UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS
WASHINGTON, D.C. 20555-0001

ACNWS-0177

December 11, 2007

The Honorable Dale E. Klein
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: SUMMARY REPORT – 184th MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS, NOVEMBER 13-15, 2007, AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 184th meeting, November 13 -15, 2007, the Advisory Committee on Nuclear Waste and Materials (ACNW&M) discussed several matters and completed the following letters to Dr. Dale E. Klein, NRC Chairman, from Dr. Michael T. Ryan, ACNW&M Chairman.

- Proposed Rulemaking to Prevent Legacy Sites
- NUREG-1854, "NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations – Draft Final Report for Interim Use"
- Review of Draft Regulatory Guide 4012
- Total System Performance Assessment Code Version 5.1
- Regulatory Guide Revision

HIGHLIGHTS OF KEY ISSUES

1. Drift Degradation – Staff Review Approach and Capability

NRC staff representatives from the Office of Nuclear Materials Safety and Safeguards (NMSS) gave a presentation about post-emplacement drift degradation at the Yucca Mountain, NV, proposed high-level waste geologic repository. The purpose of the briefing was to describe the staff's approach and capability to review the Department of Energy's (DOE's) analyses in a potential license application. NRC staff summarized the DOE underground design, as it is currently known, and then discussed the potential causes of failure of underground openings. In-situ stress conditions change because of excavation-induced mechanical stresses, thermal stresses, and earthquakes. Failure may be due to the strength of the rock being exceeded or due to excessive deformation. DOE plans to install ground support to provide stable underground openings during pre-closure operations. NRC staff will determine the adequacy of ground support design in the context of pre-closure performance objectives. DOE takes no credit for ground support performance beyond the pre-closure period. The staff considers that the uncertainty is high in predicting long-term stability of underground openings under thermal

and seismic conditions. Rockfall, drift collapse, and drift degradation could occur during the long regulatory period and impact the engineered barrier mechanical performance.

The NRC staff's review will evaluate whether DOE appropriately considered the following in their application: (1) site characteristics and material properties; (2) conceptual models and failure criteria; (3) calibrated and validated models; and (4) ranges of conditions and parameter distributions to account for uncertainty and variability. The staff review will also consider results of independent analyses regarding effects of static loads, potential drip shield-waste package interaction, and potential for damage under seismic conditions. Abstractions in TPA 5.1 consider the potential long-term impacts of drift degradation due to thermal and seismic stresses on engineered barrier performance. Secondary considerations for potential failure modes include the separation of intact drip shields, individual rockfall impacts upon drip shields, and waste package damage due to faulting events.

Committee Action

The Committee has requested a briefing on a new Electric Power Research Institute (EPRI) report on drift degradation, to be presented at the December meeting. At that time, a letter report to the Commission will be drafted on drift degradation issues based on insights gained from the November and December briefings, and from observations at the NRC-DOE Appendix 7 meeting in October.

2. Final Proposed Design for a Geologic Repository at Yucca Mountain, Nevada

The Committee has been periodically briefed on the maturity of the DOE's geologic repository design to be used for any license application that falls under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository in Yucca Mountain, Nevada." In June 2008, DOE is expected to submit a license application to the NRC to obtain authorization to construct the geologic repository. At its 184th meeting, the ACNW&M was briefed on the final surface facility design to be included in the forthcoming license application. The DOE representative noted that the key features of the geologic repository operations area (GROA) physical plant have been designed around the types of waste forms expected to be received for disposal at the proposed Yucca Mountain geologic repository. The presentation also included an overview of the structural design process. It was noted that, based on updated scientific information derived from the study of additional site characterization data, the seismic design basis ground acceleration has been lowered from 0.7g to 0.5g. The DOE spokesperson noted that during the NRC staff review of the license application, DOE intends to develop a more detailed design for the purpose of establishing a baseline cost estimate. It was also noted that there were some aspects of the GROA design which were unique to a geologic repository and that detailed information on those features' performance and reliability might not be available until after a DOE procurement has been put into place. This would likely be after an NRC construction authorization decision.

Lastly, there was some discussion of the 3.0g design basis to be used by vendors fabricating the transportation-aging-disposal (TAD) canisters. The DOE speaker noted that the 3.0g value was established as a "beyond design basis event" phenomenon and was intend to ensure that dry cask storage systems would not be susceptible to overturning moments as a result of a seismic event. The concern was that TAD systems do not have radiation shielding on either the top or the bottom of the storage containers. In the event of an overturn, attempts to upright the containers could compromise worker safety.

