



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

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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.

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

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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?