



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

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July 27, 2007

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

SUBJECT: SUMMARY REPORT—180TH MEETING OF THE ADVISORY COMMITTEE ON
NUCLEAR WASTE AND MATERIALS, JUNE 19–21, 2007, AND RELATED
ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 180th meeting on June 19–21, 2007, the Advisory Committee on Nuclear Waste and Materials (ACNW&M or the Committee) discussed several issues and completed the following letter to Dr. Dale E. Klein, Chairman of the U.S. Nuclear Regulatory Commission (NRC), from Dr. Michael T. Ryan, Chairman of ACNW&M:

- "Working Group Meeting on 10 CFR 20.1406, Minimization of Contamination and Proposed Regulatory Guide 4012," dated June 28, 2007

HIGHLIGHTS OF KEY ISSUES

1. 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

Mr. Christopher Kouts from the U.S. Department of Energy (DOE), Office of Civilian Radioactive Waste Management, briefed the Committee on the status of the transportation, aging, and disposal (TAD) canister that will be used to transport and dispose of spent nuclear fuel (SNF) and other high-level radioactive waste at the proposed Yucca Mountain Repository. Mr. Kouts also discussed the DOE Total System Model (TSM) which supports the transportation effort.

Mr. Kouts discussed the implementation process for the TAD, TAD performance specifications, and TAD operations. Mr. Kouts explained that the TAD system is intended to standardize the SNF disposal process, simplify handling and operations, reduce the production and handling of low-level radioactive waste, and reduce cost and complexity of DOE facilities. In addition, he explained how the TAD concept fits in with the Nuclear Waste Policy Act's direction to use private industry to the fullest extent possible for transportation-related activities.

Mr. Kouts informed the Committee that DOE has identified four dry cask storage vendors that will work directly with utilities and the NRC to receive certification for transportation (Title 10, Part 71, "Packaging and Transportation of Radioactive Material," of the *Code of Federal*

Regulations [10 CFR Part 71]) and storage (10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste") utilizing TAD cask systems. Upon DOE approval of the conceptual design, cask vendors will proceed to develop complete TAD system designs and safety analysis reports to be submitted to the NRC for certification under 10 CFR Part 71 and 10 CFR Part 72. DOE will review NRC-certified TAD systems to affirm compliance with DOE performance specifications. DOE will require that utilities using TAD-based systems certify that components are fabricated in accordance with approved design drawings and specifications. DOE will procure TAD system transportation overpacks for the purposes of transporting utility-purchased TAD canisters from utility dry storage sites to the repository.

Mr. Kouts briefly highlighted some of the information contained in the TAD canister performance specifications (e.g., capacity, diameter, maximum weight, and construction materials). He informed the Committee that the four vendors recommended modifications to the preliminary performance specifications to enable the TAD canisters to be more widely deployed at utility sites. DOE considered most of the recommendations from the vendors, except the suggestion to develop the TAD canister into a larger capacity system. Mr. Kouts told the Committee that DOE expects the TAD design to evolve into higher capacity systems in the future. He also told the Committee that the final procurement specification was currently available on the DOE Web site.

Mr. Kouts provided the Committee with an overview and the developmental history of the TSM as an integrated analysis tool. The use of TAD canisters is an important component of the TSM, which addresses waste acceptance and transportation, and activities at the repository. Mr. Kouts explained to the Committee how the DOE TSM is used to analyze various scenarios involving the TAD canister, a variety of preclosure scenarios, and the performance of the entire waste management system.

Following his presentation, Mr. Kouts responded to questions and comments from the ACNW&M members. The verbatim meeting transcript, which serves as the official meeting record for this presentation, captures the scope of the Committee's questions and comments and Mr. Kouts' responses to them.

Committee Action

The Committee expressed interest in hearing from a cask vendor about its perspective on the TAD canister before issuing a letter report.

2. Election of ACNW&M Officers for the Period of July 1, 2007 to June 30, 2008

The Committee re-elected Michael T. Ryan and Allen G. Croff to the positions of Chairman and Vice Chairman, respectively, of the ACNW&M for a 1-year term ending June 30, 2008.

