



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

ACNWS-0167

December 26, 2006

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

Dear Chairman Klein:

SUBJECT: SUMMARY REPORT—174TH MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE, NOVEMBER 13–16, 2006, AND RELATED ACTIVITIES OF THE COMMITTEE

During its 174th meeting, November 13–16, 2006, the Advisory Committee on Nuclear Waste (ACNW) discussed several matters and completed the following letters and memorandum:

LETTERS:

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

- Spent Fuel Transportation Package Response to the Baltimore Tunnel Fire Scenario, dated November 28, 2006
- Standard Review Plan for Activities Related to U.S. Department of Energy Waste, dated December 1, 2006

MEMORANDUM:

Memorandum to Luis A. Reyes, Executive Director for Operations, NRC, from John T. Larkins, Executive Director, ACRS, on Draft Proposed Revision to Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs—Effluent Stream and the Environment," dated November 20, 2006

HIGHLIGHTS OF KEY ISSUES

1. Update on the Status of Seismic Design Bases and Methodology: NRC Perspective

The Committee met with representatives of the NRC staff to be briefed on seismic issues and review methodologies applicable to the preclosure phase of Yucca Mountain repository operations. In May 2006, the NRC staff issued Interim Staff Guidance (ISG), "Review Methodology for Seismically Initiated Event Sequences," designated DHLWRS-ISG-01, for

public comment.¹ This ISG was intended to supplement the existing Yucca Mountain Review Plan (YMRP) for the staff's review of seismically initiated event sequences. Such event sequences are expected to be described in the U.S. Department of Energy's (DOE's) preclosure safety analysis (PCSA) submitted as part of a 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 staff determined that additional guidance was needed regarding how the YMRP should address the treatment of seismic issues in the context of a PCSA. The staff had previously noted that the methodology proposed in DHLWRS-ISG-01 is consistent with the seismic review methodology it proposed for the review of the mixed-oxide fuel fabrication facility at the Savannah River Site, in South Carolina², as well as the recently issued American Society of Civil Engineers (ASCE) consensus standard ASCE/SEI 43-05³ on seismic design criteria for nuclear facilities. In June 2006, the NRC staff conducted a technical exchange meeting with DOE to discuss draft DHLWRS-ISG-01. Later, in September 2006, the staff conducted a separate public meeting with representatives of the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI). The NRC staff noted that it had received 23 comments from 5 different organizations on draft DHLWRS-ISG-01. The staff also noted that it generally believed that it had satisfactorily responded to technical comments on DHLWRS-ISG-01 which were received from the public, although some stakeholders (specifically NEI and EPRI) may have continuing nontechnical concerns about the use of the ISG format as staff guidance in the area of high-level radioactive waste management.

During the course of the Committee briefing, the NRC staff also expressed the view that the guidance outlined in DHLWRS-ISG-01 did not place more rigorous seismic design requirements on DOE than would be found in a typical nuclear power plant. The staff also noted that the NRC's Office of Nuclear Reactor Regulation (NRR) is attempting to integrate ASCE/SEI 43-04 into its review methodology for new nuclear power plant licensing.

Committee Action

The ACNW is scheduled to be briefed by NEI and EPRI on their views on DHLWRS-ISG-01 at its December 2006 meeting.

¹U.S. Nuclear Regulatory Commission, "Notice of Availability of Draft Interim Staff Guidance Document HLWRS-ISG-01 Review Methodology for Seismically Initiated Event Sequences [Notice of Availability]," *Federal Register*, Vol. 71, No. 98, p. 29369, May 22, 2006.

²U.S. Nuclear Regulatory Commission, "Final Safety Evaluation Report on the Construction Authorization Request for the Mixed Oxide Fuel Fabrication Facility at the Savannah River Site, South Carolina—Docket No. 70-3098, Duke Cogema Stone & Webster, LLC," Division of Fuel Cycle Safety and Safeguards, NUREG-1821, March 2005.

³American Society of Civil Engineers, "Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities," Reston, Nuclear Standards Committee, ASCE/SEI 43-05, 2005.

