



## POLICY ISSUE

(NEGATIVE CONSENT)

May 7, 1990

SECY-90-162

For: The Commissioners

From: James M. Taylor  
Executive Director for Operations

Subject: COMMENTS ON WORKING DRAFT NO. 2 OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S HIGH-LEVEL WASTE DISPOSAL STANDARDS

Purpose: To inform the Commission of the staff's intent to formally comment on Working Draft No. 2 of the high-level waste (HLW) disposal standards currently under development by the U.S. Environmental Protection Agency (EPA).

Summary: In 1985, EPA promulgated environmental standards for management and disposal of HLW, but in 1987, those standards were remanded in a Federal court decision. EPA is now preparing to reissue its standards, and has informally circulated copies of a "working draft" of the standards for review and comment. Comments generated by the staff and a proposed transmittal letter are enclosed.

Background: In the late 1970's, EPA began development of environmental radiation protection standards for disposal of HLW. Standards were proposed for public comment on December 29, 1982 (40 CFR Part 191, 47 FR 58196), and the U.S. Nuclear Regulatory Commission (NRC) provided comments on May 10 and 11, 1983. One of the NRC's major comments addressed the probabilistic nature of the proposed standards, as discussed in SECY-89-319. The EPA standards were published in final form on September 19, 1985 (50 FR 38066), but were remanded by a Federal court decision in 1987.

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Public

Discussion:

EPA is now preparing to reissue its HLW standards, and has informally circulated copies of "Working Draft No. 2" of the standards for review by affected Federal agencies and other interested parties. (A copy of this working draft was previously forwarded to the Commission.) In SECY-89-319, the staff noted its plans to provide written comments to EPA on this draft and to inform the Commission of any problems and the staff's recommendations for resolving them before providing the comments to EPA.

In SECY-89-319, the staff noted its view that evaluation of compliance with the probabilistic release limits of EPA's standards should not be the sole basis for repository licensing decisions. On the basis of its review, the staff finds nothing in Working Draft No. 2 that would infringe on the Commission's authority to make qualitative, non-probabilistic judgments in applying EPA's numerical, probabilistic standards. Nevertheless, under Working Draft No. 2, developing probability estimates for very unlikely processes and events will still be necessary, difficult, and controversial. Therefore, one of the enclosed comments (no. 8) suggests a way to reword the "containment requirements" so as to achieve the same level of safety now sought by EPA, while eliminating the need for numerical predictions of the probabilities of very unlikely processes and events. This format for the standards, if adopted by EPA, would significantly reduce concerns about the workability of EPA's standards.

Closely related to concerns about the probabilistic format of the standards, there is considerable controversy that the standards may be overly stringent. Two of the enclosed comments (nos. 1 and 2) encourage EPA to thoroughly document the risk levels associated with its standards and to demonstrate that those risk levels will be achievable by actual repositories.

Most of the staff's other comments address definitions of terms or other rather detailed aspects of the standards. The staff has, however, identified a third potential problem

which it wishes to raise to the Commission's attention. When EPA proposed its HLW standards in 1982, the standards contained several "assurance requirements" and "procedural requirements" which dealt with implementation of the standards. The Commission viewed those parts of the standards as intruding into the Commission's area of jurisdiction, and objected strongly to them in formal comments to EPA. Ultimately, in 1985, an agreement was reached which provided that those portions of EPA's standards would not be applicable to facilities licensed by NRC, and that NRC would incorporate equivalent provisions within its regulations (letter from Chairman Palladino to Administrator Thomas, dated December 2, 1985). However, that agreement was not open-ended -- i.e., the Commission did not agree to propose any amendments other than those spelled out in the agreement.

In Working Draft No. 2, EPA has added new "assurance requirements" to its standards as well as a new 40 CFR 191.17, addressing demonstrations of compliance with the standards. The staff does not consider the Commission's previous agreement with EPA to be applicable to these new provisions of the standards, and the staff's comments (nos. 10-12 and 17) notify EPA that the staff will not recommend that the Commission adopt equivalent requirements.

In SECY-89-319, the staff recommended a plan "to pursue a long-term, on-going evaluation of the EPA standards . . . and . . . to maintain close contact with EPA to identify and resolve . . . potential implementation issues to the extent practical." The enclosed comments represent an initial step in the recommended interaction with EPA. (We note that if the Commission were to direct the staff to pursue alternative no. 2 of SECY-89-319, revised wording for comment no. 8 would need to be considered.) Unless directed otherwise by the Commission, the staff will continue to pursue the proposed alternative (no. 3) of SECY-89-319.

