



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555

August 27, 1991

MEMORANDUM FOR: James M. Taylor
Executive Director for Operations

FROM: *Raymond F. Fraley*
Raymond F. Fraley
Executive Director, ACNW

SUBJECT: 33RD ACNW MEETING FOLLOW-UP ITEMS

Based on discussions regarding methods for improving implementation and follow-up of ACNW recommendations, a summary of "Actions, Agreements, Assignments, and Requests" made during each ACNW meeting is sent to your office following each meeting.

Attached is a summary of the "Actions, Agreements, Assignments, and Requests" made at the 33rd ACNW meeting, July 25-26, 1991, that deal with requests made of the NRC staff or that are pertinent to NRC staff activities.

Attachment: As stated

cc: H. L. Thompson, EDO
J. L. Blaha, EDO
S. J. Chilk, SECY
E. J. Jordan, AEOD
R. M. Bernero, NMSS
T. E. Murley, NRR
E. S. Beckjord, RES
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SUMMARY OF ACTIONS, AGREEMENTS, ASSIGNMENTS, AND REQUESTS
33RD ACNW MEETING - JULY 25-26, 1991

MEMORANDA

- The Role of Formal Elicitation of Expert Judgment in the Performance of a Geologic High-Level Waste Repository (Memorandum to Robert M. Bernero, Director, Office of Nuclear Material Safety and Safeguards, dated July 31, 1991. Enclosure 1)
- Visit to the Center for Nuclear Waste Regulatory Analyses (Memorandum to Eric S. Beckjord, Director, Office of Nuclear Regulatory Research, and Robert M. Bernero, Director, Office of Nuclear Material Safety and Safeguards, dated July 31, 1991. Enclosure 2)

HIGHLIGHTS OF MATTERS CONSIDERED BY THE COMMITTEE

1. Meeting with the NRC Commissioners

The Committee met with the NRC Commissioners to discuss items of mutual interest, including:

- Uncertainties in implementing the EPA high-level waste (HLW) standards
- Response to questions accompanying working draft #3 of the EPA HLW standards
- Visit to the Center for Nuclear Waste Regulatory Analyses
- Use of expert judgment in performance assessment for a geologic repository

Chairman Selin requested the ACNW to investigate the feasibility of a systems analysis approach to reviewing the over-all high-level waste program, including the short and mid-range technical milestones for handling high-level waste and to report back to the Commission the ACNW's recommendations as to the scope and advisability of it undertaking such a review. Discussion of this question is scheduled for the August 27-29, 1991 ACNW meeting.

2. Expert Judgment

The Committee discussed and issued a memorandum on the use of expert judgment in conducting performance assessments in support of licensing of a geologic high-level radioactive waste repository.

During the discussion, the Committee reviewed a memorandum to Giorgio Gnugnoli from Robert Budnitz, President, Future Resources Associates, Inc., dated July 14, 1991, regarding Expert Judgment in the Regulatory Decision Process for a HLW Repository. The Committee recommended that this memorandum be provided to the NRC staff. The ACNW staff has forwarded this memorandum to the NRC staff under separate cover.

3. Visit to the Center for Nuclear Waste Regulatory Analyses

The Committee discussed its recent trip to and meeting at the Center for Nuclear Waste Regulatory Analyses. A memorandum was issued. As noted earlier in this memorandum, a copy is attached as Enclosure 2.

During the discussion of the Systematic Regulatory Analysis (SRA) that was conducted by the Center, the members expressed concern on whether some of the issues identified in the SRA are being adequately addressed by the NRC staff. John Linehan, NMSS, noted that a report on this subject was issued last March and was provided to the Committee. He also stated that the NMSS staff is preparing a "white paper" on the SRA and proactive program and offered to make it available to the Committee when completed. Dr. Pomeroy expressed his interest in seeing the paper and more specifically, in how iterative performance assessment will be used.

4. ACNW Future Activities

- The Committee agreed to expand the 33rd meeting to include a two-hour executive session on Tuesday evening from 7:00 to 9:00 p.m. This session was scheduled to provide additional time for the members to discuss a response to the question raised by Chairman Selin during the July 25, 1991 meeting between the Commission and the ACNW regarding interim storage of high-level waste.
- Due to a conflict in meeting dates with the EPRI - Sponsored Workshop to Address Issues from the EPA-HLW Disposal Regulatory Criteria (September 24-26, 1991), the Committee agreed to reschedule the 34th ACNW meeting from September 25-27th to September 27, 1991.
- The Committee tentatively agreed to schedule a Working Group meeting on the Review of Regulatory Guides for Implementing Revisions to 10 CFR Part 20 on September 23-24, 1991. (This will be a joint meeting with the ACRS Subcommittee on Occupational and Environmental Protection Systems. All available Regulatory Guides will be reviewed.)