2. Results from the Liquid Radioactive Release Lessons Learned Task Force

Stuart Richards and Timothy Frye, Division of Inspection and Regional Support, NRR, discussed the results of the recently completed work of the Liquid Radioactive Release Lessons Learned Task Force. They provided background on the recent discoveries that led to the establishment of the task force and the charter outlining the task force's work. They discussed the members of the task force, and their qualifications and work experience which made the task force successful. Mr. Richards and Mr. Frye discussed some of the more important findings of the task force, including that none of the events reviewed resulted in any health impacts, but that the potential exists for unplanned and unmonitored liquid releases to migrate offsite undetected. Other findings discussed included that it can be difficult to monitor and predict the movement of groundwater contamination and that external stakeholder interest can be high concerning these types of events.

Committee Action

Rather than write a letter to the Commission on the results of the task force, the Committee agreed to include observations and recommendations in a white paper in 2007 that consolidates work on several decommissioning topics.

3. Preparation for the Meeting with NRC Commissioners

The Committee reviewed and revised draft slides in preparation for the Commission briefing on December 14, 2006.

Committee Action

The slides presenters will finalize the slides and rehearse their presentations at the December 2006 Committee meeting.

4. ACNW Working Group Meeting on Decommissioning Lessons Learned

The ACNW held a working group meeting on lessons learned in decommissioning. The working group meeting was organized as a followup to information previously presented to the Committee on the NRC's lessons learned initiatives. It also sought to specifically obtain information to address a request from the Commission to review best practices in decommissioning and look for ways to improve the design and construction of reactor and materials facilities that would lead to less environmental impact and more efficient decommissioning. The working group focused on obtaining information on ways of risk-informing future rulemaking and guidance to achieve the objectives of the NRC staff's lessons learned initiative. Invited experts in decommissioning who have supported the Committee during several previous decommissioning working group meetings again provided their assistance.

The working group meeting was comprised of two sessions: (1) Lessons Learned in Decommissioning and (2) Factoring Lessons Learned into NRC Directives. The summaries below describe each session.

Session 1: Lessons Learned in Decommissioning. This session featured representatives from industry, licensees, DOE, and decommissioning practitioners. It focused on lessons learned in decommissioning, especially those that could lead to risk-informed approaches to minimizing releases and achieve less costly decommissioning.

- An invited expert from NEI provided information on lessons learned in decommissioning nuclear power reactors and the efforts of EPRI and NEI to preserve these lessons learned for future power plant licensees.
- An invited expert from the Fuel Cycle Facilities Forum provided information on lessons learned in decommissioning complex materials and fuel cycle facilities.
- An invited expert from the U.S. Army Corps of Engineers provided information on lessons learned in completion of Formerly Utilized Sites Remedial Action Program remediation sites and other facilities cleaned up by the Corps.
- An invited expert from Argonne National Laboratory provided information on lessons learned in decommissioning DOE facilities.

Session 2: Factoring Lessons Learned into NRC Directives. This session featured a representative of an Agreement State and several NRC staff who addressed the decommissioning lessons learned to date that could lead to risk-informed approaches to minimizing releases and reducing decommissioning costs, as well as how the staff is factoring (or will factor) these lessons learned into rulemaking and guidance.

- A representative of an Agreement State presented the State's views on decommissioning lessons learned.
- Representatives of the Office of Federal and State Materials and Environmental Management Programs (FSME) presented information on their lessons learned efforts and on an update on revisions to 10 CFR 20.1406, "Minimization of Contamination." The office is considering the inclusion of decommissioning lessons learned in some form in some of the provisions of the proposed draft revisions to the rule.
- An NRR representative presented information on the development of Standard Review Plan chapters for the review of a license application for a new nuclear power plant.
- A representative from the Office of Nuclear Regulatory Research (RES) presented information on the development of a regulatory guide for implementation of 10 CFR 20.1406 and other work of the staffs in NRR, the Office of New Reactors (NRO), and RES that is intended to include some aspects of decommissioning lessons learned efforts.

