NUREG-1423
Volume 3

A Compilation of Reports of The Advisory Committee on Nuclear Waste

July 1991 – June 1992

U.S. Nuclear Regulatory Commission

August 1992

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ABSTRACT

This compilation contains 29 reports issued by the Advisory Committee on Nuclear Waste (ACNW) during the fourth year of its operation. The reports were submitted to the Chairman and Commissioners of the U. S. Nuclear Regulatory Commission, the Executive Director for Operations, the Director, Office of Nuclear Regulatory Research, or to the Director, Office of Nuclear Material Safety and Safeguards. All reports prepared by the Committee have been made available to the public through the NRC Public Document Room and the U. S. Library of Congress.

PREFACE

The enclosed reports are the recommendations and comments of the U. S. Nuclear Regulatory Commission's Advisory Committee on Nuclear Waste during the period between July 1, 1991 and June 30, 1992. NUREG-1423 is published annually. Volumes 1 and 2 contain the Committee's recommendations and comments from July 1, 1988 through June 30, 1990, and July 1, 1990 through June 30, 1991, respectively.

ACNW MEMBERSHIP (JULY 1, 1991-JUNE 30, 1992)

CHAIRMAN: Dr. Dade W Moeller, Professor of Engineering in Environmental Health and Associate Dean for Continuing Education, School of Public Health, Harvard University, Boston, Massachusetts

VICE CHAIRMAN: Dr. Martin J. Steindler, Director, Chemical Technology Division, Argonne National Laboratory, Argonne Illinois

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Advisory Committee on Nuclear Waste
U. S. Nuclear Regulatory Commission

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

September 3, 1991

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: PROGRAM PLAN FOR THE ADVISORY COMMITTEE ON NUCLEAR WASTE

Since December 1989 the Advisory Committee on Nuclear Waste (ACNW) has provided at four-month intervals a program plan of anticipated Committee activities. This plan covers the period September-December 1991. We hope you will find this a convenient avenue for us to share information on our proposed upcoming activities and for you to provide feedback on issues on which the Commission wishes us to focus our efforts.

In preparing this program plan, we have considered the list of specific technical issues of particular interest to the Commission, requests of individual Commissioners, the EDO's list of proposed agenda items for the ACRS and the ACNW, the NRC's Five-Year Plan, and items of particular interest and/or concern to the Committee. The priorities proposed are based on information provided by representatives of NMSS, NRR, RES, and the EDO, as well as our own interpretation of the subject in relation to our activities as a Committee and our input into the regulatory process.

This program plan is based on the current best estimates of work output by the DOE, EPA, NRC staff, and their consultants and contractors, as well as our own estimates of how to deal with these issues effectively. In addition to the full Committee meetings noted, Working Group meetings will be held as necessary to facilitate full Committee review and action. A list of planned Working Group meetings follows the list of full Committee topics. There may be some revisions to this plan due to delays in the completion of NRC staff, applicant, and/or contractor studies and reviews as well as other schedule problems beyond our control.

Full Committee meeting dates for this period are presently scheduled as follows:

35th Meeting	-	September 27, 1991
36th Meeting	-	October 18, 1991
37th Meeting	-	November 20-21, 1991
38th Meeting	-	December 18-19, 1991

The Committee anticipates considering the topics listed below during this four-month period.

September 27, 1991

- The Committee will continue deliberations 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 with the goal of reporting back to the Commission the ACNW's recommendations as to the scope of such a review and the advisability of the ACNW undertaking it. (High Priority)

- The Committee will review and comment on selected draft Regulatory Guides that implement the revised 10 CFR Part 20, Standards for Protection Against Radiation. (Medium Priority)

- Members of the Committee plan to attend the EPRI Workshop on the technical basis for the Environmental Protection Agency's high-level waste standards. The workshop is being held in Arlington, Virginia on September 24-26, 1991.

October 18, 1991

- The Committee will complete its response to the request of the Chairman for 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 will report to the Commission the ACNW's recommendations as to the scope of such a review and the advisability of ACNW undertaking it. (High Priority)

- The Committee will begin deliberations on a request from Commissioner Rogers regarding whether the NRC staff has developed a suitable performance assessment program and whether the NRC staff has adequate equipment, expertise and training to conduct high- and low-level waste computer modeling. (High Priority)

- The Committee will be briefed by the DHLW staff on their basis for establishing a probability limit for distinguishing between unlikely and very unlikely events. This relates to the alternative approach to the probabilistic section of the containment requirements in 40 CFR 191.

November 20-21, 1991

- The Committee will complete a response to a request from Commissioner Rogers regarding whether the NRC staff has developed a suitable performance assessment program and whether the NRC staff has adequate equipment, expertise and training to conduct high- and low-level waste computer modeling. (High Priority)

- The Committee will review and comment on Rulemaking to revise 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste. (High Priority)

- The Committee will review and comment on a revision to NUREG-1200, Standard Review Plan for the review of a license application for a Low-Level Radioactive Waste Disposal Facility. (High Priority)

- The Committee will be briefed by Louisiana Energy Systems on their private uranium enrichment facility plans. Topics of interest include the disposal of the depleted uranium and the licensing process for the facility. (Medium Priority)

- The Committee has scheduled a visit to the WIPP site on November 5, 1991. Discussions at the site and a tour of the facility are planned.

- The Committee is scheduled to meet with the Commissioners to discuss items of mutual interest during the November ACNW meeting. The Committee requests that this meeting with the Commissioners be deferred to the December 1991 ACNW meeting. (High Priority)

December 18-19, 1991

- The Committee will review and comment on an NRC staff Technical Position on Investigations to Identify Fault Displacements and Seismic Hazards. (High Priority)

- The Committee will review and discuss the historical evidence and the potential for climate changes in the Southern Basin and Range and their associated impact on performance assessment for the proposed high-level radioactive waste repository at Yucca Mountain. (High Priority)

- The Committee will review and discuss problems and limitations with various Quaternary dating methods to be used in the assessment of volcanic features for site characterization of the proposed high-level waste repository at Yucca Mountain. (High Priority)

Other Topics: (Will be considered as documents and time become available.)

- The Committee will be briefed on the NRC HLW staff's review of the Calico Hills Risk/Benefit Analysis and the staff's position on penetration of the Calico Hills tuff.

- The Committee will be briefed on the NRC staff's review of the DOE reports on the Exploratory Studies Facility Alternatives Study and the site suitability analysis.

- The Committee will be briefed on the adoption by EPA of a revised Hazard Ranking System for use in assessing the threat associated with the release or potential release into the environment of hazardous chemicals and/or radioactive materials.

- The Committee will be briefed on the status of the low-level radioactive waste compacts.

- Members of the Committee will participate in a conference sponsored by the Society for Risk Analysis at which a summary of the Committee's report on expert judgment will be presented. Conference dates are December 9-11, 1991, in Baltimore, Maryland.

Working Group Meetings:

Regulatory Guides for Implementing Revisions to 10 CFR Part 20, September 23-24, 1991, Bethesda, Md. - The Working group will review, discuss and make recommendations on regulatory guides, being prepared by the NRC staff which assess the impacts of handling, storage and treatment of nuclear waste materials, as well as other radiation protection activities.

NRC Staff Computer Modeling and Performance Assessment Program in High-and Low-Level Waste, October 15, 16, 17, 1991, Bethesda, Md. - The Working Group will begin its review of a request from Commissioner Rogers regarding whether or not the NRC staff has developed a suitable performance assessment program and whether the NRC staff has adequate equipment, expertise and training to conduct high- and low-level waste computer modeling.

Geologic Dating, November 19, 1991, Bethesda, Md. - The Working Group will review and discuss problems and limitations of various Quaternary dating methods that are proposed for use in the assessment of volcanic features for site characterization of a high-level waste repository at Yucca Mountain.

The Impact of Long-Range Climate Change in the Area of the Southern Basin and Range, December 17, 1991, Bethesda, Md. - The Working Group will review and discuss the historical evidence and the potential for climate changes in the Southern Basin and Range and their associated impact on performance assessment for the proposed high-level radioactive waste repository at Yucca Mountain.

Post-Closure Monitoring, TBD, Bethesda, Md. - The Working Group will discuss post-closure monitoring of an HLW repository and other

related issues. Representatives from EPA and NRC will be invited to brief the Committee on various aspects of post-closure monitoring.

Residual Contamination Clean-up Criteria, TBD, Bethesda, Md. - The Working Group will review, discuss and make recommendations on guidelines for radionuclide contamination limits for unrestricted use of sites that are or have been under NRC license.

Methods for Assessing Natural Resources at a Proposed High-Level Waste Repository Site, TBD, Bethesda, Md. - The Working Group will discuss methodologies for the assessment of the potential for natural resources at the proposed high-level waste repository site at Yucca Mountain. The relationship between such resources and the potential for human intrusion will be emphasized.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

cc: Commissioner Rogers
Commissioner Curtiss
Commissioner Remick
Samuel J. Chilk, SECY
James M. Taylor, EDO
Robert M. Bernero, NMSS

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

October 23, 1991

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Taylor:

SUBJECT: REGULATORY GUIDES BEING DEVELOPED IN SUPPORT OF THE REVISED 10 CFR PART 20, "STANDARDS FOR PROTECTION AGAINST RADIATION"

On September 23 and 24, 1991, the Regulatory Guide Working Group of the Advisory Committee on Nuclear Waste (ACNW) and the Subcommittee on Occupational and Environmental Protection Systems of the Advisory Committee on Reactor Safeguards (ACRS) met jointly with the NRC staff to discuss twelve regulatory guides related to the implementation of the revised 10 CFR Part 20. During this meeting, we also had the benefit of comments by a representative from the Nuclear Management and Resources Council (NUMARC). The eight guides for which the ACNW accepted lead review responsibility were subsequently discussed during the 35th and 36th meetings of the ACNW on September 27 and October 18, 1991, respectively. The ACRS provided a letter to you on October 17, 1991, with comments on the four proposed regulatory guides for which they retained lead review responsibility. This letter summarizes separately our general comments on this subject.

1. Although the staff has made significant progress in developing these guides, much work remains to be done. In addition to required editorial changes, there is a need to outline the basic premises that support certain key assumptions and/or judgments in several of the guides. In others, there are technical errors that need to be corrected both in the guides and the supporting NUREG documents. Some of the information appears to be incomplete while other information appears to be far too prescriptive. Specific details in each of these areas were brought to the staff's attention during our discussions.

2. Although it is recognized that the contents of these guides are restricted to the implementation of the revised 10 CFR Part 20, this effort offers an opportunity to incorporate into these guides newer nomenclature and concepts that will help bring NRC licensees up to date on current thinking in the radiation protection field. As a minimum, we recommend that the NRC staff incorporate into these guides the SI units and the newer dose terminology of the International Commission on

Radiological Protection. This information can be included, parenthetically, immediately following the traditional units and terminology.

