POLICY ISSUE
(Notation Vote)

August 13, 1985

SECY-85-272

For: The Commissioners

From: William J. Dircks
Executive Director for Operations

Subject: REPORT ON THE ENVIRONMENTAL PROTECTION AGENCY'S ENVIRONMENTAL STANDARDS FOR HIGH-LEVEL RADIOACTIVE WASTE DISPOSAL

Purpose: 1) To inform the Commission of EPA's resolution of NRC comments on the proposed standards, including the status of negotiations with the EPA staff related to EPA's proposed assurance and procedural requirements, and the content of the latest working draft of the EPA HLW standards.

2) To recommend transmittal of a letter to EPA documenting the Commission's intent to pursue a rulemaking related to EPA's proposed "assurance requirements."

Discussion: Background: On December 29, 1982, the Environmental Protection Agency published proposed environmental standards for management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes (47 FR 58196). On May 10 and 11, 1983 the NRC submitted formal comments on the proposed standards to EPA (Enclosures 1 and 2). During the past two years, EPA has considered numerous changes to the proposed standards, and has periodically circulated "working drafts" of the final standards to the NRC and other interested parties. The latest such draft, Working Draft No. 8, is enclosed as Enclosure 3.

On May 17, 1984, the Commission directed the staff to pursue discussions with EPA regarding elements of concern in the proposed EPA standards (Enclosure 4). Specifically

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427-4796

regarding the assurance requirements, the Commission directed the staff to attempt to come to a mutual agreement with EPA on equivalent requirements which could be proposed for incorporation into 10 CFR Part 60.

On January 21, 1985, the States of Nevada and Minnesota filed a petition for rulemaking (noticed at 50 FR 18267) requesting, among other things, that the NRC incorporate within its regulations the wording of EPA's proposed assurance requirements, thereby eliminating an alleged obstacle to promulgation of the final EPA standards.

The Nuclear Waste Policy Act directed EPA to issue final environmental standards for geologic repositories by January, 1984. Because of failure to meet that date, a lawsuit (NRDC v. Thomas, No. 85-0518 (D.D.C.)) has been brought against EPA seeking to force issuance of the final standards. The staff understands that EPA plans to publish the final standards on or about August 15, 1985 as part of the settlement of this lawsuit.

Resolution of Comments: The NRC's formal comments on EPA's proposed standards included three items which required resolution by EPA -- the probabilistic nature of the standards, the definition of "high-level radioactive waste," and the assurance and procedural requirements.

1. NRC comments on the proposed standards (Enclosure 1) stated "The numerical probabilities in (the proposed standards) would require a degree of precision which is unlikely to be achievable in evaluating a real waste disposal system." The NRC staff has explained to EPA the basis for objecting to standards containing numerical probabilities and, as a result of these discussions, EPA has added a new paragraph to Section 191.13 of the standards as follows:

> "Performance assessments need not provide complete assurance that the requirements of 191.13(a) will be met. Because of the long time period involved and the nature of the events and processes of interest, there will inevitably be substantial uncertainties in projecting disposal system performance. Proof of the future performance of a disposal system is not to be had in the ordinary sense of the word in situations that deal with much shorter time frames. Instead, what is required is a reasonable expectation, on the

basis of the record before the implementing agency, that compliance with 191.13(a) will be achieved."

The staff considers that establishing this wording (which conforms closely to §60.101(a)(2) of the Commission's regulations) sets reasonable bounds on the degree of assurance required for estimates of the likelihood and consequences of potentially disruptive events and processes. The Commission will not need to place sole reliance on probabilistic analyses when evaluating repository safety but, rather, will have considerable opportunity to employ its more traditional analytical and engineering methods. The staff considers that the specific performance objectives of 10 CFR Part 60, the detailed siting and other qualitative criteria of 10 CFR Parts 60 and 960, and the technical positions under development by the NRC staff will help assure that the appropriate balance is struck between use of traditional analytical and engineering methods and probabilistic analyses in making licensing findings. Although the staff continues to believe that the probabilistic nature of the standards will pose a significant challenge, the staff considers that the standards, in the current form, can be implemented in a licensing review.

2. The Nuclear Waste Policy Act (NWPA) was enacted shortly after publication of EPA's proposed standards and contained a definition of "high-level radioactive waste" different from that in the proposed standards. The NRC's comments suggested that EPA adopt the NWPA wording, and EPA has done so.

3. The NRC objected strongly to sections of the proposed standards labeled "assurance requirements" and "procedural requirements," and to a section regarding variances from the proposed standards. The NRC objection was that such requirements pertained to matters of implementation and thus went beyond the limits of EPA jurisdiction. (The section on variances has been deleted from recent working drafts, resolving the NRC's concern in this area.) As discussed previously, the Commission later directed the staff to pursue discussions with EPA to attempt to reach an agreement on wording equivalent to the assurance and procedural requirements which could then be proposed for incorporation into 10 CFR Part 60.

The staff has reached substantive agreement with EPA on wording changes for Part 60, and the text of these changes

is presented in Enclosure 5. In turn, Working Draft No. 8 of the EPA standards (Section 191.14) now states that the assurance requirements section does not apply to facilities regulated by the NRC.

The section formerly called "procedural requirements" has been extensively revised by EPA and is now present in Working Draft No. 8 as a non-binding informational appendix (which would be codified in the Code of Federal Regulations). While the content of this appendix involves matters of implementation of the standards, the staff considers that the NRC has the responsibility to independently develop and technically support its own procedures and guidance for implementation. Thus, this appendix is expected to have little relevance for repositories licensed by the NRC. Since this appendix would expressly be nonbinding, the staff does not propose to object to it.

Content of Working Draft No. 8: Some of the more significant features of the latest working draft of the EPA standards are summarized below.

--The standards continue to consist of two subparts. Subpart A is applicable to preclosure management and storage operations, and Subpart B sets limits for releases of radioactivity following repository closure.

--The standards apply to management and disposal of spent nuclear fuel, high-level radioactive waste, and transuranic wastes (with concentrations greater than 100 nCi/gm). The standards do not apply to any wastes (including transuranic wastes) for which the NRC authorizes disposal under 10 CFR Part 61.

--Subpart A effectively extends the EPA's existing uranium fuel cycle standards (40 CFR Part 190) to also include operations at a HLW repository. Annual doses to the public from all fuel cycle sources combined, including HLW repositories, are not to exceed 25 mrem to the whole body, 75 mrem to the thyroid, or 25 mrem to any other critical organ.

--The definition of the term "accessible environment" has been changed substantially from that in the proposed standards. The "accessible environment" now includes areas outside a "controlled area" which is defined as an area encompassing no more than 100 square kilometers and

extending no more than 5 kilometers in any direction from the outer boundary of a repository. (A conforming change to the definition of "controlled area" in Part 60 is anticipated.)

The definition of the "controlled area" is important because it identifies the area which the Commission regards as being subject to its jurisdiction rather than EPA's. The staff considers the technical approach in the proposed standard to be appropriate. The "controlled area," as there defined, is sufficiently large to enable the geologic setting to act as an effective barrier. It is also sufficiently small so that the effectiveness of the passive institutional controls (e.g., monuments) over long time periods can be predicted with reasonable assurance.

--The containment requirements (§191.13) limit the total amount of radioactivity projected to be released to the "accessible environment" during the first 10,000 years after disposal. The release limits are proportional to the amount of waste disposed of, and are applicable for unlikely releases as well as the expected performance of a repository. EPA has revised some of the supporting technical analyses for the standards, resulting in release limits different from those in the proposed standards. (On average, the release limits have been increased by nearly an order of magnitude.)

--A new section has been added to this working draft entitled Individual Protection Requirements (§191.15). This section would limit projected doses to members of the public during the first 1,000 years after disposal. This section applies only for "undisturbed performance" of a repository.

--The groundwater protection requirements (§191.16) would limit projected radionuclide concentrations in water withdrawn from certain "special sources of ground water." Such sources are defined as Class I groundwaters identified in accordance with EPA's "Ground-Water Protection Strategy" (published August 1984). (Class I groundwaters are those which are irreplaceable sources of drinking water or which are vital for maintenance of particularly sensitive ecological systems.) This section also applies only during the first 1,000 years after disposal and only for "undisturbed performance" of a repository.