Recommendation:

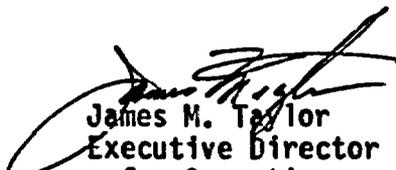
The staff will send the enclosed comments to EPA ten working days after the date of this paper, unless directed otherwise by the Commission. These comments are not inconsistent with those transmitted by ACNW in its letter to the Chairman dated May 1, 1990.

The Commissioners

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Coordination:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of Nuclear Regulatory Research has also reviewed and concurred in this paper.

  
James M. Taylor  
Executive Director  
for Operations

Enclosures:

1. Comments on Working Draft No. 2
2. Draft Ltr to R.Guimond from  
R. Browning

SECY NOTE; In the absence of instructions to the contrary, SECY will notify the staff on Monday, May 21, 1990, that the Commission, by negative consent, assents to the action proposed in this paper.

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COMMENTS ON WORKING DRAFT NO. 2  
OF EPA'S HIGH-LEVEL WASTE STANDARDS

General

1. There continues to be considerable controversy regarding the perceived 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 differing perceptions of the actual level of risk allowed by EPA's standards, and by an inability of many observers to relate that level of risk to other risks experienced by society. We are concerned that a clear public 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. As we understand EPA's development, it consisted of the following:

1) EPA determined that radiological impacts from disposal of HLW should be no greater than those experienced by individuals and populations today. EPA therefore surveyed the radiological impacts of natural background radiation exposure, nuclear weapons testing fallout, unmined uranium ore deposits, and nuclear power operations to provide benchmarks for evaluating the waste isolation capability of HLW repositories.

2) EPA described several hypothetical HLW repositories and conducted performance assessments to evaluate their waste isolation capabilities. These performance assessments showed that repositories are able to restrict population impacts to less than 1,000 health effects over 10,000 years -- a level comparable to or less than the benchmarks surveyed in step 1, above. Individual radiological impacts were found to be very low.

3) Because of the large uncertainties involved in calculations of radiation doses far into the future, EPA used a generic environmental model to translate its 1,000 health effects goal into a table of allowable limits for releases of radioactive materials to the environment. While these release limits might correspond to fewer than 1,000 health effects at an actual repository site, EPA's Science Advisory Board found this translation to be appropriate for a generic analysis. In EPA's view, any conservatism involved in developing the table of release limits is well justified in light of the implementation difficulties that would be involved if the standards required long-term projections of population locations, sizes and lifestyles.

4) The long regulatory time period of interest and the sizeable uncertainties involved in projecting releases over that time period caused EPA to use the term "reasonable expectation" to describe the level of confidence required for

a demonstration of compliance with the standards. As EPA stated (50 FR 38071, September 19, 1985), "[t]his phrase reflects the fact that unequivocal numerical proof of compliance is neither necessary nor likely to be obtained."

We encourage EPA to clearly and concisely document the basis for its standards so as to improve public understanding and acceptance of those standards.

2. Another reason for the perception of excess stringency is the technical basis for the standards. As discussed above, 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. Standards developed in this way may be perceived to be overly stringent for the following reasons:

1) In setting the standards, EPA has stated its belief that real repository sites can be found that can be shown to perform as well as its hypothetical sites. But, experience to date in the HLW repository program reveals that real sites that have been investigated are much more complex than EPA's hypothetical sites, and projected performance is much less certain. EPA's release limits may be too restrictive to accommodate the uncertainties at these sites, or more generally, at any real site. In any event, documentation that real sites can be shown to perform as well as the hypothetical sites is lacking.

2) EPA's analyses of repository performance are very simplistic. EPA's models are not able to accurately simulate some of the phenomena potentially important for projecting repository performance, such as groundwater flow and contaminant transport in fractured, unsaturated media, and the effects of waste-generated heat on the geochemical, hydrologic, and mechanical properties of a repository. Again, EPA's release limits may be too restrictive to accommodate the uncertainties that will be inherent in more realistic analyses of repository performance.

3) EPA has not considered a complete range of release scenarios in its supporting analyses. Some processes and events were omitted from EPA's analyses, such as the gaseous release pathway for unsaturated repository sites. Also, combinations of processes and events, such as fault movement followed by drilling, were not considered. These omissions caused the release limits to be set at a level that might rule out repositories capable of providing an adequate level of protection of public health and safety.

