



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

ACNWS-0174

August 7, 2007

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

SUBJECT: SUMMARY REPORT—181ST MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS, JULY 17–19, 2007, AND RELATED ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 181st meeting on July 17–19, 2007, the Advisory Committee on Nuclear Waste and Materials (ACNW&M or the Committee) discussed several issues and completed the following letters to Dr. Dale E. Klein, Chairman of the U.S. Nuclear Regulatory Commission (NRC), from Dr. Michael T. Ryan, Chairman of ACNW&M:

- “Agency Efforts Regarding Radiation Protection Information,” dated July 27, 2007
- “Chapters 11.2 through 11.5 of NUREG-0800, ‘Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants,’” dated August 6, 2007

HIGHLIGHTS OF KEY ISSUES

1. Semiannual Briefing by the Office of Nuclear Material Safety and Safeguards

Mr. Michael Weber, Director of the Office of Nuclear Material Safety and Safeguards (NMSS), his deputy director, Mr. Eric Leeds, and the NMSS division directors gave a semiannual briefing to the Committee. The directors summarized current topics of special interest in their respective divisions. For the Division of Fuel Cycle Safety and Safeguards, these topics included proposed new enrichment facilities, conversion/deconversion facilities, mixed oxide fuel fabrication facilities, and the Global Nuclear Energy Partnership (GNEP). The Division of Spent Fuel Storage and Transportation had a special focus on moderator exclusion; transport of high burnup fuel and burnup credit; transportation, aging, and disposal (TAD) canisters; risk-informing storage standard review plans; analysis of severe transportation accidents; and the National Spent Fuel Management Strategy. The Division of High-Level Waste Repository Safety (HLWRS) is currently focused on the Yucca Mountain schedule and NRC staff preparation of a potential license application for review, revisions to 10 CFR Part 63, and NRC-U.S. Department of Energy (DOE) technical interactions.

Committee Action

The NMSS management team identified several topics for which they anticipate future interactions with the ACNW&M. The HLWRS would like to interact with the Committee on four issues: drift degradation, total system performance assessment, TAD canisters, and risk-informed decisionmaking. At some point in the future, NMSS will be looking for input from ACNW&M on spent nuclear fuel burnup credit and identifying potential waste streams that could result from GNEP.

2. Waste Incidental to Reprocessing Monitoring Activities at the Idaho National Laboratory (INL) and Savannah River (SR) Sites

The Committee received a briefing by NRC staff from the Office of Federal and State Materials and Environmental Management Programs (FSME) on their plans for monitoring disposal actions by DOE at the INL nuclear technology and engineering center tank farm facility and the salt waste disposal facility at the SR site. The staff has prepared the monitoring plans for both sites in fulfillment of NRC's responsibilities under Section 3116 of the Ronald Reagan National Defense Authorization Act of 2005 (NDAA). The staff discussed NRC's responsibilities under the NDAA, the monitoring plans for both facilities, and the Agency's general monitoring approach including technical reviews and onsite observations as well as coordination with DOE and the concerned states (Idaho and South Carolina). The staff noted that they had completed Technical Evaluation Reports for both facilities and that the monitoring plans cover the key monitoring areas (KMAs) identified in these reports. The staff also discussed the criteria for compliance with the performance objectives by both facilities, and indicated that they will prepare a "Periodic Compliance Monitoring Report" that will assess and document such compliance.

The staff answered questions by the Committee members and ACNW&M staff on several topics of concern including the performance objectives, duration for and termination of monitoring, lessons learned from previous leaks, performance assessment and modeling uncertainties, the combining monitoring and modeling activities, vadose zone monitoring, waste form monitoring, adequacy of monitoring information, and feed tank sampling.

Committee Action

The Committee will submit a letter providing its advice and recommendations on the NRC plans for monitoring disposal actions by DOE at the INL and SR facilities.

3. The U.S. Department of Energy's Reexamination of Past U.S. Geological Survey Infiltration Studies

An NMSS staff scientist summarized DOE's review of U.S. Geological Survey (USGS) infiltration studies in the wake of emails by USGS scientists that gave the appearance of disregard for quality assurance procedures. The USGS had been responsible for modeling infiltration at Yucca Mountain for DOE. DOE has investigated the root-cause and extent-of-condition associated with this issue. Sandia National Laboratories (SNL) are developing a new infiltration model for DOE and will issue a new infiltration Analysis Model Report (AMR) on the topic. Preliminary results show that SNL estimates significantly higher rates of net infiltration at Yucca Mountain for all climate scenarios (present day, monsoon, and glacial transition) up to

10,000 years. The higher infiltration rates are obtained by assuming thinner soils at the site, more permeable surface rocks, and a reduced rooting depth for vegetation (~2 m instead of ~6 m). NRC staff has an independent model for infiltration and has collected data on key parameters, such as soil thickness. Several NRC/DOE agreements related to infiltration had previously been closed at the NRC staff level. They are being reexamined to determine whether any of them need to be reopened.