Summary: The staff considers that Working Draft No. 8 can be implemented in a licensing review, and will not object to EPA's promulgation of the standards in final form. The staff plans to initiate technical analyses to determine whether any changes will be needed in the performance objectives of Part 60 to ensure consistency with the revised containment requirements and the new groundwater and individual protection requirements.

The NRC and EPA staffs have reached substantive agreement on the wording of Enclosure 5. Within 120 days after the standards have been finalized, the NRC staff will initiate a rulemaking to conform Part 60 to the standards and to propose the wording changes of Enclosure 5. Enclosure 6 is a draft letter for the Chairman's signature informing EPA of the NRC's commitment to pursue, through rulemaking, the wording changes identified in Enclosure 5.

Recommendation: That the Chairman sign the enclosed letter (Enclosure 6) addressed to Administrator Thomas of EPA documenting the NRC's intent to propose for adoption the revisions to Part 60 listed in Enclosure 5.

William J. Dircks
Executive Director for Operations

Enclosures:
1. Comment letter from John G. Davis to EPA dated May 10, 1983.
2. Letter from Chairman Palladino to Mr. Lee Verstandig dated May 11, 1983.
3. Working Draft No. 8 of the EPA high-level waste standards dated July 19, 1985.
4. Memorandum from Samuel J. Chilk to William J. Dircks dated May 17, 1984 (COMJA-84-4).
5. Staff discussion of assurance requirements, issues and proposed changes to Part 60.
6. Draft letter from Chairman Palladino to EPA Administrator Thomas.

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Thursday, August 29, 1985.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Thursday, August 22, 1985, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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ENCLOSURE 1

MAY 10 1983

I -

Central Docket Section (A-130)
Environmental Protection Agency
ATTN: Docket No. R-82-3
Washington, DC 20460

The Nuclear Regulatory Commission (NRC) is pleased to respond to the request by the Environmental Protection Agency (EPA) for comments on the EPA's proposed environmental standards for management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes (47 FR 58196). Our principal comments are highlighted below, while detailed comments and responses to EPA's six specific questions are contained in the enclosure.

The NRC considers the management, storage, and containment requirements of the proposed standards to be a reasonable approach for a HLW standard and considers that (with some recommended changes) they can be implemented and achieved under the procedures and technical criteria of NRC's 10 CFR Part 60. With respect to recommended changes, two points, which are elaborated in Enclosure 1, are important:

1. The numerical probabilities in the definitions of "reasonably foreseeable releases" and "very unlikely releases" would require a degree of precision which is unlikely to be achievable in evaluating a real waste disposal system. The NRC considers that identification of the relevant processes and events affecting a particular site will require considerable judgment and will not be amenable to accurate quantification, by statistical analysis, of their probability of occurrence. Alternative definitions of "reasonably foreseeable releases" and "very unlikely releases" are recommended that will be consistent with the Commission's regulations. We note that this same comment has been provided previously to the EPA as a result of reviews of early drafts of the HLW standards. We trust that our repetition of the concern is a strong indication that the proposed definitions will be unworkable.

2. We believe the definition of "high-level radioactive wastes" should be made compatible with the Nuclear Waste Policy Act of 1982 (NWPA). Since the NWPA contemplates that the Commission will define the term to apply to highly radioactive wastes that require permanent isolation, it would be inappropriate to include any contrary provision in 40 CFR Part 191. Accordingly, we recommend that the standards be revised to apply to high-level radioactive wastes as

will be defined by the Commission in 10 CFR Part 60 under the provisions of the NWPA, and that Table 1 be deleted.

We also wish to highlight an observation in response to the request for comment on alternative options. In responding to EPA's questions, the NRC has considered standards based on individual doses and standards covering times longer than 10,000 years as potential alternatives to the proposed EPA containment requirements. The NRC believes that these alternatives would be unlikely to produce any significant additional protection of public health and safety and that they would be more difficult to implement in a licensing proceeding.

In addition to the enclosed comments, a general concern of ours is that the proposed assurance and procedural requirements deal with means of implementation. As they do not set limits on radiation exposures or levels, or concentrations or quantities of radioactive material in the general environment, we do not believe they should be included in 40 CFR Part 191. The Commission will be issuing a separate letter addressing this concern.

In summary, the NRC considers the management, storage, and containment requirements of the proposed standards to represent a reasonable approach for a HLW standard and considers that (with the recommended changes) they can be implemented and achieved. We encourage EPA to promulgate these standards in final form as soon as practical. The NRC staff will be pleased to consult with the EPA staff on these comments or on other matters that will assist in early publication of final standards.

Commissioner Ahearne's additional comments are attached as Enclosure 2.

Sincerely,

/s/

John G. Davis, Director
Office of Nuclear Material
Safety and Safeguards

Enclosures: 2, as stated

DETAILED NRC COMMENTS ON THE PROPOSED EPA HIGH-LEVEL WASTE STANDARDS

The NRC comments are organized into three sections. The first amplifies the NRC comments made in the transmittal letter concerning reasonably foreseeable and very unlikely releases. The second section addresses other aspects of the containment requirements. The third section consists of responses to the six questions asked by EPA.

Section I - Reasonably Foreseeable and Very Unlikely Releases

The numerical probabilities in the definitions of "reasonably foreseeable releases" and "very unlikely releases" would require a degree of precision which is not likely to be achievable in evaluating a real waste disposal system. The current definitions would presumably require the use of numerical risk analysis techniques, such as fault tree analyses, to identify potential sequences of events or processes. A numerical probability estimate would then be made for each of these sequences. It is this latter step which the NRC considers to be both unworkable and unnecessary for determining the acceptability of a proposed waste disposal system. We note that this same comment has been provided previously* to the EPA, and we are very concerned that our comment has not been addressed in the proposed standards.

The NRC recognizes the merit in using a risk analysis approach -- to the extent that data are available -- as <u>one</u> of the bases for evaluating disposal system performance. However, as the EPA itself recognizes in the supporting documentation for the proposed standards (e.g., page 96 of EPA-520/3-80-006), <u>numerical</u> estimates of the probabilities or frequencies of some future events may not be meaningful. The NRC considers that identification and evaluation of such events and processes will require considerable judgment and therefore will not be amenable to quantification by statistical analyses without the inclusion of very broad ranges of uncertainty. These uncertainty ranges will make it difficult, if not impossible, to combine the probabilities of such events with enough precision to make a meaningful contribution to a licensing proceeding.

As an implementing agency, the NRC is particularly concerned that the licensing process, while providing for protection of health and safety, should be designed to facilitate timely decisionmaking. The NRC therefore

*See letter from R. B. Minogue to W. Mills dated December 27, 1978 (Attachment A), and letter from J. M. Hendrie to D. M. Costle dated June 22, 1979 (Attachment B).

considers that two changes are necessary to make it practical to implement the proposed standards. First, the definitions of release categories must be stated qualitatively rather than quantitatively, and, second, the standard for very unlikely releases must be applied to releases from specific scenarios, considered individually, rather than to releases from a combination of all very unlikely scenarios.

The first point can be addressed by modifying the definitions of the release categories as follows to conform to the definitions of "anticipated processes and events" and "unanticipated processes and events" in 10 CFR Part 60.

(g) "Reasonably foreseeable releases" means the cumulative release caused by processes and events which are reasonably likely within 10,000 years assuming that processes operating in the disposal system during the Quaternary Period were to continue to operate but with the perturbations caused by the presence of emplaced waste superimposed thereon.

(h) "Very unlikely releases" means releases caused by processes and events which are not anticipated to occur within 10,000 years, but which are sufficiently credible to warrant consideration. Such processes and events include those which were not evidenced during the Quaternary Period or which, though evidenced during the Quaternary, are not reasonably likely to occur within 10,000 years.

The second point can be resolved by revising §191.13(b) as follows:

§191.13(b) "Any very unlikely releases of waste to the accessible environment is are projected to be less than ten times the quantities calculated according to Table 2 (Appendix)."

The NRC considers that the definition of very unlikely releases and §191.13(b) combine to address only the incremental release resulting from the very unlikely event or process itself. However, the total impact on the accessible environment associated with a very unlikely process or event would nevertheless consist of both the release resulting from the event itself and the cumulative release from the reasonably foreseeable events and processes that also occur. The NRC recommends that the EPA include in its statement of considerations appropriate language which documents this interpretation.

