



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 14, 2000

MEMORANDUM TO: Chairman Meserve
Commissioner Dicus
Commissioner Diaz
Commissioner McGaffigan
Commissioner Merrifield

FROM: Dennis K. Rathbun, Director *DR*
Office of Congressional Affairs

SUBJECT: NATIONAL RESEARCH COUNCIL RESPONSES TO QUESTIONS
FROM JUNE 23, 2000, HOUSE COMMERCE HEARING ON HLW

Attached are responses of Dr. Kevin Crowley, Director, Board on Radioactive Waste Management, National Research Council, to followup questions from the June 23, 2000, hearing on Yucca Mountain Radiation Protection Standards before the House Commerce Committee's Subcommittee on Energy and Power.

Attachment:
As stated

cc: OEDO
OGC
OGC (Cyr)
NMSS
RES
NRR
OPA
SECY
OIG
ACNW
OCIO
OCFO
OCAA

Contact: Tom Combs, 415-1776

THE NATIONAL ACADEMIES

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National Academy of Sciences
National Academy of Engineering
Institute of Medicine
National Research Council

Board on Radioactive Waste Management

August 18, 2000

The Honorable Joe Barton
Chairman
Subcommittee on Energy and Power
Committee on Commerce
U.S. House of Representatives
Room 215 Rayburn House Office Building
Washington, D.C. 20515-6115

Dear Chairman Barton:

In response to your letter dated July 20, 2000, I am enclosing responses to your follow-up questions from the June 23, 2000 hearing on radiation protection standards for Yucca Mountain. Please do not hesitate to contact me if you need additional information.

Sincerely yours,

Kevin D. Crowley
Director
Board on Radioactive Waste Management

Response to questions regarding the June 23, 2000 hearing on

Yucca Mountain Radiation Protection Standards

Before the

U.S. House of Representatives
Committee on Commerce
Subcommittee on Energy and Power

Kevin Crowley, Ph.D.
Director
Board on Radioactive Waste Management
National Research Council

Note: The following three references are cited in this document:

1. Environmental Protection Agency [EPA], 1999: Environmental Radiation Protection Standards for Yucca Mountain, Nevada, Proposed Rule: 64 Federal Register 46976-47016 (August 27, 1999). This document contains EPA's proposed radiation-protection standard for Yucca Mountain.

2. National Research Council [NRC], 1995: Technical Bases for Yucca Mountain Standards: Washington, D.C., National Academy Press. This report was written for EPA at the request of the U.S. Congress and contains the National Academies' findings and recommendations on radiation-protection standards for Yucca Mountain. This report is referred to as the "TYMS report" in this document.

3. National Research Council [NRC], 1999: Comments on Proposed Radiation Protection Standards for Yucca Mountain, Nevada by the Board on Radioactive Waste Management: Washington, D.C., National Academy Press. This report provides a comparison of the proposed EPA standards with the findings and recommendations in the TYMS report. It is referred to as the "BRWM report" in this document.

Question 1: Please elaborate on the reasons for the Board's opposition to EPA's proposed separate 4 millirem groundwater protection standard.

Response: The Board on Radioactive Waste Management [BRWM] has not taken a position either in favor of or in opposition to EPA's proposed groundwater standard for Yucca Mountain. Rather, the BRWM has stated (NRC, 1999, p. 11) that it "does not believe there is a basis in science for establishing such limits" to protect public health. The TYMS report (NRC, 1995) concluded that an individual-protection standard would be sufficient to protect public health from a repository at Yucca Mountain.

In my written testimony to the subcommittee, I explained why there is no scientific basis for the proposed groundwater standard. EPA made what appear to be several arbitrary modifications in applying its safe drinking water regulations (40 CFR 141) to Yucca Mountain. In particular, the groundwater standard in EPA's safe drinking water regulations applies to water delivered at the tap through a public water system, whereas the proposed groundwater standard for Yucca Mountain will be applied to a volume of groundwater in an aquifer some 2,000 feet below the Earth's surface at some as-yet undetermined distance from the repository. Second, the groundwater standard is based on a different level of risk than the individual-protection standard and, for some radionuclides, may actually provide more protection to groundwater than the individual-protection standard provides to people.

In my written testimony I also suggested how EPA could justify a separate groundwater standard for Yucca Mountain based on science: namely, by adopting the risk-based approach recommended in the TYMS report (NRC, 1995). I noted that if EPA based its Yucca Mountain standards on a single value of acceptable risk, it could express that risk in terms of two elements, one for radiation exposures through the groundwater pathway (a groundwater standard) and one for exposures through all pathways (an all-pathways standard). These two elements would be scientifically consistent so long as they are based on a single value of acceptable risk. To implement this approach, however, EPA would have to modify the dose limits for the all-pathways and groundwater standards that currently exist in its proposed rule so that they represent the same value of acceptable risk.

Question 2: I understand that one of the first radionuclides that could be released from the repository would be iodine-129. What is the health risk associated with a 4 millirem dose from iodine-129? Is this within the risk range recommended by the National Academy of Sciences? Are there other radionuclides that would fall outside the NAS's recommended risk range under EPA's proposed groundwater standard?

