



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

ACNWS-0143

April 12, 2004

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: SUMMARY REPORT—148TH MEETING OF THE ADVISORY COMMITTEE
ON NUCLEAR WASTE, FEBRUARY 24–27, 2004, AND OTHER RELATED
COMMITTEE ACTIVITIES

Dear Chairman Diaz:

During its 148th meeting on February 24–27, 2004, the Advisory Committee on Nuclear Waste (ACNW) discussed several matters and completed the following reports to Nils J. Diaz, Chairman, NRC, from B. John Garrick, Chairman, ACNW:

- Instability of Emplacement Drifts of the Proposed Yucca Mountain High-Level Waste Repository, dated March 4, 2004
- Comments on Selected NRC-Sponsored Technical Assistance Programs of the Center for Nuclear Waste Regulatory Analyses, dated March 4, 2004

HIGHLIGHTS OF KEY ISSUES CONSIDERED BY THE COMMITTEE

1. **Working Group on Biosphere Dose Assessments for the Proposed Yucca Mountain High-Level Waste Repository**

To better understand the effects of assumptions and simplifications on Yucca Mountain dose assessments, the ACNW conducted a 2-day working group session (WGS) on February 24 and 25, 2004, to examine approaches for use in performing the required analyses. The scope of this technical session covered how radiological doses from the proposed geologic repository at Yucca Mountain will be calculated, as well as the technical bases underpinning those assessments. A specific area of interest to the WGS was the radiological dose to the stipulated receptor (the “reasonably maximally exposed individual or RMEI”) in the rural community of Amargosa Valley. The Biosphere WGS reviewed both the manner by which the U.S. Department of Energy (DOE) intends to perform the required assessments and how the staff of the U.S. Nuclear Regulatory Commission (NRC) intends to review those assessments. As part of the technical

discussions, WGS participants were asked to highlight dose assessment modeling assumptions, uncertainties in those key assumptions, and how the assumptions and other prescribed parameters affect the magnitude of the calculated radiological dose.

Similar to the earlier ACNW working groups, the Biosphere WGS focused on those activities (both underway and planned) that are intended to increase confidence in evaluating repository performance. This WGS focused on understanding how dose assessments will be performed and what are the most important contributors to dose. For certain key radionuclides that are known to affect Yucca Mountain dose projections (^{129}I , ^{99}Tc , ^{237}Np , ^{241}Am , ^{14}C , and ^{239}Pu), the Biosphere WGS examined (1) modeling of the food-chain/receptor pathway, (2) ingestion and inhalation scenarios, and (3) stylized approaches to dose calculations.

In addition, this WGS promoted discussions regarding (1) the technical bases (measurements, analyses, and interpretations) necessary to conduct biosphere dose assessments, (2) the role of risk insights in the development of those technical bases, and (3) the impact of outstanding technical issues on the resolution of key technical issue (KTI) agreements, at the staff level.

To promote the discussions, the ACNW relied on the following outside experts with expertise in the area of dose assessment methodology:

<u>EXPERT</u>	<u>AFFILIATION</u>
Dr. Dade Moeller ¹	Chairman of the Board Dade Moeller and Associates
Dr. Jeffrey Daniels	Environmental Sciences Division Lawrence Livermore National Laboratory
Dr. Keith Eckerman	Earth Sciences Division Oak Ridge National Laboratory
Dr. David Kocher	Specialists in Energy, Nuclear, and Environmental Services (SENES) Oak Ridge, Inc., Center for Risk Analysis
Dr. Michael Thorne ²	Principal Mike Thorne and Associates (UK)
Dr. John Till	President Risk Assessment Corporation

¹Former President of the Health Physics Society; Associate Dean of the School of Environmental Science, Harvard University; and former Chairman of the NRC's Advisory Committee on Reactor Safeguards and the ACNW

²Representing the State of Nevada

Both the NRC and DOE staffs made presentations consistent with the scope of the meeting. Following each of the technical presentations, the panel of invited experts reviewed the material presented and offered their opinions regarding the respective staff approaches. Stakeholders and members of the public commented on the discussions that took place during the technical sessions. An individual representing the Electric Power Research Institute also offered that organization's views on the issues being discussed.

In addition, the discussions included an overview of the U.S. Environmental Protection Agency's Federal guidance applicable to Yucca Mountain led by Dr. Keith Eckerman. Dr. Dade Moeller began the sessions with a keynote talk that set the tone for WGS technical discussions.

Committee Action

The Committee will use the results of the Biosphere WGS to develop a letter report to the Commission with the ACNW's observations and possible recommendations. The Committee will also publish proceedings of this WGS as a NUREG-series report (NUREG/CP).

2. Safety Research Report — Waste Management

The Committee discussed the NRC-sponsored technical assistance work being performed by the Center for Nuclear Waste Regulatory Analyses staff.

Committee Action

The Committee issued a report to the NRC Chairman, dated March 4, 2004, with observations and recommendations related to this work.

3. Risk Insights Baseline Status Report

The NRC staff defines "risk insights" as the results and findings that come from performance assessments. Risk insights could include the use of risk curves or predicted doses from radioactive waste disposal facilities. For many years, the ACNW has urged the staff to use performance assessment results (insights) to develop risk insights in its Yucca Mountain programs and to focus on the most risk-significant issues.³ In 2002, the staff briefed the Committee on the results of its initial risk insights initiative.

³This past advice has included recommendations that the staff should (1) use performance assessment results to judge quantitatively the effectiveness of individual repository barriers, (2) develop and use performance assessment techniques such as a post-processor to rank-order individual barrier contribution to performance, (3) use probabilistic methods (i.e., the risk triplet) in performance assessment modeling, and (4) use performance assessment analyses to prioritize KTIs and to reexamine KTIs and attendant subissues.