3. The NUMARC representative informed us that the guides most desired by commercial nuclear power plant licensees were not necessarily those in the most advanced stages of development. Guides of immediate interest to these licensees include those that will provide instructions for recording and reporting occupational radiation exposure data and those for estimating the dose to the embryo/fetus. We urge that completion of these guides be expedited. At the same time, we believe that the time and effort required to revise the existing drafts of the guides, to issue them for public comment, and for the staff subsequently to consider and evaluate the resulting comments, may make the scheduled date for implementation of the revised 10 CFR Part 20 unrealistic. It appears appropriate that the Commission reevaluate the proposed schedule so as to avoid unnecessary complications in the future.

4. Although we agree that guidance is needed in a number of the subject areas being covered in this effort, questions arose in several cases whether the guide being developed by the NRC staff is the best mechanism for accomplishing this task. We understand, for example, that the American National Standards Institute is developing consensus standards on air sampling and monitoring. Consideration should be given to citing these standards as a possible substitute for the development of a detailed regulatory guide. It is also possible that some of the instructional information concerning risk from occupational radiation exposures might better be issued as a NUREG document or educational pamphlet.

5. We believe that the NRC staff should encourage licensees to use electronic information processing and communicating systems, where appropriate, to report the data suggested by these guides. We are pleased to note that in draft Regulatory Guide 8.7 (Rev. 1), "Instructions for Recording and Reporting Occupational Radiation Exposure Data," the staff recommends the use of such systems. To the extent possible, the staff should work with licensees to develop software for reporting, maintaining, and summarizing the various recommended data sets in the proper format.

6. One of the guides being developed relates to the determination of the dose to the embryo/fetus. This is a pioneering effort, and the staff is to be commended for the major contributions it is making in providing guidance in this area. Guidance provided on this subject by organizations such as the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection, for

example, is very limited. At the same time, however, we believe it is important to recognize that the associated dose estimations involve large uncertainties and that the subject, itself, has particularly troublesome legal and ethical ramifications. This guide should be carefully reviewed with these thoughts in mind.

7. One topic not covered either in these guides or in the revised 10 CFR Part 20 is guidance on the limitation of occupational radiation exposures in accident situations. We recommend that the NRC staff make a note of the need for this type of information and, when time and resources permit, develop guidance on this subject. Specific topics to be addressed include acceptable doses under accident situations, perhaps as a function of the challenge faced, and whether doses received under these conditions would be "forgiven" in a regulatory sense.

Additional details regarding our comments on the individual guides are available in the transcript of the meeting held on September 23 and 24, 1991.

We look forward to continuing interactions with the staff as the development of these guides progresses.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

References:

1. U.S. NRC, Draft Regulatory Guide DG-8003, "Air Sampling in the Work Place," August 1991.
2. U.S. NRC, Draft Regulatory Guide DG-8004, "Radiation Protection Programs for Nuclear Power Plants," September 1991.
3. U.S. NRC, Draft Regulatory Guide DG-8005, "Assessing External Radiation Doses from Airborne Radioactive Materials," September 1991.
4. U.S. NRC, Draft Regulatory Guide DG-8006, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants," September 1991.
5. U.S. NRC, Draft Appendix B to Regulatory Guide 10.6, Revision 2, "Preparation of Applications for the Use of Sealed Sources and Devices for Performing Industrial Radiography," July 1991.
6. U.S. NRC, Draft Appendix X to Regulatory Guide 10.8, Revision 1, "Preparation of Applications for Medical Use Programs," July 1991.

7. U.S. NRC, Draft Regulatory Guide 8.N7, "Dose to the Embryo/Fetus," August 1991.
8. U.S. NRC, Draft Regulatory Guide 8.29, Revision 1, "Instruction on Health Risks from Occupational Exposure," July 1991.
9. U.S. NRC, Draft Regulatory Guide 8.9, Revision 1, "Interpretation of Bioassay Measurements," March 7, 1991.
10. U.S. NRC, Draft Regulatory Guide 8.N5, "Criteria for Monitoring Thresholds and Procedures for Summation of Internal and External Occupation Doses," July 1991.
11. U.S. NRC, Draft Regulatory Guide 8.N6, "Planned Special Exposures," August 1991.
12. U.S. NRC, Draft Regulatory Guide 8.7, Revision 1, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," July 1991.

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

December 2, 1991

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: STAFF REQUIREMENTS MEMORANDUM (SRM) M910725A DATED AUGUST 21, 1991

In the subject SRM, the Advisory Committee on Nuclear Waste was asked "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 report back to the Commission the ACNW's recommendations as to the scope and advisability of it undertaking such a review." The SECY suspense date for this requested effort was November 22, 1991.

Subsequent to this assignment, the Committee met with Robert M. Bernero, Director, NMSS, and had discussions with other knowledgeable members of the NRC staff and with nuclear industry representatives. Additionally, I had the benefit of discussions with you and Commissioner Rogers and Commissioner Remick.

In order to obtain the necessary background, the Committee has scheduled meetings with the former Chairman of the Monitored Retrievable Storage (MRS) Commission and the Director of the Department of Energy's Office of Civilian Radioactive Waste Management. Additional discussions with others, such as the Nuclear Waste Negotiator, are under consideration. A variety of related documents have also been reviewed.

In light of our desire to respond to your request in an adequate manner, we have concluded that we cannot meet the SECY suspense date and, therefore, request an extension to the May-June 1992 time frame. The Committee believes that by then the Committee should be able to outline the significant questions of interest to, and relevant to, future NRC activities related to this subject.

An update of the project status will be provided during our December 1991 meeting with the Commissioners.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

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

December 2, 1991

The Honorable Kenneth C. Rogers
Commissioner
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Commissioner Rogers:

SUBJECT: NRC CAPABILITIES IN PERFORMANCE ASSESSMENT AND COMPUTER MODELING OF HIGH-LEVEL WASTE DISPOSAL FACILITIES

The purpose of this letter is to respond to the first two questions in your memorandum of April 29, 1991, requesting ACNW comments on the adequacy of the performance assessment and computer modeling capabilities of the Office of Nuclear Regulatory Research (RES) and the Division of High Level Waste Management (HLWM), including the Center for Nuclear Waste Regulatory Analyses (CNWRA). Our comments are based on deliberations and discussions with the NRC staff and members of the CNWRA during an Advisory Committee on Nuclear Waste (ACNW) Working Group meeting on October 16, 1991, and during the 36th and 37th ACNW meetings on October 18 and November 20-21, 1991, respectively. During the Working Group meeting, we had the support of a team of invited experts.

General Observations

It is our general conclusion that the NRC HLW staff is a highly qualified and professional group and is developing a suitable program for performance assessments of an HLW disposal facility. If supported by careful and appropriate experimental confirmation studies and selectively focused assessments, this program should be sufficient for the NRC to demonstrate to a licensing board whether a repository meets the requirements of 10 CFR 60.112 and 60.113. Although we consider the NRC program to be adequate, we recognize that its assessments cannot be totally independent, due to the necessary reliance by the NRC staff on models, data, and computer codes developed by other organizations. Additional points that should be considered, include:

1. The staff intends to conduct a selectively focused review of the performance assessments conducted by the U.S. Department of Energy (DOE), supported by in-depth analyses in only certain key areas. This approach is historically consistent with reviews conducted by the NRC in the evaluation of other types of license applications. It represents a realistic method for handling such reviews. A relatively simple bounding performance analysis -- supported by experience with more detailed, independently evaluated process codes -- provides an independent product that can be understood and defended within the licensing arena.

2. As stated above, the assessments by the NRC staff must, of necessity, involve to a considerable extent the use of data, codes, and methodologies developed by the DOE. This approach is acceptable as long as the NRC staff has the capability to independently evaluate the quality and applicability of such information and techniques.

3. To ensure the continuation of a successful performance assessment and computer modeling program, the NRC staff would benefit from an endorsement and affirmation from the Commission and upper NRC management. Such an affirmation would include a clear delineation of what the NRC staff's role and responsibilities are in using these techniques in the licensing process. There is also a need to provide funds for additional staff and facilities.

Specific Comments

In the way of specific comments, we offer the following:

1. There is a need for the development of a strategy document that specifies the goals of the NRC HLW performance assessment program. This document should provide details on what the program is designed to accomplish, how it is to be executed, and a timetable for its implementation. While the Implementation Plan, the Program Plan, and the License Application Review Plan will address parts of this concern, the staff needs to address the scientific and technical problems and other facets of performance assessment in greater detail and sophistication. This document should provide the fundamental transition from Phase 1 into the longer range Iterative Performance Assessment Program.

2. The NRC staff continues to have difficulties in obtaining data and software that have been developed by DOE and its contractors. We believe that formal generic arrangements should be developed that permit ready access by the NRC staff to DOE data and codes. The staff should be mindful of the quality assurance and quality control status of these codes and data. It is essential that the software used for modeling repository performance be compatible with the data and information. Furthermore, codes that are used sequentially should have compatible assumptions and limitations; otherwise, the results would be inconsistent and unreliable.

3. The NRC staff is expanding its performance assessment capabilities beyond the ability to estimate radionuclide releases; namely, it is expanding the codes to provide estimates of the doses to individuals and population groups. To increase the effectiveness of this effort, the NRC staff should also expand its interactions with appropriate groups in foreign countries

so as to benefit from the codes that have already been developed for making such estimates. The Commission and upper NRC management should encourage and cultivate NRC staff participation and interaction with international efforts such as the modeling of source-term parameters (near-field and far-field).

4. The insights and products gained through the application of the Iterative Performance Assessment Program can have important benefits, both in helping the NRC staff to develop needed capabilities for licensing a repository and in establishing research priorities. The role that performance assessment methodologies can play should be formally incorporated into the protocol for assigning priorities to research. Areas in which such methodologies would be helpful include the selection of specific research projects in the geosciences (such as geochemistry), and the determination of which of these should be assigned to the CNWRA. Furthermore, all members of the NRC staff who are involved in the HLW program should be required to become familiar with the methodologies of performance assessment.

5. The initiation of the Phase 2 performance assessment of the proposed Yucca Mountain repository offers the NRC staff an opportunity to explore several key difficult analyses in depth. Several challenging and complex, yet realistic, analyses involving natural phenomena (e.g., climate change, tectonic, and other processes) should be performed. These analyses should be chosen to illustrate the mechanisms for the solicitation and use of expert judgment, for the identification and quantification of uncertainties, and to gain a better understanding of the difficulties in determining compliance with the standards of the Environmental Protection Agency.

6. The NRC HLW staff must accept and provide for the role of expert judgment. Although hard data, validated complex computer codes, and large-capacity computational equipment are available, the staff should devote an intensive effort to developing a strategy for the use of expert judgment in performance assessments and computer modeling, both in conducting NRC's analyses and in reviewing how DOE uses expert judgment in its assessments.

