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

ACNWR-0057

June 27, 1991

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

Dear Chairman Carr:

SUBJECT: RESPONSE TO QUESTIONS ACCOMPANYING WORKING DRAFT #3 OF THE EPA STANDARDS

Draft #3 of the proposed Environmental Protection Agency (EPA) Standards for the management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes includes six questions. With the thought that our comments would be helpful, we have prepared the following summary responses to each of these questions.

Question 1:

Two options are presented in Sections 191.03 and 191.14 pertaining to maximum exposures to individuals in the vicinity of waste management, storage and disposal facilities: a 25 millirems/year ede limit and a 10 millirems/year ede limit. Which is the more appropriate choice and why?

Response:

The question, as phrased, refers to "maximum" exposures to "individuals." Because radionuclide releases from a high-level waste (HLW) repository, if they occur, could continue for a number of years, we have responded to the question in the sense of what would be the maximum acceptable annual exposure (dose) to members of the public over an extended period of time, in contrast to what might be considered an acceptable maximum exposure over a single year. This is in accord with the approach taken by both the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

In a similar manner, we assume that by maximum exposures to "individuals," the EPA means maximum exposures to a "critical population group," following the approach recommended by the ICRP. With those caveats, our response follows.

We believe an effective dose rate limit of 0.10 mSv (10 mrem) per year is more appropriate for several reasons:

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1. Recent evaluations indicate that the biological effects of ionizing radiation may be higher than previously estimated.

2. The population in question may be exposed to more than one radiation source.

3. A fraction of the current dose limit should be reserved for potential future radiation sources.

4. Radionuclide releases from a repository, if they occur, could continue over a long period.

Such a dose rate limit would also be consistent with the recommendations of international organizations such as the ICRP, the International Atomic Energy Agency, and as noted in the 1989 report prepared by the radiation protection and nuclear safety authorities of Denmark, Finland, Iceland, Norway and Sweden (commonly referred to as the "Nordic" Study).

Question 2:

A new assurance requirement is presented in Section 191.13 that would require a qualitative evaluation of expected releases from potential disposal systems over a 100,000-year timeframe. Are such evaluations likely to provide useful information in any future selecting of preferred disposal sites?

Response:

We recognize that the specification of the 10,000-year time limit is somewhat arbitrary. It is important that significant geologic or climatic changes do not occur in the near-term period following the 10,000-year limit. We also agree that many geologic and climatic events that may affect the evaluation of site performance can be meaningfully extended beyond 10,000 years. In these cases, such an extension could provide information that would be useful for comparing the relative merits of several potential repository sites. In general, however, and particularly in the evaluation of the merits of a single site, the uncertainties involved in such an extension would make the value of the associated assessments questionable. It is important to note that, although evaluations of site performance may be quantitative, the results are subject to interpretation.

Question 3:

Two options are presented in Section 191.14 and 191.23 pertaining to the length of time over which the individual and ground water protection requirements would apply: a 1,000-year duration and a 10,000-year duration. Which is the more appropriate timeframe and why?

Response:

Title 10 Part 60 of the NRC regulations specifies that containment of the radionuclides within the waste be substantially complete for a period not less than 300 years nor more than 1,000 years. This constraint, coupled with other requirements, including the stipulation that the groundwater travel time to the accessible environment be at least 1,000 years, is designed to ensure that protection of the individual and the groundwater will extend well beyond 1,000 years.

When one also considers the fact that, after only a few thousand years of decay, the health hazards of the high-level wastes will be no greater than that of the original unmined uranium ore, it becomes readily apparent that it should be possible to ensure individual and groundwater protection for a duration of 10,000 years. We therefore endorse the extension of this time period. Such an extension would also make this requirement compatible with the limitation on health effects resulting from an HLW repository.

Question 4:

In Subpart C the Agency proposes to prevent degradation of "underground sources of drinking water" beyond the concentrations found in 40 CFR Part 141 -- the National Primary Drinking Water Regulations. The Agency is aware, however, that there may be some types of ground waters that warrant additional protection because they are of unusually high value or are more susceptible to contamination. Should the Agency develop no-degradation requirements for especially valuable ground waters? If so, what types of ground waters warrant this extra level of protection?

Response:

We agree that pollution of "underground sources of drinking water" should not be permitted beyond the limits specified in the National Primary Drinking Water Regulations. We believe that a no-degradation requirement for certain large volume aquifers, that represent major long-term existing or potential drinking water sources, may represent undue stringency. A preferred approach would be to reject as potential sites for the storage or disposal of high-level radioactive wastes those land areas which, if contaminated, could have the potential for polluting such aquifers. However, the volume and present value of an aquifer should not be the sole criteria for identifying those that should be protected. Other criteria may become significant with the passage of time.