- The members discussed a recent incident involving a potential criticality problem at the General Electric Fuel Fabrication Facility at Wilmington, North Carolina. The Committee agreed not to schedule a briefing, however, the members expressed interest in receiving a copy of the NRC Incident Investigation Team report. The ACNW staff will provide this report to the ACNW members. The ACRS plans to schedule a discussion of this incident during the October 10-12, 1991 ACRS meeting.
- The Committee agreed to schedule a visit to the Waste Isolation Pilot Project, Carlsbad, New Mexico, on or about November 5, 1991.

Appendix A summarizes the proposed items for future meetings of the Committee and related Working Groups. This list includes items proposed by the Commissioners and NRC staff as well as ACNW members.

APPENDIX A. FUTURE AGENDA

34th ACNW Committee Meeting August 27-29, 1991 (Tentative Agenda)

Review of DOE's Site Characterization Plan by the State of Nevada
Representatives of the State of Nevada will brief the Committee on the State's review and comments on DOE's Site Characterization Plan and related Study Plans.

Responses to DOE's Site Characterization Plan - The Committee will be briefed by representatives of DOE on its responses to comments received from EPA, NRC, and the State of Nevada on the Yucca Mountain Site Characterization Plan.

Responses to NRC's Site Characterization Analysis - The Committee will be briefed by representatives of the Division of High Level Waste Management (HLWM) on the results of the review of DOE's responses to the NRC staff's Site Characterization Analysis.

Proactive Program for High-Level Waste Management - The Committee will be briefed by the HLWM staff on its proactive program on HLW. This involves planned rulemakings, guidelines, and technical positions in support of the HLW program.

ACNW Four-Month Plan - The Committee will prepare its next four-month plan to the Commission for the period September-December 1991.

Response to a Request from Chairman Selin - The Committee will begin to investigate the feasibility of a systems analysis approach to reviewing the over-all high-level waste program, including the short and mid-range technical milestones for handling high-level waste and to report back to the Commission the ACNW's recommendations as to the scope and advisability of it undertaking such a review.

EPA High-Level Waste Standards - The Committee will review the current position of the NRC staff on the Working Draft #3 of the EPA HLW Disposal Standards. The Committee will also review a revised NRC staff paper on their approach for dealing with uncertainties in implementing the EPA HLW Disposal Standards.

Containment Requirements in 40 CFR Part 191 - The Committee will review the NRC staff's response to the ACNW report, dated May 30, 1991, on alternative approach to the probabilistic section of the containment requirements in 40 CFR Part 191 ("The Three-Bucket Approach").

Rule on Ethical Conduct of Employees - The Committee will discuss the proposed OGE rule on ethical conduct of employees of the Executive Branch and the impact it will have on the personal and professional (non-government) activities of Committee members as well as its impact on the functioning of the Committee. [Portions of this session will be closed as necessary to discuss information the release of which would represent a clearly unwarranted invasion of personal privacy.]

Committee Activities - The Committee will discuss anticipated and proposed Committee activities, future meeting agenda, and organizational matters, as appropriate. The members will also discuss matters and specific issues that were not completed during previous meetings as time and availability of information permit.

Working Group Meetings

Review of Regulatory Guides for Implementing Revisions to 10 CFR Part 20, September 23-24, 1991, 7920 Norfolk Avenue, Bethesda, MD (Gnugnoli) - The Working Group will review, discuss and make recommendations where appropriate on regulatory guides related to the implementation of the revised 10 CFR Part 20 rule. This review will be done jointly with the ACRS Subcommittee on Occupational and Environmental Protection Systems.

NRC Staff Computer Modeling and Performance Assessment Capabilities in HLW and LLW, (Date to be determined), 7920 Norfolk Avenue, Bethesda, MD (Gnugnoli) - The Working Group will review, discuss and make recommendations regarding the NRC staff capabilities to make independent evaluations of licensee proposals with respect to the performance of low-level and high-level radioactive disposal facilities. Emphasis will be placed on computational capabilities involving computer modeling, documentation, verification and validation.