Computer Modeling Capabilities

Our comments on the adequacy of the NRC computer modeling capabilities are addressed to the related hardware and software and personnel training needs.

1. The computer hardware currently used by the NRC staff is outdated and inadequate. Moreover, electronic communication between the computers at NRC headquarters and those at other facilities, including the CNWRA, is almost nonexistent, primarily because of a lack of equipment at the NRC headquarters end of the link. In contrast, the CNWRA appears to have adequate hardware to meet its present needs and responsibilities, and has plans to acquire additional capability as needed. Having said this, it is important to note that the NRC staff is fully aware of these problems and has been granted funds under a pilot program that should enable it to correct its hardware deficiencies within the next year. Continuing upgrades will be needed.

2. In sharp contrast to its hardware, the NRC staff has generally good capabilities for developing conceptual, mathematical, and computer models. These capabilities reside within the agency staff, as contrasted to existing solely or primarily within the staffs of its contractors. Although the CNWRA has had difficulty in recruiting the needed expertise, the current performance assessment program element manager has excellent modeling and performance assessment skills.

3. We are pleased to note that training for the NRC staff in the field of performance assessment and computer modeling is being implemented. We endorse plans for providing training opportunities to the staff both through the capabilities of the NRC itself and through outside groups. The CNWRA appears to have a similar, but perhaps less formal, program. The Commission and NRC management should encourage this continuing education process.

In summary, it is our conclusion that HLWM and RES have capable staffs, that they are developing a suitable performance assessment program, and that they have sound computer modeling capabilities. Primary needs in HLW performance assessment are to develop a strategy document detailing the goals of the program and the specific means to achieve these goals, to upgrade the NRC staff's computer hardware, to resolve current limitations on the availability of key software and data, and to ensure that adequate resources are provided to meet future personnel and equipment needs as the performance assessment program evolves.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

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

December 2, 1991

The Honorable Kenneth C. Rogers
Commissioner
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Commissioner Rogers:

SUBJECT: NRC CAPABILITIES IN COMPUTER MODELING AND PERFORMANCE ASSESSMENT OF LOW-LEVEL WASTE DISPOSAL FACILITIES

The purpose of this letter is to respond to the first two questions in your memorandum of April 29, 1991, requesting ACNW comments on the adequacy of the computer modeling and performance assessment capabilities of the Division of Low-Level Waste Management and Decommissioning (LLWM) and the Office of Nuclear Regulatory Research (RES). Our comments are based on deliberations and discussions with representatives of the NRC staff, the Sandia National Laboratories, and the State of Nebraska, during a meeting of a Working Group of the ACNW on October 17, 1991, and during the 36th and 37th ACNW meetings on October 18 and November 20-21, 1991, respectively. During the Working Group meeting, we had the support of a team of invited experts. Comments on similar capabilities of the NRC staff from the standpoint of addressing the management and disposal of high-level waste (HLW) are being provided to you in a separate letter.

General Observations

In our review of this subject, we observed some fundamental differences in the nature of the programs needed by the NRC staff to respond to its regulatory functions with respect to performance assessments of LLW disposal facilities, as contrasted to HLW disposal facilities. These differences can be summarized as follows:

1. Whereas the planning and design phase of an HLW repository is still in its infancy, facilities for the disposal of LLW already exist and several proposed new facilities are in advanced stages of design and licensing review. Therefore, there is a sense of urgency in developing and exercising assessment capabilities for LLW disposal facilities.

2. Whereas the NRC's regulatory function for the HLW repository is singular and clear, these functions for a major share of the LLW disposal facilities are or will be the responsibility

of NRC Agreement States. In these cases, the role of the NRC staff will primarily be to provide advice to the regulatory staffs of these States. Only for facilities planned within the non-Agreement States will the NRC be responsible for the review and approval of license applications for the construction and operation of disposal facilities.

3. Although applicable regulations (namely 10 CFR Part 61) already exist, the NRC staff has announced plans for their modification. In addition, the U.S. Environmental Protection Agency is developing new standards for the disposal of low-level radioactive wastes that could have significant impact on the regulation of such facilities. Compounding the existing uncertainties is the fact that Part 61 was not written for explicit application to above-ground disposal facilities. In fact, the representative from the State of Nebraska noted that the application of these regulations to the above-ground facility being planned for construction in that State had proven difficult. Further, Part 61 is not clear in terms of the time frames over which the individual safety objectives specified in the regulations apply. Several states are now developing estimates of the impact of LLW disposal facilities for time periods extending out to 10,000 years.

4. Also playing a role in the regulatory requirements are the revisions being made to NUREG-1200, "Standard Review Plan for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility" and NUREG-1300, "Environmental Standard Review Plan for the Review of a License Application for a Low-Level Waste Disposal Facility," and the ongoing development of a Technical Position and/or Regulatory Guide on performance assessment for LLW disposal facilities. Because personnel in the Agreement States are in the process of reviewing license applications, efforts to revise and issue these documents should be expedited.

Specific Comments

In the way of specific comments, we offer the following:

1. As is the case for HLW, there is a need for a strategy document that details the goals of, and mechanisms for, the NRC performance assessment program for the management and disposal of LLW. We understand that such a document is being developed, and we look forward to learning what the program is designed to accomplish, how it is to be applied, and a timetable for its implementation. The document should also provide a clear description of the circumstances under which the NRC staff plans to evaluate the performance assessment efforts of those groups applying for licenses to construct and operate LLW disposal facilities. This description should

include a delineation of the extent to which the NRC staff expects regulatory agencies in the Agreement States to perform similar functions.

2. An integral part of the strategy document, noted above, should be a description of the application of performance assessment for the delineation of research needs. Although the NRC staff cited the need for research on groundwater hydrology, concrete degradation, and improved dosimetry as being identified by the performance assessment studies it had conducted, this appeared to be something that "developed" as opposed to being the formal "outgrowth" of a planned program. One other factor that should be included in the strategy document is a statement emphasizing that the performance assessment program should be an important factor in identifying data that need to be collected. A related consideration is the difficulty in applying data obtained from small samples or over limited time intervals to the analysis of the behavior of a larger module or segment of the disposal facility over longer time periods. An example is applying laboratory (short-term) "leach" rate data to long-term performance of an LLW disposal facility.

3. As is true in the regulation of HLW, the insights and products gained through the application of performance assessments on an iterative basis can have important benefits in helping the NRC staff to develop needed capabilities for licensing LLW disposal facilities. To ensure that these benefits are realized, all members of the NRC staff who are involved in the LLW program should be required to become familiar with the methodologies of performance assessment.

4. Many aspects of the methodology applied to performance assessments for LLW disposal facilities involve the application of deterministic analyses that implicitly include probabilistic elements. Probabilistic techniques are being used on an increasing basis, for example, in estimating future states of LLW disposal facilities and in assessing the potential impacts of human intrusion. We urge that the NRC staff begin now to incorporate probabilistic assessments on a formal basis within the current LLW program. This type of effort leads to the identification of new scenarios and failure modes and provides a level of confidence for using simpler and more robust codes for licensing purposes. Use of a probabilistic approach also provides a means of dealing with uncertainty, without compounding conservatisms. Because of the educational value of such analyses, they should, as a minimum, be made a major part of the next (Phase 2) program.

5. One of the major problems in assessing LLW disposal is the extreme diversity of the waste, itself. This situation makes estimation of the source term in any modeling effort extremely

difficult. We recommend that more attention be directed to this topic. This subject is being pursued by the U.S. Department of Energy and also through an NRC contractual effort at the Brookhaven National Laboratory. Improved knowledge of the source term, for example, is critical in assessing the potential for geochemical interactions, mass transfer, and such specifics as gas generation. More attention should also be directed to the establishment of the nature, characteristics, and volumes of LLW that will be produced as a result of the decommissioning of existing nuclear power plants and other types of nuclear facilities.

6. International programs provide a wealth of data and information on LLW performance assessment. This is true especially in areas of source-term modeling. The NRC should dedicate specific resources to allow its staff to participate and interact more fully with technical peers in other nations to promote effective use of available resources. We understand, for example, that groups in several European countries are engaged in an extensive review and development of methods for estimating doses to members of the public as a result of the operation of waste disposal facilities.

Computer Modeling Capabilities

Our comments on the adequacy of the NRC computer modeling capabilities are addressed to the related hardware and software and personnel training needs.

1. The NRC LLW staff does not have adequate computer hardware capabilities at the present time. In addition, computer hardware continues to be in a rapid state of development and the staff will need to be provided the resources necessary to keep abreast of developments in this field. Such resources may include engineering work stations, peripherals, and data/communication links with contracted support organizations. At present, a portion of the computer modeling capabilities resides with NRC contractors. The staff needs to move aggressively to enhance their in-house capabilities. To accomplish this, the staff should take advantage of the pioneering efforts, in addition to INTRAVAL, of some of the individual states and the international community. This might include wider access to existing national and international data links.

2. The demands on computer modeling for the LLW case are, in many ways, greater than for HLW:

   - Any methodology must be robust. There is only one proposed HLW site with one set of surrounding conditions;

LLW sites will vary in climate, in near-field and far-field site conditions, and in source terms.

- The source term is uncertain because the inventories are not well characterized. Improved manifest and record procedures may help for future sites.

- The facility may consist of a variety of designs, including shallow land burial, earth-mounded concrete bunker, or freestanding above-ground vaults.

The staff is presently relying on a modular methodology, where sequential codes can be interchanged to better meet the needs of any particular site or application. However, care should be taken with regard to compatible linkage of sequential codes and their input data. We are concerned that the assumptions and defaults in one code will not be compatible with the next. This applies to the linkage between data and codes as well.

3. In the course of our discussions, we were reminded that the U.S. Department of Energy (DOE) has an extensive program to provide consultive advice to the states in the development of LLW disposal facilities. One product of this effort, for example, was the Prototype License Application; Safety Analysis Report (PLASAR). The NRC staff should establish closer ties with the DOE effort.

4. Key LLWM personnel with performance assessment duties should be clearly identified and this should be their primary responsibility.

5. The NRC staff has demonstrated a commitment to training through the conduct of workshops in performance assessment and computer modeling for state regulatory personnel. Included in this effort has been the publication of a self-teaching curriculum (NUREG/CR-5539). Much of this effort has been accomplished through contractual efforts and through cooperation with the NRC State Programs staff. Although "doing" is an effective form of learning, the NRC should make a greater effort to encourage its performance assessment staff to attend, participate, and assume a leadership role in national and international LLW and intermediate-level waste performance assessment efforts.

In summary, it is our conclusion that the NRC is developing sound computer modeling and performance assessment capabilities and is assembling a competent staff. Primary needs are for this staff to complete the development of a strategy document, to upgrade NRC computer hardware and peripherals, to establish closer ties with other groups involved in related activities (both at the national and international level), and to ensure that adequate resources are

provided to meet future personnel and equipment needs as this program expands. To meet the impending licensing requirements, these needs must be met in a timely fashion.