Response: I cannot provide the subcommittee with a direct answer to this question. The BRWM has not performed a detailed examination of the health risks associated with a 4 millirem dose from iodine-129 or any other radionuclides associated with EPA's groundwater standard. Moreover, given that the groundwater standard proposed by EPA is based on outdated dosimetry, as noted in the BRWM report (NRC, 1999, p. 12) and in my written testimony (p. 10), the risk values calculated by EPA may not be representative of actual risks.

Question 3: The Conference Report accompanying the 1992 Act read as follows: "The Conferees do not intend for the National Academy of Sciences, in making its recommendations, to establish specific standards for protection of the public but rather to provide expert scientific guidance on the issues involved in establishing those

standards." The National Academy was not intended to usurp the EPA's rulemaking authority, but the direction to EPA is very clear in the 1992 law—the EPA Administrator is to set generally applicable standards for the Yucca Mountain site "based upon and consistent with the findings and recommendations of the National Academy of Sciences." Mr. Page suggested in his testimony the "EPA was to consider technical recommendations from the National Academy of Sciences." However, the law says "based upon and consistent with." In your view, are the proposed EPA standards based upon and consistent with the findings and recommendations of the National Academy of Sciences?

Response: As noted in NRC (1999) and in my written testimony to the subcommittee, many important elements of EPA's proposed standards are, either in design or implementation, based upon and consistent with the findings and recommendations contained in the TYMS report (NRC, 1995). These are discussed on pages 4-5 of my written testimony to the subcommittee and include *who is protected*, the *level of protection* for the individual-protection standard, *human intrusion*, and *exposure scenarios*. My written testimony also identified three elements of EPA's proposed standards that are not based upon and consistent with the recommendations in the TYMS report: (1) use of a dose-based standard; (2) the inclusion of a separate groundwater standard; and (3) the time period over which the standard should be applied. My written testimony explains the nature of these inconsistencies (see especially pages 6-13). The BRWM considers the first two of these inconsistencies to be very significant. The third inconsistency is less significant, as explained in my response to the last question in this document.

Question 4: The National Academy recommended that EPA adopt a risk-based standard for the protection of individuals, yet EPA proposed a dose-based standard. I recognize that the 1992 Act directed EPA to "prescribe the maximum annual effective dose equivalent to individual members of the public." That statutory language could be interpreted to merely dictate the final form of the standard, and certainly does not prevent EPA from using risk, as the National Academy recommended, to derive a final dose equivalent. Is EPA, in fact, using a risk level to determine the final dose?

Response: The BRWM noted (NRC, 1999, p. 4) that EPA did not use risk to establish dose limits for its individual-protection standard. Instead, EPA used dose-based standards that were carried over from existing regulations (40 CFR 191 and 40 CFR 141) and derived equivalent risk values through arithmetic conversion.

As noted in both the TYMS (NRC, 1995) and BRWM (NRC, 1999) reports, there is no scientific basis for setting a level of protection for either a dose- or risk-based standard. Rather, protection levels are a public policy decision, best established through rulemaking, based on the risk the public is willing to bear from radiation releases from a repository at Yucca Mountain. The TYMS report recommended (NRC,

1995, p. 64-65) that the Yucca Mountain standard be based on risk because (1) it would not have to be revised in subsequent rulemaking as scientific knowledge advances, and (2) risk is more readily understood by the general public than dose, and it provides a convenient way to compare hazards to public health from different sources.

The BRWM recognized (NRC, 1999, p. 6) that establishing a risk-based standard would be a major departure from current EPA practice and that it would be far more difficult for EPA to ask the public about acceptable risk than follow established precedents. Nevertheless, the BRWM strongly recommended (NRC, 1999, p. 7) that EPA adopt a risk-based individual-protection standard precisely because it requires public involvement in what is, fundamentally, an important public-policy decision.

Question 5: Could you please elaborate on the Board's concerns about the time period over which the radiation standard must be applied?

Response: In its proposed rule, EPA has asked for comments on two alternative standards for the period of compliance. The first alternative is essentially that proposed in the TYMS report (NRC, 1995) in which the period of compliance extends to the time of peak risk from repository releases. The BRWM has no concerns about this alternative, and in fact believes that its adoption would be consistent with the recommendations in the TYMS report (NRC, 1995).

The second alternative applies a quantitative dose limit for a period of 10,000 years, but it also imposes an additional requirement that repository performance be examined after 10,000 years to see if dramatic changes could be anticipated. The BRWM recognizes that EPA can choose, as a matter of policy, to adopt the 10,000-year limit in the second alternative. Nevertheless, the BRWM is concerned about this alternative because EPA provides no guidance on how the required analyses are to be carried out beyond 10,000 years or how the results are to be used in judging the acceptability of the repository. The BRWM noted (NRC, 1999, p. 13) that "to mandate that these results become 'part of the public record' but to give no indication of how they will be taken into account seems to postpone rather than solve problems associated with licensing and provide no real benefits to protection of the public." This is especially true given that peak doses from repository releases are likely to occur after 10,000 years.

The BRWM recommended (NRC, 1999, p. 13) that EPA either be more specific in providing guidance on how the analyses beyond 10,000 years should be used in determining compliance, or else explicitly pass the task for developing such guidance to the U.S. Nuclear Regulatory Commission, which is responsible for establishing regulations consistent with the final EPA rule.

**Response to Questions on Yucca Mountain Standards
August 18, 2000**

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