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

ACNWR-0239

May 9, 2006

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

SUBJECT: REPORT OF RESEARCH AT THE DEPARTMENT OF ENERGY OFFICE OF SCIENCE, TECHNOLOGY AND INTERNATIONAL PROGRAMS

Dear Chairman Diaz:

At its 168th meeting, March 22-24, 2006, the Advisory Committee on Nuclear Waste (ACNW) heard an information briefing by Department of Energy (DOE) staff supported by the Office of Civilian Radioactive Waste Management's (OCRWM's) Office of Science, Technology, and International programs (OST&I). The briefing was well organized, detailed, and useful to the ACNW. OST&I projects use researchers from industry, universities, national laboratories, international organizations, and Federal agencies and thereby have access to a wide range of knowledge not easily assembled in a single organization. The OST&I staff reported that these programs and their results are not part of the Yucca Mountain Project. The Committee concluded that the results of these OST&I research programs may offer improved understanding of the performance of the proposed repository and/or reduce its cost. The OST&I has recently become part of the OCRWM Office of the Chief Scientist.

Summary of OST&I Reported Activities

Dr. John Wengle, director of the OST&I program, presented an overview of the genesis of OST&I and the focus and direction of its present work. The OST&I work is focused on generating insights into the performance of the waste form and packaging and the proposed Yucca Mountain repository's natural barriers and engineered systems. The OST&I research is organized into the following program areas: advanced technologies, source term, radioactive getters, natural barriers, and materials performance. A seven member external senior-level panel reviews the overall program and provides advice on program direction and investment strategy. Technical leadership is provided for each program area, with work within program areas being performed by various organizations having the needed technical expertise.

Dr. Rodney Ewing discussed current research related to the source term. His presentation focused on the influence of the spent fuel structure and the structure of related uranyl minerals on radionuclide mobility (or stability) in the repository environment. The work addresses the kinetics of waste form corrosion, formation of secondary alteration phases, sorption of radionuclides on the surfaces of near-field materials, the formation and mobility of colloids, the

identification of the most risk-significant radionuclides, and the integration of this information into a performance assessment. Three major research areas are spent nuclear fuel dissolution mechanisms and rates, the formation and properties of U(VI) secondary phases, and the interaction of in-package chemical and physical processes. One reported result of this research is the finding that uranium transport may be slower than initially indicated.

Dr. Joseph Payer presented results of current studies on the corrosion potential, corrosion rates, and passivation of Alloy 22 and related materials in an oxidizing environment. This research is directed at enhancing the understanding of materials corrosion performance and exploring potential technical enhancements. The current work is focused on the performance of waste packages, corrosion-resistant metals, and metal coatings. The project addresses three principal corrosion issues: (1) corrosion of metal surfaces, (2) damage caused by localized corrosion, and (3) the influence of the drift environment on waste package corrosion. Studies focused on corrosion at key time periods are leading to better understanding on the performance of engineered barriers.

Dr. Yvonne Tsang and Dr. Bo Bodvarsson discussed studies of the in-drift environment and of matrix and fracture flow in that environment. They also discussed studies at the Pena Blanca and Hazel-Atlas Mine natural analog sites. The objectives of this work are to develop more realistic models of the natural system by reducing uncertainties and removing of model conservatisms and to provide additional support to multi-barrier evaluations of the proposed repository. It was reported that one finding of the matrix diffusion work is that the natural system makes a large contribution to repository performance. Various phenomena relating to seepage into the near and in-drift environment and transport in the unsaturated and saturated zones are being studied. In particular, “drift shadow effects” in the unsaturated zone below the drift tunnel are being studied.

Dr. Jeffrey Walker discussed a variety of new advanced technologies and their potential applicability to the repository, including improved fabrication techniques, iron-based amorphous metal coatings, tunnel backfill, use of silica-based, low-alkali cements and improved tunnel boring disc cutters in tunnel construction, and the development of more realistic seismic ground response models. The use of iron-based structural amorphous metal coatings could replace Alloy-22 and titanium, as well as improve waste package performance.

Observation

The ACNW continues to believe that the assessment of the performance of the proposed Yucca mountain repository should be risk-informed and based on the best available scientific information. The OST&I research program results reported to the Committee are potentially important to an assessment of this kind. Further, the OST&I’s work has potential application to design improvements that could affect the performance and/or cost of the proposed repository.

Recommendation

The Committee supports enhanced communication between the NRC staff and OST&I, so that the NRC staff will be prepared to use, as appropriate, the information developed by OST&I in its assessment of the performance of the Yucca Mountain repository.

Sincerely,

/RA/

Michael T. Ryan
Chairman

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Sincerely,

Michael T. Ryan
Chairman

* See previous concurrence.

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