3. Working Group Meeting on the Implementation of 10 CFR 20.1406

During its 180th meeting, on June 19, 2007, ACNW&M held a working group meeting on the implementation of 10 CFR 20.1406, "Minimization of Contamination." The working group specifically focused on a review of draft Regulatory Guide 4012, "Minimization of Contamination and Radioactive Waste Generation in Support of Decommissioning," developed by the NRC staff to incorporate decommissioning lessons learned into new facilities. This working group meeting was a follow-on to a working group held by the Committee in November 2006 during its 174th meeting at which decommissioning lessons learned were discussed. The working group is part of a Committee effort to address a request from the Commission to review best practices in decommissioning to identify improvements in the design and construction of reactor and materials facilities that would lead to less environmental impact and more efficient decommissioning. The Committee was again supported by invited experts in decommissioning, Mr. Eric Darois from Radiation Safety and Controls Services and Mr. Eric Abelquist from Oak Ridge Institute for Science and Education, who have supported the Committee during several previous decommissioning working group meetings.

The Committee heard from Mr. Timothy Meneely of Westinghouse Electric Company and Mr. Eric Kirstein of General Electric Nuclear (GE). Mr. Meneely presented the elements of design and construction included in the design control document (DCD) for the Westinghouse AP1000, which was prepared as part of the standard design certification application review, that are intended to meet the requirements of 10 CFR 20.1406. Mr. Kirstein made a presentation on the elements included in the DCD for the GE economic simplified boiling water reactor which are also intended to meet the 10 CFR 20.1406 requirements. These presentations demonstrated the planning undertaken by the standard design vendors when the DCDs were developed to meet the requirements of 10 CFR 20.1406 without any regulatory guidance from the NRC. Many of the elements included in the two DCDs are similar for the two designs, including the design for large component removal, minimal use of embedded pipes, and waterproofing and appropriate sloping of floors to drains where liquids are stored. The design of the AP1000 includes a unique element that calls for the entire spent fuel pool to be elevated to ensure that the external surfaces of the pool are completely accessible.

Mr. Ralph Andersen of the Nuclear Energy Institute (NEI) provided feedback on the guidance that the industry has incorporated in its efforts to date to make use of the most important lessons learned. He cautioned that NRC regulatory guidance in this technical area should focus on the process of meeting the requirement and not just provide a "laundry list" of items to address a specific weakness. He suggested using an approach analogous to the way in which the NRC and the industry have implemented the "as low as reasonably achievable" philosophy.

The Committee then heard from Mr. Edward O'Donnell from the NRC Office of Nuclear Regulatory Research who provided background information and a summary of the guidance to be provided in draft Regulatory Guide 4012, which is scheduled to be issued for public review at the beginning of July 2007.

Following the presentations, the Committee members and invited experts engaged the presenters, who were joined by Mr. Jean-Claude Dehmel of the NRC Office of New Reactors, in a panel discussion. The panelists identified the five design or construction changes to the old facility designs that would provide the most improvements in efficiency and effectiveness of

decommissioning if they were implemented. The panelists also addressed what additions they would make to regulatory guidance to demonstrate compliance with 10 CFR 20.1406.

Committee Action

The Committee agreed to write a letter to the Commission regarding draft Regulatory Guide 4012 at the conclusion of the working group meeting.

4. NRC Office of Public Affairs' Perspectives on Radiation Risk Communication

Mr. David McIntyre from the Office of Public Affairs (OPA) briefed the Committee on the NRC's efforts to inform the public about the health effects from low-dose radiation exposure. The briefing also addressed the public's perceptions about radiation exposure. Mr. McIntyre explained the mission of OPA, the primary function of the NRC's public outreach efforts, recent initiatives, and the information that can be found on the NRC Web site.

Mr. McIntyre informed the Committee that OPA ensures openness in the NRC regulatory process by making clear and accurate information about the agency's policies, decisions, programs, and activities available in a timely manner to the news media and the public. In addition, Mr. McIntyre indicated that OPA alerts the Commission and senior managers to news items that could impact the NRC. OPA also responds to reporter and citizen telephone calls, letters, emails, and facsimiles. In addition, OPA prepares and distributes brochures, pamphlets, and fact sheets about the NRC and various topics of interest.

