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Comment:

For your information, following is a copy of NEI comments formally submitted to EPA on October 26, 1995.

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NUCLEAR ENERGY INSTITUTE

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October 26, 1995

NAS Report Comments
Radioactive Waste Management Branch (6602J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460-0001

SUBJECT: Notice of Availability, Request for Comments, and Announcement of Public Meetings, "Environmental Radiation Protection Standards for Yucca Mountain, NV," Noticed in the *Federal Register* on September 11, 1995 (60 FR 47172)

This letter provides comments of the Nuclear Energy Institute (NEI)¹ on behalf of the nuclear energy industry in response to the subject *Federal Register* notice regarding proposed EPA rulemaking to promulgate environmental radiation protection standards for a deep geologic repository for spent nuclear fuel and high level waste at the Yucca Mountain site in Nevada. These comments have been developed considering the nuclear energy industry's interest in the safe, economic and timely disposal of spent nuclear fuel from commercial nuclear power plants. Specific comments are enclosed regarding several of the findings and recommendations in the National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards."

We encourage EPA to pursue its publicly stated goal "to set a standard that is protective of public health and the environment for the long term, but also to set a standard that can be implemented by the [NRC]."² We agree that "only a standard that meets both of these tests will be acceptable to the public."³ We support the

¹ NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy issue. These comments also reflect technical input and support from the Electric Power Research Institute.

² Statement of Larry Weinstein, Director, Radiation Protection Division, Office of Indoor Air and Radiation, EPA, to the Nuclear Waste Technical Review Board, October 17, 1995.

³ *Ibid.*

establishment of staff liaisons in the EPA and NRC "to ensure continued and effective staff interaction and cooperation" in development of the standards.⁴ We also support EPA's commitment of priority and resources to move quickly on the rulemaking to promulgate environmental radiation protection standards for Yucca Mountain within the strict time limits directed by Congress in the Energy Policy Act of 1992, which requires a final rule "not later than 1 year after the [EPA] Administrator receives the findings and recommendations of the National Academy of Sciences."⁵

In our view, the NAS report is responsive to what is required by the Energy Policy Act of 1992. We find the report's conclusions to be generally appropriate with regard to the Yucca Mountain site, i.e., that containment requirements or release limits are inappropriate for Yucca Mountain, that it is neither possible nor necessary to predict the probability of human intrusion into a repository over the long term, and that it is neither possible nor necessary to predict on the basis of scientific analysis the societal factors required for an exposure scenario.

We agree with the report's conclusion "that a health-based individual standard will provide a reasonable standard for protection of the general public."⁶ We do not agree, however, that EPA's standard should be expressed directly in terms of risk. Rather, limits in the standard should be expressed in terms of dose, which is consistent with other, analogous EPA standards and the Federal radiation protection guidance to Federal agencies. Also, the use of a dose-based standard for protection of public health and safety is prescribed by the Energy Policy Act of 1992. We have enclosed our specific comments on this issue.

We do not disagree with the report's conclusion "that the performance of the repository can be assessed over time frames during which the geologic system is relatively stable or varies in a boundable manner."⁷ However, in our enclosed comments we have proposed an approach to establishing a time frame for evaluating compliance during licensing that differs from the approach recommended in the NAS report. We believe our proposal, based on the need for an implementable standard, is in keeping with the report's observation "that although selection of a time period of applicability has scientific elements, it also has policy aspects that the Committee has not addressed."⁸

⁴ Ibid.

⁵ Section 601(a) of the Energy Policy Act of 1992 [U.S.C. 10141]

⁶ "Technical Bases for Yucca Mountain Standards," National Research Council Committee on Technical Bases for Yucca Mountain Standards (National Academy Press, Washington, D.C.) 1995.

⁷ Ibid.

⁸ Ibid.

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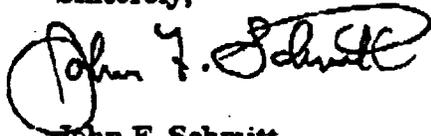
We urge EPA to formulate in the proposed rule many of the NAS report's recommendations, in particular, that an appropriately defined critical-group approach should be used, that the reference biosphere should use assumptions that reflect current technologies and living patterns, and that subsystem requirements might possibly result in suboptimal repository design.

As outlined in our enclosed comments, we believe that several topics discussed in the NAS report, including exposure scenarios, critical groups, and human intrusion, involve criteria for evaluating compliance during licensing. Addressing these issues in regulation or guidance falls within the implementation authority of NRC, and, therefore, is outside the scope of EPA's rulemaking to promulgate environmental standards for Yucca Mountain.

