



POLICY ISSUE

(NEGATIVE CONSENT)

July 22, 1991

SECY-91-218

For: The Commissioners

From: James M. Taylor
Executive Director for Operations

Subject: WORKING DRAFT NO. 3 OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S HIGH-LEVEL WASTE DISPOSAL STANDARDS

Purpose:

- (1) To advise the Commission of the staff's positions on the issues to be addressed by the U.S. Environmental Protection Agency (EPA) in developing its high-level waste (HLW) standards, including EPA's responses to the staff's earlier comments on Working Draft 2 of the standards and new issues in Working Draft 3.
- (2) To request Commission approval to transmit new comments to EPA on Working Draft 3 of the standards and on the draft Supplementary Information that accompanies Working Draft 3.
- (3) To inform the Commission of the results of the staff's meeting with RESOLVE regarding a potential negotiated rulemaking for development of EPA's HLW standards.

Background: The EPA HLW standards were published in final form on September 19, 1985 (50 FR 38066), but were remanded by a Federal court decision in 1987. In preparation for reissuance of the standards, EPA has circulated "working drafts" of the standards to solicit the views of other Federal agencies and interested parties. An August 27, 1990, letter from Robert E. Browning to Richard Guimond

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provided EPA with the staff's comments on Working Draft 2 of EPA's standards.

Discussion:

Early in May, EPA distributed Working Draft 3 of its HLW standards, a draft of the Supplementary Information to be published with the standards in the Federal Register, and a solicitation of comment on the Nuclear Regulatory Commission (NRC) staff's proposal for rewording the probabilistic "containment requirements." Copies of those documents were informally transmitted to the Commission upon receipt.

Staff's Positions on Issues

Issues likely to be discussed in any negotiated rulemaking that EPA might pursue were identified in SECY-91-168. The staff's positions are essentially those of our comments on Working Draft 2, and can be summarized as follows.

Regarding the stringency and the technical-achievability basis underlying the standards, the staff believes that EPA should place more emphasis on comparisons with other risks experienced by society and the risk levels used as the basis for other safety standards, particularly those for the uranium fuel cycle. EPA's analyses of hypothetical repository performance should play a less prominent role in supporting the standards.

The staff believes that a probabilistic format is needed for EPA's standards to accommodate the large uncertainties in projecting potential human intrusion, geologic, and climatologic conditions at a repository site. At the same time, the staff is sensitive to the difficulties associated with numerical probability estimates, as required by EPA's 1985 standards. Alternative wording for the probabilistic containment requirements was suggested in comments on Working Draft 2. The staff expects its wording to alleviate the need for precise numerical probability estimates for unlikely processes and events, including human intrusion.

The staff agrees with the release limit format of EPA's containment requirements, the 10,000-year cut-off for evaluation of releases, and the absence of a requirement that releases be as low as reasonably achievable.

The staff recognizes that protecting individuals, rather than populations, would make EPA's standards consistent with other national and international radiation protection

standards and guidance. However, the staff is not convinced that implementation of the standards in an NRC licensing review would be affected if EPA were to emphasize protection of individuals. Accordingly, the staff has not objected to EPA's decision to derive the containment requirements from a population impacts goal. The staff also has not commented on the level of protection or the applicable time period (1,000 or 10,000 years) for the individual and groundwater protection requirements. These are matters within EPA's discretion, given EPA's authority to develop environmental radiation protection standards.

The staff objects to EPA's assurance requirements, criteria for demonstrating compliance, and implementation guidance. In the staff's view, these are matters of implementation that go beyond EPA's standard-setting authority.

Responses to Draft 2 Comments

The NRC staff has reviewed Working Draft 3 and the draft Supplementary Information. Enclosure 1 presents an analysis of EPA's responses to the NRC staff's previous comments on Working Draft 2. EPA has accommodated some of the staff's concerns. EPA has not yet updated its technical documents that support the standards to provide improved comparisons with other risks and radiation-protection standards. EPA appears to be unsympathetic to the staff's concerns about the fundamental basis for the standards and about the jurisdictional issues associated with the standards.

Comments on Working Draft 3

Enclosure 2 presents the staff's comments on Working Draft 3. These comments reinforce our earlier comments on Draft 2, as well as provide our views on new issues that have arisen in Draft 3 and in the draft Supplementary Information. The staff proposes to forward to EPA the comments of the Advisory Committee on Nuclear Waste, as well as its own comments.

Meeting with RESOLVE

EPA is considering several options for obtaining public input on the major issues surrounding its HLW standards. Options range from relatively informal workshops to the formal negotiated rulemaking process. EPA has hired RESOLVE, an arm of the Conservation Foundation, to

evaluate the merits of the options available to EPA. On June 7, 1991, representatives of RESOLVE met with the NRC staff to solicit the staff's views on the potential for successfully negotiating resolutions to some of the issues facing EPA.

