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

ACNWS-0170

May 1, 2007

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

SUBJECT: SUMMARY REPORT—177TH MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE, MARCH 20–22, 2007, AND RELATED ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 177th meeting on March 20–22, 2007, the Advisory Committee on Nuclear Waste (ACNW or the Committee) discussed several matters.

HIGHLIGHTS OF KEY ISSUES

1. Savannah River National Laboratory Workshop on Cementitious Materials Used in Waste Determination

Professor Barry Scheetz from the Pennsylvania State University briefed the Committee on a workshop on the use of cement in radioactive waste applications that was held in Aiken, South Carolina, on December 12–14, 2006, and hosted by the Savannah River National Laboratory, U.S. Department of Energy (DOE), Vanderbilt University, and the Consortium for Risk Evaluation with Stakeholder Participation.

Professor Scheetz explained that the workshop was structured around five main topics. These are (1) the role of cementitious materials in meeting regulatory and stakeholder requirements for DOE low-level waste disposal, (2) chemical, mineralogical, and contaminant transport properties of cementitious materials, (3) water and gas transport through cementitious materials, (4) degradation mechanisms and test methods, durability criteria, and long-term degradation evaluation, and (5) long-term performance predictions and risk assessment integration of cementitious materials in performance assessment modeling. He also noted that civil engineering applications focus on a timeframe of 25 to 100 years and not the thousands of years required for DOE applications, and that the use of data from civil engineering applications to assess the performance of cementitious materials in waste treatment and disposal applications over thousands of years represented a challenge.

Professor Scheetz indicated that the issues discussed at the workshop related to modeling and perceived needs, including modeling and data needs. Modeling issues discussed included (1) the appropriateness of applying models to assess the performance of cement in applications involving long timeframes, (2) the need for an iterative approach so that models can be adapted

to changing regulations and technologies, (3) avoidance of conservatism and gross under-estimation of the performance of systems, and use of an appropriate degree of complexity and realism, and (4) the need for controlling mechanisms, monitoring, and maintenance. He said that there is a need for an integrated cement durability degradation model, as well as coupling of reaction and transport with mechanical properties, modeling of transport in the vadose zone, and moving toward probabilistic models. He added that data needs include lack of fundamental thermodynamic data, lack of kinetic data, lack of information on redux coupling in an alkaline environment, lack of speciation data for radionuclides, lack of experience with transport in the vadose zone, lack of a common engineering and materials database, lack of a framework for survivability of blended cements, need for better understanding of cracking, and lack of microstructural development and evolution.

Professor Scheetz noted two other important issues that the workshop did not cover. These are the role of organic admixtures in grout/concrete formulations and the failure to understand scaling with respect to energy input into mass concrete.

Committee Action

No action is necessary.

2. Stakeholder Views on Moderator Exclusion

Representatives from the Nuclear Energy Institute, the Electric Power Research Institute (EPRI), and H322 Consulting LLC briefed the Committee on their views concerning moderator exclusion in transportation casks for spent nuclear fuel. In particular, they addressed the pros and cons, alternatives, and risk considerations for moderator exclusion. Additionally, staff from Idaho National Laboratory/DOE briefed the Committee on an upcoming license application requesting the approval of the U.S. Nuclear Regulatory Commission (NRC) for the DOE standardized spent nuclear fuel canister relying on the use of moderator exclusion. The presentation to the Committee summarized (1) the reasons that credit for moderator exclusion is needed, (2) the packaging approach for ensuring leak-tightness, (3) the supporting analytical work and testing, and (4) the presenters' understanding of the regulatory issues associated with crediting the canister for remaining leaktight. Following the presentations, Dr. Ruth Weiner led a followup discussion with the presenters and representatives from the NRC's Office of Nuclear Materials Safety and Safeguards, Division of Spent Fuel Storage and Transportation, on the technical and regulatory issues surrounding the moderator exclusion issue.

Committee Action

The Committee plans to write a letter report to the Commission that summarizes its conclusions and recommendations concerning the use of moderator exclusion for spent fuel transportation casks.