Section II - Containment Requirements

The NRC staff and contractors have completed extensive analyses of the achievability of the release limits of the proposed standards as we have construed them, using models and data independent of those used by the EPA. The results of these analyses (documented in NUREG/CR-3235 which has been transmitted separately) demonstrate that the proposed release limits should be achievable for reasonable ranges of geologic repository parameters and conditions.

These analyses used information available in the literature to define hypothetical repository systems in three types of rock: basalt, tuff and bedded salt. Parameters describing the disposal system were defined by ranges of data, and uncertainty analyses of repository performance were performed by sampling data values over the entire ranges. Thus, these analyses give both a "best estimate" of the achievability of the proposed release limits and an estimate of the likelihood that the limits would be exceeded.

The results of these analyses show that both "normal" releases and the releases following several different disruptive scenarios are quite likely to comply with the release limits of the proposed standards. A few releases which failed to meet the release limits were caused by selecting very pessimistic values from the input data ranges. These data values represent conditions (e.g., low radionuclide retardation) which would generally be regarded as tending to make a site unsuitable for repository licensing. The NRC therefore concludes that the proposed release limits are both achievable and appropriately restrictive to "weed out" poor waste disposal systems.

We note that judgment is needed when determining compliance with standards such as the proposed containment requirements. In order to explain this point, the NRC will include the following statement in 10 CFR Part 60 regarding the performance objectives of that regulation:

> While these performance objectives and criteria are generally stated in unqualified terms, it is not expected that complete assurance that they will be met can be presented. A reasonable assurance, on the basis of the record before the Commission, that the objectives and criteria will be met is the general standard that is required. For §60.112, and other portions of this subpart that impose objectives and criteria for repository performance over long times into the future, there will inevitably be greater uncertainties. Proof of the future performance of engineered barrier systems and the geologic setting over time periods of many hundreds or many thousands of years is not to be had in the ordinary sense of the word. For such long-term objectives and criteria, what is required

is reasonable assurance, making allowance for the time period, hazards, and uncertainties involved, that the outcome will be in conformance with those objectives and criteria. Demonstration of compliance with such objectives and criteria will involve the use of data from accelerated tests and predictive models that are supported by such measures as field and laboratory tests, monitoring data and natural analog studies.

The NRC believes that the proposed standards, if adopted, would need to be applied in accordance with these principles -- i.e., that there must be reasonable assurance, on the basis of the record, that the outcome will be in conformance with the limits specified by EPA. NRC would construe the standards so as to accommodate this approach. Nevertheless, EPA may want to amplify its discussion so as to eliminate unnecessary ambiguity.

Section III - Responses to EPA Questions

The following comments present the NRC's responses to the six questions for which the EPA specifically solicited public comment.

1. "Is our definition of high-level waste, which excludes any material with concentrations below the values specified in Table 1, a proper approach to distinguish between wastes which require maximum isolation (as in a geologic repository) and wastes which may be disposed of in less secure facilities?"

We believe the definition should be made compatible with the Nuclear Waste Policy Act of 1982 (NWPA). Since the Act contemplates that the NRC will define the term to cover highly radioactive wastes that require permanent isolation, it would be inappropriate to include any contrary provision in 40 CFR Part 191. In this regard, it should be noted that §121(a) of NWPA contemplates that EPA shall "promulgate generally applicable standards for protection of the general environment from offsite releases from radioactive material in repositories" without regard to the kind of radioactive material concerned. Accordingly, we recommend that the standards be revised to apply to high-level radioactive wastes as defined by the Commission under the provisions of the NWPA, and that Table 1 be deleted.

An appropriate change to the proposed standards to implement this recommendation is to change Section 191.02 (b) to read (additional text is underlined):

"(b) 'High-level radioactive wastes' <u>means (1) the highly radioactive material resulting from the reprocessing of spent</u>

nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (2) other highly radioactive material that the Nuclear Regulatory Commission, consistent with existing law, determines by rule requires permanent isolation." ~~means any of the following that contain radionuclides in concentrations greater than those identified in Table 1 (Appendix): (1) liquid wastes resulting from the operation of the first cycle solvent extraction system or equivalent; in a facility for reprocessing spent nuclear fuel; (2) the concentrated wastes from subsequent extraction cycles; or equivalent; (3) solids into which such liquid wastes have been converted; or (4) spent nuclear fuel if disposed of without reprocessing."~~

or

"(b) 'High-level radioactive wastes' means high-level radioactive waste as defined by the Nuclear Waste Policy Act of 1982."

2. "In choosing the proposed level of protection provided by the standards, have we taken an appropriate approach with regard to the long-term residual risks we may pass on to future generations?"

The NRC believes that the EPA's approach is an appropriate reflection of the Congressional finding in §111(a)(7) of the NWPA that

> "High-level radioactive waste and spent nuclear fuel have become major subjects of public concern, and appropriate precautions must be taken to ensure that such waste and spent fuel do not adversely affect the public health and safety and the environment for this or future generations."

In the draft EIS for 40 CFR Part 191, the EPA presents estimates of the levels of health effects expected from natural background radiation exposure, unmined uranium ore deposits, nuclear power generation and nuclear weapons fallout, and compares these levels with the impacts expected under the proposed standards (1000 health effects over 10,000 years from 100,000 MTHM). This comparison shows that the level of risk allowed by the proposed standards is comparable to the risks of unmined uranium ore, and is much lower than the other reference risk levels. The NRC considers this an appropriate approach for establishing risk levels for the EPA high-level waste standards, one that is consistent with the statutory direction.

Although the approach EPA has taken is a reasonable one, some of its underlying evaluation is open to question. We have several observations in this regard.

First, the NRC staff and its contractors have independently evaluated the relationship between the release limits of the proposed standards and the resulting level of health effects anticipated over 10,000 years. The results of these analyses indicate that EPA's environmental transport analyses may overestimate the number of expected health effects per curie of radioactivity released to the environment. We have not identified any systematic or gross over-conservatisms in the models or data used by EPA. However, it appears that a number of marginally conservative assumptions (e.g., cancer risk estimates, fraction of river flow used for irrigation, etc.), when considered together, may result in the acceptance of overly conservative estimates of health effects per curie released. We encourage EPA to reevaluate its environmental transport models and release limits in light of more recent information such as that used in NUREG/CR-3235.

The NRC agrees with the interval which EPA has selected to address long-term risks. However, the NRC believes that EPA's rationale for selecting an interval of 10,000 years should be strengthened. To that end, we recommend that EPA review the analyses in NUREG/CR-3235 in which the behavior of an undisturbed system is modeled for intervals up to 50,000 years, and it is seen that no dramatic degradation in performance occurs in any 10,000 year interval between 10,000 and 50,000 years.

3. "Have we chosen an appropriate approach with regard to the degree of protection that should be anticipated from active and passive institutional controls?"

4. "Should we adopt our proposed requirements to avoid siting disposal systems where there may be scarce or easily accessible resources -- a requirement which could rule out sites which might be advantageous in meeting all of our other requirements?"

5. "Should we adopt our proposed requirement that recovery of most of the wastes should be feasible if unforeseen events require this in the future--a requirement which might rule out some alternatives to mined geologic disposal?"

These questions address the "procedural" and "assurance" requirements which concern matters for which the NRC is responsible, and they will be addressed by the Commission in a separate letter.

6. "Is our choice of limits on total radioactivity released an appropriate approach to protecting the environment from these long-lived wastes? Or should we develop standards that limit maximum exposures to individuals instead?"

The NRC strongly supports the current form of the containment requirements (section 191.13) which limit the total amount of radioactivity projected to be released to the environment over 10,000 years. This approach would appropriately protect the environment while limiting the consideration of speculative and unnecessary dosimetry-related issues in a repository licensing review. A standard which specified maximum dose limits to individuals would have two major adverse effects:

- It would encourage dilution rather than containment of wastes (e.g., by siting repositories near prolific aquifers or large rivers), which the NRC considers to be an inappropriate approach to waste disposal, and

- It would needlessly inject into a licensing review questions of individual and societal lifestyles far into the future. These are difficult predictions to make even a few years into the future, and predictions over 10,000 years would be highly speculative. The approach adopted by EPA in developing these standards (limiting total activity released to the environment) would avoid this difficulty while still ensuring that a waste disposal system would achieve its intended function, i.e., long-term isolation of wastes from the environment.

