



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

March 4, 2004

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

Dear Chairman Diaz:

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

The Advisory Committee on Nuclear Waste (ACNW) conducts periodic reviews of the activities of the U.S. Nuclear Regulatory Commission (NRC) in the Nuclear Waste Safety Arena as they relate to safety research and high-level waste (HLW) technical assistance. In this report we present comments and recommendations regarding aspects of the NRC-sponsored technical assistance being performed by the Center for Nuclear Waste Regulatory Analyses (CNWRA). On February 17-18, 2004, two ACNW members visited the CNWRA to obtain information to be considered by the Committee during its 148th meeting on February 24-27, 2004. Aspects of the CNWRA programs and issues in these programs have also been reviewed with the NRC and CNWRA staffs and other stakeholders at previous ACNW meetings and working groups during the past year. In this letter we focus on:

- Igneous Activity Key Technical Issue (KTI)
- Spent Fuel/Water Interactions in the Waste Package
- Repository Design and Thermal-Mechanical Effects (Post-Closure Drift Stability KTI)
- Pre-Closure Safety Analysis (PCSA Tool)

RECOMMENDATIONS

1. An important part of the igneous activities studies is related to inhalation models for exposure to volcanic ash containing radioactive material. The relationship between specific activity in ash particles and airborne concentration should be used to evaluate doses resulting from inhalation of airborne radioactive materials. These evaluations should include the effects of particle size, solubility, and the relative importance of inhalation and ingestion components of internal dose.
2. The CNWRA staff is currently designing experiments to examine the interactions of water and spent fuel in the waste package. The use of experiments with unirradiated UO₂ fuel pellets as a model for spent fuel/water interactions, as currently proposed by CNWRA, needs to be justified.

3. Further, the CNWRA staff should evaluate the use of spent fuel pool data and safety analyses from existing nuclear power plants and seek opportunities to obtain information from these facilities to provide insights into spent fuel/water interactions.
4. CNWRA evaluations of drift stability and degradation may have design implications. The ACNW is aware of differing views between NRC and DOE on drift stability. It is important that these differences be resolved. See the ACNW letter of March 4, 2004, entitled, "Instability of Emplacement Drifts of the Proposed Yucca Mountain High-Level Waste Repository," for more details on drift stability.
5. It is recommended that staff involved in the development of the PCSA tool obtain information and experience by observing operations at nuclear facilities that handle spent fuel. Information regarding safety assessments at these facilities should be reviewed.

DISCUSSION

The technical assistance work at the CNWRA dealing with issues of importance to an NRC review of the potential Yucca Mountain HLW repository license application continues to be of high quality. For example, the experimental corrosion studies at the Center are building on the evolving knowledge of the near-field environment.

The CNWRA is currently conducting investigations into the consequences of redistribution of volcanic ash containing radioactive material and resuspension of these materials coupled to inhalation exposure scenarios. The Committee supports this effort. Significant progress has been made in developing rational models for addressing this difficult issue. Efforts should be made to use the relationship between the specific activity of airborne particles and airborne concentrations to better develop an inhalation abstraction for intakes. These evaluations should include effects of particle size (from submicron to 100 microns in size), solubility, and the relative importance of the inhalation and ingestion components of internal dose.

The CNWRA staff is currently designing experiments to examine the interactions of water and spent fuel in the waste package. The Committee questions the value of experiments with unirradiated UO₂ fuel pellets as currently proposed by CNWRA. Existing data and analyses from spent fuel pools may be useful to address the question. Fuel has been stored in water at these facilities, in some cases for decades, and pool waters have been sampled and cleaned with ion exchange systems. Information regarding the accumulated activity in pool water and cleanup resins may provide insights about the behavior of spent fuel stored under water over time.

During its October 2003 and November 2003 ACNW meetings, the Committee heard presentations from CNWRA and the Department of Energy (DOE) regarding drift stability and degradation and how these phenomena were analyzed. Additional information was obtained during the February 17-18, 2004, visit that identified three major concerns of the Center staff regarding calculational procedures:

1. The need for an evaluation of the maximum compressive strength of the repository rocks as a function of Young's modulus over a range of values spanning a suitable confidence interval

2. Boundary conditions used by the DOE in its modeling of drift stability
3. Inadequacies in the correction to the horizontal fracture data derived from geological mapping in the Exploratory Studies Facility (ESF)

The Committee encourages the CNWRA and the NRC staff to meet with DOE in the near future to discuss these issues. It is important that the differences in drift stability and degradation be resolved.

The PCSA Tool is being developed to assess the consequences from accidents in the surface facilities of the potential repository. The framework of the PCSA Tool is adequate for analysis of a range of surface facility designs. The staff has performed well in developing a reasonable framework for analyzing public and worker dose scenarios even in the absence of a detailed DOE design.

Sincerely,

/RA/

B. John Garrick
Chairman