A discussion and a question-and-comment session involving the Committee members, the invited decommissioning experts, and the speakers followed the formal presentations.

Working Group Meeting Highlights

Participants presented a broad range of experience in decommissioning projects and exhibited a great deal of knowledge regarding the conduct of decommissioning at a variety of facilities containing radioactive (and other hazardous) materials. Many of the lessons learned at one type of facility were very similar to lessons learned at another type of facility. However, certain decommissioning issues typically arise at only one type of facility. For example, nuclear power plants have many types of decommissioning issues that do not arise at smaller licensee facilities. Participants generally agreed that preserving and learning from decommissioning lessons learned at this time is a useful way to reduce the impact on the environment and costs from future facilities.

Meeting participants expressed other key points, including the following:

- There will be a gap of about 25–30 years before any additional currently operating nuclear power plants are decommissioned. It will be a challenge to preserve and then actually use a lesson learned with such a long gap between collecting and using the information.
- It is recommended that the decommissioning plan for a facility be considered a “living” document that is prepared in advance of decommissioning and is updated with information on spills, equipment replacement, and other events. NRC rules now require this for large and complex facilities. It would also be beneficial to emphasize more decommissioning-related subjects in inspections; for example, identification and tracking of spill sites.
- One expert questioned the utility of applying lessons learned from today’s decommissioning when so little can be accurately predicted about the conditions (especially the regulations) that will be relevant in the decommissioning of future power plants.
- Nuclear power plants undergoing decommissioning now are starting to store all classes of low-level waste on-site in anticipation of the closure of the Barnwell, South Carolina, disposal facility.
- More and better site characterization and historical information about site and facility use would have been of great value in decommissioning, therefore a more lifecycle approach to decommissioning is recommended.
- Many older facilities have poor records of as-built conditions. Any facilities built now should be able to avoid this problem. Many new technologies exist today that can be used to facilitate recording details on a facility as it is built.
- Intact large component and equipment removals save money and reduce exposure to workers. It would be advantageous to build this into newer facilities.

- Disposal decisions and management drive decommissioning costs in the commercial sector (but not for DOE). Many potential solutions to decommissioning cost issues can be made with changes to disposal restrictions and other disposal policy changes. Transportation makes up a large component of the costs for many facilities undergoing decommissioning because the only disposal facility available for most very low concentration low-level waste is in the western United States, far from many facilities undergoing decommissioning.
- Sometimes health physics monitoring costs more than the actual decommissioning of the facilities and removal of wastes.
- Conditions that lead to less environmental impact and/or less waste and, therefore, less costly decommissioning include: (1) avoiding imbedded piping, (2) providing secondary containment of liquids, (3) avoiding floor penetrations, (4) avoiding corrosion issues (e.g., using plastic piping), (5) using dry rather than wet processes, and (6) siting facilities where homogenous site conditions exist.
- One expert recommended establishing the derived concentration guideline levels for cleanup during the licensing process and allowing the licensee the ability to decommission portions of the facility/site as part of the operating license.
- FSME delivered a memorandum to NRR and NRO providing decommissioning lessons learned, which the reactor offices are factoring into certain SRP chapters for nuclear power plant license application reviews. In addition, RES is preparing a regulatory guide on the implementation of 10 CFR 20.1406, which will also incorporate decommissioning lessons learned. These documents will also incorporate appropriate lessons learned from the Liquid Radioactive Release Lessons Learned Task Force report.
- One expert noted that some decommissioning issues seem to arise from unanticipated accumulation or concentration of releases that are allowable under the current regulations, and this may need to be addressed.

Committee Action

The Committee will write a letter to the Commission based on the working group meeting and other information regarding decommissioning lessons learned.