COPY

DEC 27 1978

Dr. William Mills, Acting Deputy Assistant
Administrator for Radiation Programs
Office of Radiation Program (ANR-458)
U.S. Environmental Protection Agency
401 M Street, S. W.
Washington, D. C. 20460

Dear Dr. Mills:

We have been in close contact with your staff since last August, in discussions of the HLW standards which EPA and NRC are scheduled to issue soon. I believe it would be useful at this time for me to set down some of our ideas on the specific structure and implementation of regulatory standards.

There are three important regulatory elements for HLW disposal: (1) the EPA environmental radiation standard for HLW, (2) the NRC regulation for disposal of HLW, and (3) the NRC review and licensing process by which a specific repository is authorized. The NRC elements must be based on the EPA standard or, if they precede it, must be brought into conformity with it when it is promulgated. The NRC regulation and licensing action must implement the specific requirements of the EPA standard. This close relationship between the EPA standard and the NRC regulation and licensing actions makes us especially sensitive to the structure of the EPA standard and its explicit requirements.

We feel strongly that a deterministic method should be used to regulate nuclear facilities. We are aware that you are considering a substantially different type, a probabilistic standard which requires quantitative risk assessment. Based on our understanding of the virtues and the weaknesses of quantitative risk assessment, we are convinced that it can and should be used to provide insight on the quality and effectiveness of HLW disposal regulation, but it cannot be the explicit basis of the regulation which requires rigorous satisfaction because:

1. The analytical techniques are complex and there are many areas in them which are the subject of wide disagreement in the technical community.

Attachment A

2. These quantitative techniques are greatly dependent on the quantity and quality of the data upon which they are based.

3. In most cases where one confronts the analysis of low probability events, statistical uncertainties make rigorous use of the quantitative results impossible.

Standards for protecting public health and safety can be expressed as limiting levels of physically meaningful parameters, such as materials released, radiation dose, health effects (a deterministic standard), or as a probability of certain parameter levels being reached or exceeded (a probabilistic standard). In the first instance, the implementor is required to demonstrate compliance with physical limits on consequences, taking into account the effect of important potentially disruptive events such as floods, faulting, etc. Compliance in the second instance hinges on demonstration of the probability of occurrence (as well as the consequences, i.e., risk) of those events. Although there are no laws of science which preclude the possibility of performing such risk assessments on the long-term isolation of radioactive waste, the capability to perform such risk assessments in a manner sufficiently rigorous to serve as the primary basis for licensing decision does not now exist and there is no assurance that it will (or can) be developed in the next several years.

In the past two weeks we have been working on possible forms for a deterministic EPA standard which would be consistent with your analyses and with our need to implement its specific requirements. I suggest that we meet soon to discuss this matter further.

Sincerely,

Original signed by:
ROBERT B. MINOGUE

Robert B. Minogue, Director
Office of Standards Development

COPY

WASHINGTON, D. C. 20555

CHAIRMAN

June 22, 1979

The Honorable Douglas M. Costle
Administrator
Environmental Protection Agency
401 M. Street, S. W.
Washington, D. C. 20460

Dear Mr. Costle: Doug,

Our staffs have been in close contact since last August, examining ways of relating the EPA numerical standard for high-level radioactive waste to the associated NRC regulation which is currently being developed. In this effort we have been using a working draft of the EPA standard which we received informally on January 18, 1979 (Enclosure A). I am writing this letter to provide you NRC staff comments on the technical and the structural aspects of the draft EPA standard.

With regard to the technical aspects, the NRC staff conducted a weeklong peer group review of the supporting technical information for the EPA numerical standard, including the work done by Arthur D. Little, Inc. (ADL). This review was made possible by the active participation and cooperation of the EPA staff with the peer group, which was composed of selected members of the NRC staff and consultants. Enclosure B is a copy of the report of that peer group entitled "Risk Assessment of Radioactive Waste Isolation in Deep Geologic Formations - NRC Review Group Report." We believe that the conclusion of this report should be given your serious consideration.

In summary, the peer review group concluded:

- Although analysis of risk (i.e., product of probability and consequence) can be useful in establishing environmental standards, its use does not necessarily require a standard based upon explicit probability values.

- The material available for review did not provide adequate technical support for the draft EPA standard.

- The degree of conservatism in the resultant risk curves is not known since the ADL work did not include uncertainty analysis (i.e., estimation of error bands for consequences and probabilities). Therefore it is impossible to determine how realistic the "high" and "low" risk estimates actually are.

360 066

Attachment B

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Neither a rigorous sensitivity analysis nor a systematic examination of a comprehensive set of potential repository failure mechanisms were included in the ADL work. The potential risk to public health and safety will depend upon the properties of the site -- including the radionuclides released -- as well as the particular failure mechanism chosen for calculation. Because the ADL repository model considered a limited range of site properties and possible repository failure mechanisms, the EPA conclusion which identified specific nuclides as dominating the risk cannot be confirmed.

As indicated previously, the peer review group used the Enclosure A working draft of the EPA standard to evaluate its structural aspects. This working draft includes explicit probabilities in its requirements. Without careful clarification, these probabilities could be presumed to be either based upon engineering judgment or upon highly sophisticated models -- complete with error band estimates for the probabilities. We are specifically concerned about the analytical precision which may be implied by citing a probability of as low as one in a million over 10,000 years, for releases from the repository exceeding proposed EPA limits. As it is presently drafted, the EPA standard would apparently require NRC to make a formal licensing finding in accordance with these specific probabilities. We have serious doubts that this would be possible because of the paucity of probability data in this field. Our experience, even in areas where the availability of data is significantly greater, convinces us that we must use a deterministic approach for licensing -- at least for the near future. This conclusion was previously conveyed to Dr. Mills by Mr. Minogue. (Letter dated December 27, 1978 -- Enclosure C.) We are particularly concerned that a proposed repository located at a hypothetically ideal site, with all the appropriate engineering barriers, might not qualify for licensing under the draft standard simply because DOE, as the license applicant, will be constrained by the geo-sciences state-of-the-art for predicting repository failures and might not be able to carry the burden of persuasion that the EPA criteria will be met. In this sense the NRC may not be able to implement the draft standard in a licensing context.

In addition to our concern about use of probabilities, the staff seriously doubts that a set of the key nuclide contributors to risk, as deduced from the ADL study with its limitations and as listed in the EPA standard, can be applied generally to determine the acceptability of a specific site since nuclide transport scenarios depend so strongly on the characteristics of the actual site.

In summary, while I feel our staffs have made progress in developing effective standards for the regulation of high level waste repositories, much work on both the technical basis and the form of the standard remains to be accomplished. We are especially concerned because our regulation development effort is proceeding on the assumption that a workable standard will be in place when it is needed. We are firmly committed to continue to assist in this challenging area of developing practical standards that assure protection of the public health and safety.

As you know, the Interagency Review Group Report called for EPA and NRC to develop a Memorandum of Understanding (MOU) on their development of standards for all phases of waste management activities. I would like to take this opportunity to propose that we start immediately to develop this MOU, giving the highest priority to an understanding on high level waste standards. The principal NRC staff contact in this matter is Karl R. Goller, Director of our Division of Siting Health and Safeguards Standards (443-5991).

Sincerely,

Joseph M. Hendrie

Enclosures:
(A) EPA Standard
(B) Peer Review Report
(C) Letter dated 12/27/78

360 068

COMMISSIONER AHEARNE'S ADDITIONAL COMMENTS ON THE PROPOSED EPA HIGH-LEVEL WASTE STANDARDS

I object to portions of EPA's proposal because I believe they go far beyond EPA's authority under Reorganization Plan No. 3 (which is the authority cited by EPA in the Federal Register notice). In particular I object to the "assurance requirements" (§191.14) and the procedural aspects of the variance section (§191.04(b)), and probably the "procedural requirements" (§191.15).