At the 148th meeting of the ACNW, the staff briefed the Committee on the results of its most recent risk insights initiative. Embracing past ACNW advice, the staff is developing an integrated synopsis report that describes its understanding of the key contributors to performance for a geologic repository at Yucca Mountain. This integrated synopsis report, entitled the "Risk Insights Baseline Report," is to reflect the informal expert opinion of the NRC staff regarding the risk significance of 14 integrated sub-issues (ISIs)⁴ to overall repository performance. The staff will base this opinion on its own independent performance assessment work, reviews of DOE performance assessments, and other documented sources.

The staff is evaluating risk significance relative to the waste isolation capabilities of the repository system. In general, *high* risk significance is associated with features, events, and processes that could (1) affect the integrity and longevity of a large number of waste packages, (2) affect the release of radionuclides from the waste form and waste package, or (3) affect the transport of radionuclides through the geosphere and biosphere. *Medium* risk significance is associated with a lesser effect on waste packages, radionuclide releases, or radionuclide transport. *Low* risk significance is associated with no or negligible effect.

For each of the 14 ISIs, the staff is developing the following types of information:

- (1) ranking of risk significance to waste isolation
- (2) discussion of the specific risk insights, including the technical basis for the staff's judgment and the identification of uncertainties associated with that judgment.
- (3) recommended areas for additional analyses to reduce the uncertainty in the judgments
- (4) identification of principal technical references

The staff noted its intent to use the "Risk Insights Baseline Report" in conjunction with the "Yucca Mountain Review Plan" (NUREG-1804) and the "Integrated Issue Resolution Status Report" (NUREG-1762) to review DOE's license application. The staff also noted that it will conduct approximately 22 additional performance assessment analyses between now and the scheduled license application submittal to reduce the uncertainty in the earlier risk judgments.

⁴Independent of the risk insights initiative, the NRC staff identified 14 model abstractions that, in its view, collectively contribute to the waste isolation capabilities of the repository system. Within each of these 14 model abstractions, now called "ISIs," the staff has also identified key features, events, and processes that are important to repository performance.

Committee Action

At present, the Risk Insights Baseline Report is not publicly available to the Committee. Once the report becomes publicly available, the ACNW will review it and consider whether there is a need to prepare a report to the Commission concerning staff efforts in this area.

4. Report on Key Technical Issue Status and Division of Waste Management Evaluation of Department of Energy's Bundling Approach

An NRC senior project manager reviewed the current status of 293 Yucca Mountain KTIs for which 90 agreements have been completed so far. The project manager also summarized the risk significance ranking (high, medium, low) of the respective agreements. He then discussed the NRC's process for reviewing DOE submittals in response to the agreements, many of which have been submitted as groups or "bundles" of related agreements. The NRC staff is reviewing the DOE responses and related technical basis documents in an integrated fashion to prepare for DOE's possible submittal of a license application later this year. Given the delays in DOE's response submittals, it appears that the NRC staff will not have time to completely address all of these submittals and certify the agreements as "closed" prior to receiving the license application.

Committee Action

This was an information briefing. The ACNW members will consider whether a written report to the Commission is warranted.

5. Reconciliation of ACNW Comments and Recommendations

During its Planning and Procedures meeting on February 26, 2004, the Committee considered a report from the NRC's Executive Director for Operations (EDO), dated November 12, 2003, in which the EDO responded to the ACNW letter, dated October 1, 2003, concerning the WGS on Performance Confirmation for Yucca Mountain.

The Committee indicated that the EDO's response stated that performance confirmation (PC) is an appropriate area for pre-licensing interaction with the DOE, and that the staff will continue to hold pre-licensing interactions with DOE regarding its PC program plan. The EDO's response made reference to NRC's review of Revision 2 of DOE's PC Plan. However, NRC staff and a DOE representative reported to the ACNW on February 26, 2004, that Revision 2 will apparently not be provided for NRC review, and Revision 3 will no longer contain the detailed PC plans that had been previously expected. DOE intends to make draft pre-decisional versions of the PC plan available to the NRC staff, but these will not be accessible to the public. It appears that DOE's PC plan may not receive "formal" pre-licensing review by the NRC staff. An NRC/DOE technical exchange on PC is tentatively scheduled for later in 2004. The Committee decided that it would request further status briefings on NRC/DOE pre-licensing PC interactions during 2004. As of March 2004, DOE has no formal PC plan.

6. Proposed Agenda for the 149th ACNW MEETING

The Committee agreed to consider the following topics at its 149th meeting on April 20–22, 2004:

- Update on West Valley and Its Performance Assessment Plans
- Risk-Informed Regulatory Activities of the Office of Nuclear Material Safety and Safeguards (NMSS)
- Environmental Protection Agency, Regulation 40 CFR, Chapter 1, Advance Notice of Proposed Rulemaking, "Approaches to An Integrated Framework for Management and Disposal of Low-Activity Radioactive Waste"
- DOE Schedule for Responses to KTI Agreements
- Division of Waste Management (DWM) Evaluation of DOE Bundling Approach
- Preparation of ACNW Reports on:
 - Risk Insights Report
 - DWM Evaluation of DOE Bundling Approach
 - Risk-Informed Regulation for NMSS Activities
 - Public Interactions During November 2003 Nevada Field Trip
 - Biosphere Working Group Session
 - West Valley Performance Assessment Plans
 - ACNW Annual Report on Waste-Management-Related Research

Sincerely,

/RA/

B. John Garrick
Chairman