5. Dose Effect Relationships and Estimation of the Carcinogenic Effects of Low Doses of Ionizing Radiation

Two French scientists, Drs. Yves Garcier and Bernard Le Guen, briefed the Committee regarding the content and recommendations of the 2005 report on low radiation dose effects by the French Academy of Sciences and National Academy of Medicine. Dr. Le Guen, a physician and medical advisor for nuclear plant operations at Electricité de France gave most of the presentation. Dr. Le Guen is also a co-author of the March 2005 report. This report raises doubts about the validity of using the linear no-threshold model (LNT) for evaluating carcinogenic risks of low doses (< 100 millisieverts (mSv)), and even more so for very low doses (< 10 mSv).

Dr. Le Guen commented that the LNT model well describes the relation between dose and carcinogenesis in the higher dose range where it can be scientifically tested. Use of LNT is also recognized as a pragmatic administrative tool for worker protection at doses above 10 mSv. However, using LNT to extrapolate carcinogenic risk below 100 mSv is not based on valid scientific data. Epidemiological and biological data are compatible with the existence of a practical dose threshold in the range of 10 to 60 mSv. The actual threshold cannot be demonstrated with data available today. Dr. Le Guen also reported that collective dose cannot be used to evaluate the cancer risk in a population. An example of this erroneous use of LNT is to “calculate” the number of deaths induced if millions of people were exposed to a few microsieverts. This incorrectly assumes that a very low dose administered to many people has the same carcinogenic effect as a higher dose administered to a small number of people. These calculations do not have any meaning, as the United Nations Scientific Committee on the Effects of Atomic Radiation and the International Commission on Radiological Protection have pointed out.

Committee Action

The conclusions reached in the March 2005 French Academies report conflict with those of the June 2005 Biological Effects of Ionizing Radiation (BEIR) VII report, which states that when the complete body of research is considered, a consensus view emerges that the health risks of ionizing radiation, while small at low doses, are a function of dose. BEIR VII goes on to conclude that no compelling evidence indicates a dose threshold below which the risk of tumor induction is zero.

The Committee is drafting a letter to the Commission that focuses on differences between the French Academies study and the findings in the BEIR VII report. The Committee will discuss the draft letter at the December 2006 ACNW meeting.

6. White Paper on Potential Advanced Fuel Cycles

The Committee met with ACNW consultants to discuss their progress on a white paper currently under development to examine spent nuclear fuel reprocessing, including associated technology, experience, and issues. In a Staff Requirements Memorandum dated February 7, 2006, the Commission directed the ACNW to remain abreast of technical and legal developments in the area of reprocessing and to be ready to provide advice should the need arise. The purpose of the white paper is to support the Committee’s response to the Commission directive to consolidate historical information and experience, and to use this information to identify insights important to licensing and regulating reprocessing facilities. Presentations during the meeting covered U.S. and international reprocessing techniques and experience, proliferation-resistant fuel cycle initiatives including the UREX+1a process, flowsheets that identify radiological waste streams, reprocessing equipment, facility design considerations, and the current regulatory framework with options for licensing a reprocessing facility. The paper summarizes suggested technical and regulatory issues for ACNW consideration, including managing the disposition of various waste streams (including waste classification, facility licensing, and decommissioning). The presentation identified issues related to radioactive effluent releases that require a balance between risk, available

technology, and cost. The Committee looks forward to the completion of the white paper later in FY 2007.

Committee Action

This was an information briefing. No Committee action is necessary. The Committee will use the information gained in future meetings with the staff on the NRC's licensing approach to reprocessing spent nuclear fuel. The Committee expects to submit a letter on spent nuclear fuel reprocessing in early 2007.

7. Proposed Revision to Regulatory Guide 1.112

Dr. Stephanie Bush-Goddard, Chief, RES Health Effects Branch, RES, briefed the Committee on the proposed revision to Regulatory Guide 1.112, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Reactors," and how this revision would support future plant licensing (New Reactor Program). Dr. Bush-Goddard presented to the Committee an overview of the regulatory guide and the changes made to the guide. The overview included a description of the GALE Code (a mathematical model used to calculate the annual gaseous and liquid effluent source term) and the Code's current limitations for current and new reactor designs. Dr. Bush-Goddard indicated that there are no immediate plans to update the GALE Code, however, the staff is allocating resources to update the Code in 2008. The updated version will address improvements in reactor technology (i.e., newer fuel designs) and new processes and effluent treatment technologies.