We trust that these comments respond to your request.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

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

December 2, 1991

Mr. Eric S. Beckjord, Director
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Beckjord:

SUBJECT: PROPOSED PAPER ON METRICATION POLICY

During the 37th meeting of the Advisory Committee on Nuclear Waste, November 20-21, 1991, we discussed the proposed policy statement on metrication and the related ACRS report dated October 17, 1991.

The members of the ACNW agree with the ACRS recommendations regarding implementation of the metrication policy.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Draft SECY paper for the Commissioners from James M. Taylor, Executive Director for Operations, NRC, Subject: Metrication Policy, transmitted by memorandum dated October 3, 1991, from Eric S. Beckjord, Office of Nuclear Regulatory Research, to Raymond F. Fraley, ACRS (Predecisional)

cc:
James M. Taylor, EDO

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

December 23, 1991

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: PROGRAM PLAN FOR THE ADVISORY COMMITTEE ON NUCLEAR WASTE

Since December 1989, the Advisory Committee on Nuclear Waste (ACNW) has provided at four-month intervals a program plan of anticipated Committee activities. This letter covers January through April 1992. We view these letters as a convenient avenue for us to share information on our proposed activities. We invite you to provide guidance on issues on which the Commission desires that we focus our efforts.

In preparing this program plan, we have considered the list of technical issues of particular interest to the Commission, requests of individual Commissioners, the EDO's list of proposed agenda items for the ACRS and the ACNW, the NRC's Five-Year Plan, and items of special interest and/or concern to Committee members. The priority for each issue proposed is based on information provided by representatives from the offices of the EDO, NMSS, NRR, and RES, as well as our own interpretation of the subject in relation to our activities as a Committee and our input into the regulatory process.

This program plan is based on the current best estimates of work output by the DOE, EPA, NRC staff, and their consultants and contractors, as well as our own views on how to deal with these issues most effectively. In addition to the full Committee meetings noted, we will hold Working Group meetings as necessary to facilitate full Committee review and action. There may be some revisions to this plan depending on the progress of NRC staff, applicant, and/or contractor studies and reviews as well as other factors beyond our control.

Full Committee meeting dates for this period are scheduled as follows:

39th Meeting	-	January 15-17, 1992
40th Meeting	-	February 20-21, 1992
41st Meeting	-	March 12-13, 1992
42nd Meeting	-	April 23-24, 1992 (Tentative)

The Committee anticipates that it will consider the topics listed below during this four-month period.

January 15-17, 1992

- The Committee will continue deliberations to investigate the feasibility of a systems-analysis approach to review the overall high-level waste program, including the short and mid-range technical milestones for handling high-level waste, with the goal of reporting back to the Commission our recommendations as to the scope of such a review and the advisability of undertaking it. (High Priority)

- The Committee will review and comment on a revision to NUREG-1200, Standard Review Plan for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility. (High Priority)

- The Committee will complete its review and comment on the draft staff technical position on "The Identification of Fault Displacement and Seismic Hazards at a Geologic Repository." (High Priority)

- The Committee will discuss a paper being prepared for presentation at the January 29-31, 1992 Low-Level Waste Forum winter meeting. The paper will be based on reports recently issued by the ACNW on various low-level radioactive waste topics. (Medium Priority)

February 20-21, 1992

- The Committee will continue deliberations to investigate the feasibility of a systems-analysis approach to review the overall high-level waste program, including the short and mid-range technical milestones for handling high-level waste with the goal of reporting back to the Commission our recommendations as to the scope of such a review and the advisability of undertaking it. (High Priority)

- The Committee will discuss points of interest following attendance at the second EPRI session on the EPA high-level waste standards. (High Priority)

- The Committee will be briefed by representatives of Louisiana Energy Systems on plans for their uranium enrichment facility. Topics of interest include the disposal of the depleted uranium and the licensing of waste related activities. (Medium Priority)

- The Committee will be briefed by representatives of a state and a consulting firm on techniques being used to assess a low-level waste facility. (Medium Priority)

March 12-13, 1992

- The Committee will continue deliberations to investigate the feasibility of a systems-analysis approach to review the overall high-level waste program, including the short and mid-range technical milestones for handling high-level waste with the goal of reporting back to the Commission our recommendations as to the scope of such a review and the advisability of undertaking it. (High Priority)

- The Committee will discuss long-range climate changes in the area of the southern Basin and Range. Discussions will center on the ability to predict climate changes and their associated impacts on the performance of a proposed high-level waste repository. (High Priority)

April 23-24, 1992

- The Committee will continue deliberations to investigate the feasibility of a systems-analysis approach to review the overall high-level waste program, including the short and mid-range technical milestones for handling high-level waste with the goal of reporting back to the Commission our recommendations as to the scope of such a review and the advisability of undertaking it. (High Priority)

- The Committee will be briefed on the adoption by EPA of a revised Hazard Ranking System for use in assessing the risk associated with the release or potential release into the environment of hazardous chemicals and/or radioactive materials. (Medium Priority)

Other Topics: (Will be considered as documents and time become available.)

- The Committee will be briefed by the HLWM staff on their position on penetration of the Calico Hills tuff and their review of DOE's Calico Hills/Risk-Benefit Analysis.

- The Committee will review a DOE study plan that has not been selected for detailed technical review by the NRC staff.

- The Committee will be briefed on the NRC staff's review of the DOE reports on the Exploratory Studies Facility Alternatives Study and site suitability analyses.

- The Committee will review the design basis accident rulemaking for a high-level waste repository.

The Committee will be briefed by RES on planned research for high-level waste. These plans are outlined in draft NUREG-1406, High-Level Radioactive Waste Research Program Plan.

WORKING GROUP MEETINGS

Systems-Analysis Approach to Reviewing the Overall High-Level Waste Program, February 19, 1992, Bethesda, Maryland - The Working Group will discuss the feasibility of a systems-analysis approach to reviewing the overall high-level waste program, including the short and mid-range technical milestones for handling high-level waste.

The Impact of Long-Range Climate Change in the Area of the Southern Basin and Range, March 11, 1992, Bethesda, Maryland - The Working Group will discuss long-range climate changes in the area of the southern Basin and Range. Discussions will center on the ability to predict climate changes and their associated impacts on the performance of a proposed high-level radioactive waste repository.

Methods for Assessing Natural Resou s at a Proposed High-Level Waste Repository Site, To Be Determi , Bethesda, Maryland - The Working Group will discuss methodologies for the assessment of the potential for natural resources at the proposed high-level waste repository site at Yucca Mountain. The relationship between such resources and the potential for human intrusion will be emphasized.

Residual Contamination Clean-up Criteria, To Be Determined, Bethesda, Maryland - The Working Group will review, discuss, and make recommendations on guidelines for radionuclide contamination limits for unrestricted use of sites that are or have been under NRC license.

This list represents our best estimate of the topics to be considered through April 1992. If you or your fellow Commissioners have additional items to suggest or proposed changes in priorities, please let us know.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

cc: Commissioner Rogers
Commissioner Curtiss
Commissioner Remick
Commissioner de Planque
Samuel J. Chilk, SECY
James M. Taylor, EDO
Robert M. Bernero, NMSS

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

December 24, 1991

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: GEOLOGIC DATING OF QUATERNARY VOLCANIC FEATURES AND MATERIALS

On November 19, 1991, a Working Group of the Advisory Committee on Nuclear Waste (ACNW) held a meeting on Geologic Dating of Quaternary Volcanic Features and Materials. This matter was also discussed during the 37th and 38th meetings of the ACNW on November 20-21, 1991 and December 18-19, 1991, respectively.

The dating of Quaternary volcanic features and materials in the Yucca Mountain region is a major factor in determining the probability of interference by volcanism within the repository region. If this probability is sufficiently high, the resulting level of risk may be unacceptable. Thus, the precision of dating the occurrence of volcanism over the past two million years (Quaternary Period) is important. Unfortunately, dating of volcanic rocks of Quaternary age, and especially for those more recently formed than 200 thousand years ago, has significant uncertainties. For example, the Lathrop Wells volcanic cone, located approximately 20 km from the proposed Yucca Mountain site, has been variously dated from a few tens of thousands of years to about 250 thousand years. The age of this feature remains controversial among geoscientists involved in characterizing the site. In view of this controversy, the ACNW invited eight experts on geologic dating techniques potentially applicable to Quaternary-age materials to discuss (1) the status of the science of these methods, (2) their advantages and limitations, (3) their potential applicability to dating volcanic rocks that occur in the Yucca Mountain region, and (4) the assumptions upon which these methods are based. These experts were from the U.S. Geological Survey, Woods Hole Oceanographic Institute, Los Alamos National Laboratories, the State of Nevada, Purdue University, and the Ohio State University. No attempt was made to directly address the ages of volcanic materials and features in the Yucca Mountain region.

Considering all the methods discussed at the Working Group meeting, the potassium/argon (K/Ar) method is considered to be the most well established. K/Ar ages of about 140 thousand years have been obtained recently for Lathrop Wells volcanic materials, but the

validity of this age is still in question. One reason for questioning this age is a concern about the possible incorporation of excess or inherited argon within the sample. This concern illustrates the need to foster the refinement and application of the K/Ar method as well as other independent age-dating techniques.

As a result of the Working Group meeting and our deliberations, we have reached the following conclusions regarding the nature of future specific dating activities:

(1) Isotopic dating methods should be independently replicated by different scientists at different laboratories. Such replication is important not only because it is accepted scientific practice, but also because dating is a difficult problem.

(2) Multiple dating techniques should be applied with the expectation that they will produce convergence (or a "concordant" age). However, the techniques considered should be limited to those that have the highest potential accuracy. The techniques should also be based upon different chemical/physical/geological systematics that have firm chemical/physical/geological foundations.

(3) Improper selection and inadequate characterization of samples may lead to additional age uncertainty. For this reason, care must be taken to ensure that samples represent a full range of sources from volcanic units to specific minerals.

Despite the precautions noted above, differences in the measured ages of volcanic materials are likely to remain. In view of the limitations, problems, and uncertainties in these ages, it is important that the NRC consider the impact of varying degrees of age uncertainty on the calculation of risk due to volcanism at the Yucca Mountain site and what degree of age uncertainty is acceptable. The latter is an important form of guidance yet to be developed by NRC for the Department of Energy and its contractors.