OPA also reviews the agency's communication plans on programs with high public interest. OPA recently added radiation protection as a key topic on the NRC home page. Mr. McIntyre concluded his presentation by performing a live demonstration of how various topics and brochures can be found on the NRC Web site. During the demonstration, he compared the NRC Web site to that of the U.S. Environmental Protection Agency.

Following his presentation, Mr. McIntyre responded to questions and comments from ACNW&M members. The verbatim meeting transcript, which serves as the official meeting record for this presentation, captures the scope of the Committee's questions and comments and Mr. McIntyre's responses to them.

Committee Action

The Committee plans to write a letter report on the subject of radiation risk communication.

5. A Basic Primer on High-Burnup Spent Nuclear Fuel and Its Cladding

ACNW&M staff engineer Mr. Christopher Brown provided the Committee with an information briefing on SNF, the effects from high-burnup exposure, and how storage and transportation of SNF can be influenced by burnup-affected characteristics. Mr. Brown discussed cladding types, differences between boiling-water reactor and pressurized-water reactor rods and assemblies, hydriding, and oxidation of SNF cladding.

Mr. Brown began the briefing by explaining that the NRC staff has focused on technical issues involving the cladding integrity of SNF for the last 7 years. The NRC views the cladding of SNF as the primary barrier used to ensure that the spent fuel is contained in a known geometric configuration in storage and transportation casks. He also explained that the cladding is expected to be an important barrier to retard radionuclide migration in any waste repository.

Mr. Brown spent a considerable amount of time discussing the phenomenon of hydride reorientation. He explained that SNF cladding contains precipitates of hydrogen in the form of zirconium hydrides that are normally present in SNF as circumferential hydrides and occur mainly on the outermost parts of the clad of zirconium-clad fuel. Hydride reorientation arises after SNF is heated to a temperature that permits some of the hydrides to dissolve into the zirconium-based alloy of the cladding. When the fuel is heated in this way, it eventually cools to temperatures at which it is no longer soluble and reprecipitates as randomly oriented zirconium hydrides. When the hoop stress inside the fuel rods is sufficiently high, evidence suggests that the precipitates of zirconium hydrides may be oriented perpendicular to the surfaces of the cladding. These radially oriented hydrides are referred to as radial hydrides. Following his presentation, Mr. Brown and another colleague, Dr. Robert Einziger, responded to questions and comments from the ACNW&M members. The verbatim meeting transcript, which serves as the official meeting record for this presentation, captures the scope of the Committee's questions and comments and Mr. Brown and Dr. Einziger's responses to them.

Committee Action

The Committee expressed interest in hearing more on this topic. In particular, the Committee was interested in the potential reaction of uranium dioxide fuel pellets to volcanic events at Yucca Mountain and asked to learn more about Dr. Einziger's recently developed paper on spent nuclear fuel.

6. ACNW&M Staff Attendance at Recent Technical Meetings

ACNW&M staff recently attended several public meetings concerning areas of interest to the Committee. At the 180th meeting, these staff members were given the opportunity to summarize their observations of those meetings. The following paragraphs provide the key highlights of these observations.

- A. Nuclear Regulatory Commission/National Mining Association Uranium Recovery Workshop and NRC staff meetings with uranium recovery stakeholders held in Denver, Colorado, May 14–17, 2007

Dr. Latif Hamdan from the ACNW&M staff briefed the Committee on the annual NRC/National Mining Association Uranium Recovery (UR) Workshop and other NRC staff meetings with stakeholders held in Denver, Colorado, on May 14–17, 2007. Dr. Hamdan participated in these meetings to obtain information to support Committee reviews and recommendations to the Commission with regard to the impending rulemaking on ground water protection at in situ leach (ISL) UR facilities. He indicated that the workshop and the NRC stakeholder meetings were very efficient, the uranium mining industry was energized, and the NRC was bracing to review about 25 UR-related applications in the next 2 years, including applications for expansions, restarts, and new facilities. He observed that ISL is the mining method of choice for four out five operators in the United States. Workshop participants also discussed the multiplicity of regulations and regulators and interagency interactions, applicable regulations, requirements under the National Environmental Policy Act, and aquifer restoration at the conclusion of the mining operations. Dr. Hamdan noted that two topics were not sufficiently covered—effluent disposal and decommissioning of ISL sites.

