



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

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September 11, 1990

The Honorable Kenneth M. Carr
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Carr:

As a follow-up to our recent conversation, I am enclosing a copy of the paper that has been prepared by the Advisory Committee on Nuclear Waste for presentation at the upcoming (September 17-18, 1990) Symposium being held by the Board on Radioactive Waste Management, National Academy of Sciences.

Sincerely,

Dade W. Moeller
Chairman

Enclosure:
As stated

- cc: Commissioner Rogers
- Commissioner Curtiss
- Commissioner Remick
- H. Thompson, EDO
- R. Bernero, NMSS
- R. Browning, NMSS
- A. Eiss, NMSS

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**COMMENTS OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE
OF THE U.S. NUCLEAR REGULATORY COMMISSION**

General Introduction

In June 1988, the U.S. Nuclear Regulatory Commission established the Advisory Committee on Nuclear Waste (ACNW). The Committee reports to and advises the Nuclear Regulatory Commission (NRC) on aspects of nuclear waste management within the purview of NRC's regulatory responsibilities. The focus of the Committee's work is largely on disposal but also includes other aspects such as handling, processing, transportation, storage, and safeguarding of nuclear wastes including spent fuel, nuclear wastes mixed with other hazardous substances, and uranium mill tailings. In performing its work, the Committee examines and reports on specific areas of concern referred to it by the Commission. The Committee is authorized to undertake other studies and activities on its own initiative related to those issues directed by the Commission.

In its first two years of existence, the Committee held 21 general meetings and several working group sessions and issued 37 letter reports. In addition, the Committee routinely met with the Nuclear Regulatory Commission to discuss items of mutual interest and concern.

Currently, the Committee is authorized a maximum of four members. Members are appointed by the Nuclear Regulatory Commission.

The ACNW traces its history back to the Advisory Committee on Reactor Safeguards (ACRS). The first Chairman and Vice-Chairman of the ACNW (Drs. Moeller and Steindler, respectively) had served on the ACRS where they participated extensively in the waste management reviews by the ACRS. They now continue this function with the ACNW. The current members of the ACNW are:

ACNW MEMBERSHIP

CHAIRMAN: Dr. Dade W. Moeller, Professor of Engineering in Environmental Health, School of Public Health, Harvard University, Boston, Massachusetts

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

MEMBERS: Dr. William J. Hinze, Professor, Department
of Earth and Atmospheric Sciences,
Purdue University, West Lafayette, Indiana

Dr. Paul W. Pomeroy, President, Rondout
Associates, Incorporated, Stone Ridge, New York

Today, we will be providing a summary of the advice given to the Nuclear Regulatory Commission on EPA's proposed high-level waste standards and ACNW comments on the NRC staff's review of the DOE Site Characterization Plan (SCP) for the proposed high-level waste repository at Yucca Mountain, Nevada.

EPA STANDARDS

For more than five years the ACNW and its predecessor organization have been concerned that the current set of proposed EPA standards is overly stringent, is wasteful of resources, and cannot be implemented. These concerns are based on extensive meetings and discussions with a wide range of organizations, including relevant Federal and State agencies as well as industrial and private groups. One of the highlights of these interactions was a meeting held at the Committee's conference room in Bethesda, Maryland, on March 23, 1990. The Committee continues to doubt that compliance with the EPA standards can be demonstrated for a specific repository site, even with reasonable application of the caveats included in the currently proposed standard, such as the "reasonable assurance" phrase that allows for certain flexibilities in the interpretation of probabilistic analyses. Regardless of the schemes proposed to resolve uncertainties in applying probabilistic techniques (e.g., rulemaking), the Committee has seen no convincing evidence that the current set of standards will prove to be workable.

The ACNW has concluded that the EPA standards need to be revised and that now is the time to accomplish this task. The Committee has even suggested several organizations whose recommendations for change should be sought, including the National Academy of Sciences. In such a revision, the Committee recommended that the standards should be organized in a hierarchical structure with the higher levels expressing the objectives in a qualitative sense and the lower levels stating the objectives quantitatively. The Committee stressed that the several levels be consistent and that lower levels not be more stringent or conservative than the higher levels so that they become de facto new standards. The Committee believes that the proposed quantitative EPA standards may be internally inconsistent. In addition, we believe that secondary requirements, if expressed in the EPA standards, should be given only as guidance, with qualifying statements clearly specifying that they are not to be applied in a regulatory sense.

