



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

ACNWS-0178

January 14, 2008

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

SUBJECT: SUMMARY REPORT – 185<sup>th</sup> MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS, DECEMBER 17-19, 2007, AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 185<sup>th</sup> meeting, December 17-19, 2007, the Advisory Committee on Nuclear Waste and Materials (ACNW&M) discussed several matters and completed the following letter to Dr. Dale E. Klein, Chairman of the Nuclear Regulatory Commission (NRC) from Dr. Michael T. Ryan, Chairman of the ACNW&M.

- “Seismic Design of Pre-Closure Facilities at the Proposed Yucca Mountain Geologic Repository Operations Area,” dated January 8, 2008

HIGHLIGHTS OF KEY ISSUES

1. Electric Power Research Institute’s (EPRI’s) Report on Drift degradation at Yucca Mountain

Dr. John Kemeny, from the University of Arizona and representing EPRI, addressed the Committee on his recent results when modeling thermal spalling of the tuff host rock found in underground excavations at the proposed Yucca Mountain Repository. He defined rock spalling as rock failure at the boundary of a rock mass, usually forming slabs that bulge from the rock and may eventually detach, causing rockfall. Progressive spalling can occur due to changing stress conditions and time-dependent behavior. Dr. Kemeny emphasized that progressive spalling that leads to total drift collapse only occurs in extreme conditions: (a) extremely high stresses relative to the rock strength (in-situ stresses greater than five times rock mass strength; maximum tangential stress at boundary greater than 10 times rock mass strength); (b) very low stresses and a very weak rock mass. These extreme conditions are not expected to occur for the static stresses and thermal loading expected at Yucca Mountain.

Dr. Kemeny commented that the opinion of the Center for Nuclear Waste Regulatory Analyses (CNWRA), i.e., that thermal stresses would cause relatively large rock failure zones, was based on an elastic structural analysis with a worst-case assumption about post-peak rock behavior in the failed zones. EPRI modeling, instead, was performed using a continuum model (FLAC) and a discontinuum model (UDEC). Various model results were presented for a variety of rock types and conditions. The FLAC results show that if the strain softening parameter is small

enough, a large amount of spalling could occur. However, Dr. Kemeny noted that for all categories of lithophysal tuff, the actual values of the rock strain softening parameter were significantly greater than the critical value needed for large spalling. The model therefore predicts stable drifts with isolated rockfall in the initially overstressed region. The UDEC results indicate that only isolated blocks within the damaged zone would be expected to produce rockfall and most of the damage would occur within the first 50 -150 years. Dr. Kemeny reported that there is good correlation between the FLAC and UDEC results. None of the computer code results predict large amounts of spalling under thermal loading that would fill the drifts with rock blocks.

Dr. Kemeny commented that his model results are consistent with actual observations in the drifts, such as the small amount of spalling that has occurred at the drift-scale heater test in the nonlithophysal tuff. He referred to this test as the best analog available for the thermal effects. If "runaway spalling" is not seen in the nonlithophysal tuff, it definitely would not be seen in the lithophysal tuffs that make up most of the proposed repository. Dr. Kemeny said that the CNWRA does not consider this a good analog because the test drift was outfitted with rock bolts and mesh. However, the support stress provided by a rock bolt is very small compared to the thermal stress in the rock; therefore, the rock bolts would not likely change the dynamic of the spalling region, as confirmed by his model results.

#### Committee Action

The Committee is preparing a letter report to the Commission on drift degradation issues based on insights gained from the November 2007 and December 2007 briefings, and from observations during the NRC-DOE Appendix 7 meeting in October 2007 on drift degradation.

#### 2. Update on NRC Rulemaking on Groundwater Protection at In-Situ Leach Uranium Mining Facilities

NRC staff Gary Comfort and Mike Fliegel from the Office of Federal and State Materials and Environmental Management Programs briefed the Committee on the NRC rulemaking on groundwater protection at in-situ leach uranium mining facilities. Staff provided background information, including Commission directives, and discussed the rulemaking development activities and the status of the rulemaking effort. The Committee was updated on ongoing and planned interactions with the U.S. Environmental Protection Agency (EPA), with regard to the appropriate standard to be used as well as EPA comments on preliminary language for the draft rule that staff had requested the EPA to review. Staff also discussed the planned activities and indicated that they expect to complete an updated draft rule and submit it to the rulemaking working group by early 2008, and a version that can be submitted to the Commission in the fall of 2008. The staff noted that all of the Committee recommendations included in a May 9, 2007, Committee letter report to the Commission have been addressed.

#### Committee Action

The Committee decided not to write a letter report to the Commission as a result of this briefing. However, the ACNW&M staff was instructed to redistribute to FSME staff a copy of the earlier trip report by Committee members Ruth Weiner and Bill Hinze, and ACNW&M staff member Latif Hamdan, on their visit to the U.S. Department of Energy's Office of Legacy Management in Grand Junction, Colorado, and uranium mill tailings sites in Colorado and Utah in August 2007.

