



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

ACNWR-0086

PDR

February 5, 1993

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

Dear Chairman Selin:

SUBJECT: ISSUES RAISED IN THE ENERGY POLICY ACT OF 1992,
SECTION 801

During its 50th meeting, January 27 and 28, 1993, the Advisory Committee on Nuclear Waste (ACNW) met with representatives from the U.K. National Radiological Protection Board, the U.S. National Council on Radiation Protection and Measurements, and the NRC Staff to discuss the three principal issues that the National Academy of Sciences will be addressing in response to the assignment outlined by the U.S. Congress in the Energy Policy Act of 1992.

The Committee did not have an opportunity to review SECY-93-13, which presents the NRC staff analysis of these issues. The comments that follow are primarily based on discussions held during our meeting.

In considering Section 801 of the Energy Policy Act, it is important to note that the charge to the National Academy of Sciences involves the development of standards that are intended to be site specific for the proposed repository at Yucca Mountain. As we interpret it, these standards, to be developed by the U.S. Environmental Protection Agency (EPA), will be used to guide the design and to define compliance of this repository. In this regard, we offer the following observations:

- a. Environmental standards are most useful when formulated without reference to a specific site. We interpret Section 801 of the Energy Policy Act as calling for the development by EPA of "generally applicable standards" but for the proposed Yucca Mountain site. This should provide EPA sufficient flexibility to avoid the development of standards that would be unnecessarily site specific. In making corresponding changes to 10 CFR Part 60, the Commission should similarly avoid, wherever possible, developing regulations that are uniquely applicable to the Yucca Mountain site. The regulations should be based on assumptions or conditions that have a sound foundation in the pertinent technical disciplines and methodologies.

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- b. Regardless of the form of the standards, we believe that they should be geared to specific time periods in the future. For example, such periods might include one during which it is reasonable to assume the presence of institutional controls, a second during which it is assumed that the biosphere will be comparable to the present, and a third that extends so far into the future that the associated predictions have such unacceptably large uncertainties as to compromise their usefulness. The Commission may want to encourage this type of approach.
- c. Fundamental to the standards should be a provision that individuals and populations in the future are accorded a level of protection at least equivalent to that which is accorded to individuals and populations alive now.

ISSUE ONE

"Whether a health-based standard based upon doses to individual members of the public from releases to the accessible environment will provide a reasonable standard for protection of the health and safety of the general public"?

In response to this inquiry, our answer is "Yes." In support of that view, we offer the following comments:

- a. We interpret a "health-based standard" as incorporating a "risk-based standard." In this sense, such an approach would represent a major step forward in that risk is a more fundamental criterion than dose for the protection of members of the public. Although a risk-based standard could incorporate a limit on the dose, it should also reflect the possibility that the limit could be exceeded. Setting the standards on the basis of risk would also avoid having to revise them as newer data on the health effects of radiation are developed. In addition, application of a risk-based standard makes it possible to compare the risks of radionuclide releases from a high-level waste repository to the risks from other environmental contaminants.
- b. Interestingly, this approach, if adopted, would place an annual, versus cumulative, limit on permissible doses to members of the public. In incorporating this approach, however, it is important that the limit include application of the concept of the "critical group," rather than the concept of the "maximally exposed individual." Benefits of the concept of the "critical group" are that it ensures not only that members of the public will not receive unacceptable exposures, but also that decisions on the acceptability of a practice will not be prejudiced by a very small number of individuals with unusual habits.

- c. A standard containing a radionuclide release limit avoids the necessity to estimate environmental radionuclide transport and associated human intake. [However, determining compliance with such a standard through environmental monitoring would be very difficult, as would be comparing a release limit to the impacts of other radiation sources (e.g., natural background).] An environmental standard should have broad application; one that incorporates radionuclide release limits is useful only as a guide for design.
- d. Limits on individual doses should not be used as a justification for selecting poor repository sites. For certain proposed sites, it could theoretically be possible to exceed a dose limit for individual members of the public due to the fact that there is very little water available. A "risk-based" standard would help to overcome this problem by making it necessary to take into consideration the probability that the individual dose limit might be exceeded. At the same time, limitations on the quantities of water available would restrict the number of people who could be exposed, and the associated collective doses (or societal impacts) of the radionuclide releases. In this regard, it should be noted that collective dose estimates beyond several generations are not very useful due to a lack of information on the number, or the living habits, of people who might live in a given area.