Geologic Dating, (Date to be determined), 7920 Norfolk Avenue, Bethesda, MD (Abrams) - The Working Group will review and discuss the problems and limitations associated with the various quaternary dating methods to be used in site characterization of an HLW repository.

Residual Contamination Clean-up Criteria, October 25, 1991, 7920 Norfolk Avenue, Bethesda, MD (Gnugnoli) - The Working Group will review, discuss and make recommendations regarding the soil clean-up criteria and acceptable levels for unrestricted use of contaminated sites that have been, or were at one time, under AEC or NRC license. The NRC staff is in the process of determining acceptable radionuclide concentrations for uranium- and thorium-

contaminated soils and surface level contamination limits for structures to be released for unrestricted use.

Long-Term Climate Change in the Area of the Southern Basin and Range, November 19, 1991, 7920 Norfolk Avenue, Bethesda, MD (Abrams) - The Working Group will review and discuss the impact of potential long-term climate changes on the performance assessment for the proposed HLW repository.

Post-Closure Monitoring, November 22, 1991, 7920 Norfolk Avenue, Bethesda, MD (Larson) - The Working Group will review the potential problems and possible limitations associated with the post-closure monitoring of a proposed HLW repository. The potential utilization of non-invasive methods in providing such a capability as well as the duration of such monitoring, and the significance and impact of the results will also be considered.

Presence of Natural Resources at the Proposed HLW Site, December 17, 1991, 7920 Norfolk Avenue, Bethesda, MD (Abrams) - The Working Group will discuss methodologies for the assessment of the potential for natural resources at the proposed HLW disposal site.



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July 31, 1991

MEMORANDUM FOR: Robert M. Bernero, Director
 Office of Nuclear Material Safety
 and Safeguards

FROM: *Dade W. Moeller*
 Dade W. Moeller, Chairman
 Advisory Committee on Nuclear Waste

SUBJECT: THE ROLE OF FORMAL ELICITATION OF EXPERT
 JUDGMENT IN THE PERFORMANCE ASSESSMENT OF A
 GEOLOGIC HIGH-LEVEL WASTE REPOSITORY

The Advisory Committee on Nuclear Waste has held two workshops (January 25, 1991, and June 18-19, 1991) on the role and use of expert judgment in the site characterization, performance assessment, and eventual licensing of a geologic repository for the disposal of high-level radioactive waste (HLW). We also discussed this matter during the Committee's 28th and 32nd meetings on February 20-21, 1991 and June 20, 1991, respectively. The purpose of this memorandum is to provide our comments and recommendations relative to this matter. In addition, the NRC staff should consult the transcripts of the meetings noted above, as well as the written reports and publications distributed during these meetings.

Expert judgment has played and must continue to play an important role in the decisionmaking process related to evaluations of the anticipated performance of a proposed HLW repository. Certain applications of expert judgment will be implicit; others will be explicit. This memorandum deals primarily with the latter.

The immediacy of our concern is evidenced by the current reliance of the U.S. Department of Energy on explicit, formal elicitation of expert judgment in resolving some of the most significant problems in repository siting, for example, the Calico Hills Risk/Benefit Analysis. On the basis of our review and in light of this urgency, we offer the following recommendations:

1. The NRC staff should prepare and provide guidance on the appropriate use of and reliance on explicit expert judgment. As part of this guidance, the staff should develop the criteria that it will use to analyze, evaluate, and ultimately accept or reject the information generated by the formal elicitation of expert judgment. Some of our observations associated with the application and use of expert judgment are listed in Appendix A.

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2. As noted in Appendix A, Item 6, the methodology used in eliciting expert judgment may distort the result of the process. To minimize such distortion, the staff should
 - a. seek consensus in the technical community on an appropriate methodology, and
 - b. provide guidance on the appropriate use of this methodology.

This guidance should address the potential influence of the factors listed in Appendix B. We recognize that responsible parties will bring forth legitimate methodology questions that will have to be addressed in the licensing process. However, if the appropriate methodologies for formally eliciting expert judgment can be agreed on and established through staff guidance, discussion during the licensing process can focus on the judgments and the underlying bases for the judgments rather than on the methodology.