Background

Under Reorganization Plan No. 3 of 1970, EPA was given two functions relating to federal radiation control. First, it was given the standard setting authority of AEC:

> "...to the extent that such functions of the Commission consist of establishing generally applicable environmental standards for the protection of the general environment from radioactive material. As used herein, standards mean limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material." Section 2(a)(6) (emphasis added).

Second, it was given "[a]ll functions of the Federal Radiation Council" (Section 2(a)(7), citing 274(h) of the Atomic Energy Act):

> "The Council shall advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States." Atomic Energy Act, §274(h) (emphasis added).

In the early 1970's EPA and AEC had a jurisdictional dispute which was presented to the President. It was resolved in a December 7, 1973 memorandum from Roy L. Ash, Director of OMB, to EPA and AEC:

> "[There was a] difference of views between your two agencies as to which should have the responsibility for issuing standards to define permissible limits on radioactivity that may be emitted from facilities in the nuclear power industry.
>
> ....
>
> EPA has construed too broadly its responsibilities, as set forth in Reorganization Plan No. 3 of 1970, to set 'generally applicable environmental standards for the protection of the general environment from radioactive material.'
>
> On behalf of the President, this memorandum is to advise you ... that EPA should discontinue its preparations for issuing, now or in the future, any standards for types of facilities; and that EPA should continue, under its current authority, to have responsibility for

setting standards for the total amount of radiation in the general environment from all facilities combined in the uranium fuel cycle, i.e., an ambient standard which would have to reflect AEC's standards as to the practicability of emission controls."

Clearly, EPA has now gone far beyond setting ambient standards.

I do not go so far as to insist EPA set only ambient standards, primarily because over the last few years the NRC has developed Part 60 on the assumption that EPA would be the agency responsible for developing release limits under its standard setting authority. However, the same is not true for other sections of their proposed "standards."

Procedural requirements (§191.15) and Variances (§191.04)

EPA argues the "procedural requirements" of §141.15 are needed because "some of the procedures [EPA] used in [its] assessments must be retained to insure that the intent of [its] containment requirements is met." 47 FR at 58201. EPA appears to be addressing implementation of its standards, which is NRC's responsibility.

In addition, I specifically object to §191.04(b). I question whether any of the variance section is appropriately issued under EPA's standard setting authority. However, the Commission apparently did not object to a variance provision in Part 190 resembling 191.04(a). But I see absolutely no justification for EPA's prescribing that we publish a Federal Register notice and send a letter to governors of affected states.

Assurance requirement (§191.14)

My basic objection is to the "assurance requirements" in §119.14. In 1980 the Commission was briefed by EPA about its ongoing efforts to develop radiation standards, including those for high level waste. Of relevance to the "assurance requirements" is the following presentation by Mr. Egan, EPA on its high level waste standards:

"MR. EGAN: ...As David [Rosenbaum, EPA] indicated before, we had two authorities to work with in this area. One is to promulgate generally applicable standards like the mill tailings standards. The other is to propose better radiation guidance like the occupational guidance. This package has both types of proposals in it. ...

The two parts of the environmental standards would be Subpart A and B. Subpart A would apply to waste management operations and storage of these wastes. ...

What this action will do will just explicitly extend the same dose limitations that are in 40 CFR 190 to these other processes as well.

Subpart B, which is the standards for disposal are then of course much different than standards we've developed before in 40 CFR 190, or in Part A of this standard. We are here discussing limits on projected releases over a 10,000-year period. ...

....

And of course the other part of the requirements for disposal which we propose to include as an appendix to the CFR language, the Federal Radiation Guidance containing general principles that should be followed for disposal systems. [emphasis added]

This part of the action would be promulgated somewhat differently, as David explained earlier, when we finally make the action final, in that the Federal Radiation Guidance of course would be recommended to the President for issuance as guidance. The Administrator cannot issue it directly by himself; whereas the standards Subpart A and B, say, would in fact be issued directly by the Administrator. [emphasis added]

DR. ROSENBAUM: Let me say one word about that. This complication arose very late in the process when our lawyers, just a month or so ago, decided that we couldn't issue the whole thing as a standard. We had to separate out part of this and issue it as guidance.

....

CHAIRMAN AHEARNE: Have you, on the seven general principles, could you say a few words on what approximately these are?

....

MR. EGAN: The simplest one is that releases from a disposal system should be reduced as low as is reasonably achievable. ...

Another one that is somewhat related but again different, is that the disposal system should use multiple barriers to isolate the waste; and that each of these barriers should be designed to provide substantial protection, even if the other barriers don't work the way they're supposed to. ...

Another would be that we believe that active institutional controls to protect the disposal system should not be relied upon for more than 100 years. ...

... It's an introduction to the next one which says that we believe waste should be disposed of promptly once you've got a system that will do it. ...

Another principle is that you should locate a site away from potential areas of resources -- both resources which are obvious that we now consider to be resources; but also away from areas where there are unique concentrations of materials that may be a resource in the future, even if they're not now. ...

....

Another principle is just that you should record, and mark, and otherwise warn the future about the repository as well as you possibly can. ...

....

The last one, and the one that usually requires more explanation than the others, is that we feel the waste should be disposed of what we call 'recoverably.'" Transcript of September 3, 1980 Commission meeting at 85-91.

However, EPA now simply asserts, "Under authorities established by the Atomic Energy Act and Reorganization Plan No. 3 of 1970, we are proposing generally applicable environmental standards for managing and disposing of these wastes." 47 FR at 58197 (December 29, 1982). EPA contends the "assurance requirements [which are a reincarnation of the proposed Federal Radiation Guidance] address and compensate for the uncertainties that necessarily accompany plans to isolate these dangerous wastes from the environment for a very long time." 47 FR at 58200. Thus EPA has changed its jurisdictional basis and is now using a justification which explicitly addresses implementation of the standards, which is clearly within NRC's jurisdiction rather than EPA's.

Some of these principles may be a good idea; with some modifications the NRC might agree with all of them; and EPA (under its FRC function) could recommend to the President that they be adopted as guidance. Thus one might argue we should simply let the issue pass, that raising the issue is simply a bureaucratic turf exercise. However, I disagree.

I believe this raises a question about the best framework for the waste program. Unlike the release limits, much of the discussion duplicates work NRC has done for Part 60, and to some extent EPA's tentative positions are inconsistent with ours. If EPA simply decides on its own what it wishes to do, there are going to be significant problems in the future when a specific application is affected by any differences since it will be difficult to resolve disputes among EPA, NRC and DOE. However, if the President chooses to address the matter and endorse some resolution (as a result of EPA exercising its FRC function), there will be a great deal more certainty when controversy arises at a later time in the context of a particular application.

ENCLOSURE 2

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

CHAIRMAN

May 11, 1983

Mr. Lee Verstandig
Acting Administrator
Environmental Protection Agency
401 M Street, S.E.
Washington, D.C. 20460

Dear Mr. Verstandig:

In a letter dated May 10, 1983, the Nuclear Regulatory Commission (NRC or Commission) staff provided comments on the Environmental Protection Agency's (EPA) proposed environmental standards for the management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes. 47 Fed Reg. 58196 (December 29, 1982). That letter stated that the Commission had general concerns about sections of the proposed standards that deal with means of implementation and that these concerns would be addressed in a separate letter. For the reasons discussed below, the Commission believes that Section 191.04(b), 191.14 and 191.15 address matters of implementing EPA's standards and, thus, are solely within the Commission's jurisdiction with regard to NRC licensed facilities. Accordingly, the Commission urges that these provisions be deleted from the final standards as being beyond EPA's authority.

Agency Authority

Reorganization Plan No. 3 of 1970 transferred to EPA two functions regarding federal control of radiation and radioactive materials. Section 2(a)(6) transferred the standard setting authority of the Atomic Energy Commission (AEC):

> "... to the extent that such functions of the Commission consist of establishing generally applicable environmental standards for the protection of the general environment from radioactive material. As used herein, standards mean limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material."

Section 2(a)(7) transferred all functions of the Federal Radiation Council established under Section 274(h) of the Atomic Energy Act of 1954, as amended.