We are continuing to assess the implications of several of the report's recommendations, e.g., regarding ground-water protection, the exclusion zone, dose apportionment, and applicability of the ALARA principle. We may provide additional comments to EPA regarding these or other topics as these assessments yield insights.

We appreciate the opportunity to comment on this very important rulemaking being pursued by EPA. If EPA staff wish to discuss our comments, please contact Ralph Andersen at (202) 739-8111 or me at (202) 739-8108.

Sincerely,



John F. Schmitt

JFS/RLA:tnb
Enclosure

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**NEI Comments on Behalf of the Nuclear Industry
on Selected Findings and Recommendations of the NAS Report,
*Technical Bases for Yucca Mountain Standards***

These comments address several of the findings and recommendations in the NAS report, *Technical Bases for Yucca Mountain Standards*, and include alternative approaches and suggestions for consideration by EPA in developing a proposed rule to promulgate environmental standards for Yucca Mountain. Unless otherwise noted, quoted sections are taken from the NAS report.

1. Time Period for Demonstration of Compliance

The NAS report recommends application of the standard for individual risk to the period when the peak potential risks may occur. This recommendation is based on the Committee's view that calculation of the maximum risks of radiation releases from the repository should be made whenever they occur as long as the geologic regime of the repository environment does not change significantly, which for Yucca Mountain is on the order of approximately one million years. The NAS report points out that one of the major reasons for selecting geologic disposal was to place the wastes in as stable an environment as many scientists consider possible, and that the deep subsurface at Yucca Mountain fulfills this condition very well. As noted in the report, even changes in climate at the surface would probably have little effect on repository performance below the ground. In summary, the report concludes there is "no scientific basis for limiting the time period of the individual-risk standard to 10,000 years or any other value."

However, the report states "that although selection of a time period of applicability has scientific elements, it also has policy aspects that the Committee has not addressed. For example, EPA might choose to establish consistent policies for managing risks from disposal of both long-lived hazardous materials and radioactive materials." A review of several relevant examples in EPA rules indicates that regulatory time frames employed for managing such risks range from 1,000 years¹ to 10,000 years.^{2,3} It is also notable that EPA's rationale for the 10,000 year time frame in 40 CFR 191 was found adequate when reviewed by a Federal court in 1987.

¹40 CFR 192, "Standards for Remedial Actions at Inactive Uranium Processing Sites." *Federal Register*, September 24, 1987.

²40 CFR 148, "Hazardous Waste Injection Restrictions." *Federal Register*, July 26, 1988.

³40 CFR 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Wastes." *Federal Register*, December 20, 1993.

EPA's goal is "not only to set a standard that is protective of public health and the environment for the long term, but also to set a standard that can be implemented by the Nuclear Regulatory Commission."⁴ NRC has stated its preference "that any numerical [High Level Waste] standard be applied for only a limited time after disposal (e.g., 10,000 years) [because] the very large uncertainties inherent in estimating releases over very long times makes it impractical to make a scientifically rigorous demonstration of compliance with numerical regulatory limits." NRC has also stated that "potential releases that might occur after the regulatory period should be estimated by DOE and disclosed in a suitable format, such as an Environmental Impact Statement."⁵

Concern regarding the demonstration of compliance with licensing standards for periods beyond 10,000 years has been expressed by DOE, concluding that "significant uncertainties in such long-term predictions would make it difficult to provide reasonable assurance in a licensing arena." DOE also has stated that it "would still expect to perform these calculations [i.e., risk assessments beyond 10,000 years] to gain insight into system performance, in a qualitative sense."⁶

We strongly suggest that EPA consider the use of a limited time-frame, e.g., 1,000 to 10,000 years, in the proposed rule with regard to application of the health-based individual standard. This approach is more consistent with current EPA regulatory policy than the approach recommended in the NAS report, and it reflects the degree of practicality necessary to support promulgation of environmental standards that can be implemented in NRC licensing regulations. We do not disagree with the perspective in the NAS report that it is feasible to perform assessments covering very long time periods, but we believe assessments beyond 1,000 years are better performed to gain qualitative insights into total system performance of the repository, consistent with the views expressed by NRC and DOE.

⁴Statement of Larry Weinstock, Director, Radiation Protection Division, USEPA, to the NWTRB, October 17, 1995.

⁵"U.S. Nuclear Regulatory Commission Staff Views on Environmental Standards for Disposal of High-Level Wastes," presented to the NAS Committee on Technical Bases for Yucca Mountain Standards by Margaret V. Federline, Chief, Hydrology and Systems Performance Branch, Division of High Level Waste Management, USNRC, May 27, 1993.