The following views were expressed by the NRC staff:

-The fundamental safety goal for HLW disposal is that no future person be subjected to radiological impacts that would not be acceptable today. EPA tried to convert this goal into standards by evaluating the impacts of uranium ore deposits and by evaluating the waste isolation capabilities of hypothetical repositories.

-NRC's major problems with EPA's standards have involved (1) the probabilistic format of the standards and (2) the "assurance requirements" which seem to be outside EPA's authority to establish "generally applicable environmental standards." The complexity of the standards as developed by EPA intrudes into the regulatory process.

-The NRC staff expects that a formal negotiated rulemaking would be unsuccessful because some of the potential parties to such a rulemaking lack the technical resources needed to evaluate and debate the alternatives that would be negotiated. While keeping an open mind on negotiated rulemaking, the staff is inclined towards something less formal.

-Technically knowledgeable representatives of the major interested parties (Federal agencies, States, environmental groups and utilities) could probably reach technical consensus on the major issues needing discussion and on the nature of technical analyses needed to test the workability of EPA's standards. It is less likely that resolutions to the issues would be reached.

-Technical workshops on limited issues might help the scientific community approach consensus on those issues. An example is the public health significance of potential gaseous C-14 releases from a repository at Yucca Mountain.

-EPA's 1985 standards are probably workable although there is room for improvement.

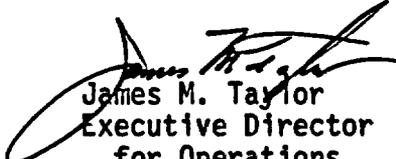
-The staff reiterated an earlier NRC position (letter from Chairman Carr to Dr. Don U. Deere, dated November 15, 1990) that the NRC remains committed to working with EPA as it revises its standards and to fostering an open exchange of views by all interested parties.

EPA Schedule

The staff was informed on July 15 by the Acting Director of Radiation Programs at EPA that they are not going to pursue the negotiation or negotiated rulemaking approach. The new EPA schedule is to submit the proposed revision of 40 CFR 191 to the Office of Management and Budget by December. The NRC staff is now preparing more specific analyses and recommendations on some of the NRC comments on Draft No. 3 in order to provide EPA with the proposed rule change language and supporting documentation to address as many of the NRC comments as can be accommodated in the limited timeframe available.

Recommendation: The staff will send the enclosed comments to EPA 10 working days after the date of this paper, unless directed otherwise by the Commission. The staff will keep the Commission informed of the comments for which proposed rulemaking language and supporting documentation is proposed.

Coordination: The Office of the General Counsel has reviewed this paper and has no legal objection.


James M. Taylor
Executive Director
for Operations

Enclosures:

1. Analysis of EPA responses to NRC comments on Working Draft 2
2. NRC comments on Working Draft 3 of EPA's HLW Standards

SECY NOTE: In the absence of instructions to the contrary, SECY will notify the staff on Monday, August 5, 1991, that the Commission, by negative consent, assents to the action proposed in this paper.

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Enclosure 1

**Analysis of Environmental Protection Agency Responses to
Nuclear Regulatory Commission Comments on
Working Draft 2 Comments**

ANALYSIS OF ENVIRONMENTAL PROTECTION AGENCY RESPONSES
TO NUCLEAR REGULATORY COMMISSION COMMENTS
ON WORKING DRAFT 2

NRC Comment No. 1. There continues to be considerable controversy regarding the stringency of the U.S. Environmental Protection Agency's (EPA's) environmental standards for disposal of spent nuclear fuel, high-level radioactive wastes (HLW), and transuranic radioactive wastes (TRU). This controversy results, at least in part, from concerns over the very low levels of risk which underlie release limits imposed by EPA's standards, particularly when compared to other Federal health and safety standards. We are concerned that a clear understanding and acceptance of the standards will not be achieved until EPA has explicitly documented the acceptable risk level that underlies the release limits of the standards and the way in which the release limits were derived from that risk level. The Commission is concerned about this issue. So that the Commission might better understand the basis for the proposed standards and evaluate the stringency issue, we encourage EPA to clearly and concisely document the risk basis for its standards

EPA Response. The draft Supplementary Information accompanying Working Draft No. 3 states (pp. 12-13):

The Agency [EPA] developed the various elements of this [working draft] and selected the level of acceptable risk which underlies it by balancing several considerations. First, the Agency considered the expected capabilities of waste management and disposal technologies. Expected risks to public health and the environment were examined through a number of generic performance assessments of the potential waste facilities. A second consideration, where applicable, was consistency with other related Agency standards for radiation exposure. A third factor was evaluation of various benchmarks to assess the acceptability of the residual risks that might be allowed by the rule. This was particularly important for the disposal standards, where there were few precedents to guide the Agency's judgments. Finally, the Agency placed considerable emphasis on public comments and concerns expressed throughout the various phases of this rulemaking, particularly where these concerns involved addressing the substantial uncertainties inherent in the unprecedented time periods of interest. [The working draft] reflects a combination of all these considerations.