In the NRC staff's view, there are several actions that EPA could take to respond to these concerns. For example, EPA could perform much more detailed and realistic supporting analyses to defend the achievability of its release

limits. Also, when presenting its release limits, EPA could 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. Finally, EPA could modify the standards in the manner discussed below (comment no. 8) so as to reduce potential difficulties in demonstrating compliance with the standards for low probability events.

### Applicability

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. If that is actually EPA's intent, it can be accomplished by revising the applicability statements to refer to ". . . radioactive waste as defined herein at any facility that is intended to be used for, or may be used for, the permanent disposal of high-level radioactive waste, transuranic radioactive waste, or spent nuclear fuel . . ." The NRC staff would support such 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.

### Subpart A

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, and notes that amendments to the Commission's regulations for radiation protection, 10 CFR Part 20, have been proposed that would adopt the updated concepts. EPA's Supplementary Information should explain the reason for the different treatment in 40 CFR Part 191 and EPA's plans for updating the format of Subpart A.

### Definitions

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. The following paragraphs present the revised terminology currently being considered by the NRC staff.

The current term "anticipated processes and events" would be replaced by:

"Anticipated performance" means the predicted behavior of a geologic repository, taking into account the uncertainties in predicted behavior, if the geologic repository is not disrupted by human intrusion or the occurrence of an unlikely process or event.

The Supplementary Information would explain that human-initiated disruptions other than intrusion into the repository (e.g., ground water pumping) may be anticipated, if they are sufficiently likely.

The term "unlikely process or event" in the definition above might also need to be defined, either in the rule or in the Supplementary Information.

The full range of conditions for which performance of the repository must be evaluated (currently "anticipated" plus "unanticipated processes and events") would be defined by:

"Significant processes and events that may affect the geologic repository" means all processes and events potentially affecting the geologic repository that are sufficiently credible to warrant consideration. Significant processes and events that may affect the geologic repository may be either natural processes and events or processes and events initiated by human activities other than those activities licensed under this part. Processes and events initiated by human activities may only be found to be sufficiently credible to warrant consideration if it is assumed that:

- (1) the monuments provided for by this part are sufficiently permanent to serve their intended purpose;
- (2) the value to future generations of potential resources within the site can be assessed adequately under the applicable provisions of this part;
- (3) an understanding of the nature of radioactivity, and an appreciation of its hazards, have been retained in some functioning institutions;
- (4) institutions are able to assess risk and to take remedial action at a level of social organization and technological competence equivalent to, or superior to that which was applied in initiating the processes or events concerned; and

(5) relevant records are preserved, and remain accessible, for several hundred years after permanent closure.

The Supplementary Information would discuss EPA's suggested probability cut-off for categories of processes and events (1/10,000 over 10,000 years) as in the previous conforming amendments.

6. The NRC staff particularly notes the distinction between "anticipated performance," as defined above, and "undisturbed performance" in Working Draft No. 2. In our view, "undisturbed performance" may be a very unlikely set of conditions and, therefore, may have little merit for evaluating individual barrier performance as contemplated by 10 CFR 60.113. Although EPA's classification of "undisturbed performance" serves quite a different purpose, we nevertheless urge EPA to consider adopting "anticipated performance," as defined above, as a replacement term.

7. Although EPA's definition of "ground water" comports with common use (see, e.g., Webster's New Collegiate Dictionary), the NRC staff notes that the term is used differently in Part 60. Discussions are needed between EPA and NRC staff to try to develop a common definition.

#### Containment Requirements

8. As EPA is aware, there continues to be controversy regarding the workability of standards that require numerical probability estimates for very unlikely processes and events. In our formal comments on EPA's 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. That alternative would have required development of a complementary cumulative distribution function (CCDF) only for the more likely disruptive processes and events (those now defined as "anticipated" in 10 CFR Part 60). Very unlikely processes and events ("unanticipated" in Part 60 parlance) would be restricted by a release limit applied event-by-event, rather than cumulatively. With this structure for the containment requirements, there would be no need to develop precise numerical probability estimates for very unlikely processes and events. The following text for 40 CFR 191.13 illustrates the concept recommended in the Commission's earlier comment.

#### 191.13 Containment Requirements

(a) Disposal systems . . . shall be designed to provide a reasonable expectation that, for 10,000 years after disposal:

(1) anticipated performance will not cause cumulative releases of radionuclides to the accessible environment to have a likelihood greater than one chance in 10 of exceeding the quantities calculated according to Table 1 (Appendix B); and

(2) the release resulting from any process, event, or sequence of processes and events that is sufficiently credible to warrant consideration will not exceed ten times the quantities calculated according to Table 1 (Appendix B).