Three principal Committee recommendations for revising the EPA standards are:

1. An acceptable risk from a high-level waste repository should be defined and justified, keeping in mind the benefits derived from the activity involved, and other societal risks as well as additional relevant considerations. Lower-level standards should be expressed in terms of annual risk limits from a disposal facility in an undisturbed and a disturbed state. The critical population group being considered should be clearly defined. This approach is in accord with recommendations of organizations such as the International Commission on Radiological Protection and the United Kingdom's National Radiological Protection Board.
2. It should be specified that inclusion in the standards of an appropriate probabilistic approach is acceptable to the definition of risk from a repository, only if it is clearly noted that this probabilistic approach is not the single determining factor in judging the acceptability of a specific site. Experience has shown that probabilistic risk analyses (PRAs) alone cannot be used to reliably determine the compliance of a single nuclear power plant with a set of standards or as the basis for judging the adequacy of its safety. A single high-level waste repository, which is to function for thousands of years, is still more difficult to assess quantitatively. The EPA standards should clearly specify that risk assessments are but one of several tools for the evaluation of a given high-level waste repository site and/or facility and that PRAs should be only one factor in evaluating compliance of such a facility with the EPA standards. Expert opinion and deterministic criteria are of considerable importance in judging the acceptability of a specific site.
3. Evaluations of the anticipated performance of the proposed Waste Isolation Pilot Plant indicate that, for the disturbed state, human intrusion is the dominant contributor to risk. Early indications suggested that performance analyses for the proposed Yucca Mountain repository may also show human intrusion to be important. For these reasons, separate considerations for evaluating the impacts of human intrusion should be included. The Committee suggested that the standards be rewritten to separate the evaluation of anticipated repository performance into three parts: (a) the undisturbed repository; (b) the disturbed repository, exclusive of human intrusion; and (c) the repository as it might be affected by human intrusion. This would clearly separate out the issues surrounding human intrusion and permit it to be addressed directly.

Currently, the NRC staff and the ACNW are moving toward, but are not yet at, a consensus over how the EPA standards must be revised. The ACNW will continue its evaluation of the EPA standards.

ACNW Review of the NRC Analysis of the DOE Site Characterization Plan

The stringency of the EPA standards, coupled with their probabilistic base, has led to the need for extensive plans for conducting studies and for collecting the data necessary for the analyses associated with determining whether a given waste disposal site can be demonstrated to show compliance. As a result, the ACNW has devoted considerable time and effort in reviewing the DOE SCP and the NRC staff's review of this plan, the Site Characterization Analysis (SCA). The ACNW review of these documents was, of necessity, less than comprehensive. Rather, the Committee focused on specific critical topics. Members and consultants reviewed relevant material in-depth, using an iterative process with the assistance of the NRC and DOE staffs. The Committee was in general agreement with the overall content of the SCA. However, the Committee had several significant concerns, some of which are summarized below:

- Statements are absent in the SCP addressing the systematic and early identification and evaluation of potentially disqualifying features at the Yucca Mountain Site. Although the SCP is an action plan for site characterization, the Committee believes a much stronger focus should be placed on early detection of potentially disqualifying features. The Committee also found that the NRC staff's SCA is not sufficiently emphatic in its critique of the lack of such a focus. The Committee concluded that the SCA should point to the need in DOE's SCP for an integrated section of the plan that explicitly addresses the activities leading to an evaluation of the characteristics of the site directly related to disqualifying features (e.g., groundwater travel time as stated in the NRC regulations).
- Insufficient attention is given in the SCP to the limitations and uncertainties in the Yucca Mountain data bases, and the associated difficulties in demonstrating that the repository will comply with EPA's high-level waste standards (40 CFR Part 191). Here, the key factor is that the standards, as currently written, are probabilistic and therefore the methods for demonstrating compliance must have a probabilistic base. The approach required to be used includes the construction of a complementary cumulative distribution function (CCDF) and, through this process, a demonstration that the repository complies with the EPA standards. Primary

concerns of the ACNW are the uncertainties and limitations in the data to be used to construct the CCDF. Since the ability to resolve these uncertainties experimentally may well be beyond the capability of the site characterization program, increased consideration should be given to the feasibility of developing deterministic criteria for judging the adequacy of the site relative to the EPA goals. As stated previously, the Committee considers the demonstration of compliance of the proposed repository with the EPA standards to be a major concern.

- The ACNW raised its concern over the delays by DOE in implementing satisfactory quality assurance (QA) programs. The Committee urged that this troublesome issue be resolved promptly, since continued absence of approvable QA systems will increase the burden on the participants in the licensing processes when qualification of data is at issue.

In addition to the above, the Committee offered a number of comments pertaining to other specific aspects of the site characterization program, such as resolving the dilemma of how to determine the characteristics of the Calico Hills Formation, while still maintaining this structure as a barrier between radioactive wastes placed in the repository and the underlying saturated zone, and the need to define the materials to be used in the waste packages and the manner in which these packages will be sealed. The latter information is essential to the evaluation of possible interactions between the waste package and repository materials.

We appreciate the opportunity to participate in today's discussion and look forward to an interesting exchange of information. The success of the nation's nuclear energy program will be measured in part by the skill used to manage nuclear waste. This task clearly requires the participation of people who are expert in a wide range of fields. This meeting is an important contribution to the process and thereby to the quality of the product.