⁶"Preliminary DOE Reaction to National Academy of Sciences Report," presented to the NWTRB by Dr. Stephen J. Brocram, Assistant Manager for Suitability and Licensing, Yucca Mountain Site Characterization Office, USDOE, October 17, 1995.

2. Individual-Dose Standard

The NAS report concludes that "a health-based individual standard will provide a reasonable standard for protection of the general public. However, [NAS] recommend[s] that this be a risk-based, rather than a dose-based standard." NAS provides the following reasons for making its recommendation regarding the preferred form of the standard:

1. "A risk-based standard would not have to be revised in subsequent rulemaking if advances in scientific knowledge reveal that the dose-response relationship is different than envisaged today."
2. "Risks to human health from different sources, such as nuclear power plants, waste repositories, or toxic chemicals, can be compared in reasonably understandable terms."

A risk-based standard would not be consistent with current recommendations of the ICRP and NCRP.^{7,8} This inconsistency could prove especially troublesome because the current ICRP and NCRP recommendations regarding limitation of dose to the public are not based solely on the scientific understanding of the assumed dose-response relationship at low levels of exposure. The recommendations are also based on consideration of the variations in the existing level of dose from natural background radiation, excluding radon. Thus, this broader approach employed by ICRP and NCRP in recommending a dose limit for public exposure may not result in these recommendations being directly affected by possible changes to the assumed dose-response relationship, and such changes would not necessarily imply a need to revise dose-based standards, as inferred by the NAS report.

Also, promulgation of a risk-based standard would not be consistent with other analogous EPA standards⁹ and the Federal guidance to Federal agencies^{10,11,12} which requires promulgation of radiation protection standards in terms of radiation dose, or other radiation units, rather than in terms of implied risk.

⁷ "1990 Recommendations of the International Commission on Radiological Protection," ICRP Publication 60 (Pergamon Press, Elmsford, NY) 1991.

⁸ "Limitation of Exposure to Ionizing Radiation," NCRP Report No. 116 (NCRP, Bethesda, Maryland) 1993.

⁹ See, for example, 40 CFR 190 and 40 CFR 191.

¹⁰ "Radiation Protection Guidance for Federal Agencies - Memorandum for the President from the Federal Radiation Council (Approved by President Dwight D. Eisenhower), *Federal Register*, May 18, 1960.

¹¹ "Radiation Protection Guidance to Federal Agencies for Occupational Exposure; Approval of Environmental Protection Agency Recommendations," The President, *Federal Register*, January 27, 1987.

¹² "Federal Radiation Protection Guidance for Exposure of the General Public" (Proposed), USEPA, *Federal Register*, December 23, 1994.

Consistent with this policy, most regulations which provide public radiation limits state these limits in units of radiation dose. Thus, comparison between a risk-based environmental standard for Yucca Mountain and the health risks implied by other Federal radiation protection regulations would require consideration of radiation dose terms and units employed in those regulations, as well as the risk bases underlying the value of the dose limit for each regulation. Therefore a dose-based standard may improve public understanding of comparative radiation risks, rather than a risk-based standard, as stated in the NAS report.

Finally, a risk-based standard would not be consistent with the direction provided in the Energy Policy Act of 1992, which requires that the environmental standards for Yucca Mountain "shall prescribe the maximum effective dose equivalent to individual members of the public from releases to the accessible environment from radioactive materials stored or disposed of in the repository." Pursuit of a risk-based standard, as recommended by NAS, would likely require that EPA make some accommodation with regard to conformity with the Act.

We suggest that EPA consider the use of an individual dose-based standard in the environmental standards for Yucca Mountain. Such a dose-based standard would be consistent with ICRP and NCRP recommendations, Federal radiation protection policy, and the Energy Policy Act of 1992.

8. Exposure Scenarios

The NAS report states "[s]pecifying exposure scenarios therefore requires a policy decision that is appropriately made in a rulemaking process conducted by EPA." We disagree that EPA is the appropriate Federal agency to specify "exposure scenarios for performance assessment calculations." EPA's authority under the Atomic Energy Act and Reorganization Plan No. 3 of 1970 is to establish generally applicable environmental standards which protect the general environment from radioactive materials. The Energy Policy Act specifically reconfirms this authority to promulgate environmental standards for the Yucca Mountain site. However, the implementation authority to determine whether the Yucca Mountain site will comply with the EPA's environmental standards, conduct reviews of the license application utilizing the compliance criteria, and grant a license for the repository is solely held by the NRC.