NRC Staff Evaluation. In 1985, EPA prepared a "Background Information Document" (EPA 520/1-85-023, dated August 1985) that described the derivation of EPA's HLW standards. This document included EPA's assessments of the waste-isolation capabilities of hypothetical repositories and EPA's comparisons of those risk levels with the risks of unmined uranium ore, natural background radiation levels, nuclear power generation, and nuclear weapons testing fallout. EPA is reportedly working to update that document to support the reissuance of its standards. However, that updated information is not yet complete, and has not been made available to the NRC staff.

NRC Comment No. 2. Another reason for the concern over the excess stringency is the technical basis for the standards. We understand that EPA developed descriptions of several hypothetical repositories, and used relatively simple analyses to project the performance of those facilities. The release limits of the standards were then set so as to require actual repositories to perform approximately as well as EPA's hypothetical repositories. We are concerned that standards developed in this way may be overly stringent

In the NRC staff's view, there are several actions that need to be taken to respond to these concerns. EPA should reexamine the stringency of the standard in light of other risks experienced by society and risk levels used as the basis for other safety standards, particularly those for the uranium fuel cycle. When presenting its releases (sic) limits, EPA should also place increased emphasis on comparisons with other regulatory standards and guidance, and with other risks experienced by society. EPA's analyses of hypothetical repository performance would then play a less prominent role in supporting the standards. . . .

EPA Response. The draft Supplementary Information for Working Draft 3 discusses the level of protection associated with the standards as follows (pp. 27-28):

This level of protection satisfies two important objectives. First, it provides a level of protection that appears reasonably achievable by the various options that have been considered within the national program for commercial and defense wastes if siting, construction, and operational activities are conducted with care. Second, the Agency believes that such a limitation would clearly keep risks to future populations at acceptably small levels, particularly since it appears to limit risks to no more than the logarithmic midpoint of the range of estimated risks that future generations would have been exposed to if the uranium ore used to create the wastes had never been mined. Thus, because mined geologic repositories appear capable of providing such good protection, the Agency has decided to establish containment requirements that meet these two objectives.

NRC Staff Evaluation. EPA continues to emphasize a "technical achievability" basis for its standards, that is, the release limits of the standards are based on what EPA thinks is achievable rather than what is necessary to protect public health or the environment. The NRC staff understands that EPA has initiated a contract to provide comparisons with other risk levels, as suggested in NRC's comment. To date, no products from that contract have been made available to the staff.

NRC Comment No. 3. The applicability statements of 40 CFR 191.01 and 191.11 are limited to spent nuclear fuel, HLW, and TRU. In 40 CFR 191.02, however, the term "radioactive waste" also includes any other radioactive material managed or disposed of with spent fuel, HLW, or TRU. This definition suggests that EPA intends to avoid the potential for two or more different standards to be applicable to a single repository, if both HLW and non-HLW are disposed of

in that facility. . . . The NRC staff would support . . . a broadened statement of applicability for the standards, provided it was accompanied by an explicit exemption from other EPA radioactive waste standards (e.g., low-level waste standards) that might otherwise be applicable.

EPA Response. EPA has clarified the applicability statements of Draft 2. In Draft 3, "radioactive waste" now means spent nuclear fuel, high-level waste, transuranic waste, and "any other radioactive material managed or disposed of with these wastes." The draft Supplementary Information recognizes (page 14) that other wastes, especially "greater-than-Class-C" wastes, may be disposed of at a HLW repository, and clearly states EPA's intent that releases of such materials be included within the scope of these standards.

NRC Staff Evaluation. The staff finds the revised applicability statement appropriate. However, EPA has not yet indicated that it will similarly limit the applicability of other standards that EPA might develop. Therefore, the potential still exists for two or more EPA standards to apply to a single HLW disposal facility.

NRC Comment No. 4. The NRC staff notes that Subpart A continues to specify dose limits in terms of individual organ doses even while Subpart B proposes to adopt the newer "effective whole body dose equivalent" concept. The NRC staff supports use of the newer concept

EPA Response. Working Draft 3 now uses "effective whole body dose equivalent" throughout the standards.

NRC Staff Evaluation. The staff agrees with EPA's response.

NRC Comment No. 5. The NRC staff is considering proposals to revise 10 CFR Part 60 by substituting new terms for the current definitions of "anticipated" and "unanticipated processes and events." The new terms would serve the same purpose in the rule as the current terms -- i.e., to specify the design conditions for the engineered barriers in 10 CFR 60.113 and the range of conditions for analysis of overall system performance in 10 CFR 60.21. The NRC staff is particularly interested in working with EPA to try to develop a common set of terms that could be used in both agencies' regulations.

EPA Response. EPA continues to use the terms "undisturbed performance" and "all significant processes and events that may affect the disposal system."

NRC Staff Evaluation. The staff has not yet completed development of its concepts for potential revisions to Part 60. Accordingly, no specific proposals have been made to EPA for reconciliation of the two regulations.