Committee Action

NRC staff has closely tracked this issue related to net infiltration at Yucca Mountain. ACNW&M will examine the new infiltration AMR when it becomes available. After review of additional materials on infiltration, the Committee will decide whether to send a letter on this topic to the Commission.

4. Annual Briefing by the Office of Nuclear Regulatory Research

Sher Bahadur, Deputy Director, Division of Fuel, Engineering, and Radiological Research; Stephanie Bush-Goddard, Chief, Health Effects Branch; and William Ott, Chief, Waste Research Branch of the Office of Nuclear Regulatory Research (RES) briefed the Committee on recent and future activities of interest within their respective programs.

Dr. Bahadur gave a general overview of the two branches' activities, such as updates to regulatory guides. Likewise, Dr. Bahadur stated that his staff will be briefing the ACNW&M within six months to obtain comments and recommendations on revisions made on the Gaseous and Liquid Effluent (GALE) Code.

Dr. Bush-Goddard discussed international activities, domestic activities, current radiation protection research, and upcoming radiation protection research, such as regulatory guides and user needs that are part of the branch's activities. In terms of international activities, the staff's interactions with the United Nations Scientific Committee on the Effects of Atomic Radiation, the International Commission on Radiological Protection, the International Atomic Energy Agency (IAEA), and the Organization for Economic Co-operation and Development – Nuclear Energy Agency were described to the Committee. Also, activities with the National Academies, the National Council on Radiation Protection and Measurements, the Council on Ionizing Radiation Measurements and Standards, and the Interagency Steering Committee on Radiation Standards were described. Dr. Bush-Goddard echoed Dr. Bahadur's comment concerning RES plans to update several computer codes, including the GALE Code.

Mr. Ott discussed the progress and plans concerning NRC's research program on radionuclide transport in the environment. In particular, he discussed source term estimation, the engineered barriers program, work done in the area of groundwater monitoring and modeling, transport processes (sorption), performance assessment models, and biosphere pathways. In addition, Mr. Ott discussed the support the branch provided to the regional offices on groundwater contamination at the Indian Point, Dresden, Byron, Three Mile Island, and Braidwood sites. Since there will be a reduction in funds to support the decommissioning program in fiscal year (FY) 2008, it was mentioned that some studies will be completed and some will be closed out. For example, the development of RESRAD will be terminated and the performance assessment of non-concrete barriers will be completed using FY 2007 funds.

Following the presentations, Dr. Bush-Goddard and Mr. Ott responded to questions and comments from ACNW&M members.

Committee Action

The Committee appreciated the opportunity to hear about activities underway in RES. The Committee plans to revisit the need to update some of the methodologies and supporting codes (e.g., the GALE Code) in upcoming meetings, as indicated in item 9 of this report.

5. Nuclear Energy Institute Briefing on the Use of Burnup Credit for Spent Fuel Storage and Transportation Casks

Dr. Everett Redmond from Nuclear Energy Institute (NEI) and Dr. Abert Machiels from the Electric Power Research Institute (EPRI) briefed the Committee on the industry's views on why full burnup credit should be granted to support licensing of spent fuel transportation and dual purpose (storage and transport) cask designs.

Dr. Redmond's key message to the Committee was that NRC staff should consider using similar methods and analysis done under 10 CFR Part 50 to demonstrate high-burnup fuel as acceptable for approval under 10 CFR Parts 71 and 72. He described how the regulations and review guidance for criticality for wet storage (Part 50) differ from dry storage (Part 72) and transportation (Part 71). For example, Part 50 allows full fission product credit, whereas Part 71 allows actinide-only credit. He pointed out the modeling similarities between Parts 50, 71, and 72 (such as the materials of construction are the same for spent fuel racks and the cask basket). In conclusion, Dr. Redmond showed a series of graphs that demonstrated that full burnup credit should be considered since there is a low probability of a criticality accident occurring during transport.

Dr. Machiels continued the discussion on burnup credit. In particular, he discussed how the staff could improve on the regulatory guidance contained in Interim Staff Guidance (ISG) - 8, Revision 2, "Burnup Credit in the Criticality Safety Analyses of PWR Spent Fuel in Transport and Storage Casks." He emphasized that NRC staff should revise its regulatory guidance to delete the requirement for in-pool measurements. EPRI believes it is unnecessary, since fuel assembly burnup information is already well characterized by the industry.

Following their presentations, Dr. Redmond and Dr. Machiels responded to questions and comments from ACNW&M members.

Committee Action

The Committee plans to remain informed on issues associated with transportation of high burnup spent nuclear fuel, such as, burnup credit and use of moderator exclusion, and will use this knowledge in future letter reports.