3. The NRC staff should continue the orderly development and iterative application of its performance assessment capability, in order to identify those areas where formal expert judgment is critical in the decisionmaking process.

We recognize that resolution of these recommendations represent difficult and unique problems, but now is the time for the staff to develop an acceptable and systematic approach to expert judgment.

We hope that these comments will be useful.

Enclosures:

1. Appendix A, Observations on the Use of Expert Judgment
2. Appendix B, Questions to be Considered in Providing Guidance on the Use of Expert Judgment

cc: J. Youngblood, NMSS
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S. Coplan, NMSS
S. Chilk, SECY
A. Eiss, NMSS
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R. Virgilio, GPA
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APPENDIX A

OBSERVATIONS ON THE USE OF EXPERT JUDGMENT

1. It will be necessary to apply expert judgment as a part of the development of a license application for an HLW repository. Outright rejection of expert opinion where there are inadequate data would be inconsistent with its established role in risk analysis.
2. Explicit expert judgment should not be used instead of "hard" data, but rather in conjunction with those data.
3. The elicitation and use of expert judgment, as well as its evaluation and analysis by the decisionmaker, are non-trivial tasks that require care, planning, documentation, and resources. There is a need for systematic, visible, and easily understood protocols for elicitation.
4. Explicit formal elicitation should not be conducted simply as a poll of experts. It should include explicit articulation of the principles, reasoning, and data on which the judgments are based. The bases for each expert's judgment, as well as the attendant uncertainties, must be examined and displayed carefully -- this is a quality assurance as well as a scientific issue.
5. The formal elicitation of expert judgment can and should clearly explicate the uncertainties for the decisionmaker, but it should be recognized that such judgments represent only "snapshots" in time of prevalent opinion. Expert judgment should not be characterized as a means for revealing truths.
6. The methodology used in eliciting expert judgment may significantly influence the result of the process. Key factors within that methodology include the identification and selection of issues and the identification, selection, and use of experts and elicitors, as well as the biases of the experts and elicitors and the methods for aggregating results. These areas are addressed in greater detail in Appendix B.
7. An important issue is estimating the magnitude of the uncertainty, especially where there are limited data on which expert judgment can be based. Efforts should be made to estimate the uncertainty in the results of expert judgment, perhaps through redundancy.
8. Where there are inadequate data, the NRC staff should not necessarily choose the most conservative approach. In all cases the selected approach should be justified. This is especially true in light of the stringency of the applicable U.S. Environmental Protection Agency HLW standards.

APPENDIX B

QUESTIONS TO BE CONSIDERED IN PROVIDING GUIDANCE ON THE USE OF EXPERT JUDGMENT

1. How should experts be identified and selected?
2. How should the elicitation be designed and conducted?
3. How can biases (institutional, motivational, etc.) on the part of experts or elicitors be evaluated and reduced?
4. Is dependency among experts (mutual influence) desirable? If so, what are the appropriate ways to encourage it? If not, how can it be minimized or eliminated?
5. Are there appropriate protocols for weighting the judgments of experts and for weighting alternative models and their results? If so, what are the criteria for assigning weighting factors?
6. How should judgments be aggregated? What are the criteria for choosing an aggregation method?
7. What is the appropriate level of documentation for the elicitation? Can or should the quality assurance system for HLW be applied to expert judgment?
8. How should the potential influence of the normative experts on the outcome be controlled?



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MEMORANDUM FOR: Eric S. Beckjord, Director
 Office of Nuclear Regulatory Research

Robert M. Bernero, Director
 Office of Nuclear Material Safety
 and Safeguards

FROM: *Dade W. Moeller*
 Dade W. Moeller, Chairman
 Advisory Committee on Nuclear Waste

SUBJECT: VISIT TO THE CENTER FOR NUCLEAR WASTE
 REGULATORY ANALYSES

On June 26 - 28, 1991, members of the Advisory Committee on Nuclear Waste, supported by three consultants, journeyed to San Antonio, Texas, to review the programs of the Center for Nuclear Waste Regulatory Analyses (Center). Also participating in this visit were members of the staffs from, and consultants to, each of your offices as well as a representative from the Nuclear Safety Research Review Committee. Through this memorandum, the Committee wants to share with you its comments and observations.