Committee Action

The Committee intends to integrate some of the information it learned during this briefing into a future letter on seismic design issues.

3. Accounting for Dose Consequence in the State-of-the-Art Reactor Consequence Analyses (SOARCA) Project

Representatives from NRC's Office of Nuclear Regulatory Research (RES) and the Office of Nuclear Security and Incident Response (NSIR) briefed the Committee about the State-of-the-Art Reactor Consequence Analyses (SOARCA) Project. The goal of SOARCA is to develop an updated, more realistic evaluation of severe accident progression, hypothetical radiological releases, and offsite consequences for dominant accident sequences. The updated analyses would replace older analyses such as those in NUREG/CR-2239, "Technical Guidance for Siting Criteria Development," which was issued in 1982.

The SOARCA project plan would initially include not more than eight power plants that together represent the different reactor and containment design combinations operating in the United States. Full power operation would be assumed, as would existing plant improvements in design, operations, and emergency response. Sensitivity analyses would be used to assess the effectiveness of safety measures. State-of-the-art accident progression modeling would be performed based on 25 years of research to provide a best-estimate for containment performance, time of release, and fission product behavior. More realistic offsite dispersion modeling would be applied. An evaluation of public evacuation would be based on updated site-specific emergency plans.

The presenters emphasized that the hypothetical consequence analyses would need to identify potential early fatalities and also estimate latent cancer fatalities. Various options are being considered for latent cancer fatality estimates. These include: (1) using the linear no threshold (LNT) model; (2) applying a range of biological response thresholds (from 0 to 5 rem); and (3) using an estimated point value as suggested by the Health Physics Society (i.e., 5 rem in one year, 10 rem in a lifetime). No specific modeling analyses were presented to the Committee at this meeting. A Commission paper on SOARCA is currently under staff review.

Committee Action

The Committee has requested RES staff to provide another briefing in the near future in order to address specific details about the computational tools (e.g., the MACCS2 code, used to predict consequences from accidental atmospheric radiological releases) being used to support this effort. The Committee will also host a working group meeting on the LNT model in April 2008.

RECONCILIATION OF ACNW&M COMMENTS AND RECOMMENDATIONS WITH COMMITMENTS TO THE EXECUTIVE DIRECTOR FOR OPERATIONS (EDO)

- During its planning and procedures meeting on November 13, 2007, the Committee considered the response of the EDO, dated November 6, 2007, to comments and recommendations included in the October 2, 2007, ACNW&M letter on, "NRC Plans for Monitoring Disposal Actions for Waste Incidental to Reprocessing at U.S. Department of Energy Facilities at the Idaho National Laboratory and Savannah River Sites."

The Committee was satisfied with the EDO response and decided that no follow up action was necessary.

- The Committee also agreed that, instead of writing a rebuttal letter to the EDO's response, dated August 7, 2007, on the June 28, 2007, ACNW&M letter titled, "Working Group Meeting on 10 CFR 20.1406 Minimization of Contamination and Proposed Regulatory Guide 4012," the Members would write a new letter to the Commission on the same topic but with stronger and clearer recommendations.

PROPOSED SCHEDULE FOR THE 185th ACNW&M MEETING

The Committee agreed to consider the following topics during the 185th ACNW&M meeting to be held on December 17-19, 2007:

- EPRI's Report on Drift Degradation at Yucca Mountain
- Update on NRC Rulemaking on Groundwater Protection at In-Situ Leach Uranium Mining Facilities
- Vendor's View on the TAD Performance Specifications
- Status of Operations at the Barnwell LLW Disposal Facility
- NRC 2006 Commercial LLW Strategic Planning Initiative
- Review of Planned Waste Management Activities at U.S. Department of Energy Mixed-Oxide Fuel Fabrication Facility
- Briefing on Tritium Task Force Actions to Revise the Significance Determination Process to Address Spills and Leaks

Sincerely,

/RA/

Michael T. Ryan
Chairman

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Michael T. Ryan
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Letter To: Dale E. Klein, NRC Chairman

From: Michael T. Ryan, Chairman
ACNW&M

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