently evaluating improvements in the modeling of phenomena such as tephra remobilization, consequences of drift degradation, drip shield and waste container weld corrosion, and colloid transport. Furthermore, numerous parameter values and their distributions reflect recent progress in the understanding of relevant features, events, and processes (FEPs). This work is ongoing and is expected to lead to improvements in evaluation of the risk associated with the FEPs involved in the performance of the proposed repository.
- (6) The CNWRA has ongoing programs that address the frequency, consequences, and potential health effects that are associated with igneous activity, and will publish a number of letters in the next several months. The ACNW will continue to interact with the NRC staff on this subject and will provide a letter to the Commission in the near future.

The CNWRA reported to the ACNW team on its evaluation of models and codes for use in pathway dose assessment for complex decommissioning applications and expects to complete a final letter in October 2005. The ACNW plans to review this work when it is completed.

The ACNW will continue its dialog and meetings with the NRC and CNWRA staffs and will keep the Commission apprised of our view of the progress of this work.

Sincerely,

/RA/

Michael T. Ryan
Chairman

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