6. Transportation, Aging, and Disposal (TAD) Canister System Performance Specification, Revision 0, Recently Issued by DOE

Dr. Ruth Weiner, ACNW&M member, briefed the Committee on the June 2007 release of the Final TAD Performance Specifications. The TAD will be used to transport and dispose of spent nuclear fuel and other high-level radioactive waste at the proposed Yucca Mountain Repository.

Dr. Weiner gave a broad overview of the TAD specifications, which included the maximum dimensions, fuel capacity, and temperature limits for the canister. In addition, she discussed the criticality control (i.e., neutron absorbers) and containment requirements (i.e., leak testing) for the canister. She also discussed the maximum dimensional and weight requirements for the overpack. Applicable NRC and DOE regulations, industry codes and standards used to develop the specifications were highlighted during the briefing.

Committee Action

The Committee will continue to review and evaluate pertinent documents associated with licensing of the TAD system.

7. Vendor's View on the TAD Performance Specification

Robert Grubb from Transnuclear (TN), a commercial cask vendor, briefed the Committee on TN's views on the DOE's TAD concept and views on TAD performance specification.

Mr. Grubb explained that TN's TAD system design is based on a current licensed cask design being used by U.S. utilities and will accommodate all pressurized water reactor (PWR) and boiling water reactor (BWR) commercial fuel except South Texas Class fuel. Mr. Grubb told the Committee that TN raised a number of concerns to DOE about deficiencies in the current specification for the TAD. It should be noted that some of the concerns raised by TN were incorporated in the final TAD performance specification issued by DOE. For example, variable canister lengths are now allowed and clarification was given on the maximum burnup for the canister. Some suggestions and recommendations offered by TN to DOE were not considered in the revised specification, such as increasing the maximum capacity of fuel to be loaded into a TAD canister. TN, and most of the industry, considers this suggestion to be crucial. Increasing the capacity of PWR and BWR fuel to be loaded would reduce the total dose (as low as reasonably achievable) to workers, the number of spent fuel shipments, the number of disposal transfers, and the space required for a final disposal facility. Mr. Grubb emphasized that TN's design allows disposal in a horizontal orientation as opposed to a vertical orientation. TN believes that a design that allows horizontal orientation will ease operation at the repository. Mr. Grubb also mentioned that if the DOE-proposed neutron absorber (borated stainless steel) is to be used as a structural material, an ASME Code case will be required for this material to ensure it meets the structural requirements contained in 10 CFR Part 71. Mr. Grubb concluded his presentation by emphasizing the following three points:

- A. DOE should be encouraged to improve the design basis at Yucca Mountain to increase capacity of TAD canisters.

- B. DOE quickly should develop incentives to encourage utilities to switch to the TAD systems, since these are less cost effective for utilities than currently licensed storage and transport cask systems.
- C. The focus on TAD application review could slow down the NRC review and increase the review time for critical storage and transport applications.

Following his presentation, Mr. Grubb responded to questions and comments from ACNW&M members.

Committee Action

The Committee plans to remain informed on TAD design issues and the effects upon preclosure and postclosure activities at Yucca Mountain.

8. ACNW&M White Paper on Spent Nuclear Fuel Recycle Facilities

The Committee and consultants, Dr. Raymond Wymer and Dr. Lawrence Tavlarides, held a round table discussion with NRC staff and external stakeholders on the draft white paper entitled "Background, Status, and Issues Related to the Regulation of Advanced Spent Nuclear Fuel Recycle Facilities." NRC staff participants included Phillip Reed (RES), Amy Snyder (NMSS), and Michael Norato (NMSS). External stakeholders participants included Daniel Stout, DOE; Dorothy Davidson and Alan Hanson, AREVA; and Colin Boardman and Alan Dobson, EnergySolutions.

Prior to the round table discussion, Colin Boardman and Alan Dobson presented an overview of EnergySolutions' approach to spent nuclear fuel recycle. The presentation focused on the experience gained from reprocessing spent nuclear fuel at United Kingdom's Sellafield site. Topics discussed included radioactive waste disposition, effluent management, and decontamination and decommissioning of recycle facilities. The following topics were discussed regarding reprocessing waste:

- A. Americium and curium should be separated and transformed into reactor fuel or targets.
- B. Strontium and technetium should be vitrified with the rest of the fission products.
- C. Because of the short half-life of cesium and strontium, temporary storage of waste prior to disposal may be a better approach than extracting the highly-radioactive waste for a low-level waste repository.
- D. Storing krypton as a waste product had a greater risk than releasing it to the atmosphere.
- E. The biggest uncertainty that was discussed is the type of reactor fuel that will be needed to burn the transuranic waste as being planned by DOE for GNEP.