We plan to continue to monitor progress on this subject.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

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

January 24, 1992

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: NRC STAFF TECHNICAL POSITION ON "THE IDENTIFICATION OF FAULT DISPLACEMENT AND SEISMIC HAZARDS AT A GEOLOGIC REPOSITORY"

During a meeting of a working group of the Advisory Committee on Nuclear Waste (ACNW) on December 17, 1991, and during the 38th meeting of the ACNW on December 18-19, 1991, the staff of the Office of Nuclear Material Safety and Safeguards presented its final draft staff technical position (STP) on "The Identification of Fault Displacement and Seismic Hazards at a Geologic Repository." The ACNW completed its deliberations regarding this matter during its 39th meeting, January 15-17, 1992. At the working group meeting, the Committee also held discussions on the draft STP with representatives of the U.S. Department of Energy (DOE), the State of Nevada, and the Edison Electric Institute. In addition, the Committee benefited from a presentation by representatives of the American Society of Civil Engineers, an organization that is completing a draft of a report on faulting and seismic design considerations for a high-level waste repository. We believe this report, when complete, will also provide a useful and important viewpoint on the analysis of fault and seismic data.

On the basis of these discussions, the ACNW has the following recommendations and comments.

Recommendations

1. We believe that the STP should be completed and issued in a timely manner. There is a need for the guidance provided by the STP since DOE has already begun site characterization and investigations for faulting and seismic hazards. In addition, the staff has previously identified concerns related to the DOE site characterization program of investigations for hazards of fault displacement and seismicity (NUREG-1347, "NRC Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain, Nevada," August 1989). The number and importance of these concerns also demonstrate the need for the STP. The same concerns continue to be relevant to DOE study plans that relate to site investigations for seismic and faulting hazards.

2. The STP provides guidance on investigations for seismic and fault displacement hazards. A companion STP on the analyses of such hazards, currently being prepared by the NRC staff, will provide information critical to the analysis of data collected for the evaluation of these hazards. Because of the strong linkage between these two STPs, we urge the staff to expedite the completion of the companion STP. We further urge that the staff integrate its efforts on guidance related to tectonic investigations and analyses.

3. In addition to the subject STP, there is a need for a statement, in the form of an STP followed by rulemaking, on the acceptability of geologic repository sites with "susceptible" faults present within the controlled area. We believe that the staff should initiate this action as soon as possible.

4. The staff has also proposed a third STP in its hierarchy of documents related to its strategy for guidance on tectonics. This third STP, previously issued as a draft for public comment in 1989, provides guidance on the use of tectonic models that apply to site investigations and iterative performance assessments. The staff has held work on this STP in abeyance until the revised U.S. Environmental Protection Agency (EPA) high-level waste standards (40 CFR Part 191) are issued. Because of the need for this guidance during early site characterization, the staff should move forward regardless of progress in development of the revised EPA standards.

Specific Comments

Several other concerns were expressed during the working group and full Committee meetings. On the basis of the related discussions, we recommend that the STP be modified to incorporate the following suggested changes.

1. The term "susceptible faults" should be abandoned. We suggest that the staff use a categorization scheme for faults or substitute some other nonprejudicial term.

2. The definition and use of the term "geologic setting" are confusing. The staff should clarify the meaning of this term. For guidance on this matter, we suggest that the staff refer to the definition in 10 CFR 60.2.

3. The staff should consider clarifying the use of the term "relevant and material" in the STP, and substitute, where possible, the technical equivalent.

4. The staff should further emphasize that Appendix A of 10 CFR Part 100 does not apply to a high-level waste repository. Such a statement should be included in the introduction of the

subject STP. There still appears to be some confusion among certain reviewers of the STP as to the staff's intent in this regard.

5. The STP should not preclude the use of probabilistic assessments of candidate faults lying outside the controlled area. A clarifying statement that a qualitative probabilistic performance assessment is acceptable should be added to the text accompanying Figure 1.

6. The staff should revise Figure 3 of the STP to indicate that only if Quaternary evidence is incomplete or unclear, should secondary criteria be evoked.

7. With respect to the use of fault length as a criterion (page 12 of the STP), it is important to consider the length of both discrete faults and fault zones, portions of which may rupture during an earthquake (e.g., Cedar Mountain earthquake of 1932). A statement to that effect should be added to the STP.

8. The staff should revise the STP to reflect more specifically the three-dimensional aspects of fault structures.

9. The title of the STP should be changed to "seismic and fault displacement hazards" to clarify that hazards refers to both areas of concern.

It is our conclusion that the subject STP will provide important and necessary guidance to the site characterization program and should be issued as soon as possible. We urge that the staff expedite the completion of companion documents to this STP and issue those documents in a timely manner. The Committee has also provided the staff with a list of editorial comments regarding the subject STP.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Staff Technical Position on Investigations to Identify Fault Displacement and Seismic Hazards at a Geologic Repository, Revised Public Comment Draft, November 1991

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

February 25, 1992

Mr. Robert M. Bernero, Director
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Bernero:

SUBJECT: PROPOSED RULEMAKING ON EPA HIGH-LEVEL WASTE STANDARDS

During its 40th meeting, February 20-21, 1992, the Advisory Committee on Nuclear Waste met with representatives from the U.S. Environmental Protection Agency (EPA) to discuss the EPA's proposed rulemaking on 40 CFR Part 191, "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes." Also taking part in the discussions were members of the NRC staff and a representative from the U.S. Department of Energy. On the basis of these discussions, we understand that EPA has agreed to consider and respond to a major share of the comments and/or suggestions that have been made by the NRC staff regarding 40 CFR Part 191.

We are pleased to observe the progress being made by EPA in revising these standards, and we concur with the positions adopted by the NRC staff. We especially want to commend the staff for the constructive manner in which they have been interacting with the EPA staff to resolve existing differences. Topics and/or positions yet to be resolved, and in which we share the concerns of the NRC staff, include:

1. the lack of a documented technical basis for the standards;

2. the continued stringency in the release limit for Carbon-14 as listed in Table 1 of 40 CFR Part 191;

3. the lack of clarity and application of the required "projections" of repository performance out to 100,000 years;

4. a similar lack of clarity on guidance in projecting the demographics for future societies; and

5. the application of dose rate limits to individual members of the public (rather than to a critical population group), and the prohibition of truncation in any form in calculations of collective dose.

To the extent we can be helpful, we encourage you to have the NRC staff call on us as they work with EPA to resolve these remaining issues.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Draft Federal Register Notice For 40 CFR Part 191, dated February 3, 1992

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

April 30, 1992

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: STAFF TECHNICAL POSITION ON ALTERNATE CONCENTRATION LIMITS FOR TITLE II URANIUM MILLS

During its 42nd meeting, April 22-24, 1992, the Advisory Committee on Nuclear Waste met with members of the NRC staff to review a draft version of the Staff Technical Position on Alternate Concentration Limits for Title II Uranium Mills. The Committee also had the benefit of the reference cited at the end of this letter.

We believe that this technical position represents the culmination of considerable effort on the part of the staff in response to a need of the uranium industry. This technical position is limited in its application to the surface impoundment of the mill tailings. The staff has done an excellent job in collecting the information necessary for the preparation of documents in support of a request to implement alternate concentration limits under specified conditions. Further, the rationale for the alternate concentrations rests appropriately on Environmental Protection Agency standards. This rationale is described in the technical position as reasonable, while maintaining protection of the health and safety of the public and the environment. We conclude that this technical position should be issued as soon as feasible.

We recognize that a few uranium mills have returned some of their tailings to parts of mines. We urge that the staff prepare a corresponding document to address potential alternate concentration limits for these cases which require considerations different from those in the technical position we reviewed.

We trust that these comments will be helpful.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Letter from J. J. Surmeier, NMSS, to R. K. Major, ACNW, April 1, 1992, Subject: Proposed Final Technical Position on Alternate Concentration Limits for Uranium Mills **(INTERNAL USE ONLY)**

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

April 30, 1992

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: PROPOSED EXPEDITED RULEMAKING: PROCEDURES AND CRITERIA FOR ON-SITE STORAGE OF LOW-LEVEL RADIOACTIVE WASTE

During its 42nd meeting, April 22-24, 1992, the Advisory Committee on Nuclear Waste met with the NRC staff to discuss the expedited rulemaking on "Procedures and Criteria for On-Site Storage of Low-Level Radioactive Waste." On the basis of these discussions, we offer the following comments.

This is an important rulemaking and we strongly endorse its objectives. The Commission should clearly indicate to potential host States that this regulatory effort not be interpreted as a retreat by the Commission from its well-established position that long-term storage of low-level radioactive waste (LLW) is not an acceptable substitute for disposal. It is also vital that efforts to site, design, construct, and operate LLW disposal facilities continue as expeditiously as possible in accordance with the requirements of the Low-Level Waste Policy Amendments Act of 1985.

Although the rule addresses the post-1996 timeframe, we are concerned about the more immediate post-1992 timeframe. Indications are that the acceptance of radioactive waste at all existing low-level waste disposal sites, except Hanford, may be terminated by the end of 1992. If this proves to be a reality, interim storage of LLW will become necessary. We recommend that NRC and Agreement State inspectors be encouraged to follow such operations closely, being especially alert to note any possible indications of unsafe conditions and operations. As the NRC staff moves ahead in developing this rule, we urge that its impacts on small waste generators, such as universities, hospitals, and research institutions, be evaluated.

We will continue to follow progress on this effort with interest.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Preliminary draft of "On-Site Storage of Low-Level Radioactive Waste Commission Paper and Rulemaking," received April 15, 1992 **(INTERNAL USE ONLY)**

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

May 1, 1992

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: PROGRAM PLAN FOR THE ADVISORY COMMITTEE ON NUCLEAR WASTE

Since December 1989, the Advisory Committee on Nuclear Waste (ACNW) has provided at four-month intervals a program plan of anticipated Committee activities. This letter covers May through August 1992[1]. We view these letters as a convenient avenue for us to share information on our proposed activities. We invite you to provide guidance on issues on which the Commission desires that we focus our efforts.

In preparing this program plan, we have considered the list of technical issues of particular interest to the Commission, requests of individual Commissioners, the list of items proposed by the EDO's office for ACRS and ACNW consideration, the NRC's Five-Year Plan, and items of particular interest and/or concern to the Committee members. The priority for each issue proposed is based on information provided by representatives of NMSS, NRR, RES, and the EDO's office, as well as our own interpretation of the subject in relation to our activities as a Committee and our input into the regulatory process.

This program plan is based on the current best estimates of work output by the DOE, EPA, NRC staff, and their consultants and contractors, as well as our own views on how to deal with these issues effectively. In addition to the full Committee meetings noted, we will hold working group meetings as necessary to facilitate full Committee review and action. There may be some revisions to this plan depending on the progress of NRC staff, applicant, and/or contractor studies and reviews, as well as other schedular problems beyond our control.

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[1] Since the August meeting has been deferred, the next program plan will be submitted in September.

Full Committee meeting dates for this period are tentatively scheduled as follows:

43rd meeting	-	May 28-29, 1992
44th meeting	-	June 23-25, 1992 (Site Visit/Meeting, Richland, Washington)
45th meeting	-	July 30-31, 1992
46th meeting	-	Deferred to September 24-25, 1992

The Committee anticipates that it will consider the topics listed below during this four-month period.