NRC Comment No. 6. Although EPA's definition of "ground water" comports with common use . . . the NRC staff notes that the term is defined and used differently in Part 60. EPA's definition includes only subsurface water in a zone of saturation, whereas NRC's definition includes all subsurface water.

EPA Response. EPA's Working Draft 3 definition of "ground water" is now substantively identical to the definition in Part 60.

NRC Staff Evaluation. The staff agrees with EPA's response.

NRC Comment No. 7. As EPA is aware, the Commission continues to be concerned about the workability of standards that require numerical probability estimates for very unlikely processes and events. In our formal comments on EPA's [1982] proposed standards, we suggested alternative wording for the containment requirements that would ease potential implementability problems while retaining approximately the same level of safety sought by EPA. . . . The following text for 40 CFR 191.13 illustrates the concept recommended in the Commission's earlier comment We strongly recommend that EPA reconsider adopting this concept for the containment requirements

EPA Response. EPA did not incorporate the suggested alternative within Working Draft 3. However, a solicitation of comments on this alternative was circulated with Draft 3 to interested parties.

NRC Staff Evaluation. EPA's solicitation of comments indicates that EPA is seriously considering adoption of the staff's suggestion.

NRC Comment No. 8. The NRC staff also notes that EPA continues to use the term "reasonable expectation" in the text of the containment requirements. In our previous "conforming amendments," we found that DOE and some other commenters perceived "reasonable expectation" to be a much less stringent standard than "reasonable assurance," as used in Part 60. A dialogue is needed between EPA and NRC staff to identify a single term to be used in both regulations.

EPA Response. EPA continues to use the term "reasonable expectation" in Working Draft 3. The draft Supplementary Information accompanying Draft 3 states (pp. 32-33):

The containment requirements call for a "reasonable expectation" that their various quantitative tests will be met. This phrase reflects the fact that unequivocal numerical proof of compliance is neither necessary nor likely to be obtained. Because they address such a long time period and because they include unplanned releases, the containment requirements can be implemented only through analytical projections of disposal system performance. There will be many uncertainties in making such long-term performance projections. Accordingly, our proposed standards require a "reasonable expectation" that these containment requirements will be met. A similar qualitative test, that of "reasonable assurance," has been used with NRC regulations for many years. Although the Agency's intent is

similar, the NRC phrase has not been used in 40 CFR Part 191 because "reasonable assurance" has come to be associated with a level of confidence that may not be appropriate for the very long-term analytical projections that are called for by §191.12. The long-term performance of a given disposal system cannot be determined to the degree of precision possible for the man-made components of a nuclear power plant. The use of a different test of judgment is meant to acknowledge the unique considerations likely to be encountered upon implementation of these disposal standards.

The Agency believes that the proposed containment requirements provide an objective framework that requires very stringent isolation while allowing the implementing agencies adequate flexibility to handle specific uncertainties that may be encountered.

NRC Staff Evaluation. Section 60.101 of 10 CFR Part 60 describes the NRC's interpretation of the term "reasonable assurance" for repository licensing. The staff believes that this usage is the same as that intended by EPA when it specifies a "reasonable expectation" of compliance with its standards.

NRC Comment No. 9. The NRC staff objects to the two new assurance requirements of Working Draft No. 2, and would not recommend to the Commission that it add comparable provisions to its regulations as implied by the parenthetical statement of 40 CFR 191.14. The Commission's views on the impracticality of an "as low as reasonably achievable" (ALARA) requirement were discussed extensively in the Supplementary Information accompanying the technical criteria of 10 CFR Part 60 (48 FR 28194, 28198, June 21, 1983). There the Commission noted that the substantial uncertainties involved with predicting long-term repository performance, the already low EPA limits and the already stringent geologic performance requirements make it doubtful that the ALARA concept could be applied in a meaningful way.

EPA Response. EPA has deleted the "ALARA" assurance requirement that was present in Working Draft 2.

NRC Staff Evaluation. The staff agrees with EPA's resolution.

NRC Comment No. 10. The 100,000-year comparison of alternative sites seems superfluous given the previous identification for site characterization of the Yucca Mountain site and selection of the Waste Isolation Pilot Plant (WIPP) site. More importantly, calculations of repository performance over such long periods of time would involve such large uncertainties that they could have little value for judging repository safety. "Undisturbed performance," as defined in Working Draft No. 2, provides little useful information for selecting a preferred site from a slate of alternatives, and could even be counter-productive if it diverted attention away from potentially disruptive features of the sites. In any case, under the provisions of the Nuclear Waste Policy Act, as amended, repository site selection is the responsibility of the Department of Energy, not the Commission. For these reasons, the NRC staff

would not propose addition of a comparable provision to the Commission's regulations.

EPA Response. Working Draft 3 retains a 100,000 year comparison of alternative sites, but no longer limits this comparison to "undisturbed performance." Working Draft 3 now refers to "qualitative comparisons of the potential releases, projected for 100,000 years"

NRC Staff Evaluation. The staff views the comparison of alternative sites as a process mandated by the National Environmental Policy Act, not the Atomic Energy Act. Criteria for this process are therefore not appropriate in EPA's HLW standards. And, as previously noted, site selection is the responsibility of DOE rather than the Commission.

