



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

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June 29, 2007

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

SUBJECT: SUMMARY REPORT—179<sup>TH</sup> MEETING OF THE ADVISORY COMMITTEE ON  
NUCLEAR WASTE AND MATERIALS, MAY 16–17, 2007, AND RELATED  
ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 179<sup>th</sup> meeting on May 16–17, 2007, the Advisory Committee on Nuclear Waste and Materials (ACNW&M or the Committee) completed the following letters and discussed several matters:

LETTERS

Letters to Dale E. Klein, Chairman, NRC, from Michael T. Ryan, Chairman, ACNW&M:

- NRC Office of Nuclear Regulatory Research (RES) Long-Term Research: Fiscal Year 2009 Activities, dated June 27, 2007
- Igneous Activity at Yucca Mountain: Technical Basis for Decision Making, dated June 6, 2007

HIGHLIGHTS OF KEY ISSUES

1. AREVA Spent Nuclear Fuel Recycle Facilities

Representatives from AREVA Federal Services, LLC, provided an overview of the recycle facilities and technologies it uses to reprocess and fabricate nuclear fuel. Maximizing the amount of material recovered from spent fuel for use in producing additional energy and minimizing the amount of waste needing disposal in a geological repository are the primary objectives of the AREVA program.

The AREVA operation at La Hague, France, is the largest reprocessing enterprise in the world. Operating at a capacity of 1700 metric tons equivalent heavy metal per year, the facility has processed more than 22,650 metric tons of spent nuclear fuel at La Hague since the facility began operation in 1969. AREVA sends the reprocessed fuel to its MELOX mixed oxide (MOX) fuel fabrication plant, where it is fabricated into MOX fuel and supplied to reactors in France, Germany, Belgium, and Switzerland. AREVA also has reprocessing plants undergoing decontamination and decommissioning at sites in La Hague and Marcoule and holds training sessions at a “decommissioning school” at Marcoule. Decommissioning involves tradeoffs between the level of decontamination, the technical approach, waste paths, cost of waste

generated, and global life-cycle costs and risk. Resolving orphan waste issues by finding a disposal path presents the greatest challenge during decommissioning.

Most of the discussions and Committee questions focused on waste forms and waste management strategies associated with the reprocessing facilities. Facilities in France can take advantage of a waste classification scheme that is unavailable in the United States. The French scheme includes an intermediate (greater than low-level) waste category for disposal of greater than low-level waste in surface facilities rather than in a deep geological repository. France also has a category that allows materials to be released from regulatory control. The absence of these regulatory categories presents a significant challenge to reprocessing spent nuclear fuel in the United States.

In addition to improving the capture and reduction of tritium effluence releases, AREVA continues to look at disposal options for long-term intermediate waste. From the perspective of AREVA, the licensing of a reprocessing facility (rather than technical issues) poses the greatest challenge. AREVA representatives identified effluence limits and knowing what limits to meet, optimization of the waste streams and disposal, and safety in the use of solvents as the three most challenging areas.

#### Committee Action

The briefing supports the development of a white paper by ACNW&M on the recycling of spent nuclear fuel and a Committee letter to be written after stakeholder input (fall 2007).

#### 2. ACNW&M White Paper on Volcanism

The Committee finalized and approved its white paper on Volcanism.

#### 3. ACNW&M Meeting with NRC Commissioner Jeffrey S. Merrifield

Commissioner Jeffrey S. Merrifield was first appointed as an NRC Commissioner on October 23, 1998. He was sworn in for a second term on August 5, 2002; his current appointment is expected to end in June 2007. Commissioner Merrifield has previously announced his intention not to seek reappointment for a third term. In light of his pending departure from the NRC, the Commissioner took the opportunity to share his views on issues he expects the ACNW&M to be engaged with over the next several months and perhaps years. (He noted that the views he was expressing were his own and not those of his fellow Commissioners.)

In his opening remarks, the Commissioner observed that during its history, the ACNW&M had focused on reviewing technical issues associated with the back-end of the nuclear fuel cycle—that is, primarily, radioactive waste management issues associated with commercial low-level radioactive waste (LLW) and the geologic repository program at Yucca Mountain, Nevada. Although he still expects the primary focus of the Committee's work to be radioactive waste management issues, the Commissioner suggested a broadening of ACNW&M review activities, as well as reviews of new issues associated with the front-end of the nuclear fuel cycle. These areas include the following:

- in situ leach mining of uranium ore
- emerging nuclear fuel conversion and enrichment technologies
- alternatives to commercial LLW management
- options for the management of low-activity, mixed radioactive waste
- improvements in the decommissioning of nuclear fuel cycle facilities
- NRC activities associated with the Global Energy Nuclear Partnership (GENP)

### Committee Action

The Committee will consider Commissioner Merrifield's comments and advice as it implements its action plan for fiscal years (FYs) 2007 and 2008.