The term "anticipated performance" would be defined as suggested in comment no. 5, above.

The Commission would, of course, need to evaluate compliance by means of appropriate performance assessments. This would involve analyses that: (1) identify all processes and events that might affect the disposal system and are "sufficiently credible to warrant consideration," and (2) estimate the releases of radionuclides caused by those processes and events. For anticipated performance, a performance assessment would also (3) estimate the probability of likely processes and events, and (4) to the extent practicable, combine the release and probability estimates for likely processes and events into an overall probability distribution of cumulative release.

We strongly recommend that EPA reconsider adopting this concept for the containment requirements, because it would impose almost exactly the same level of safety on a repository, while avoiding the potential pitfalls of probability estimation for very unlikely and speculative events that could occur far in the future.

9. 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.

#### Assurance Requirements

10. 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 release limits and the already stringent requirements of the performance objectives of 10 CFR Part 60 make it doubtful that an ALARA requirement could be applied in any meaningful way.

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11. The 100,000 year comparison of alternative sites seems superfluous given the previous selection of the Yucca Mountain and Waste Isolation Pilot Plant (WIPP) sites. 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.

12. 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 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.

Individual and Ground Water Protection Requirements

13. The NRC staff prefers those options (1.A and 2.A of EPA's Working Draft No. 2) 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.

14. The NRC staff finds the definition of the term "man-made radionuclide" confusing since it clearly includes radionuclides that are not man-made. The staff is also puzzled by EPA's use of the term (to refer to concentrations of radioactive materials in ground waters) since it does not follow the jurisdictional scheme of the Atomic Energy Act. A better explanation of EPA's intent is needed. Alternatively, we note that the staff's preferred options for ground water protection (1.A and 2.A) would eliminate the separate ground water standards where this term is used.

15. The NRC staff objects to any 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.

16. 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.

#### Demonstration of Capability to Comply

17. The new 40 CFR 191.17, "Demonstration of Capability to Comply," 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).

#### Appendix C - Guidance for Implementation

18. We recommend that EPA reevaluate the technical base underlying the guidance on frequency and severity of 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.

19. This Appendix 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."



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

Richard Guimond, Director  
Office of Radiation Programs, ANR-458  
U.S. Environmental Protection Agency  
401 M Street, S.W.  
Washington, DC 20460

Dear Mr. Guimond:

Enclosed are the comments of the staff of the U.S. Nuclear Regulatory Commission on Working Draft No. 2 of the U.S. Environmental Protection Agency (EPA) environmental standards for management and disposal of high-level and transuranic radioactive wastes.

As you know, the Commission plans to issue "conforming amendments" to our regulations (10 CFR Part 60) to adopt the requirements of your standards. Ideally, I would like to propose those amendments to Part 60 concurrently with proposal of your standards, so that both documents can be reviewed by the public simultaneously. In order to achieve this goal, significant interactions between our staffs will be needed. Our staffs have worked well together in the past, and a starting point for future interactions might be development of a common set of terms for use in both regulations, as addressed in one of our comments. I propose that our staffs meet as soon as practical to work toward development of this common terminology.

I am concerned that there continues to be considerable controversy regarding the perceived stringency of your standards, with many observers arguing that the standards are excessively conservative when compared with other accepted standards. One of our comments recommends that EPA provide further insight into the basis for the standards in a way that would permit ready comparison with other regulatory standards and guidance, and with other risks experienced by society. I strongly encourage you to be very explicit and thorough in your description of the basis for your standards so that the level of safety can be evaluated in public comments, and so that questions about excessive stringency can be resolved.

Finally, there continues to be considerable controversy, both within the NRC and outside, about the probabilistic format of your standards and the potential difficulties that might be encountered in attempting to implement those standards. The enclosed comments include a reiteration (with slight modification) of one of NRC's 1983 comments. This comment suggests a way to reword the "containment requirements" so as to achieve the same level of safety now sought by EPA, while eliminating the need for numerical predictions of the probabilities of very unlikely processes and events. I strongly encourage you to consider adoption of the recommended text as a way of ending the debate about your probabilistic format.

Thank you for the opportunity to review and comment on Working Draft No. 2.  
I look forward to working closely with EPA during reissuance of your standards.

Sincerely,

Robert E. Browning, Director  
Division of High-Level Waste Management  
Office of Nuclear Material Safety  
and Safeguards

Enclosure:  
Comments on Working Draft No. 2