At the same time, we believe it is important to recognize that the dose rate from underground sources of drinking water, even if contaminated to the limits specified in the National Primary Drinking Water Regulations, would still contribute only a small

fraction (4 percent) of the current long-term dose rate limit for members of the public. Even considering the more restrictive limit for an HLW repository (as suggested in our response to Question 1 above), groundwater complying with the Drinking Water Regulations would contribute no more than 40 percent of the dose rate limit. In this sense, application of the Drinking Water Regulations to a repository represents a degree of stringency, especially because the primary pathway for public exposures from such facilities is through drinking water.

Question 5:

Two options are presented in Notes 1(d) and (e) of Appendix B pertaining to the transuranic waste unit: a 1,000,000 curies option and a 3,000,000 curies option. Which is the more appropriate TRU waste unit and why?

Response:

The number of curies of transuranic waste that would be comparable to 1,000 MTHM of spent fuel ranges from 1 to 6 million curies, depending on when the assessment is made. Accordingly, we believe that it would be reasonable to adopt the 3 million curie option.

Question 6:

The Agency is investigating the impacts of gaseous radionuclide releases from radioactive waste disposal systems and whether, in light of these releases, changes to the Standards are appropriate. To assist us in this effort, we would appreciate any information pertaining to gaseous release source terms, chemical forms, rates, retardation factors, mitigation techniques and any other relevant technical information.

Response:

Two reports that may be helpful are

1. W. B. Light, et al., "C-14 Release and Transport from a Nuclear Waste Repository in an Unsaturated Medium," Lawrence Berkeley Laboratory, Report LBL-28923 (June 1990).

2. W. B. Light, et al., "Transport of Gaseous C-14 from a Repository in Unsaturated Rock," Lawrence Berkeley Laboratory, Report LBL-29744 (September 1990).

In commenting on this subject previously, we have noted the following:

a. The total inventory of carbon-14 in a repository containing 100,000 MTHM is estimated to be about 100,000

curies. This compares to a global production of carbon-14 by cosmic radiation of 28,000 curies per year, a global inventory of about 230 million curies, and an atmospheric inventory of 4 million curies. In fact, release of all of the carbon-14 inventory in a repository would increase the atmospheric inventory by only about 2 percent; this compares to natural variations in the atmospheric inventory of 10 percent to 40 percent.

b. Based on an assumed inventory of 100,000 MTHM, the rate of release of carbon-14 from a repository that would be permissible under the existing EPA Standards would be about 1 curie per year. Experience shows that any carbon-14 that is released would rapidly mix in the atmosphere, and estimates are that the accompanying dose rate to a person on top of Yucca Mountain would be far less than 0.01 mSv (1 mrem) per year. We also note that the limit on the release rate of 1 curie per year for a repository compares to an average release rate of 10 curies per year from a typical 1,000 MWe light-water reactor.

At the time the EPA Standards were developed, considerations were limited to evaluations of a saturated site. In such a case, water transport and geochemical barriers would have been strongly influential in retaining the carbon-14. Subsequent consideration of Yucca Mountain (an unsaturated site) makes the existing EPA Standards inappropriate. We believe the limit for carbon-14 as specified in the proposed Standards should be relaxed. For additional discussion on this topic, we refer you to the transcript and minutes of the Advisory Committee on Nuclear Waste Working Group meeting held on March 19, 1991.

We trust these comments will be helpful. If appropriate, we request that you forward them to Mr. Floyd L. Galpin of the U.S. Environmental Protection Agency.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference

EPA, 40 CFR 191 - Draft Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, dated April 26, 1991, with attachments.

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

July 2, 1991

NOTE TO: Donald H. Lanham, Acting Chief
Docketing and Document Control Desk Section
Document Control Branch

FROM: Ethel M. Barnard
Advisory Committee on Nuclear Waste

SUBJECT: PLACEMENT OF "FULL TEXT" ACNW DOCUMENTS ON NUDOCS

In accordance with direction from Jim Blanton, I have attached the following documents for "full text" processing through the NUDOCS system:

ACNWR-0056 - Moeller ltr 6/27/91, Comments Regarding 10 CFR Part 61 Proposed Revisions Related to Groundwater Protection

ACNWR-0057 - Moeller ltr 6/27/91, Response to Questions Accompanying Working Draft #3 of the EPA Standards

Also enclosed is a 3 1/2" diskette containing the "electronic text" of the documents. The documents are in "WORDPERFECT" format. Your signature in the space below, will serve as confirmation of receipt of the "Hard Copy" and "Electronic Copy". Please return a copy of this note to me at Mail Stop P-315. If you have any questions concerning this matter, please feel free to contact me on x27691.

Ethel M. Barnard, ACNW

Received by Donald H. Lanham:

Signature: Susan Fridley for DHL Date: 7/3/91