#### 4. Yucca Mountain Preclosure Repository Design: NRC Staff Review Readiness and Views on the Issues

For several years, the NRC staff has been conducting focused preclosing reviews of available U.S. Department of Energy (DOE) technical basis documents expected to support the preclosure geologic repository operations area (GROA) design. The Committee is aware of the general substance of these reviews as it receives periodic updates from both the NRC and DOE staffs. The most recent NRC preclosure program update was in August 2005 (162<sup>nd</sup> meeting). The most recent DOE preclosure update was in March 2007 (177<sup>th</sup> meeting). During this meeting, staff representatives from the Office of Nuclear Material Safety and Safeguards (NMSS), Division of High-Level Waste and Repository Safety (DHLWRS), briefed the Committee on the division's readiness to review a GROA design submitted by DOE as part of any license application under Title 10 Part 63 of the *Code of Federal Regulations* (10 CFR Part 63), "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada." According to information widely reported, DOE expects to submit a 10 CFR Part 63 license application by June 2008.

The focus of this briefing was the staff's description of how the various regulatory review elements in the NRC preclosure program fit together. For its part, the NRC staff expects to be prepared to review any GROA design. The final Yucca Mountain regulation is expected to be in place shortly, a Yucca Mountain Review Plan (YMRP) consistent with the rule is also in place, and a preclosure integrated safety assessment (ISA) computational tool has been perfected to evaluate the DOE design for compliance with the NRC's worker safety radiation exposure standards at 10 CFR Part 20, "Standards for Protection against Radiation." Over the last year or so, the staff has determined that it is necessary to develop strategies for integrating the rule, the YMRP, and the ISA tool for the review of any GROA design. The staff is also engaged in other activities to prepare to review any DOE license application. The speaker noted that DOE intends to support several additional meetings with the staff on a number of preclosure-related design topics. These meetings will provide additional clarification for the staff regarding DOE plans and thus provide some insight as to those areas where information and dialogue would be useful before any potential licensing review and hearing.

The staff has also determined that a few areas of the YMRP would benefit from additional clarification and has prepared interim staff guidance (ISG) to provide that extra detail. The speaker noted that the staff has not fully implemented the ISA review tool as DOE had not finalized its GROA design concept until very recently. Consequently, the staff has been able to exercise only selected features of the ISA tool. Moreover, because of the changing DOE design concepts over the years, it is not readily apparent that either the NRC or DOE has a full appreciation of which preclosure structures, systems, and components are important to safety or what the risk-significant issues will be during the preclosure phase of operations. The staff has recently reviewed NRC licensing actions and studied analog DOE defense facilities to gain some insight into these issues. However, the staff noted that the information needs related to Yucca Mountain may become better defined in the meetings scheduled to take place with DOE before the end of the calendar year.

### Committee Action

The staff agreed to demonstrate the ISA tool for the ACNW&M later in the calendar year to allow the Committee to independently judge the adequacy of this review capability.

#### 5. Proposed Revision to Standard Review Plan Chapter 11.5 for New Reactor Licensing

Dr. Jean-Claude Dehmel of the Office of New Reactor Programs (NRO) briefed the Committee on the proposed updates and revisions to Chapter 11.5, "Process and Effluent Radiological Monitoring Instrumentation and Sampling System (PERMISS)," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." He explained that the Standard Review Plan (SRP) chapters have been updated to include 10 CFR 20.1406, "Minimization of Contamination," as an acceptance criteria and guidance for reviews to meet this requirement, and to include more information on meeting the U.S. Environmental Protection Agency dose standard of 40 CFR Part 190, "Environmental Protection Standards for Nuclear Power Operations." He noted that other changes have been made to bring the chapter up to date with reactor licensing procedures and rule language modifications since the last revision. The SRP chapter incorporates, where appropriate, information from the Tritium Task Force Report and from lessons learned in decommissioning developed by the then NMSS.

Dr. Dehmel indicated that more revisions may be necessary for this SRP chapter following the completion of Tritium Task Force Report activities, the future revision of 10 CFR Part 20.1406, and any updates to computer codes that are referenced in this and other SRP chapters related to radioactive waste management that may result from further work by the Office of Nuclear Regulatory Research.

In response to questions from the Committee, Dr. Dehmel explained the difference between the hypothetical maximally exposed member of the public who is the receptor in 10 CFR Part 20 dose calculations and the "real member" of the public who is the receptor for meeting the 40 CFR Part 190 dose standard, and how the SRP chapter addresses this issue.