### 3. Vendor's View on the Transportation-Aging-Disposal Performance Specifications

Mr. Charles Pennington from NAC International, a commercial cask vendor, briefed the Committee on NAC's views on the Department of Energy (DOE) Transportation-Aging-Disposal (TAD) performance specification (PS). Mr. Pennington discussed four technical issues in the PS that NAC believes are important and should be given attention by both the industry and NRC. Mr. Pennington addressed the use of borated stainless steel neutron absorber material in the TAD basket design as a structural material. To date, NRC has not approved borated stainless steel as a structural material in cask designs. In order to do so, the NRC staff will probably need the evaluation of an American Society of Mechanical Engineers (ASME) code case. In addition, questions linger about the weldability and the use of flux traps for a borated stainless steel basket. Mr. Pennington also informed the Committee that current designs for NAC's commercial storage/transport canisters have a design life of 40 to 50 years. However, the PS specifies a canister design life of 60 years at reactor sites and 50 years at an aging facility. Mr. Pennington said that NAC foresees no limitations on design life requirements, but justification to demonstrate such a change is not clear to the industry. Mr. Pennington discussed issues associated with the disposable control rod assembly (DCRA), such as the need for more design information on thick Zircaloy spent fuel cladding and extended poison coverage. He also told the Committee that water displacement by the DCRA's may make flux traps a more important issue for DOE to consider in the design of the TAD. The PS requires analysis of canister drops at the GROA [geological repository operations area] from seismic or handling events. NAC feels that these analyses may have some impact on the TAD's design requirements for storage and transportation.

#### Committee Action

The Committee agreed not to write a letter report to the Commission as a result of this briefing. However, the Committee will continue to stay informed about the technical issues associated with the TAD.

### 4. Status of Operations at the Barnwell Low-Level Radioactive Waste (LLW) Disposal Facility

Mr. William House, a representative from Energy Solutions, the operator of the Barnwell LLW disposal site, briefed the Committee on planned activities at this commercial disposal facility in anticipation of scaled-back operations. In 2000, the South Carolina State Legislature voted to implement a permanent moratorium (to take effect in July 2008) on non-Compact waste disposal at the Barnwell site. Mr. House stated that the Barnwell site is estimated to have about 30 to 50 years of remaining operational life based on projected volumes of in-region wastes representing about 1.2 million cubic feet of disposal capacity. This volume is considered sufficient for the fleet of existing nuclear power reactors sited within the Atlantic LLW compact. Transitioning to in-region operations is also expected to have an impact on the cost-structure for future waste disposal operations at the Barnwell site since those costs will no longer benefit from economies of scale formerly associated with higher-volume disposal operations. The speaker outlined what those future disposal costs might be based on three different operational scenarios. To ease the transition to in-region only operations, the speaker also noted that Energy Solutions has decided to commence certain long-term site stabilization activities that would facilitate disposal site decommissioning and long-term institutional care at some later date. This would include the installation of 8 to 10 new ground-water monitoring wells. Mr. House noted that it will take about two years of modified in-region operations to acquire estimates of new disposal costs for in-region LLW generators.

### Committee Action

This briefing was intended for information purposes only. No letter report to the Commission will be prepared. The Committee, however, intends to keep track of issues related to long-term LLW storage.

#### 5. NRC 2006 Commercial Low-Level Radioactive Waste (LLW) Strategic Planning Initiative

Mr. James Kennedy, representing NRC's Office of Federal and State Materials and Environmental Management Programs (FSME), briefed the Committee on SECY-07-0180. Over the last several years, there have been a number of external activities and initiatives underway that may have a bearing on the future of commercial LLW management in the United States. As a result, the NRC staff decided to conduct a strategic assessment of its LLW regulatory program. The ultimate objective of this assessment was to identify and prioritize activities that the NRC staff could undertake to address vulnerabilities in the current regulatory framework, while also factoring in and addressing future needs and changes that may occur in the nation's commercial LLW management system. NRC staff solicited stakeholder views on these issues by publishing a request in the *Federal Register* in July 2006. Following a review of the comments received, the staff issued their LLW strategic assessment as SECY-07-0180 in October 2007. Mr. Kennedy noted that 20 tasks/activities were identified for consideration in the assessment. Appendix C to SECY-07-0180 provides a comprehensive summary showing the relationship of each of the 20 proposed products/activities to NRC strategic goals, the relative need for the task, the estimated level of effort required, anticipated benefits, potential unintended consequences, and ranking of each task as low, medium, or high priority. During the briefing, it was emphasized that the LLW strategic assessment was considered to be more of a management tool to describe what specific tasks/activities the staff intends to undertake in the near-term rather than a broader examination of what can be done to improve the development of new LLW disposal capacity within the nation. Mr. Kennedy noted that there were about nine LLW tasks the staff intends to undertake and complete in fiscal years 2008-09.

### Committee Action

The Committee decided to write a letter report to the Commission commenting on SECY-07-0180.