3. ACNW Meeting with NRC Commissioner Gregory B. Jaczko

Commissioner Jaczko gave a public presentation that addressed regulatory issues of interest to him and to the Committee. In his introductory remarks, the Commissioner indicated that he wanted to discuss some issues that he found important and that he wanted to hear the

Committee's views on these issues and other topics of interest to the Committee. He noted that the ACNW charter should be revised and that the Committee's role should be expanded to include the materials area. He also noted that the ACNW role is to give indepth reviews of staff work and to inform the Commission about important issues. He observed that the Committee has done that in certain areas such as the high-level waste program. The Commissioner then discussed the following topics.

Risk from Use of Nuclear Materials. The Commissioner noted that the use of nuclear materials entails risks and that exposure from the use of nuclear materials has immediate health consequences. He said that the NRC is not well recognized for the work that it does within its regulatory authority in the materials area and that actions can be taken in this regard, including looking at improvements in human performance or training or other kinds of actions to reduce the incidence of medical exposures and industrial exposures. The Commissioner finds this area of great interest.

Use of Models. The Commissioner indicated that ACNW can provide good guidance to the Commission on the use of models in different applications and areas of interest, such as decommissioning, dose analysis and dose assessment, and high-level waste. He said information is needed on appropriateness, limitations, and accuracy of models and that such information should be presented and made accessible to policymakers and stakeholders.

Definition of Nuclear Materials. The Commissioner observed that the definition of nuclear materials is currently based on their origin and is not risk-informed and that the definition ought to be based on health and safety impacts and the associated risk. He cited the cleanup at the Heritage site in New Jersey as an example, indicating that site cleanup was limited to uranium and thorium that meet the criterion for licensable material (0.05 percent by weight) but that neither the site cleanup nor the dose calculation considered uranium and thorium that did not meet this criterion, despite the inherent risk to public health and safety. The Commissioner concluded that the definition of nuclear materials should be based on public health and safety and not on whether the material could be useful as a commercial source.

Low-Level Waste. The Commissioner discussed the need for a national policy and framework for long-term disposal issues related to low-level waste, including greater-than-Class C waste.

Risk from Dry Cask Storage. The Commissioner noted that the NRC staff has done much work recently to evaluate the risks from dry cask storage, including fuel loading, transport, and storage. He indicated that the work was good, but he was surprised that the integrated risk was so low and he believes that the estimated risk may warrant further examination.

A roundtable discussion of the issues followed the Commissioner's presentation. The Committee members responded positively to the Commissioner's concerns, and the discussion revolved around how the Committee can best use its expertise and experience to support licensing actions by the Commission. Committee Chairman Michael Ryan said that the Committee was pleased that the Commissioners had expressed interest in revising the ACNW charter and expanding ACNW support to the Commission. He noted that ACNW has shifted from the high-level waste program to the materials area, which is reflected in the ACNW Action Plan for fiscal years 2007 and 2008. He observed that there are more than 20,000 Agreement State materials licensees and that ACNW can add value in the materials area. Other topics

discussed with the Commissioner by the Committee members included modeling and monitoring; transportation of nuclear materials including testing of transport packages; material and waste definition and classification; disposal of low-activity Class A waste in Resources Conservation and Recovery Act facilities; decommissioning issues; and Yucca mountain licensing support including license application reviews and reviews of specific topics such as seismicity, drift stability, and performance assessment.

Committee Action

The Committee will consider all of Commissioner Jaczko's comments and concerns as it proceeds to implement its action plan for fiscal years 2007 and 2008.

4. Update by DOE on the Proposed Yucca Mountain Repository Design

The Committee has been periodically briefed on the maturity of the DOE geologic repository design to be used for any license application under Title 10, Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada," of the *Code of Federal Regulations* (10 CFR Part 63). The most recent of these briefings was in April 2005 during the Committee's 159th meeting. Since that briefing, DOE has announced its intent once again to rely on a multipurpose waste package disposal canister. (In the 1988 Site Characterization Plan, DOE originally had intended to rely on a multipurpose waste package disposal canister to perform essentially the same functions as the newer (circa 2006) transportation-aging-disposal or TAD canister concept.) TAD-packaged waste will go either directly underground once it arrives at the site or temporarily to one of two thermal aging pads for cooling before geologic emplacement. The use of a TAD canister is expected to simplify waste handling operations (and hence the overall surface facility design) as well as to reduce worker occupational exposures because it eliminates the need for repackaging most of the waste received at the site.