In his message to Congress transmitting Reorganization Plan No. 3 of 1970, the President stated that the "AEC would retain responsibility for the implementation and enforcement of radiation standards through its licensing authority." The complementary responsibilities of the AEC and EPA are memorialized in two Memoranda of Understanding, one for

AEC-licensed facilities, 38 Fed. Reg. 24936 (September 11, 1973), and one for AEC facilities, 38 Fed. Reg. 32965 (November 29, 1973). These responsibilities now apply to the NRC as the successor to the AEC's regulatory authority and to the Department of Energy as the successor to the AEC's programmatic responsibilities.

The limitation of EPA's authority to the setting of ambient standards was reiterated by Roy L. Ash, Director of the Office of Management and Budget, in a memorandum of December 7, 1973. The Commission believes that those limits have been exceeded by Section 191.04(b), 191.14 and 191.15 of the proposed high-level waste standards. In the Commission's view, as explained below, these provisions are addressed to matters of implementation exclusively within the NRC's jurisdiction.

Variance Procedures - §191.04(b)

Section 191.04(b) specifies procedures for the Commission to follow prior to granting a variance that would temporarily authorize operations which exceed the standards in §191.03. Within statutory limits, decisions on whether the public should participate in NRC determinations, and the procedural details for such participation, are clearly in the exclusive domain of the implementing agency. Neither Reorganization Plan No. 3 nor any statute modifies the Commission's authority to render any determinations on an application for a variance. Accordingly, the Commission believes that Section 191.04(b) is beyond EPA's authority and should be deleted from the final standards.

Assurance Requirements - §191.14

Section 191.14 contains several requirements characterized as "assurance requirements" which will "provide the confidence needed for compliance with the containment requirements of §191.13." While some of these requirements may be good ideas, their promulgation as EPA standards raises fundamental questions regarding the regulation of waste repositories. EPA discussion of several of these provisions duplicates NRC's work in developing 10 CFR Part 60 and some of EPA requirements are not entirely consistent with NRC requirements in Part 60. More fundamentally, confidence that the containment requirements will be complied with is the very essence of the licensing process conducted by the NRC. Compliance is a matter of the implementation and enforcement of standards. As such, it is clearly within the exclusive jurisdiction of the NRC and beyond the jurisdiction provided for EPA by Reorganization Plan No. 3. Accordingly, the Commission believes that Section 191.14 is beyond EPA's authority and should be deleted from the final standards.

Procedural Requirements - §191.15

The procedural requirements in Section 191.15 specify limiting assumptions that the Commission is to use in making performance assessments to determine compliance. These include limits on the length

of time for active institutional controls, the use of realistic projections, and the use of information regarding human intrusion. Such requirements are also clearly matters of implementation exclusively within NRC's jurisdiction. Accordingly, this provision also should be deleted from the final standards.

For the above reasons, the Commission urges that the proposed standards be amended as discussed above.

Sincerely,

Nunzio J. Palladino

cc: Central Docket Section (A-130)

ENCLOSURE 3

A new Part 191 is hereby added to Title 40, Code of Federal Regulations, as follows:

SUBCHAPTER F - RADIATION PROTECTION PROGRAMS

PART 191 - ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR MANAGEMENT AND DISPOSAL OF SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES

AUTHORITY: The Atomic Energy Act of 1954, as amended; Reorganization Plan No. 3 of 1970; and the Nuclear Waste Policy Act of 1982.

SUBPART A - ENVIRONMENTAL STANDARDS FOR MANAGEMENT AND STORAGE

191.01 Applicability

This Subpart applies to:

(a) radiation doses received by members of the public as a result of the management (except for transportation) and storage of spent nuclear fuel or high-level or transuranic radioactive wastes at any facility regulated by the Nuclear Regulatory Commission or by Agreement States, to the extent that such management and storage operations are not subject to the provisions of Part 190 of Title 40; and

(b) radiation doses received by members of the public as a result of the management and storage of spent nuclear fuel or high-level or transuranic wastes at any disposal facility that is operated by the Department of Energy and that is not regulated by the Commission or by Agreement States.

191.02 Definitions

Unless otherwise indicated in this Subpart, all terms shall have the same meaning as in Subpart A of Part 190.

(a) "Agency" means the Environmental Protection Agency.

(b) "Administrator" means the Administrator of the Environmental Protection Agency.

(c) "Commission" means the Nuclear Regulatory Commission.

(d) "Department" means the Department of Energy.

(e) "NWPA" means the Nuclear Waste Policy Act of 1982 (Pub. L. 97-425).

(f) "Agreement State" means any State with which the Commission or the Atomic Energy Commission has entered into an effective agreement under subsection 274b of the Atomic Energy Act of 1954, as amended (68 Stat. 919).

(g) "Spent nuclear fuel" means fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

(h) "High-level radioactive waste," as used in this Part, means high-level radioactive waste as defined in the Nuclear Waste Policy Act of 1982 (Pub. L. 97-425).

(i) "Transuranic radioactive waste," as used in this Part, means waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, per gram of waste, except for: (1) high-level radioactive waste; (2) wastes that the Department has determined, with the concurrence of the Administrator, do not need the degree of isolation required by this Part; or (3) wastes that the Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.

(j) "Radioactive waste," as used in this Part, means the high-level and transuranic radioactive waste covered by this Part.

(k) "Storage" means retention of spent nuclear fuel or radioactive wastes with the intent and capability to readily retrieve such fuel or waste for subsequent use, processing, or disposal.

(l) "Disposal" means permanent isolation of spent nuclear fuel or radioactive waste from the accessible environment with no intent of recovery, whether or not such isolation permits the recovery of such fuel or

waste. For example, disposal of waste in a mined geologic repository occurs when all of the shafts to the repository are backfilled and sealed.

(m) "Management" means any activity, operation, or process (except for transportation) conducted to prepare spent nuclear fuel or radioactive waste for storage or disposal, or the activities associated with placing such fuel or waste in a disposal system.

(n) "Site" means an area contained within the boundary of a location under the effective control of persons possessing or using spent nuclear fuel or radioactive waste that are involved in any activity, operation, or process covered by this Subpart.

(o) "General environment" means the total terrestrial, atmospheric, and aquatic environments outside sites within which any activity, operation, or process associated with the management and storage of spent nuclear fuel or radioactive waste is conducted.

(p) "Member of the public" means any individual except during the time when that individual is a worker engaged in any activity, operation, or process that is covered by the Atomic Energy Act of 1954, as amended.

(q) "Critical organ" means the most exposed human organ or tissue exclusive of the integumentary system (skin) and the cornea.

191.03 Standards

(a) Management and storage of spent nuclear fuel or high-level or transuranic radioactive wastes at all facilities regulated by the Commission or by Agreement States shall be conducted in such a manner as to provide reasonable assurance that the combined annual dose equivalent to any

member of the public in the general environment resulting from: (1) discharges of radioactive material and direct radiation from such management and storage and (2) all operations covered by Part 190; shall not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other critical organ.

(b) Management and storage of spent nuclear fuel or high-level or transuranic radioactive wastes at all facilities for the disposal of such fuel or waste that are operated by the Department and that are not regulated by the Commission or Agreement States shall be conducted in such a manner as to provide reasonable assurance that the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation from such management and storage shall not exceed 25 millirems to the whole body and 75 millirems to any critical organ.

191.04 Alternative Standards

(a) The Administrator may issue alternative standards from those standards established in 191.03(b) for waste management and storage activities at particular facilities that are not regulated by the Commission or Agreement States if, upon review of an application for such alternative standards:

(1) The Administrator determines that such alternative standards will prevent any member of the public from receiving a continuous exposure of more than 100 mrem per year dose equivalent and an infrequent exposure of more than 500 mrem dose equivalent in a year from all sources, excluding natural background and medical procedures; and

(2) The Administrator determines that continued operation of the facility is in the public interest; and

(3) The Administrator promptly makes a matter of public record the degree to which continued operation of the facility is expected to result in levels in excess of the standards specified in 191.03(b).

(b) An application for alternative standards shall be submitted as soon as possible after the Department determines that continued operation of a facility will exceed the levels specified in 191.03(b) and shall include all information necessary for the Administrator to make the determinations called for in 191.04(a).

(c) Requests for alternative standards shall be submitted to the Administrator, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C., 20460.

191.05 Effective Date

The standards in this Subpart shall be effective on [60 days after publication in the FEDERAL REGISTER].