Dr. John Flack, ACNW&M staff member, followed with a brief overview of the objectives of the white paper: (1) capture the past development of the design and operation of spent nuclear fuel recycle facilities, (2) summarize potential advanced recycle technology, and (3) identify regulatory issues if these advanced technologies were to be implemented. Areas having the greatest interest include safety and security in design and operation of the facility, proliferation, waste forms and classification, and effluences and environmental impact. Options for licensing GNEP facilities were described. Dr. Flack concluded by summarizing several key internal stakeholder comments that had been received on the white paper.

Dr. Ray Wymer, followed with an overview of the topics addressed in the white paper to include licensing and technical issues associated with reprocessing, fuel fabrication, and extended waste storage. Dr. Wymer noted that existing regulations were designed mostly for light water reactors and fabrication facilities handling relatively small amounts of radioactivity, unlike reprocessing facilities. He noted that reprocessing will result in uranium with contaminants that could potentially affect its reuse. He also mentioned that gaseous effluents controls and greater-than-class-C waste (GTCCW) disposal limits will be needed. Other issues included limited availability of qualified NRC staff, facilities, and experienced operators. Resolution between IAEA, NRC and DOE on inventory differences requirements will also be challenging. Dr. Wymer noted that it will become important to design with decommissioning in mind, and research will be needed in several areas to address safeguards instrumentation, material accountability, waste form performance, effluent control, and impact of trace species on safety. Dr. Wymer noted that DOE's June 2008 decision could result in a licensing application within the 2013-2015 timeframe, leaving only the time in between available for NRC to modify or create new regulations, and for EPA to prepare standards and issue a generic environmental impact statement.

The round table discussion opened with an opportunity for all participants seated at the table to provide their input on the white paper. Participants included Committee members, consultants, ACNW&M staff and stakeholders introduced earlier in the meeting: NRC staff, Phillip Reed, RES; Amy Snyder, NMSS; and Michael Norato, NMSS; Daniel Stout (DOE); Dorothy Davidson and Alan Hanson (AREVA); and Colin Boardman and Alan Dobson (EnergySolutions). Each participant was provided an opportunity to comment on the paper. Comments focused on the need to separate cesium and strontium from the waste stream, potential policy issues on risk-informing low-level waste, siting issues for reprocessing facilities, technical information needed for regulatory decisions, changes that have occurred in the reprocessing field over the last 30 years, and research needs. The meeting closed with a request that any follow-on written comments be provided by the end of July 2007.

Committee Action

The Committee plans to finalize their white paper and prepare a letter report based on Spent Nuclear Fuel Recycle in September 2007.

9. Regulatory Guides Scheduled for Revision by the Office of Nuclear Regulatory Research

Chairman Ryan briefed the Committee on his review of the lists of Regulatory Guides to be revised by RES. He reported that some of the Regulatory Guides he looked at in Division 8 referenced outdated and older methodologies in health physics and dosimetry. He proposed that other Committee members and selected staff evaluate the Regulatory Guides in the other

divisions and evaluate whether they also referenced outdated and older methodologies. The Committee also decided that a presentation from RES would be useful concerning how decisions were made leading to the revision lists that are being used to plan and schedule the guidance revisions.

Committee Action

The Committee agreed to request a presentation from RES for the September meeting to discuss the lists of Regulatory Guides being revised and the schedule and plan for the revisions that are still to be accomplished. The Committee also agreed to evaluate selected Regulatory Guides in Divisions 1, and 3 through 8 to determine if old or outdated methodologies were referenced in the Regulatory Guides.

PROPOSED SCHEDULE FOR THE 182ND ACNW&M MEETING

The Committee agreed to consider the following topics during its 182st meeting to be held September 18–20, 2007:

- Combined FSME Office and Division Directors Semiannual Briefing to Discuss Items of Mutual Interest
- NEI/EPRI Executive Committee Views on Low-Level Waste (LLW) Disposal and Storage Issues
- LLW Class B and C Volume Minimization Strategy at Nuclear Power Plants
- NMSS Briefing on NRC 2006 LLW Strategic Planning Initiative (Final NMSS Recommendations)
- Briefing on Tritium Task Force Action—Guidance to Define Spills and Leaks that Need to be Documented
- Briefing on Tritium Task Force Action—Information on Design and Operations in Applications for New Reactors
- NUREG on Assessment of Mechanisms for Early Waste Package Failure in the proposed Yucca Mountain Repository
- NUREG on Dissolution Kinetics of Commercial Spent Nuclear Fuels in the proposed Yucca Mountain Repository Environment
- Corrosion Performance of Waste Package and Drip Shield Materials in the proposed Yucca Mountain Repository Environment
- Approval of White Paper on Recycle

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- NRC Staff Response to Public Comments on draft Standard Review Plan for Activities Related to DOE Waste Determinations

Sincerely,

/RA/

Michael T. Ryan
Chairman

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Sincerely,

/RA/

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Chairman

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