At the 177th meeting, DOE again briefed ACNW on the status of the surface facility design. In that briefing, Mr. Paul Harrington highlighted the following major changes to the preclosure surface facility design:

- the use of a TAD canister for the disposal of most of the Yucca Mountain radioactive waste
- a reconfigured waste handling process and facility layout to receive TAD canisters
- the introduction of an initial handling facility to receive non-TAD-compatible waste (i.e., naval spent nuclear fuel and vitrified high-level radioactive waste)
- an expanded onsite emergency power generating capacity
- a nonrail waste package transport system that would convey TAD canisters to the repository emplacement horizon

The DOE representative noted that DOE will continue to have a wet handling facility for the 10 percent of the "non-spec" fuel that it expects will need to be repackaged for disposal.[1] The reconfigured facility layout also allows for the construction of expanded canister receipt and closure buildings if additional throughput capacity is needed for non-spec waste. Regarding the maturity of the overall repository design itself, the DOE speaker noted that the conceptual design had been completed (by virtue of the DOE so-called "Critical Decision 1") and the preliminary designs (i.e., those designs to be actually used for licensing) are now under development. These preliminary designs will include structural analyses to ensure that the design satisfies the necessary safety margins. The preliminary design, in conjunction with time and motion studies, will form the basis for the 10 CFR Part 63 integrated preclosure safety assessment to be included in the license application. The DOE representative noted that the Department had no outstanding information needs (requests) directed to the NRC staff in order to complete the preclosure design elements of a 10 CFR Part 63 license application later this fall.

Committee Action

No action is needed at this time. The Committee will receive a staff briefing on its readiness to review a DOE geologic repository design in May 2007. The Committee intends to track developments in this area and receive a second DOE design briefing before the end of the calendar year.

5. ACNW Action Plan for Fiscal Years 2007 and 2008

The Committee discussed and approved its Charter and Action Plan for fiscal years 2007 and 2008.

Committee Action

The Committee agreed to send the charter and action plan to the Commission.

6. Briefing on Shieldalloy, New Jersey, Site Decommissioning Plan

Ms. Rebecca Tadesse and Mr. Ken Kalman from the Division of Waste Management and Environmental Protection (DWMEP) of the Office of Federal and State Materials and Environmental Programs (FSME) provided a briefing on the Shieldalloy Metallurgical Corporation's decommissioning plan (DP) for its Mayfield, New Jersey, site. Participants agreed before the meeting that this briefing would introduce the DP and the conditions at the site and would not address any preliminary results of the staff review.

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[1] As a nominal planning assumption, DOE expects that about 10 percent of the waste destined for the proposed geologic repository will be "non-spec" and therefore unacceptable for a TAD-type of waste package canister. The operational goal, therefore, is to have the utilities load 90 percent of the waste into TAD canisters.

DWMEP staff representatives provided maps and pictures showing the location of the site and current conditions of the slag and baghouse dust that require cleanup. The representatives explained that Shieldalloy has applied to release the majority of the site under unrestricted conditions and to collect and dispose of the contaminated materials under an engineered disposal structure similar to a uranium mill tailings pile that will be released under restricted conditions with a long-term control license with the NRC. Representatives discussed the unsuccessful attempt by Shieldalloy to sell the slag and baghouse dust.

The representatives explained that seven requests for hearings on the DP license application have been submitted. In addressing questions from the Committee, the staff representatives summarized their views of the main objections contained in the requests for hearings. The representatives presented a brief schedule for the DP review, with the next step being preparation of the initial requests for additional information, which DWMEP will finish by the end of April. The representatives also indicated that DWMEP will perform an independent dose analysis of the Shieldalloy proposal as part of its DP review.