May 28-29, 1992 - 43rd ACNW Meeting

- The Committee will address a supplemental request from Chairman Selin made on April 24, 1992, on a systems analysis approach to reviewing the overall high-level waste program. (High Priority)

- The Committee will review and comment on the design-basis-accident rulemaking for a high-level waste repository (Controlled-Use Area/Design Basis Accident Limit). (High Priority)

- The Committee will review and comment on proposed changes to 10 CFR Part 72 concerning emergency planning for independent spent fuel storage installations and a monitored retrievable storage facility. (High Priority)

- The Committee will hear a report on relevant topics discussed during the 24th Annual Meeting of the Conference of State Radiation Control Program Directors, Inc. (Medium Priority)

- The Committee will be briefed on the adoption by EPA of a revised Hazard Ranking System for use in assessing the risk associated with the release or potential release into the environment of hazardous chemicals and/or radioactive materials. (Medium Priority)

June 23-25, 1992 (Site Visits/Meetings)

The Committee will visit facilities at the Hanford reservation and meet near Richland, Washington. Current plans include:

- Tuesday, June 23, 1992 (Site Visits)

  - U.S. Ecology waste disposal facility

  - Briefing/demonstration of geoscience models used to predict radionuclide transport

- Wednesday, June 24, 1992 (Site Visit)
  - Visit LLW grouting facilities
  - Visit site of LLW in-situ vitrification experiments
  - Visit and discussion of N-Reactor decommissioning program
  - Visit one of the original graphite reactors
- Thursday, June 25, 1992 (A.M. - Site Visit)
  - Visit with LLW modeling and Performance Assessment groups including current program and international perspectives
- Thursday, June 25, 1992 (P.M.) 44th ACNW Meeting (Public Meeting)

  Topics include:
  - The Committee will address the request from Chairman Selin made on April 24, 1992, for a supplemental report regarding the systems analysis approach to reviewing the overall high-level waste program. (High Priority)
  - The Committee will hear a report from the ACNW Working Group Chairman on a recent meeting in which the NRC staff presented the results of their review of DOE's Early Site Suitability Evaluation. It is anticipated that ACNW comments on these topics will be prepared. (High Priority)
  - Status of remedial actions at the Hanford site. (High Priority)
  - Briefing and discussion of HLW vitrification program (Medium Priority)

July 30-31, 1992 - 45th ACNW Meeting

- The Committee will address a supplemental request from Chairman Selin made on April 24, 1992, on a systems analysis approach to reviewing the overall high-level waste program. (High Priority)
- The Committee will review and comment on a proposed technical position on the repository design for thermal loads. (Medium Priority)
- The Committee will discuss with a representative of the State of Connecticut experiences related to the selection of a site

for a low-level radioactive waste disposal facility. (Medium Priority)

August 13-14, 1992 - 46th ACNW Meeting

- Deferred until September 24-25, 1992.

Other Topics: (Will be considered as documents and time become available consistent with priorities noted)

- The Committee will be briefed by the HLW staff on its position on penetration of the Calico Hills tuff and their review of DOE's Calico Hills/Risk-Benefit Analysis. (High Priority)

- The Committee will be briefed by the DOE on the Yucca Mountain Project Office data management system. (Medium Priority)

- The Committee will be briefed on the NRC staff's review of the DOE reports on the Exploratory Studies Facility Alternatives Study and site suitability analyses. (High Priority)

WORKING GROUP MEETINGS

ACNW Working Group on NRC Staff Comments on the DOE's Early Site Suitability Evaluation (ESSE) for the Yucca Mountain High-Level Repository, June 17, 1992. The Working Group will be briefed by the NRC staff regarding issues and concerns resulting from the NRC staff's review of DOE's ESSE and its associated conclusions.

ACNW Working Group on Phase 2 of the HLW Iterative Performance Assessment (IPA), September 23, 1992 (Tentative) Bethesda, Md. The Working Group will discuss the progress of Phase 2 of the HLW Iterative Performance Assessment effort by NRC. The Group will also be briefed by DOE representatives regarding the status of the DOE's Total System Performance Assessment.

ACNW Working Group on Inadvertent Human Intrusion Related to the Presence of Natural Resources at a High-Level Repository Site, October 21, 1992, Bethesda, Md. The Working Group will discuss methodologies for the assessment of the potential for natural resources at the proposed high-level waste repository site at Yucca Mountain. The relationship between such resources and the potential for human intrusion will be emphasized. The Working Group will also consider a DOE study plan on this topic.

The Impact of Long-Range Climate Change in the Area of the Southern Basin and Range, November 18, 1992 (Tentative), Bethesda, Md. - The Working Group will discuss the historical evidence and the potential for climate changes in the Southern Basin and Range and

the impact of climate changes on the performance of the proposed high-level radioactive waste repository at Yucca Mountain.

This list represents our best estimate of the topics to be considered through August 1992. If you or the other Commissioners have additional items to suggest or proposed changes in priorities, please let us know.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

cc: Commissioner Rogers
Commissioner Curtiss
Commissioner Remick
Commissioner de Planque
Samuel J. Chilk, SECY
James M. Taylor, EDO
Robert M. Bernero, NMSS

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

May 1, 1992

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Chairman Selin:

SUBJECT: COMPREHENSIVE SYSTEMS ANALYSIS OF THE HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL PROGRAM

In response to your request dated August 21, 1991 (M910725A), the Advisory Committee on Nuclear Waste (ACNW) has held several meetings since our oral report to you in December on the scope and need for a systems analysis of the high-level radioactive waste (HLW) management and disposal program. During these meetings, which included a working group meeting on February 19-20, 1992, we discussed this matter in some detail with members of the NRC management and staff; the Environmental Protection Agency (EPA) staff; the Department of Energy (DOE) staff, including the Director of DOE's Office of Civilian Radioactive Waste Management (OCRWM) and the general manager of its primary HLW management and operations (M&O) contractor, TRW; the Chairman of the Monitored Retrievable Storage (MRS) Commission and a representative from the Office of the Nuclear Waste Negotiator; a member of the Waste Isolation Pilot Plant Blue Ribbon Panel; representatives from the State of Nevada; and representatives from industry, including the Edison Electric Institute, the Electric Power Research Institute (EPRI), and Virginia Power. We also had the benefit of the documents listed at the end of this report.

On the basis of these discussions, we believe that a systems analysis for individual components of the HLW management and disposal program, much less the entire program, would encompass a large range of dimensions, many of which are as yet unidentified. Further, such an analysis would also require a substantial effort. This is due to a host of factors, including the number and complexity of the various disciplines that are involved; the absence of firm reference designs for the repository systems; the lack of an equally firm decision about the site being investigated; and the limited experience of the sciences and technologies in describing, with precision, the performance of related systems, both natural and man-made, over prolonged periods of time. We and others agree with your observation that a systems analysis would be extremely useful for identifying deficiencies in the HLW management and disposal program.

Assisting us in reaching conclusions on this issue was a recent beneficial discussion with the Director, OCRWM, and a presentation to us of the plans that DOE has for devising an annotated outline for the preparation of a license application. In addition, during our 41st meeting (March 12-13, 1992), DOE informed us about the processes used to formulate conclusions for the Early Site Suitability Evaluation Documents. We have also reexamined the role of the DOE Site Characterization Plan (SCP) and its relation to the performance of the repository. Of benefit was the presentation we heard on the detailed review and analysis conducted by the MRS Commission. These interactions have shown that many of these activities that are planned, or in early stages of completion, address certain aspects of the assignment given to this Committee.

In addition to our interactions with DOE, to our examination of recent EPRI studies on performance assessment, and to our corresponding reviews of the performance assessments conducted by the NRC staff, we examined several relatively small parts of the overall HLW management and disposal system. These efforts further confirmed the conclusions that the number of dimensions within even a narrow set of issues was very large, that the range of interfaces necessary to analyze the HLW system had not yet been noted in a comprehensive manner, and that an analysis of the complete system would be a formidable task.

We believe it important to reemphasize that the current interest in a systems analysis for the HLW disposal process is in no way to be construed as a desire or need to reconsider the Waste Confidence Proceedings. This Committee reaffirms its concurrence with the findings of the Commission that there is reasonable assurance that the HLW being produced in nuclear facilities can be disposed of safely, that a repository can be made available in an appropriate time frame, and that HLW can be safely stored until emplaced in a repository.

Intermediate Conclusions

- During our reviews of and discussions on this topic, we were able to come to some intermediate conclusions that have bearing on the systems analysis question. These are listed only to illustrate that even a partial and superficial inquiry into the HLW disposal system can identify issues that may need attention.

- Since one of the beneficial aspects of a systems analysis of HLW management and disposal is the identification of interfaces that may not be adequately addressed or coordinated, we noted that the current activities in HLW disposal largely fail to address the question of contingencies. Since it is not ensured that the Yucca Mountain site will prove to be suitable, or that the MRS can

be located and constructed/operated on a timely basis, the DOE and the NRC may be faced with a schedule for accepting and m ging HLW, especially spent fuel, that is not in accord with the completion of functional storage or disposal systems. We detected little if any attention being given to the activities that would be necessary should such an occasion arise.

- We have recognized that satisfactory resolution of the technical aspects of the HLW disposal issue is necessary but not sufficient to ensure that HLW can be safely emplaced in a repository. We, as have many others, have noted that communications among the technical community involved in the HLW disposal system are fully functional only among some parts but seem to be inadequate when the public is concerned. Although this area of endeavor is outside the normal scope of ACNW activities, we believe that a systems analysis would focus quickly and emphatically on this aspect as being one that could be as debilitating as the discovery of a substantial flaw in the quality of the candidate site. The NRC is likely to bear a part of the burden of this deficiency.

- We noted that while the current interest in efforts to site an MRS appears encouraging, most views of a systems description of the HLW disposal activities require the presence of such a facility at least for the interim. The restrictions placed on an MRS, both in location and in the length of time for which HLW may be stored therein, are such as to assuredly rise in importance in a systems analysis. We have gathered that interim storage for periods that reduce the heat pulse from HLW may be identified in a systems analysis as a desirable alternative that is not now actively being considered.

- Several of our discussions have focused on human intrusion as a dominant and somewhat unpredictable pathway for exposure of the public to HLW from a repository. A systems analysis is not the only method of arriving at an assessment of this issue, but we believe that unless techniques are found for better evaluation of the likelihood of major impacts from human intrusion, this problem will remain as a dominant challenge in meeting the pertinent standards and regulations.

- We and the Commission have noted before that the subsystem criteria promulgated by the NRC may not be in concert with the corresponding EPA standards. Even though the EPA standards are not yet final, we believe that a systems analysis of the performance of the HLW in a repository would show discrepancies that may not be easily resolvable, except for the consideration that the differences may fall within existing uncertainties.

- We conveyed to you during our December 1991 meeting our belief that performance assessment would be a suitable basis for developing a comprehensive systems analysis. We continue to adhere to this conclusion and are gratified that the performance assessment framework has served as the basis for partial systems analyses that are being developed. This adherence to our previous position does not, however, modify our conclusions about systems analysis as given below.