SUBPART B - ENVIRONMENTAL STANDARDS FOR DISPOSAL

191.11 Applicability

This Subpart applies to:

(a) radioactive materials released into the accessible environment as a result of the disposal of spent nuclear fuel or high-level or transuranic radioactive wastes;

(b) radiation doses received by members of the public as a result of such disposal; and

(c) radioactive contamination of certain sources of ground water in the vicinity of disposal systems for such fuel or wastes.

However, this Subpart does not apply to disposal directly into the oceans or ocean sediments. This Subpart also does not apply to wastes disposed of before the effective date of this rule.

191.12 Definitions

Unless otherwise indicated in this Subpart, all terms shall have the same meaning as in Subpart A of this Part.

(a) "Disposal system" means any combination of engineered and natural barriers that isolate spent nuclear fuel or radioactive waste after disposal.

(b) "Waste," as used in this Subpart, means any spent nuclear fuel or radioactive waste isolated in a disposal system.

(c) "Waste form" means the materials comprising the radioactive components of waste and any encapsulating or stabilizing matrix.

(d) "Barrier" means any material or structure that prevents or substantially delays movement of water or radionuclides toward the accessible environment. For example, a barrier may be a geologic structure, a canister, a waste form with physical and chemical characteristics that significantly decrease the mobility of radionuclides, or a material placed over and around waste, provided that the material or structure substantially delays movement of water or radionuclides.

(e) "Passive institutional control" means: (1) permanent markers placed at a disposal site, (2) public records and archives, (3) government ownership and regulations regarding land or resource use, and (4) other methods of preserving knowledge about the location, design, and contents of a disposal system.

(f) "Active institutional control" means: (1) controlling access to a disposal site by any means other than passive institutional controls; (2) performing maintenance operations or remedial actions at a site, (3) controlling or cleaning up releases from a site, or (4) monitoring parameters related to disposal system performance.

(g) "Controlled area" means: (1) a surface location, to be identified by passive institutional controls, that encompasses no more than 100 square kilometers and extends horizontally no more than five kilometers in any direction from the outer boundary of the original location of the radioactive wastes in a disposal system; and (2) the subsurface underlying such a surface location.

(h) "Ground water" means water below the land surface in a zone of saturation.

(i) "Aquifer" means an underground geological formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

(j) "Lithosphere" means the solid part of the Earth below the surface, including any ground water contained within it.

(k) "Accessible environment" means: (1) the atmosphere; (2) land surfaces; (3) surface waters; (4) oceans; and (5) all of the lithosphere that is beyond the controlled area.

(l) "Transmissivity" means the hydraulic conductivity integrated over the saturated thickness of an underground formation. The transmissivity of a series of formations is the sum of the individual transmissivities of each formation comprising the series.

(m) "Community water system" means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

(n) "Significant source of ground water," as used in this Part, means: (1) an aquifer that: (i) is saturated with water having less than 10,000 milligrams per liter of total dissolved solids; (ii) is within 2,500 feet of the land surface; (iii) has a transmissivity greater than 200 gallons per day per foot, provided that each formation or part of a formation included in the source of ground water has an individual hydraulic conductivity greater than 2 gallons per day per square foot; and (iv) is capable of continuously yielding at least 10,000 gallons per day to a pumped or flowing

well for a period of at least a year; or (2) an aquifer that provides the primary source of water for a community water system as of the effective date of this Subpart.

(o) "Special source of ground water," as used in this Part, means those Class I ground waters identified in accordance with the Agency's Ground-Water Protection Strategy that are irreplaceable, in that no reasonable alternative source of drinking water is available to substantial populations.

(p) "Undisturbed performance" means the predicted behavior of a disposal system, including consideration of the uncertainties in predicted behavior, if the disposal system is not disrupted by human intrusion or the occurence of unlikely natural events.

(q) "Performance assessment" means an analysis that: (1) identifies the processes and events that might affect the disposal system; (2) examines the effects of these processes and events on the performance of the disposal system; and (3) estimates the cumulative releases of radionuclides, considering the associated uncertainties, caused by all significant processes and events. These estimates shall be incorporated into an overall probability distribution of cumulative release to the extent practicable.

(r) "Heavy metal" means all uranium, plutonium, or thorium placed into a nuclear reactor.

(s) "Implementing agency," as used in this Subpart, means the Commission for spent nuclear fuel or high-level or transuranic wastes to be disposed of in facilities licensed by the Commission in accordance with the Energy Reorganization Act of 1974 and the Nuclear Waste Policy Act of 1982, and it means the Department for all other radioactive wastes covered by this Part.

191.13 Containment Requirements

(a) Disposal systems for spent nuclear fuel or high-level or transuranic radioactive wastes shall be designed to provide a reasonable expectation, based upon performance assessments, that the cumulative releases of radionuclides to the accessible environment for 10,000 years after disposal from all significant processes and events that may affect the disposal system shall:

(1) have a likelihood of less than one chance in 10 of exceeding the quantities calculated according to Table 1 (Appendix A); and

(2) have a likelihood of less than one chance in 1,000 of exceeding ten times the quantities calculated according to Table 1 (Appendix A).

(b) Performance assessments need not provide complete assurance that the requirements of 191.13(a) will be met. Because of the long time period involved and the nature of the events and processes of interest, there will inevitably be substantial uncertainties in projecting disposal system performance. Proof of the future performance of a disposal system is not to be had in the ordinary sense of the word in situations that deal with much shorter time frames. Instead, what is required is a reasonable expectation, on the basis of the record before the implementing agency, that compliance with 191.13(a) will be achieved.

191.14 Assurance Requirements

To provide the confidence needed for long-term compliance with the requirements of 191.13, disposal of spent nuclear fuel or high-level or transuranic wastes shall be conducted in accordance with the following

provisions, except that these provisions do not apply to facilities regulated by the Commission (see 10 CFR Part 60 for comparable provisions applicable to facilities regulated by the Commission):

(a) Active institutional controls over disposal sites should be maintained for as long a period of time as is practicable after disposal; however, performance assessments that assess isolation of the wastes from the accessible environment shall not consider any contributions from active institutional controls for more than 100 years after disposal.

(b) Disposal systems shall be monitored after disposal to detect any substantial and detrimental deviations from expected performance. This monitoring shall be done with techniques that do not jeopardize the isolation of the wastes and shall be conducted until there are no significant concerns to be addressed by further monitoring.

(c) Disposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.

(d) Disposal systems shall use different types of barriers to isolate the wastes from the accessible environment. Both engineered and natural barriers shall be included.

(e) Places where there has been mining for resources, or where there is a reasonable expectation of exploration for scarce or easily accessible resources, or where there is a significant concentration of any material that is not widely available from other sources, should be avoided in selecting disposal sites. Resources to be considered shall include minerals, petroleum or natural gas, valuable geologic formations, and ground

waters that are either irreplaceable because there is no reasonable alternative source of drinking water available for substantial populations or that are vital to the preservation of unique and sensitive ecosystems. Such places shall not be used for disposal of the wastes covered by this Part unless the favorable characteristics of such places compensate for their greater likelihood of being disturbed in the future.

(f) Disposal systems shall be selected so that removal of most of the wastes is not precluded for a reasonable period of time after disposal.

191.15 Individual Protection Requirements

Disposal systems for spent nuclear fuel or high-level or transuranic radioactive wastes shall be designed to provide a reasonable expectation that, for 1,000 years after disposal, undisturbed performance of the disposal system shall not cause the annual dose equivalent from the disposal system to any member of the public in the accessible environment to exceed 25 millirems to the whole body or 75 millirems to any critical organ. All potential pathways (associated with undisturbed performance) from the disposal system to people shall be considered, including the assumption that individuals consume 2 liters per day of drinking water from any significant source of ground water outside of the controlled area.

191.16 Ground Water Protection Requirements

(a) Disposal systems for spent nuclear fuel or high-level or transuranic radioactive wastes shall be designed to provide a reasonable expectation that, for 1,000 years after disposal, undisturbed performance of

the disposal system shall not cause the radionuclide concentrations averaged over any year in water withdrawn from any portion of a special source of ground water to exceed:

(1) 5 picocuries per liter of radium-226 and radium-228;

(2) 15 picocuries per liter of alpha-emitting radionuclides (including radium-226 and radium-228 but excluding radon); or

(3) the combined concentrations of radionuclides that emit either beta or gamma radiation that would produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year if an individual consumed 2 liters per day of drinking water from such a source of ground water.