NRC Comment No. 11. The NRC staff also notes that the assurance requirement dealing with natural resources substitutes "ecologically vital" for the previous phrase "...vital to the preservation of unique and sensitive ecosystems." Neither concept relates to the Atomic Energy Act policies underlying the standards. Instead, this appears to be a subject for evaluation in DOE's environmental impact statement (which Congress has directed the NRC to adopt to the extent possible) for a repository. The NRC staff would continue to view this as beyond the scope of 10 CFR Part 60 and would not propose that the Commission's regulations be changed.

EPA Response. Working Draft 3 continues to use the phrase "ecologically vital."

NRC Staff Evaluation. The staff continues to question the relevance of ecologically vital ground water to standards established under Atomic Energy Act authority. But, in any event, since the assurance requirements all pertain to issues of implementation, the Commission can consider the extent to which - if at all - such concerns should be reflected in 10 CFR Part 60.

NRC Comment No. 12. The NRC staff prefers those options . . . that would combine the individual and ground water protection requirements into a single standard. Separate ground water protection standards would not provide any significant improvement in public health or environmental protection, but would add substantial complexity to the standards, with a resulting potential for increased difficulties in implementing the standards.

EPA Response. Working Draft 3 retains separate ground water protection standards. However, those standards are stated more simply than in Draft 2. In particular, the multiple classes of ground waters (and multiple protection standards) of Draft 2 have been replaced by a single standard for a single type of ground water.

NRC Staff Evaluation. EPA's restatement of the ground water protection requirements in Working Draft 3 alleviates the staff's earlier concerns.

NRC Comment No. 13. The NRC staff finds the definition of the term "man-made radionuclide" confusing

EPA Response. EPA has deleted this term from Working Draft 3.

NRC Staff Evaluation. The staff agrees with EPA's response.

NRC Comment No. 14. The NRC staff objects to any EPA ground water protection requirement that would be applicable within the controlled area. As the staff interprets the language of Reorganization Plan No. 3, EPA's standard-setting authority is limited to releases to the general environment which, in this instance, would exclude activity retained within the controlled area.

EPA Response. The ground water protection requirements of Working Draft 3 apply only to ground water outside the controlled area.

NRC Staff Evaluation. The staff agrees with EPA's response.

NRC Comment No. 15. The NRC staff recommends that EPA reexamine the reasonableness of the part of the individual protection requirement that specifies an assumption of continual ground water use at the boundary of the controlled area. The passive institutional controls permitted by the standards would seem to provide at least some protection against such uninterrupted ground water use. The effectiveness of such controls is in any event a matter of implementation committed to the independent judgment of the Commission.

EPA Response. The text of Working Draft 3 no longer specifies an assumption of continual ground water use at the boundary of the controlled area. However, the draft Supplementary Information accompanying Working Draft 3 does say that such an assumption is required.

NRC Staff Evaluation. The inconsistency between Working Draft 3 and the draft Supplementary Information appears to be an editing error. This inconsistency will be brought to EPA's attention in comments on Working Draft 3.

NRC Comment No. 16. [Section] 191.17, "Demonstration of Capability to Comply," [of Working Draft 2] clearly is not a "generally applicable environmental standard" within the meaning of Reorganization Plan No. 3 and, therefore, is outside EPA's jurisdiction. Two remedies are possible: (1) delete the entire section, or (2) add a statement that the section does not apply to facilities regulated by the Commission (analogous to 40 CFR 191.14).

EPA Response. The requirement (now 191.15 and 191.16) remains essentially unchanged in Working Draft 3.

NRC Staff Evaluation. The staff does not object to the substantive provisions of this portion of EPA's standards. However, the staff will continue to comment on its view that EPA has no jurisdiction in matters of implementation of the standards.

NRC Comment No. 17. We recommend that EPA reevaluate the technical base underlying the guidance on frequency and severity of [human] intrusion. It is our understanding that EPA has, to date, limited its consideration to petroleum exploration. Exploration for non-petroleum resources may take much different forms. For example, multiple, closely-spaced boreholes may be drilled, the frequency of drilling will be highly site-specific, and borehole sealing may be absent or ineffective. Guidance based on petroleum industry practice may not be representative of other exploratory drilling practices -- especially for borehole sealing.

EPA Response. Working Draft 3 contains no indication that EPA has reexamined the basis for its human intrusion guidance.

NRC Staff Evaluation. The staff remains unconvinced that EPA's guidance is appropriate, and will repeat its earlier comment when commenting on Working Draft 3.

NRC Comment No. 18. [Appendix C] to the standards suggests use of "prevalent expert judgment" to select an appropriate analytical model to use for performance assessments. Of course, the Commission will consider expert judgment for all appropriate purposes, but it must arrive at its own conclusions taking into account the persuasiveness of the testimony, including the force of the underlying arguments, and not use expert judgment merely because it is "prevalent."