Committee Action

The Committee will write a letter report to the Commission that summarizes the Committee's conclusions and recommendations concerning proposed Revision 1 to Regulatory Guide 1.112.

8. Proposed Revision to Regulatory Guide 4.15,

William Ott, Chief, RES Waste Research Branch, RES, briefed the Committee on how Revision 2 of Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception Through Normal Operations to License Terminations)—Effluent Streams and the Environment," would support future plant licensing (New Reactor Program). Mr. Ott informed the Committee that the major reason for updating the regulatory guide is to incorporate quality assurance and quality control improvements, update sampling methodologies, and reference new standards in radioanalytical measurement. In addition, Mr. Ott informed the Committee that this revision is less prescriptive than the previous revision and incorporates the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) approach. MARLAP provides guidance for the planning, implementation, and assessment phases of those projects that require the laboratory analysis of radionuclides. MARLAP also uses a performance-based approach to laboratory measurements.

Committee Action

The Committee has no objection to the staff's proposal to issue this document.

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

The Committee considered the following report from the NRC Executive Director for Operations (EDO) during its Planning and Procedures meeting on November 13, 2006:

- EDO response, dated September 13, 2006, to ACNW letter, dated August 16, 2006, on the Observations from the ACNW Low-Level Working Group Meeting of May 23–24, 2006. The Committee decided that it was satisfied with the EDO response. No follow-up action is recommended. The ACNW will remain aware of progress and developments in the LLW arena.

PROPOSED SCHEDULE FOR THE 175TH ACNW MEETING

The Committee agreed to consider the following topics during its 175th meeting, to be held December 12–14, 2006:

- Semi-Annual Briefing by the Office of Nuclear Material Safety and Safeguards (NMSS)
- RACER: Tools and a Process to Guide Decisions about Risk Reduction for Contaminants in the Environment
- Nuclear Energy Institute (NEI) and Electric Power Research Institute (EPRI) Views on NRC Interim Staff Guidance (ISG) DHLWRS-ISG-01 on Seismic Event Sequences
- Proposed Revision to Standard Review Plan Chapter 11.2, "Liquid Waste Management System"
- Conceptual Licensing Process for Global Nuclear Energy Partnership (GNEP) Facilities
- Closure of Generic Safety Issue 196: Boral Degradation
- ACNW December 2006 Briefing to the Commission
- Discussion of draft and possible letters and reports on the following:
 - Developing Model Confidence through the Use of Site Monitoring
 - ACNW Working Group Meeting on Lessons Learned in Decommissioning

- Dose Effect Relationships and Estimation of the Carcinogenic Effects of Low Doses of Ionizing Radiation
- Proposed Revision to Reg Guide 1.112, Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Reactors
- Semi-Annual Briefings by the Office of Nuclear Material Safety and Safeguards (NMSS) and the Office of Federal and State Materials and Environmental Management Programs (FSME)
- RACER: Tools and a Process to Guide Decisions about Risk Reduction for Contaminants in the Environment
- Nuclear Energy Institute (NEI) and Electric Power Research Institute (EPRI) Views on NRC Interim Staff Guidance (ISG) DHLWRS-ISG-01 on Seismic Event Sequences
- Proposed Revision to Standard Review Plan Chapter 11.2, "Liquid Waste Management System"
- Public Comments on NRC 2006 Low-Level Radioactive Waste (LLW) Strategic Planning Initiative
- Conceptual Licensing Process for Global Nuclear Energy Partnership (GNEP) Facilities
- Generic Safety Issue 196: Boral Degradation

Sincerely,

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Michael T. Ryan
Chairman

NOTE: Also during the 174th meeting the Committee completed a letter to Dale E. Klein, Chairman, NRC, from Michael T. Ryan, Chairman, ACNW, Subject: DOE Low Dose Radiation Research Workshop (VI). This letter was issued November 8, 2006.

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