Before we list our specific comments, however, we want to emphasize that our overall impressions of the activities of the Center were favorable. An enthusiastic team of professionals has been recruited, communications among the several groups within the Center appeared to be good (with a resultant integration of the various programs being pursued), adequate office and laboratory space has been provided, and the necessary analytical instrumentation is being assembled. Plans for the construction of a new building to provide dedicated office space for the Center staff demonstrate the full commitment of the Southwest Research Institute to this endeavor.

We are pleased to note that the Center staff members are participating more frequently in national and international scientific meetings. They are publishing in refereed journals and are providing leadership in organizing meetings on key topics such as "Natural Analogs" (held on July 23-25, 1991). Also of note is the fact that exchanges of personnel through rotational assignments between the Center and NRC headquarters are now taking place.

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July 31, 1991

Our comments on specific technical aspects of the Center's programs are summarized below:

1. Assignment of Priorities

Although the Center staff is engaged in a variety of projects, it is not clear to us how these projects are identified and, more importantly, whether the most important subjects are being addressed. We believe that it would be useful to outline the methodology for establishing priorities for work at the Center. Specific questions to be addressed include: Who sets priorities? What criteria are used? How often are the priorities reviewed?

2. Performance Assessment and Model Validation

We are pleased to note that increasing attention by the Center staff is being directed to performance assessment. This, in our opinion, is a high priority item that should receive focused and increasing attention and be supported by a vigorous effort to recruit additional people who are competent in this subject. There is a need for ongoing external peer review of the total (Center and NRC staff) performance assessment program. This requires more than the reviews provided through working group meetings of the Advisory Committee on Nuclear Waste.

To support the performance assessment program, there is a need to validate the various computer models being used to analyze the effects of various parameters on the performance of a high-level waste repository. Although the proposed studies at the Peña Blanca site in Mexico will assist in confirming certain aspects of these computer codes, efforts need to be directed to confirming the validity of the codes being applied to other aspects of repository performance. Without such confirmation, the usefulness and application of these codes will be questioned.

3. Systematic Regulatory Analysis

During the past several years, the staff of the Center has conducted a careful analysis of 10 CFR Part 60 and the associated regulatory inconsistencies and uncertainties. We were informed that this effort has provided a framework for planning much of the work of the Center, including the iterative performance assessments that will be used to determine relevant data needs and to identify the key parameters affecting the performance of the proposed Yucca Mountain repository.

There is a need to bring to closure the issues that have been raised and to factor the results of this effort more directly into the research and technical assistance activities of the Center. We look forward to receiving more information on this subject during the scheduled upcoming briefing by the staff of the Division of High Level Waste Management.

4. Timeliness of Studies and Results

We believe it is important for the Center staff to realize that timeliness is a key factor in developing necessary experimental and computational techniques, in generating data through the application of these techniques, and in issuing reports summarizing the related information. An example of timeliness is the need for the Center staff to develop a capability to conduct evaluations of the long-term resistance of various waste canister materials to corrosion under relevant repository conditions. This work should progress even though the U.S. Department of Energy has not yet identified the specific canister material to be used. Otherwise the required testing capabilities may not be ready when needed. Tests also need to be developed for predicting repository behavior under the dry-wet-moist cycle that will exist within an unsaturated environment. Also important in meeting this goal is a requirement on the NRC staff to rapidly review Center reports submitted to it.

5. Technical Assistance and Research

It was not clear from our review how projects being conducted by the Center in providing technical assistance are coordinated with those pertaining to research. There appears to be a need for relevant program managers within the Office of Nuclear Material Safety and Safeguards and the Office of Nuclear Regulatory Research to ensure that the demands being placed on the Center are well coordinated, and that these demands fit into the overall agreed upon priorities. A major goal of such coordination should be to minimize the number of conflicting and competing demands being placed on the Center staff.

6. Laboratory Equipment and Computer Support

Many of the studies underway (or being planned) at the Center require sophisticated laboratory equipment and supporting computer capabilities. To the extent practicable, we recommend that capital funds, beyond the current operating budget, be provided to the Center for the acquisition of laboratory facilities and equipment. We also understand that there is a need at NRC headquarters for computer hardware, software, and the leased lines necessary to facilitate

July 31, 1991

electronic communications between personnel at the Center and NRC headquarters. We urge that these problems be resolved.

We recognize that these comments are based on a very limited review of the programs of the Center, but we hope that you will find them helpful. Should you desire to discuss any of our comments in more detail, we would be pleased to meet with you and/or members of your staffs.

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