#### 6. Review of Planned Waste Management Activities at DOE Mixed-Oxide Fuel Fabrication Facility

Mr. David Tiktinsky from NRC's Office of Nuclear Material Safety and Safeguards (NMSS) briefed the Committee on the proposed waste management activities at a planned DOE Mixed Oxide Fuel Fabrication Facility (MFFF) in Aiken, South Carolina. Mr. Tiktinsky informed the Committee that a Construction Authorization for the MFFF facility was issued in March 2005, and that nuclear construction began in August 2007. A License Application to possess and use radioactive material was submitted in September 2006 and accepted for docketing in December 2006. Mr. Tiktinsky indicated that the application is currently under review and provided information on the review schedule. A description of the facilities and buildings under construction was provided with specific focus on the status of the waste solidification building and an overview of the MFFF process and the types and quantities of solid and liquid waste that will be generated. Mr. Tiktinsky discussed the liquid waste streams and liquid waste holdup capabilities and transfer protocol. He also addressed the controls for the interface between the

MFFF and the Savannah River Site (SRS) for disposition of waste from the MFFF operation, as well as the potential impacts and response in case the SRS operations are disrupted or have to be suspended. Mr. Tiktinsky concluded that the storage capacity for the low level liquid waste stream is limiting and that the MFFF has contingency plans to shutdown in a safe state if the SRS is unavailable for disposition of waste.

#### Committee Action

The Committee offered comments on the proposed waste management plan in the MFFF License Application and requested a followup briefing after the staff has completed its review of the application.

#### 7. Briefing on Tritium Task Force Actions to Revise the Significance Determination Process to Address Spills and Leaks

Ms. Elaine Keegan and Mr. John Thompson from NRC's Office of Nuclear Reactor Regulation, Division of Inspection and Regional Support, briefed the Committee on proposed changes to the reactor Significance Determination Process (SDP) to address spills and leaks. These changes are in response to actions identified in the Liquid Radioactive Release Lessons Learned (Tritium) Task Force Report. The changes to the SDP were approved by the Commission in Staff Requirements Memorandum SRM-SECY-07-0112. First, Mr. Thompson provided an overview of the Reactor Oversight Process, of which the SDP is one component in determining the safety status of operating reactors. This explanation was intended to provide the Committee with background and perspective on how the changes to the SDP would work when they are implemented. Ms. Keegan then provided information on the changes to NRC Inspection Manual Chapter 0609, Appendix D, *Public Radiation Safety*; these changes add leaks and spills to the areas of review conducted to determine the significance of inspection findings concerning public radiation safety from normal operations of operating reactors. The proposed changes discussed are: (a) to eliminate the white finding from the environmental branch of the SDP; (b) to modify the radioactive effluent release branch of the SDP to specifically include spills and leaks; and, (c) to indicate that the white finding in the radioactive effluent release branch of the SDP is appropriate.

#### Committee Action

The Committee decided that a letter report to the Commission on the draft changes to the SDP was not needed.

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

During its Planning and Procedures meeting on December 17, 2007, the Committee considered:

- The response of the Executive Director for Operations (EDO) dated August 7, 2007, to comments and recommendations included in the June 28, 2007, ACNW&M letter entitled "Working Group Meeting on 10 CFR 20.1406 Minimization of Contamination and Proposed Regulatory Guide 4012." The Committee decided that it was not satisfied with the EDO's response. Instead of writing a rebuttal letter to the EDO's response, the Members wrote a

new letter report to the Commission ("Review of Regulatory Guide 4012," dated November 27, 2007) on the same topic but with stronger and clearer recommendations. The discussion, among the Committee members, on how to address the EDO's response actually began in the previous Planning and Procedure meeting, on November 13, 2007.

- The EDO's response dated November 3, 2007, to comments and recommendations included in the October 1, 2007, ACNW&M letter entitled "Low-Level Radioactive Waste Minimization Strategies and Views on Commercial Low-Level Waste Management." The Committee decided that it was satisfied with the EDO's response in that the staff is currently engaged in the areas identified by the Committee, and they committed to seek the Committee's advice on the adequacy of those actions once they reach fruition.
- The EDO's response dated November 6, 2007, to comments and recommendations included in the September 25, 2007, ACNW&M letter entitled, "Engagement with the International Commission on Radiological Protection." The Committee decided that it was satisfied with the EDO's response.

#### PROPOSED SCHEDULE FOR THE 186<sup>th</sup> ACNW&M MEETING

The Committee agreed to consider the following topics during the 186<sup>th</sup> ACNW&M meeting to be held on February 12-14, 2008:

- Working Group Meeting on Management of Low-Level Radioactive Waste Using RCRA Disposal Facilities
- Combined NMSS Office and Division Directors Semi-Annual Briefing to Discuss Items of Mutual Interest
- Corrosion Performance of Waste Package and Drip Shield Materials
- Draft Guidance on Preventing Legacy Sites
- Proposed Regulatory Framework for Phased Decommissioning at West Valley Site

Sincerely,

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Michael T. Ryan  
Chairman

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Chairman

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Letter To: The Honorable Dale E. Klein  
NRC Chairman

From: Michael T. Ryan, Chairman  
ACNW&M

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Date: January 14, 2008

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