EPA Response. References to "prevalent expert judgment" have been deleted from Working Draft 3.

NRC Staff Evaluation. The staff agrees with EPA's response.

Enclosure 2

**Nuclear Regulatory Commission Comments on Working Draft 3
of Environmental Protection Agency's High-Level Waste Standards**



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

[Name], Director
Office of Radiation Programs, ANR-458
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear [Name]:

Enclosed are comments of the staff of the U.S. Nuclear Regulatory Commission (NRC) on Working Draft 3 of the U.S. Environmental Protection Agency (EPA) environmental standards for management and disposal of high-level and transuranic radioactive wastes.

Our review of Draft 3 indicates that many of our comments on Draft 2 have been addressed by EPA. I am pleased at the progress that has been made. I also appreciate EPA's willingness to solicit the views of other interested parties regarding our suggested alternative wording for the probabilistic containment requirements section of the standards.

I believe that further consideration is needed regarding our major concern with the fundamental basis underlying the containment requirements of the standards. The draft Supplementary Information accompanying Draft 3 suggests that EPA will retain the "technical achievability" basis, even though that basis has led to widespread controversy regarding the stringency of the standards. This basis also gives rise to ambiguity whether the EPA standards are health-based and, therefore, raises unnecessary questions about whether a repository in compliance with the EPA standards will also comply with health-based requirements under the Atomic Energy Act. An enclosed comment elaborates on our reservations about the appropriateness of "technical achievability" standards, and reiterates our view that EPA should place more emphasis on comparisons with other risks and radiation protection standards.

The NRC staff continues to object to EPA's assurance requirements, criteria for demonstrating compliance, and implementation guidance. In the staff's view, these are matters of implementation that go beyond EPA's standard-setting authority, and the staff recommends deletion of these sections from the standards.

Finally, our comments provide the NRC staff's views on the questions posed in the draft Supplementary Information and suggest some additional questions for soliciting comment on other important aspects of the standards. Also enclosed, for EPA's consideration, are the views of the Advisory Committee on Nuclear Waste (ACNW) regarding the questions raised by EPA.

Thank you for the opportunity to review and comment on Working Draft 3. We look forward to working closely with EPA during reissuance of your standards.

Sincerely,

[Signature], [Title]

Enclosures:

1. NRC Comments on Working Draft 3
of EPA's HLW Standards
2. ACNW Responses to EPA's Questions

**NUCLEAR REGULATORY COMMISSION COMMENTS ON WORKING DRAFT 3
OF ENVIRONMENTAL PROTECTION AGENCY'S HIGH-LEVEL WASTE STANDARDS**

1. In the Nuclear Regulatory Commission (NRC) staff's comments on Working Draft 2, concerns were raised about the fundamental basis underlying the containment requirements of the U.S. Environmental Protection Agency's (EPA's) high-level radioactive waste (HLW) standards. Those comments recommended that EPA reexamine the stringency of the standards in light of other risks experienced by society and the risk levels used as the basis for other safety standards, particularly those for the uranium fuel cycle. EPA's analyses of hypothetical repository performance would then play a less prominent role in supporting the standards. The NRC staff wishes to elaborate on its earlier comment regarding the technical achievability basis underlying EPA's containment requirements.

First, it is the staff's view that EPA's analyses of hypothetical repository performance, as documented in EPA's 1985 "Background Information Document" (EPA 520/1-85-023), provide only a limited basis for judging the waste-isolation capabilities of geologic repositories. Of particular concern is the incompleteness of EPA's analyses. Table 8.9.1 of the 1985 document indicates that only four disruptive events were evaluated by EPA -- fault movement, brecciation, drilling for petroleum, and volcanism. Many other disruptive processes and events could contribute to releases, including development of pluvial conditions, other climate modification such as the "greenhouse effect," gaseous release of carbon-14, elevation of the water table at an unsaturated site, and exploratory drilling for non-petroleum minerals. The incompleteness of EPA's analyses may have caused EPA to underestimate the level of releases likely to occur and, in turn, to set release limits for the standards that might not be achievable at a real repository site.

The NRC staff is also concerned that EPA did not evaluate the full range of disposal technologies under consideration for disposal of high-level and transuranic wastes. In deriving its release limits, EPA evaluated a single disposal technology -- a repository for spent fuel located in the saturated zone of a geologically quiescent site. Every disposal concept currently being considered in the U.S. differs in a substantive way from the assumptions used by EPA. For example, a repository at Yucca Mountain would be located in the unsaturated zone where gaseous releases of carbon-14 might be larger than projected by EPA. EPA has not demonstrated that such releases would pose an unacceptable threat to public health or the environment, yet EPA's standards might require costly remedial measures to control those releases. Similarly, the waste forms and packaging destined for the Waste Isolation Pilot Plant are much different from those assumed for a spent fuel repository. Additional processing of those wastes might be needed to meet EPA's release limits, even though no threat to public health or the environment has been demonstrated. Finally, various "greater confinement" and near-surface disposal concepts have been explored for disposal of transuranic and Hanford tank wastes. EPA has not

evaluated the performance capabilities of these disposal technologies, yet EPA proposes that such facilities meet the same release limits as a deep geologic repository. If EPA is unable to demonstrate that such a stringent level of performance is necessary to protect public health or the environment, EPA might arbitrarily eliminate from consideration alternative disposal methods capable of providing an acceptable degree of waste isolation.