Committee Action

The Committee agreed not to write a letter to the Commission at the conclusion of this meeting. However, the Committee requested that FSME brief the ACNW again as soon as possible after it completes the initial requests for additional information on the DP.

7. Updated Electric Power Research Institute Response on Potential Igneous Event at Yucca Mountain

Dr. Meghan Morrissey (Colorado School of Mines and representing EPRI) briefed the Committee in a presentation that responded to a January 2007 report by the Center for Nuclear Waste Regulatory Analyses ("Review of Two Electric Power Research Institute Technical Reports on the Potential Igneous Processes Relevant to the Yucca Mountain Repository"; NRC ADAMS Accession No. ML070190134) that had reviewed two EPRI volcanism reports. Dr. Morrissey organized her talk in response to specific comments on topics that included the nature of magma in a drift, heat loss (including magma solidification and in-drift thermal calculations), and magma dynamics. In conclusion, Dr. Morrissey provided the following summary:

> EPRI believes that the conceptual model derived and analyses conducted by EPRI since 2004 are based on observations made routinely at volcanoes and on data from appropriate analogs of future Yucca Mountain volcanism. Contrary to the position put forward by the NRC and their consultants, EPRI's analyses are consistent with fundamental physical and chemical processes and EPRI's igneous consequences at Yucca Mountain are indeed technically defensible.

Committee Action

The presentation slides, discussion, and transcript of this briefing will assist ACNW in preparing a final version of the white paper on igneous activity. This white paper will provide an analysis of the current state of knowledge of igneous activity which the Commission can use as a technical basis for decisionmaking.

8. ACNW White Paper on Volcanism

This session was a followup of the discussion at the February working group meeting on volcanism at Yucca Mountain. Dr. William Hinze led the discussion, which included a general overview of observations, revisions, and summary conclusions for the white paper. The draft white paper placed on the Internet did not include conclusions because the authors were awaiting feedback from the many interested parties. After receiving this feedback, the authors drafted a preliminary set of conclusions, which the members reviewed and discussed. The Committee received these preliminary conclusions positively. The Committee also discussed a summary table of igneous processes, which it is considering for inclusion in the white paper. Copies of this table were emailed to interested parties, who were asked to provide any additional input within 1 week.

Committee Action

The Committee has advised the team of two members, a consultant, and a staffer to proceed with preparing a final draft of the white paper on igneous activity for review during the April meeting.

RECONCILIATION OF ACNW COMMENTS AND RECOMMENDATIONS/EXECUTIVE DIRECTOR FOR OPERATIONS COMMITMENTS

- The Committee considered the response of the Executive Director for Operations (EDO), dated February 8, 2007, to comments and recommendations included in the December 27, 2006, ACNW letter on the working group meeting on using monitoring to build model confidence. The Committee decided that it was satisfied with the EDO response.

- The Committee considered the EDO response of February 16, 2007, to comments and recommendations included in the January 4, 2007, ACNW letter on the proposed revision to Regulatory Guide 1.112, “Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Nuclear Power Reactors.” The Committee decided that it was not satisfied with the EDO response.

  In the response, the staff stated that it had considered updating the technical basis documents and the Gaseous and Liquid Effluent (GALE) computer codes before updating Regulatory Guide 1.112. Since the NRC expects to receive the first combined operating license application in fall 2007, the staff decided to proceed with incorporating an updated American National Standards Institute (ANSI) and American Nuclear Society (ANS) standard (i.e., ANSI/ANS-18.1-1999, “Radioactive Source Term for Light Water Reactors”).

  As an interim measure, the Committee believes that the NRC staff should have considered performing a preliminary evaluation to determine which of the input parameters and calculational approaches for GALE code calculations for new reactor

designs would be different from current reactor designs. The Committee also believes that the staff should use the best available experimental data and calculational models to risk-inform the GALE codes.

Sincerely,

/RA/

Michael T. Ryan
Chairman

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