#### Committee Action

The Committee agreed to write a letter to the Commission concerning the Committee's reviews of all SRP radioactive waste management chapters (11.2 through 11.5) at the conclusion of this meeting.

#### 6. Briefing on ISG-04, "Preclosure Safety Analysis—Human Reliability Analysis"

Dr. Tina Ghosh of the DHLWRS briefed the Committee on ISG-04 which updates and supplements "Yucca Mountain Review Plan" (YMRP) (NUREG-1804, Revision 2, issued July 2003) for the staff's review of human reliability analysis (HRA). Dr. Ghosh explained that the major purpose of ISG-04 is to replace older references concerning HRA in NUREG-1804 with more recent documents published by the NRC and to provide additional guidance to reviewers in areas of the license application that could be affected by HRA. She explained that the regulatory position in the ISG calls for HRA approaches to be risk informed; in other words, the complexity of the HRA should be commensurate with the risk significance. The guidance contains a hypothetical example which builds on the example presented in Appendix A of ISG-02, "Preclosure Safety Analysis—Level of Information and Reliability Estimation," which supplements the YMRP.

#### Committee Action

The Committee agreed not to write a letter to the Commission on the topic of ISG-04 at the conclusion of this meeting, but to include the Committee's observations and conclusions on ISG-04 with observations and conclusions from the presentation on "Yucca Mountain Preclosure Repository Design: NRC Staff Review Readiness and Views on the Issues"

presented earlier in this Committee meeting and from the presentation on the Implementation of the Final Revised Yucca Mountain Regulatory Framework which is scheduled for the September ACNW&M meeting.

#### 7. Briefing on Long-Term Research Activities

Representatives from the Office of Nuclear Regulatory Research (RES) briefed the Committee on NRC's plan for long-term research activities. Long-term research supports possible emergence of new regulatory initiatives or technologies that could be applied in nuclear facilities in the coming years. The research plan will be used as a technical basis for including long-term research in the FY 2009 budget as well as for subsequent years.

The four areas highlighted in the presentation are the DOE GNEP, the advanced offsite consequence code, extended in situ and real time inspection and monitoring techniques, and advanced quantitative risk assessment methods. Under GNEP, RES would begin to address infrastructure issues beginning in FY 2009. The presentation identified two areas at the forefront—chemical separation for reprocessing and sodium-cooled liquid metal technology for an advanced burner reactor. The Committee suggested that RES consider in its research plan those activities that focus on how waste streams generated by the GNEP facilities would fit into the current regulatory process.

In FY 2009, RES also plans to perform scoping analysis in several areas including development of an advanced offsite consequence code and use of sensors for extended *in situ* real-time environmental monitoring. The latter activity will include finding ways to gather more robust and precise data, for example, on ground water and ground water conditions. Also in 2009, RES will perform a scoping study to assess ways to improve probabilistic risk assessments, including the associated numerical solutions, models, cause-effect relationships between key parameters, and failure parameters that go into risk models.

Committee members suggested that the report include the meaning of long-term research and identify major NRC programs that the research will support. Additionally, probabilistic risk assessment thinking should not be limited to reactors, but should also include fuel cycle facilities. Other areas to consider in the plan include test facilities (hot cells) that may be needed to support licensing GNEP facilities and research to support decisions involving low-level waste, including associated repository and policy issues.

The long-term regulatory research plan is expected to be a living document. The Committee indicated that it wishes to remain engaged in the evolution of the plan and informed of its periodic updates.

#### Committee Action

The Committee plans to write a letter to the Commission on the RES long-term research plan. The letter will be finalized at the June 2007 meeting.

#### PROPOSED SCHEDULE FOR THE 180<sup>TH</sup> ACNW&M MEETING

The Committee agreed to consider the following topics during its 180<sup>th</sup> meeting, to be held June 19–21, 2007:

- U.S. Department of Energy Briefing on the Transportation, Aging, and Disposal Canister and the Total System Model in Support of the Yucca Mountain Repository Effort
- Election of ACNW&M Officers for the Period of July 1, 2007 to June 30, 2008
- Working Group Meeting on Implementation of 10 CFR 20.1406

The Honorable Dale E. Klein

-6-

- NRC Office of Public Affairs' Perspectives on Radiation Risk Communication
- A Basic Primer on High-Burnup Spent Nuclear Fuel and Its Cladding
- ACNW&M Staff Attendance at Recent Technical Meetings

Sincerely,

**/RA/**

Michael T. Ryan  
Chairman

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