The NRC staff has serious reservations about EPA's ability to develop a defensible basis of support for its standards using technical achievability considerations. The wide range of potential technologies and the lack of development of many of them make EPA's previous geologic repository analyses virtually meaningless as indicators of the level of performance likely to be achievable at actual future disposal facilities. Instead, the NRC staff strongly urges EPA to derive its standards from an evaluation of the acceptability of various risk levels, including those previously determined to be acceptable for uranium fuel cycle facilities.

Finally, in the staff's opinion, the proposed rules may be fundamentally inconsistent with EPA's mandate with respect to generally-applicable standards issued under the Atomic Energy Act. The basic criterion to be applied is "to protect health." AEA, Sec. 161b., 42 U.S.C. 2201b. The general level of protection should be selected on the basis of considerations other than cost-benefit tradeoffs. Yet, insofar as EPA relates its standards to concerns of practicability, and in particular economic practicability, its actions would depart from this principle and might be vulnerable to challenge. For a more detailed analysis of these considerations, see Union of Concerned Scientists v. United States Nuclear Regulatory Commission, 824 F.2d 108, 119-120 (D.C.Cir. 1987).

2. There appears to be an editing error on page 45 of the draft Supplementary Information, where EPA states that assessments of compliance with the individual-protection requirements "must assume that individuals consume all of their drinking water (2 liters per day) from any portion of an underground source of drinking water outside of the 'controlled area' surrounding the disposal system." EPA has deleted this provision from Working Draft 3, as we recommended in our comments on Working Draft 2.

3. In the NRC staff's comments on Working Draft 2, we recommended that EPA reevaluate the technical base underlying the guidance on frequency and severity of potential human intrusion. There we noted that EPA has apparently based its guidance on data from petroleum exploration. Exploration for non-petroleum resources may take much different forms, including multiple, closely spaced boreholes with highly site-specific drilling frequencies and borehole sealing practices. We continue to urge EPA to reexamine the basis for its guidance, including the credit, if any, given by EPA for deterrence of potential intrusion by passive institutional controls.

4. The NRC staff appreciates EPA's solicitation of comment on the staff's suggested alternative wording for the probabilistic containment requirements. We note, however, that our suggestion included a qualitative, rather than a numerical, definition of the boundary between "unlikely" and "very unlikely" release categories. If comments on the staff's basic concept are supportive, the staff urges EPA to reconsider the wisdom of a numerical classification of releases of such low likelihood.

5. After further consideration of implementing EPA's probabilistic containment requirements, the staff has become concerned about the reference to the "likelihood" of releases from a repository. Two extremes of interpretation of "likelihood" are possible, neither of which seems to be that intended by EPA. To some observers, the only permissible way to estimate the likelihood of a release is to extrapolate from the past frequencies of occurrence of the processes and events contributing to a release. In this interpretation, "likelihood" implies a degree of scientific rigor that will be unattainable in evaluating the performance of a repository, because the data base for previous occurrences may be sparse or nonexistent. On the other hand, the Bayesian school of probability theory would interpret "likelihood" as a "degree of belief" on the part of an analyst or decision-maker, without regard to the scientific basis, if any, that might support that degree of belief. Since neither interpretation seems to be that intended by EPA, the NRC staff suggests that EPA consider a definition of "likelihood" such as the following:

"Likelihood" means the probability that a release of a particular size will occur as projected from (1) the uncertainties in the parameters used to project the size of a release, (2) the existing state of scientific knowledge regarding the frequencies of previous occurrence of the processes and events contributing to the release, and (3) for processes and events that have not previously occurred, the existing state of scientific knowledge regarding the likelihood that such processes and events will occur.

6. The draft Supplementary Information accompanying Working Draft 3 includes six questions on which public comment would be solicited by EPA. The NRC staff's views on these questions are discussed below.

EPA Question. 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 [effective dose equivalent] limit and a 10 millirems/year ede limit. Which is the more appropriate choice and why?

NRC Staff View. In Section 191.03, EPA proposes to apply this dose limit to the combined doses from HLW facilities and all other uranium fuel cycle facilities. Absent a clear demonstration by EPA that the 10 millirem/year limit is achievable for uranium fuel cycle facilities, while allowing an adequate margin for HLW facility operations, EPA should select 25 millirem/year as the dose limit for Section 191.03. For Section 191.14, the staff agrees with the Advisory Committee on Nuclear Waste that a 10 millirem/year limit, for

this single source of exposure, would be more consistent with the recommendations of international advisory groups.