Committee Action

The Committee recognized that it will need to prepare to review both the technical basis document for the rulemaking, as well the draft rule itself. To this end, the Committee may consider the following actions:

- visits by cognizant Committee member(s) with the DOE Office of Legacy Management in Grand Junction, Colorado, to obtain information about and lessons learned from decommissioning of UR facilities
- visits by cognizant Committee member(s) or briefings to the Committee by representatives of selected States and possibly Native American organizations to gain the local government perspective and principal issues of concern with regard to ISL mining
- a briefing on the development of a general environmental impact statement for ISL applications that the NRC staff plans to develop
- briefings by the NRC staff on planned updates of NRC UR regulatory guides

B. Nuclear Energy Institute Dry Cask Storage Information Forum, May 15–17, 2007, Clearwater, Florida (Mr. Christopher Brown, ACNW&M Staff Observer)

Mr. Brown relayed that about 45 presentations were delivered at the meeting, which had an attendance of approximately 250 individuals. Key meeting participants included DOE, the NRC, NEI, the Electric Power Research Institute, cask vendors, cask fabricators, utilities, and the State of Nevada. The audience heard presentations by Government regulators, nuclear plant fuel managers, dry fuel storage project managers, fuel cask designers, utility licensing and compliance personnel, storage, transportation and disposal consultants, architect-engineers, pool-to-pad services companies, hardware suppliers, and international experts responsible for management issues

associated with used nuclear fuel. These presentations addressed the following broad subject areas:

- management of emerging and ongoing used fuel storage and transportation issues
- case studies on independent fuel storage installation inspection and enforcement
- updates on cask loading operational improvements
- updates on cask vendor design and licensing efforts
- update on Yucca Mountain project design and licensing
- discussion of the TAD canister conceptual design efforts

Many of the questions and answer sessions focused on the DOE TAD canister concept. Mr. Brown intends to prepare a separate trip report for the Committee members and staff detailing the scope and nature of the questions and associated responses.

Committee Action

The Committee intends to track developments in this area.

- C. 2007 Devil's Hole Workshop, Death Valley National Park, May 2–4, 2007, and DOE Probabilistic Volcanic Hazards Analysis—Update (PVHA-U) Workshop No. 4, May 10–11, 2007, Las Vegas, Nevada (Mr. Neil Coleman, ACNW&M Staff Observer)

The National Park Service has sponsored workshops since the mid-1990s that examine local water resource issues. Over time, these workshops have evolved from an examination of the hydrogeologic and biologic issues related specifically to the springs at Devil's Hole, in Ash Meadows, Nevada, to those associated with the greater Death Valley region encompassing southern Nevada and eastern California. The discussions in recent years have also included hydrogeologic issues bearing on the proposed geologic repository at Yucca Mountain, Nevada. These workshops generally include informal presentations of unpublished technical papers and field trips to local features of hydrologic interest. Mr. Coleman has been attending these workshops for several years and summarized highlights from the 2007 workshop held at the Furnace Creek Ranch.

Committee Action

Information related to volcanism at Yucca Mountain was presented at this meeting and this was incorporated in the Committee's white paper on volcanism.

In 1995, DOE sponsored a formal expert elicitation to determine the probability of a disruptive igneous event affecting the proposed Yucca Mountain repository. In the early 2000s, DOE decided to repeat the probabilistic volcanic hazards analysis (PVHA) using updated information from site characterization. Drs. William Hinze and Bruce Marsh (an

ACNW&M consultant from Johns Hopkins University) and ACNW&M staff member Mr. Neil Coleman have been observing the various PVHA-U meetings over the last few years. Mr. Coleman reported on his observations from the last of the PVHA-U public workshops. The DOE final PVHA-U report is expected to be published sometime in calendar year 2008. Mr. Coleman will document his detailed observations in a future trip report.

Committee Action

The Committee intends to continue tracking developments in this area.