ISSUE TWO

"Whether it is reasonable to assume that a system for post-closure oversight of the repository can be developed, based upon active institutional controls, that will prevent an unreasonable risk of breaching the repository's engineered or geologic barriers or increasing the exposure of individual members of the public to radiation beyond allowable limits"?

In response to this inquiry, our answer is "No." Supplementing this response, we offer the following comments:

- a. As a basic premise, we believe that the assumption of institutional control (or oversight) for extremely long periods of time is neither practicable nor workable. It is imperative that the assumption of post-closure oversight not be used as a justification for lessening the stringency of the repository design.
- b. Reliance on active controls also has the disadvantage of conceivably leading to acceptance of an otherwise unsatisfactory disposal facility, because it could be assumed that unacceptable radionuclide releases would be detected and mitigated by active controls.

- c. The post-closure phase presents an opportunity to continue to monitor the performance of the repository and to gather data that could be useful in the siting and design of similar facilities in the future. Although we share with the NRC staff the concerns that intrusive monitoring equipment is not acceptable, we believe that technologies could be developed for collecting data through remote sensing operations or electrical connections that will not negate the integrity of the repository. Key parameters on which data might be collected include thermal conditions, the presence of moisture, seismic events, and radionuclide releases.

ISSUE THREE

"Whether it is possible to make scientifically supportable predictions of the probability that the repository's engineered or geologic barriers will be breached as a result of human intrusion over a period of 10,000 years"?

In response to this inquiry, our answer is "No." On the basis of our discussions, we offer the following comments:

- a. As a basic premise, we believe that the design, construction, and operation of an HLW repository should be conducted using the assumption that there will be no post-closure oversight. That is to say, we believe that the design should be robust enough to ensure that such oversight is not necessary.
- b. In our opinion, inadvertent human intrusion into the proposed Yucca Mountain repository over the next 10,000 years is a reasonable likelihood; in fact, we believe it is reasonable to assume a probability of one for such an event. This being the case, we concur with the Board on Radioactive Waste Management that it would be more appropriate for the U.S. Department of Energy (DOE) to base its risk assessments of human intrusion on its potential consequences, rather than its probability. Following this approach, the possibility of human intrusion should be a factor in the selection of a site and the design of a disposal facility.
- c. We believe that the risk-based standards for individual members of the public should generally apply to radionuclide releases that occur as a result of human intrusions that have a probability of bypassing a portion of the repository barrier system. However, the limits should not apply to public exposures that occur as a result of actions by intruders who bypass all the repository barriers. Intruders who possess the capability to intrude into a repository in such a manner would presumably possess sufficient technological capabilities to identify any radionuclide releases that accompany such actions. The standards should include general guidance on

February 5, 1993

design considerations that might compensate for the damage to a facility caused by human intrusion and mitigate any radionuclide releases to the environment.

- d. We believe that the probabilities and consequences of human intrusion should be considered outside the normal evaluation of the safety of a repository in the same manner as threats of sabotage are considered in terms of releases from a commercial nuclear power plant. For this reason, we concur with the DOE position that radionuclide releases to the accessible environment from human intrusion should be treated separately from potential radionuclide releases caused by natural processes and events.
- e. In addition to the specific requirements enumerated in the statement of this issue, the upcoming National Academy of Sciences study offers an excellent opportunity to investigate the possibility of making scientifically supportable predictions of the probability that various barriers within the repository will be breached as a result of natural events over a period of 10,000 years. We strongly encourage such an effort.

We trust these comments will be helpful. The Committee plans to continue to review the impacts of the Energy Policy Act of 1992 on the disposal of high-level radioactive waste.

Sincerely,



Dade W. Moeller
Chairman

References:

1. SECY-93-13, dated January 25, 1993, for the Commissioners, from James M. Taylor, EDO, "Analysis of Energy Policy Act of 1992 Issues Related to High-Level Waste Disposal Standards"
2. National Radiological Protection Board (UK), "Board Statement on Radiological Protection Objectives for the Land-Based Disposal of Solid Radioactive Wastes," Volume 3, No. 3, 1992