Commentary, Conclusions, and Recommendations

With these factors in mind, we believe that the ongoing activities of the DOE and NRC staffs make the immediate initiation by the Commission of a separate, comprehensive analysis of the entire HLW management and disposal system premature at this time. In our opinion, the better course of action would be to await the results of these ongoing efforts. At that time, it should be possible to better determine what is needed. The NRC staff, for example, has been mindful of the importance of addressing significant issues in the repository development program; the quality of its Site Characterization Analysis (SCA) is testimony to that fact. Similarly, DOE has analyzed in detail certain components of the HLW management system, such as transportation. In addition, the nuclear utilities as well as the NRC staff are actively considering the issues encompassing on-site storage of spent fuel.

- We believe that the activities of DOE in defining the HLW management and disposal system will become more visible, and more available for direct examination, by the end of this fiscal year since DOE has announced that it plans to issue at that time draft versions of the annotated outline for preparation of a license application. In addition, the DOE M&O contractor is currently conducting a comprehensive systems analysis. Further, the NRC staff will soon complete phase two of its HLW performance assessment, which could yield a product for review in the near term. The NRC staff should be encouraged to review the DOE documents carefully to ensure not only that the important questions are being addressed but also that interfaces with the other aspects of the HLW management and disposal activities necessary to operate under a Commission license are being properly addressed and resolved. We believe that such attention is in accord with the tenor of your assignment.

- In that connection, the NRC staff should also be encouraged to emphasize in its interactions with DOE the differences between the DOE SCP and the NRC SCA to ensure that DOE is aware of the need to react directly and responsively to the recommendations made in the SCA. The NRC staff also should examine the SCA to

ensure that the interfaces among the various activities for site characterization are adequately identified and addressed.

- We plan to review in some detail the product of the systems analysis effort now being undertaken by the DOE M&O contractor. If, after review of the related documents and after interactions with the DOE staff, we find that there is a need to further ensure that important questions are being addressed in time to provide information needed for the licensing process, we will return to the Commission with a statement of work that, if carried out, will address these concerns. Owing to the major resources that we anticipate that a systems analysis would require, we plan to provide comments on the potential for benefit to the Commission in conducting such an analysis, as compared to the expected cost. We note that the identification by the Commission of the need for a systems analysis of the entire HLW management and disposal program has, by itself, served as a significant stimulus to all parties involved. It should also help ensure that much more attention will now be directed to the various program interfaces and coordination. It is expected that the key questions concerning the comprehensive nature of the investigative programs will also profit from this attention.

In summary, we believe that an in-depth systems analysis is essential to the adequate and proper conduct of an HLW management and disposal program. Ongoing activities of the DOE and NRC staffs appear to us to make it premature at this time for the Commission to initiate a separate study. In our opinion, the better course of action would be to await the results of these ongoing efforts.

We trust that these comments respond, at least in part, to the charge that you assigned us. We intend to continue to follow developments in this area and provide separately the information you requested during our meeting on April 24, 1992.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

References:

1. NRC Staff Site Characterization Analysis of the Department of Energy Site Characterization Plan, Yucca Mountain Site, Nevada, NUREG-1347, 1989
2. DOE Site Characterization Plan, Yucca Mountain Site, Nevada, Research and Development Area, Nevada, December 1989, Volumes I through IX, DOE/RW-0199, DOE, OCRWM

3. U.S. Department of Energy, Yucca Mountain Site Characterization Project, Report of Early Site Suitability Evaluation of the Potential Repository Site at Yucca Mountain, Nevada, January 1992, SAIC-91-8000
4. U.S. Department of Energy, Yucca Mountain Site Characterization Project, Report of the Peer Review Panel on the Early Site Suitability Evaluation of the Potential Repository Site at Yucca Mountain, Nevada, January 1992, SAIC-91-8001
5. Nuclear Waste: Is There a Need For Federal Interim Storage?: Report of the Monitored Retrievable Storage Review Commission, November 1, 1989
6. Strategic Plan for Building New Nuclear Power Plants, First Annual Update, Nuclear Power Oversight Committee, November 1991
7. Physical System Requirements, Overall System (DOE/RW-0334P), Department of Energy, January 1992
8. Physical System Requirements, Store Waste (DOE/RW-0319), Department of Energy, January 1992

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

May 1, 1992

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C 20555

Dear Mr. Taylor:

SUBJECT: REVIEW OF NRC HIGH-LEVEL RADIOACTIVE WASTE RESEARCH PROGRAM PLAN (DRAFT NUREG-1406)

During its 41st meeting, March 12-13, 1992, the Advisory Committee on Nuclear Waste (ACNW) met with representatives of NRC's Office of Nuclear Regulatory Research (RES) to review the NRC High-Level Radioactive Waste (HLW) Research Program Plan (Draft NUREG-1406). Also providing input to our review was a discussion held on February 18, 1992, by the ACNW Chairman with Dr. David L. Morrison, Chairman, NRC Nuclear Safety Research Review Committee (NSRRC). The ACNW also had the benefit of input from Dr. Fred J. Molz, one of the members of the NSRRC who attended our meeting with the RES staff. Discussions of this matter were also held during our 42nd meeting, April 22-24, 1992.

Our review of the draft Research Plan and our discussions with the RES staff indicate that organization of many of the RES activities is yet to be completed and that there are fundamental deficiencies or disconnects between the RES program, as described, and the needs of the Division of High Level Waste Management (HLWM). In short, the Research Plan is still evolving and major questions are yet to be resolved. Elaboration of these comments is provided below. Additional comments can be found in the transcript of our 41st meeting.

1. From the point of view of the ACNW, the principal role of the RES staff is to serve as program managers. In many ways, RES staff members appear to view themselves primarily as research scientists. The confusion between these two roles may be the source of some of the problems. One example is the fact that the draft Research Plan fails to mention rigorous independent scientific reviews to ensure that the proposed plans are justified and that the outcome will be of acceptable quality. Part of the management strategy should be to develop an in-depth and rigorous external review of individual research projects as well as review of the overall Research Plan.

2. Our review of the draft Research Plan revealed the need for developing a strategy document (either separately or as a portion of the Research Plan) in which the RES staff delineates its research goals, how the supporting program will be planned, and how priorities will be established and implemented. A key factor is the timeliness of some of the proposed research. That is, will the data be available when needed? Although the draft Research Plan discusses these subjects in a general sense, there remains a need to document in a formal manner the procedures by which priorities will be set. The approach, currently outlined, could, and apparently does, allow a limited number of NRC staff members to decide major program priorities. We believe this is inappropriate. Another key component of the strategy document should be a description of and, particularly, a justification for determining which portions of the RES HLW research will be generic in nature and which will be specifically directed to the proposed Yucca Mountain Site. Also included in a strategy document should be a description of how the RES program will be focused on the critical concerns of, and coordinated with, HLWM. Most importantly, a description should be provided of how studies conducted under the aegis of the RES program will be coordinated with those in Technical Assistance (TA). (See Item 5 below.)

3. The draft Research Plan is difficult to follow. The Introduction should contain a clear statement of the guidelines and policies or principles that are being used by RES to decide what type of program it will pursue. The early chapters should indicate how decisions will be made on the research to be conducted by the NRC, compared with the research being done by the Department of Energy (DOE), and how these research efforts will be coordinated. Although the draft Research Plan appropriately states in the introductory portions that NRC research should be limited to that of a confirmatory nature, our discussions of individual projects frequently revealed that some of the data that will be collected under the program may not be so justified and thus may not be warranted. One example is the research on the water level in the Lucky Friday Mine. Where the RES work overlaps DOE activities, the Research Plan needs to include a clear description of the rationale used to justify the overlap and at what point, if any, the NRC is expected to be "ahead" of DOE in a given area. For example, research on the regional aspects of volcanism that the NRC staff believes are important should, as stressed in the Site Characterization Analysis, be primarily the responsibility of DOE and be incorporated into its Site Characterization Plan (SCP).

4. As mentioned above, there is a need to identify how the goals of the NRC research program relate to the licensing effort for

the proposed HLW repository. In this regard, the RES staff appears to be assuming that the principal reason for the research program is to obtain the data necessary to confirm that the repository being proposed by DOE will comply with 10 CFR Part 60. The staff acknowledges only in passing that the primary goal of its licensing review is to ensure that the health and safety of the public is protected. We find this disturbing for two reasons: (a) the Systematic Regulatory Analysis has clearly shown that portions of Part 60 need to be revised, and (b) Part 60 specifies that the total system (not the individual subsystem) requirements must be demonstrated to comply with the standards being developed by the Environmental Protection Agency.

5. The draft Research Plan includes a host of individual research programs whose interfaces and coordination are not always clear. More attention needs to be directed to ensuring the integration of the overall RES research effort. Further complicating this situation is the fact that, according to information provided to the ACNW, the funds currently being spent by RES for TA support of the HLW licensing program are double those being spent on HLW research. It would be beneficial if, in the future, the ACNW could hear a combined discussion and description of these two programs, including details on how they are related and how they are coordinated. Otherwise, our review is incomplete. That better coordination is necessary was illustrated by the fact that new research, even where staff members in both offices are in agreement, might require a year or more to initiate. We believe that the processes for identifying research needs and developing focused programs to address these needs, together with the administrative matters associated with implementing the research, should be subjected to analysis to streamline these processes and make them more responsive in a timely manner to the requirements of the Commission.

6. The establishment and functioning of the Center for Nuclear Waste Regulatory Analyses (CNWRA) appear to have initiated certain problems that need attention. One of the stated goals of the NRC staff is to ensure that the funding and staffing of the CNWRA are maintained on a relatively stable basis. Although such a goal is understandable, it can limit research flexibility and may tend to set artificial priorities. Further, it may require that the time of many CNWRA staff members be directed to several projects, with a loss of both efficiency and research effectiveness. One way to overcome some of these problems is to limit the number of projects on which each CNWRA staff member works, and to ensure that the CNWRA and/or NRC staffs have adequate funds and authority to subcontract selected research projects in areas where the CNWRA does not have sufficient expertise.

7. Although we concur with the emphasis in the draft Research Plan on the use of natural analogs in identifying and evaluating relevant models, processes, procedures, and principles, effective use of analogs can only be based on a clear definition of the relevance of the analog in either a generic or a site-specific sense and the manner in which the results can be transferred to the licensing concerns of the NRC. It is not at all clear that this principle is an effective part of the Research Plan. In this regard, there may be a need to develop a major site in the United States for investigating various questions related to the development of an HLW geologic repository. Although other countries, such as Canada, Sweden, and Switzerland, have well-established underground exploratory sites, the United States does not at present have such a laboratory. Useful data have been made available through work at the Apache Leap Tuff Site and the Lucky Friday Mine, but other relevant sites, such as the G-Tunnel in Nevada, are not available. If the necessary permits can be obtained to begin underground explorations at Yucca Mountain, perhaps that will provide the needed facilities. The NRC should encourage the DOE to initiate the establishment of a relevant experimental underground laboratory in the United States.