The purpose of selecting exposure scenarios is to provide a means to adequately demonstrate compliance with the environmental standards, and

is independent of establishing the environmental standards. This distinction has been clearly demonstrated by EPA with regard to its regulations in 40 CFR 190, establishing "Environmental Radiation Protection Standards for Nuclear Power Operations." Part 190 contains no provisions pertinent to determining compliance, and is strictly limited to the establishment of dose limits.

The distinction between establishing standards and demonstrating compliance has also been demonstrated by the Agency with regard to its rulemaking for the Waste Isolation Pilot Plant (WIPP), where EPA has been given the authority by Congress for both establishing environmental standards and for implementation of the standards. In the case of WIPP rulemaking, EPA has specified exposure scenarios and other compliance assessment criteria as part of the proposed 40 CFR 194, "Criteria for the Certification and Determination of the [WIPP's] Compliance with Environmental Standards..." In a separate rule, 40 CFR 191, EPA specifies the environmental standards for WIPP.

We also disagree that exposure scenarios should be specified in a rule. Such prescriptive detail in regulation inhibits proper flexibility in implementation needed by the license applicant (i.e., DOE) to consider alternative approaches that may better achieve adequate protection of public health and safety. Also, having such detail in the rule, particularly while characterization of the site is still in progress and insights into critical performance factors are still being gained, may result in the need for added time-consuming and burdensome rulemaking to reflect regulatory "lessons-learned" acquired during development and review of the license application.

We believe that authority for selection of exposure scenarios for Yucca Mountain resides with the NRC. Also, we recommend that a framework for the selection of appropriate exposure scenarios be described in regulatory guidance and not prescribed in a rule.

4. Critical Groups

The NAS report supports use of the critical group approach in applying the health-based individual standard. We agree that the proposed rule should provide for the use of the critical group approach, appropriately defined to avoid "an extreme case defined by unreasonable assumptions regarding factors affecting dose and risk."

The NAS report also considers two examples of critical groups to illustrate how the design of an exposure scenario might be considered by EPA in the standard. As discussed in Comment 8, above, we believe specifying exposure

scenarios (i.e., specific characteristics of critical groups) is outside the scope of EPA's environmental standards, and should be carried out by NRC in regulatory guidance, rather than in a rule. Therefore, we are not providing specific comments to EPA at this time on the two examples of critical groups described in the NAS report.

5. Human Intrusion

The approach to human intrusion recommended in the NAS report is to specify in the standard a typical intrusion scenario to be analyzed for its consequences on the performance of the repository. The purpose of this consequence analysis is to evaluate the resilience of the repository to intrusion. The report asserts that "such an analysis will provide useful quantitative information that can be meaningful in the licensing process." The report recommends "that EPA should require that the conditional risk as a result of the assumed intrusion scenario should be no greater than the risk levels that would be acceptable for the undisturbed-repository case." This recommendation is based on the proposition in the report that "a repository that is suitable for safe, long-term disposal should be able to continue to provide acceptable waste isolation after some type of intrusion."

We do not agree that the approach to human intrusion recommended in the NAS report will provide useful quantitative information for comparison against the level of risk that would be acceptable for the undisturbed repository. First, the risk is conditional, and therefore the intrusion would have to actually occur in the manner and general time-frame postulated in the analysis for the consequence to be realized. Second, as noted repeatedly in the extended discussion of human intrusion in the NAS report, the form and frequency of intrusions cannot be predicted, and the probability that a future intrusion would occur in a given time period cannot be technically assessed.

Finally, the specific application for the results of the analysis in the licensing process is unclear. For example, might the license application be rejected on the basis of the results of human intrusion analysis? If so, this would seem contradictory to the discussion in the report that states "such analyses are likely to be more meaningful in selecting among alternative sites ... than in assessing the performance of a particular site and design. However, Yucca Mountain has already been selected for evaluation as a potential repository site, so the value of analyses of the consequences of human intrusion at Yucca Mountain is limited."

We recommend that the issue of human intrusion not be taken up as part of the regulatory standards applicable to Yucca Mountain. In any case, if

human intrusion were to be addressed, it should more appropriately be considered by NRC as a compliance demonstration issue, and not by EPA in the environmental standards. This is consistent with Section 801(b) of the Energy Policy Act of 1992 which indicates that NRC is the agency responsible for addressing the issue of human intrusion.

We believe that analysis of the consequences of human intrusion may provide qualitative regulatory insights with regard to the robustness of the repository site and design, and suggest that such an application be considered by DOE as part of its environmental assessment process associated with development of the license application for Yucca Mountain.