D. NRC/DOE Technical Exchange on Layout and Operations, May 30, 2007, Las Vegas, Nevada (Mr. Michael Lee, ACNW&M Staff Observer)

During its 177th meeting, held in March 2007, a DOE senior manager briefed the ACNW&M on the status of the surface facility design for the Yucca Mountain geologic repository operations area (GROA). Mr. Lee noted that the May 2007 NRC/DOE technical exchange discussed essentially the same information as the March 2007 ACNW&M briefing, but that the discussions were more detailed and included the use of previously unavailable engineering plans. Mr. Lee estimated that about 70 individuals participated in the technical exchange meeting, both in person and remotely at several sites outside of Las Vegas via videoconference and telephone connections.

The DOE presentations focused on the following subjects:

- site layout and waste-handling overview
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- layout of canister receipt and closure facility and wet-handling facility
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- layout of wet-handling facility and waste-handling operations
-
- waste-handling control philosophy
-
- seismic design considerations

Technical exchange participants had the opportunity to question the DOE speakers about the content of each presentation, and the joint NRC/DOE technical exchange meeting summary is expected to capture the scope of the questioning. A key DOE disclosure during the technical exchange meeting was that only about 50 percent of the GROA design and preclosure integrated safety assessment products needed for the June 2008 license application were completed. A DOE spokesperson noted that all products supporting that license application were scheduled for completion in the November 2007–February 2008 timeframe. Mr. Lee also reported that the NRC and DOE agreed to conduct additional technical meetings before the submittal of the license application. The group also discussed scheduled and proposed future meeting topics. All future NRC/DOE technical meetings will be open to the public.

Mr. Lee also distributed electronic copies of the DOE presentation materials. Mr. Lee does not plan to prepare a trip report because the joint NRC/DOE technical exchange meeting summary will serve as the official record for that meeting.

Committee Action

None at this time. The Committee intends to track developments in this area and receive a second DOE briefing on the status of the GROA design before the end of the calendar year.

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

- During its Planning and Procedures meeting on June 19, 2007, the Committee considered the response of the Executive Director for Operations (EDO) dated June 1, 2007, to comments and recommendations included in the April 23, 2007, ACNW&M letter on the "Use of Credit for Moderator Exclusion in the Licensing of Spent Nuclear Fuel Transportation Packages."

The Committee determined that it was not satisfied with the EDO's response. In their original letter, the Committee recommended that any decisions about rulemaking be deferred until the staff obtains experience using the existing provisions in 10 CFR 71.55c. However, the EDO's response suggested that the staff is proposing to use 10 CFR 71.55(e) as the only basis for their proposed rulemaking. Since moderator exclusion is related to burnup credit, the Committee decided to defer any comments on the EDO's letter until the Committee hears the NEI briefing on burnup credit. The opportunity to hear from NEI representatives at the July 2007 meeting may provide the Members with an opportunity to prepare a follow-up letter that better responds to the proposed reconciliation. Dr. Weiner and Mr. Brown met with staff from the Division of Spent Fuel Storage and Transportation during the week of June 18th on this issue.

- The Committee also considered the response of the EDO, dated June 10, 2007, to comments and recommendations included in the May 9, 2007, ACNW&M letter on the "Proposed Rulemaking on Groundwater Protection at In Situ Leach Uranium Recovery Facilities." The Committee was satisfied with the EDO response and decided that no follow up action was necessary.

PROPOSED SCHEDULE FOR THE 181ST ACNW&M MEETING

The Committee agreed to consider the following topics during its 181st meeting to be held July 17–19, 2007:

- Semiannual Briefing by the Office of Nuclear Material Safety and Safeguards
- Waste Incidental to Reprocessing Monitoring Activities at the Idaho National Laboratory and Savannah River Sites
- DOE Reexamination of Past U.S. Geological Survey (USGS) Infiltration Studies
- Annual Briefing by the Office of Nuclear Regulatory Research (RES)

- Nuclear Energy Institute Briefing on the Use of Burnup Credit for Spent fuel Storage and Transportation Casks
- Transportation, Aging, and Disposal (TAD) Canister System Performance Specification, Revision 0, Recently Issued by the Department of Energy
- Vendor's View on the TAD Performance Specification
- ACNW&M White Paper on Spent Nuclear Fuel Recycle Facilities
- Regulatory Guides Scheduled for Revision by RES

Sincerely,

/RA/

Michael T. Ryan
Chairman

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Sincerely,

Michael T. Ryan
Chairman

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