EPA Question. 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?

NRC Staff View. As stated, the question seems moot, given selection of the Yucca Mountain site for characterization and selection of the Waste Isolation Pilot Plant site for development. Even if a new site should be needed, the process of site selection would not be relevant to the issue whether projected releases of radioactive material were consistent with the containment requirements. (Comparison of alternative sites may be necessary for compliance with the National Environmental Policy Act, but it is not needed in order to demonstrate compliance with generally applicable environmental standards promulgated under the Atomic Energy Act.) Accordingly, apart from the staff's general reservations about EPA's assurance requirements, the NRC staff would not recommend adoption by the Commission of a provision similar to this "assurance requirement." A more pertinent question would be whether environmental standards, rather than "assurance requirements," should be developed for the post-10,000 year performance of a repository. As EPA is aware, some projections of the performance of repositories have shown the most significant releases of waste occurring after the 10,000 year cut-off of the current standards.

EPA Question. Two options are presented in Sections 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?

NRC Staff View. EPA states that "our own analyses show that either time frame is achievable," but we are not aware that EPA has ever published these analyses or subjected them to independent review. Accordingly, it is the NRC staff's view that EPA has not adequately demonstrated that either duration is technically achievable, nor has EPA shown that either duration is necessary for protection of public health or the environment.

EPA Question. In Subpart C the Agency proposes to prevent degradation of "underground sources of drinking water" beyond the concentrations found in 40 CFR 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?

NRC Staff View. EPA's previous attempt to apply graduated levels of protection to ground waters of different characteristics caused an unnecessary level of complexity in the standards. The simplicity and improved clarity of the ground water protection requirements of Working Draft 3 represent a significant

improvement over earlier drafts. The NRC staff strongly recommends that EPA not regress to the multiple ground water classifications and protection levels of earlier drafts, especially in light of the extremely stringent protection levels imposed by the ground water protection requirements of Working Draft 3. Any decision to reject a potential repository site because of the characteristics of ground waters present there should be made within the context of the National Environmental Policy Act evaluation of alternatives, rather than application of EPA's HLW standards.

EPA Question. 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?

NRC Staff View. As discussed in Comment No. 1 above, the release limits to which these notes apply were derived from EPA's limited analyses of the waste-isolation capabilities of a deep geologic repository for spent nuclear fuel. EPA has not demonstrated that the release limits would be technically achievable for a transuranic waste-disposal facility using either the 1,000,000- or the 3,000,000-curie option, nor has EPA demonstrated that either option is appropriate for protection of public health or the environment.

EPA Question. 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.

NRC Staff View. The information available to the staff is that presented at the C-14 Workshop sponsored by the Advisory Committee on Nuclear Waste. That information has already been made available to EPA.

7. In the NRC staff's view, there are several additional questions that EPA should ask, to solicit public comment on the standards:

-Is the technical achievability basis underlying the "containment requirements" an appropriate way to derive the standards, or should EPA base the standards on comparisons with other risks and radiation-protection standards, including those for the uranium fuel cycle?

-Is the two-step, probabilistic formulation of the "containment requirements" necessary, or would it be more appropriate to simply require that no credible release of radioactive material exceed the limits of Table 1?

-NRC's Advisory Committee on Nuclear Waste has suggested that the "containment requirements" be limited to releases caused by natural processes and events, and that separate standards be established to limit the potential for releases due to human intrusion. Would such standards be feasible and, if so, how should they be formulated?

-Are separate individual and ground water protection requirements necessary, or should they be combined into a single individual protection requirement?

-The ground water protection requirements of these standards delete a feature of the 1985 standards that allowed an incremental increase in radionuclide concentrations in ground waters that exceed EPA's drinking water standards before repository construction. The effect of this deletion may be to eliminate from consideration any candidate sites with high natural radionuclide concentrations. Should the incremental increase provision of the 1985 standards be restored?

-EPA's drinking-water standards were derived from evaluations of the water-treatment capabilities of public water-supply facilities. Does this provide a reasonable basis for evaluating the waste-isolation capabilities of waste management facilities? Should EPA require compliance with potential changes in the drinking-water regulations without first evaluating the achievability of the new regulations at waste-management facilities?

-EPA proposes to impose its individual protection and ground water protection requirements only for "undisturbed performance." Recognizing that some disturbances might be quite likely to occur, at least for certain repositories, would "anticipated performance" be a more appropriate set of conditions for these sections of the standards?



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

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:

Enclosure 2

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

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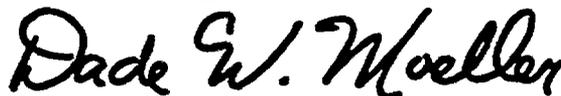
curies. This compares to a global production of carbon-14 by cosmic radiation of 28,000 curies per year, a global inventory of about 230 million curies, and an atmospheric inventory of 4 million curies. In fact, release of all of the carbon-14 inventory in a repository would increase the atmospheric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