8. We offer the following comments on specific research projects and activities:

   a. The draft Research Plan includes no research on problems related to airborne releases of carbon-14. We understand that this is being corrected, but we believe that this deficiency may illustrate a lack of comprehensive planning.

   b. Although the draft Research Plan includes a discussion of the need to reduce uncertainties, the distinction between and the rationale for focusing on "regulatory" or "technical" uncertainties are neither clear nor convincing. We believe that this distinction should be made clear, that the focus of RES should be on technical issues demonstrably connected to NRC's role in licensing, and that the RES staff should describe how it intends to accomplish this. This information should be incorporated into the Research Plan.

   c. There often appears to be confusion in the draft Research Plan on what is "transferable." Although data may not be readily transferable from one site to another, the methodologies for obtaining the data generally should be. We recommend that the RES staff concentrate on the development of transferable methodologies and applicable principles and models, not transferable data. This

should be emphasized and clarified in the next version of the Research Plan.

d. A key part of the licensing effort for the proposed HLW repository will be to confirm models and methods for scaling or projecting from experiments conducted on a short-term, and perhaps modest-scale, basis to the behavior of materials and equipment over long-term durations, and at full scale. This research mode may need to receive more attention.

e. More effort needs to be directed to the development of models that will be applicable to evaluations of repository performance in unsaturated media. Included in this effort should be work to support the understanding of the behavior of the various factors influencing the movement of water and radionuclides in such media.

f. Although a sizable effort is under way to select a potential host site for the Monitored Retrievable Storage (MRS) facility, there is little research under way on this subject within the NRC. The reason for this, according to the RES staff, is that the MRS, as envisioned, will use only standard equipment (dry storage casks, etc.) that has already been approved (licensed). Although this may be the case, we urge that the HLWM and RES staffs conduct a careful analysis of the MRS as a system to ensure that no areas are in need of confirmatory research, and that the skills of the staff in addressing relevant licensing issues are likely to be adequate.

g. At several points in the draft Research Plan, the NRC staff has identified milestones for the completion of certain research efforts. In some cases, the milestones listed are those of DOE, not the NRC. Although the DOE schedule for the HLW repository is an important factor for consideration in the NRC research program, we believe that the RES staff must be careful not to let its research program schedule be unduly influenced by DOE schedules. This problem reflects a confusion in scope of the RES program that needs to be clarified in the next version of the Research Plan.

On the basis of our review of the RES draft Research Plan, the presentations by the RES staff at our 41st meeting, and considerable discussion of other parts of the HLW research program, we offer the following recommendations some of which are beyond those imbedded in our previous comments.

1. The RES staff should prepare a strategy document, the contents of which are in accord with our previous comments. The final document should be closely coordinated with HLWM.

2. The RES and HLWM staffs should coordinate the RES program, its strategies and goals, and the current and expected TA activities. The results of this coordination and delineation of schedules should be described in the Research Plan, should serve as the guiding document for program and resource decisions, and should be the subject of a future review by the ACNW.

3. RES management should devise and implement administrative procedures whereby the RES staff is afforded periodic opportunities for prolonged (e.g., one year) full-time assignments in research (e.g., sabbatical leave to a university). During other times, the RES staff should focus its attention on the strategy, management, and evaluation of the research programs supported on behalf of HLWM.

4. RES management should clarify and insert into appropriate documents (e.g., the strategy plan) the goals and interfaces of the HLW research activities, especially as they relate to DOE activities and the needs of HLWM.

In summary, it is our belief that the RES staff needs to carefully review and reevaluate its plans for managing the HLW research program. Once this is done, the draft Research Plan should be extensively reorganized and rewritten. Areas in need of attention include the preparation of a strategy document in which the RES staff delineates its research goals; the development of a system for in-depth and rigorous external review of individual research projects as well as the overall Research Plan, including studies being conducted under both the research and TA programs; and the identification of the role that each project and/or product will play in the licensing process. Included in this reevaluation should be a careful review of the programs being conducted by, and staff assignments within, the CNWRA.

We appreciate the opportunity to review and comment on this program. We stand ready to review the revised Research Plan when completed.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

References:

1. U.S. Nuclear Regulatory Commission, "NRC High-Level Radioactive Waste Research Program Plan," (Draft Report for Comment) NUREG-1406, February 28, 1992
2. Morrison, D. L., Nuclear Safety Research Review Committee, Letter to E. S. Beckjord, Office of Nuclear Regulatory Research, NRC, February 24, 1992

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

June 2, 1992

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Taylor:

SUBJECT: RULEMAKING ON DESIGN BASIS EVENTS FOR GEOLOGIC REPOSITORY OPERATIONS AREA

During its 43rd meeting, May 28-29, 1992, the Advisory Committee on Nuclear Waste met with members of the Office of Nuclear Material Safety and Safeguards (NMSS) staff to review the proposed rulemaking on "Disposal of High-Level Radioactive Wastes in Geologic Repositories--Design Basis Events for the Geologic Repository Operations Area."

On the basis of our discussions with the staff, and our detailed reading of the supporting documents, we believe that the NMSS staff has prepared this proposed rule in a competent manner. Our principal comments follow:

1. The staff has indicated that the four classes of design basis events will be described in the "Statement of Considerations" that will accompany the rule. We suggest that further consideration be given to incorporating this descriptive information into the rule itself.

2. One of the bases for establishing the 50-mSv (5-rem) dose limit at the boundary of the "controlled-use area" is to ensure protection of the onsite workers at the repository. This goal should be clearly enunciated in the proposed rule.

Some time ago, we were told that similar rulemaking would be undertaken to resolve a number of key issues related to the licensing of a high-level radioactive waste repository. We recommend that the use of the rulemaking process be pursued to resolve these other key issues in a timely manner.

Detailed comments regarding this subject can be found in the transcript of our meeting. We endorse publication of this proposed rule for comment, taking into account our recommendations.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Memorandum dated April 29, 1992 from B. J. Youngblood, Nuclear Material Safety and Safeguards, transmitting Draft Proposed Rulemaking, "Disposal of High-Level Radioactive Waste in Geologic Repositories--Design Basis Events for the Geologic Repository Operations Area"

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

June 2, 1992

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Taylor:

SUBJECT: PROPOSED RULEMAKING ON EMERGENCY PLANNING LICENSING REQUIREMENTS FOR INDEPENDENT SPENT FUEL STORAGE FACILITIES (ISFSI) AND MONITORED RETRIEVABLE STORAGE FACILITIES (MRS)

During its 43rd meeting, May 28-29, 1992, the Advisory Committee on Nuclear Waste met with representatives of the NRC staff to discuss the proposed rulemaking on 10 CFR Part 72, "Emergency Planning Licensing Requirements for Independent Spent Fuel Storage Facilities (ISFSI) and Monitored Retrievable Storage Facilities (MRS)."

Overall, we believe that the proposed rule has been well developed and should be published for public comment. In the way of specific comments, we suggest the following:

1. The discussion in the rule should be expanded to clearly state that the reason for enhanced emergency planning at an MRS is the larger number and types of fuel handling operations anticipated at such a facility, as compared with those at offsite ISFSIs.

2. A statement should be added to the proposed rule to place limitations on the number and types of fuel handling operations that can be conducted at ISFSIs.

3. The text of the proposed rule should be revised to explain that the limit for the ingestion of soluble uranium is based on its chemical toxicity. Similar limits should be specified for other radioactive elements, if appropriate.

We hope these comments will be helpful.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Memorandum dated March 4, 1992 from Warren Minners, Office of Nuclear Regulatory Research, transmitting "Proposed Amendments to 10 CFR Part 72 to Establish the Emergency Preparedness Licensing Regulations for Independent Spent Fuel Storage Facilities (ISFSI) and Monitored Retrievable Storage Facilities (MRS)"

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

June 2, 1992

Mr. Robert M. Bernero
Director
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Bernero:

SUBJECT: LICENSE APPLICATION FOR THE HIGH-LEVEL WASTE REPOSITORY

Earlier this month, members of the Advisory Committee on Nuclear Waste were provided with copies of the two volume report, "Mined Geologic Disposal System Annotated Outline Skeleton Text for the Preparation of a License Application," dated April 17, 1992, that has been prepared by the U.S. Department of Energy (DOE). While we realize that this initial edition is only a beginning, it appears to be well organized and is tangible evidence of DOE's progress in the license application process.

Please relay our appreciation to DOE officials for sending copies of this report to the Committee. We look forward to receiving sections of the report as they are revised, updated and/or completed, and to meeting with your staff to discuss their response to the report.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

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

June 2, 1992

Mr. Eric S. Beckjord
Director
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Beckjord:

SUBJECT: COMMENTS ON REGULATORY GUIDES TO IMPLEMENT THE REVISED 10 CFR PART 20 REQUIREMENTS

During its 43rd meeting, May 28-29, 1992, the Advisory Committee on Nuclear Waste (ACNW) discussed the following regulatory guides being prepared by the Office of Nuclear Regulatory Research (RES) staff in support of the implementation of the revised 10 CFR Part 20, "Standards for Protection Against Radiation":

1. Regulatory Guide 8.25, Rev. 1, "Air Sampling in the Workplace," dated April 23, 1992;

2. Regulatory Guide 10.8, Rev. 2, "Guide for the Preparation of Applications for Medical Use Programs," Appendix X, "Guidance on Complying with New Part 20 Requirements," dated April 16, 1992;

3. Regulatory Guide DG-8010, "Criteria for Monitoring and Methods for Summation of Internal and External Occupational Doses," dated May 18, 1992; and

4. Regulatory Guide DG-8011, "Radiation Dose to the Embryo/Fetus," dated May 1992.

In addition, these guides were discussed with the RES staff during a joint ACNW/ACRS Working Group meeting held on May 27, 1992. Detailed comments and suggestions may be found in the transcripts of this meeting and of the ACNW meeting on May 28, 1992.

Our general impression is that the RES staff is developing these guides in an effective manner and has been careful to take into consideration the comments of outside groups. The final guides should serve as a useful source of background information for NRC

and Agreement State licensees. We recommend that the guides be completed and issued as expeditiously as possible.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

SUBJECT INDEX

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NRC FORM 335 (2-89) NRCM 1102, 3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

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This compilation contains 19 reports issued by the Advisory Committee on Nuclear Waste (ACNW) during the fourth year of its operation. The reports were submitted to the Chairman and Commissioners of the U. S. Nuclear Regulatory Commission, the Executive Director for Operations, the Director, Office of Nuclear Regulatory Research, or to the Director, Office of Nuclear Material Safety and Safeguards. All reports prepared by the Committee have been made available to the public through the NRC Public Document Room and the U. S. Library of Congress.

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