(b) If any of the average annual radionuclide concentrations existing in a special source of ground water before construction of the disposal system already exceed the limits in 191.16(a), the disposal system shall be designed to provide a reasonable expectation that, for 1,000 years after disposal, undisturbed performance of the disposal system shall not increase the existing average annual radionuclide concentrations in water withdrawn from that special source of ground water by more than the limits established in 191.16(a).

191.17 Alternative Provisions for Disposal

The Administrator may, by rule, substitute for any of the provisions of Subpart B alternative provisions chosen after:

(a) the alternative provisions have been proposed for public comment in the FEDERAL REGISTER together with information describing the costs, risks,

and benefits of disposal in accordance with the alternative provisions and the reasons why compliance with the existing provisions of Subpart B appears inappropriate;

(b) a public comment period of at least 90 days has been completed, during which an opportunity for public hearings in affected areas of the country has been provided; and

(c) the public comments received have been fully considered in developing the final version of such alternative provisions.

191.18 Effective Date

The standards in this Subpart shall be effective on [60 days after publication in the FEDERAL REGISTER].

APPENDIX A - TABLE FOR SUBPART B

TABLE 1 - RELEASE LIMITS FOR CONTAINMENT REQUIREMENTS
(Cumulative Releases to the Accessible Environment for 10,000 Years After Disposal)

Radionuclide	Release Limit per 1000 MTHM or other unit of waste (see Notes) (curies)
Americium-241 or -243	100
Carbon-14	100
Cesium-135 or -137	1000
Iodine-129	100
Neptunium-237	100
Plutonium-238, -239, -240, or -242	100
Radium-226	100
Strontium-90	1000
Technetium-99	10000
Thorium-230 or -232	10
Tin-126	1000
Uranium-233, -234, -235, -236, or -238	100
Any other alpha-emitting radionuclide with a half-life greater than 20 years	100
Any other radionuclide with a half-life greater than 20 years that does not emit alpha particles	1000

Application of Table 1

NOTE 1: Units of Waste. The Release Limits in Table 1 apply to the amount of wastes in any one of the following:

(a) an amount of spent nuclear fuel containing 1,000 metric tons of heavy metal (MTHM) exposed to a burnup between 25,000 megawatt-days per metric ton of heavy metal (MWd/MTHM) and 40,000 MWd/MTHM;

(b) the high-level radioactive wastes generated from reprocessing each 1,000 MTHM exposed to a burnup between 25,000 MWd/MTHM and 40,000 MWd/MTHM;

(c) each 100,000,000 curies of gamma or beta-emitting radionuclides with half-lives greater than 20 years but less than 100 years (for use as discussed in Note 5 or with materials that are identified by the Commission as high-level radioactive waste in accordance with part B of the definition of high-level waste in the NWPA);

(d) each 1,000,000 curies of other radionuclides (i.e., gamma or beta-emitters with half-lives greater than 100 years or any alpha-emitters with half-lives greater than 20 years) (for use as discussed in Note 5 or with materials that are identified by the Commission as high-level radioactive waste in accordance with part B of the definition of high-level waste in the NWPA); or

(e) an amount of transuranic (TRU) wastes containing one million curies of alpha-emitting transuranic radionuclides with half-lives greater than 20 years.

NOTE 2: Release Limits for Specific Disposal Systems. To develop Release Limits for a particular disposal system, the quantities in Table 1 shall be adjusted for the amount of waste included in the disposal system compared to the various units of waste defined in Note 1. For example:

(a) If a particular disposal system contained the high-level wastes from 50,000 MTHM, the Release Limits for that system would be the quantities in Table 1 multiplied by 50 (50,000 MTHM divided by 1,000 MTHM).

(b) If a particular disposal system contained three million curies of alpha-emitting transuranic wastes, the Release Limits for that system would be the quantities in Table 1 multiplied by three (three million curies divided by one million curies).

(c) If a particular disposal system contained both the high-level wastes from 50,000 MTHM and 5 million curies of alpha-emitting transuranic wastes, the Release Limits for that system would be the quantities in Table 1 multiplied by 55:

$$\frac{50{,}000 \text{ MTHM}}{1{,}000 \text{ MTHM}} + \frac{5{,}000{,}000 \text{ curies TRU}}{1{,}000{,}000 \text{ curies TRU}} = 55$$

NOTE 3: Adjustments for Reactor Fuels with Different Burnup. For disposal systems containing reactor fuels (or the high-level wastes from reactor fuels) exposed to an average burnup of less than 25,000 MWd/MTHM or greater than 40,000 MWd/MTHM, the units of waste defined in (a) and (b) of Note 1 shall be adjusted. The unit shall be multiplied by the ratio of 30,000 MWd/MTHM divided by the fuel's actual average burnup, except that a value of 5,000 MWd/MTHM may be used when the average fuel burnup is below 5,000 MWd/MTHM and a value of 100,000 MWd/MTHM shall be used when the average fuel burnup is above 100,000 MWd/MTHM. This adjusted unit of waste shall then be used in determining the Release Limits for the disposal system.

For example, if a particular disposal system contained only high-level wastes with an average burnup of 3,000 MWd/MTHM, the unit of waste for that disposal system would be:

$$1{,}000 \text{ MTHM} \times \frac{(30{,}000 \text{ MWd/MTHM})}{(5{,}000 \text{ MWd/MTHM})} = 6{,}000 \text{ MTHM}$$

If that disposal system contained the high-level wastes from 60,000 MTHM (with an average burnup of 3,000 MWd/MTHM), then the Release Limits for that system would be the quantities in Table 1 multiplied by ten:

$$\frac{60{,}000 \text{ MTHM}}{6{,}000 \text{ MTHM}} = 10$$

which is the same as:

$$\frac{60{,}000 \text{ MTHM}}{1{,}000 \text{ MTHM}} \times \frac{(5{,}000 \text{ MWd/MTHM})}{(30{,}000 \text{ MWd/MTHM})} = 10$$

NOTE 4: Treatment of Fractionated High-Level Wastes. In some cases, a high-level waste stream from reprocessing spent nuclear fuel may have been (or will be) separated into two or more high-level waste components destined for different disposal systems. In such cases, the implementing agency may allocate the Release Limit multiplier (based upon the original MTHM and the average fuel burnup of the high-level waste stream) among the various disposal systems as it chooses, provided that the total Release Limit multiplier used for that waste stream at all of its disposal systems may not exceed the Release Limit multiplier that would be used if the entire waste stream were disposed of in one disposal system.

NOTE 5: Treatment of Wastes with Poorly Known Burnups or Original MTHM. In some cases, the records associated with particular high-level waste streams may not be adequate to accurately determine the original metric tons of heavy metal in the reactor fuel that created the waste, or to determine the average burnup that the fuel was exposed to. If the uncertainties are such that the original amount of heavy metal or the average fuel burnup for particular high-level waste streams cannot be quantified, the units of waste derived from (a) and (b) of Note 1 shall no longer be used. Instead, the units of waste defined in (c) and (d) of Note 1 shall be used for such high-level waste streams. If the uncertainties in such information allow a range of values to be associated with the original amount of heavy metal or the average fuel burnup, then the calculations described in previous Notes will be conducted using the values that result in the smallest Release Limits, except that the Release Limits need not be smaller than those that would be calculated using the units of waste defined in (c) and (d) of Note 1.

NOTE 6: Use of Release Limits to Determine Compliance with 191.13. Once release limits for a particular disposal system have been determined in accordance with Notes 1 through 5, these release limits shall be used to determine compliance with the requirements of 191.13 as follows. In cases where a mixture of radionuclides is projected to be released to the accessible environment, the limiting values shall be determined as follows: For each

radionuclide in the mixture, determine the ratio between the cumulative release quantity projected over 10,000 years and the limit for that radionuclide as determined from Table 1 and Notes 1 through 5. The sum of such ratios for all the radionuclides in the mixture may not exceed one with regard to 191.13(a)(1) and may not exceed ten with regard to 191.13(a)(2).

For example, if radionuclides A, B, and C are projected to be released in amounts Q_a, Q_b, and Q_c, and if the applicable Release Limits are RL_a, RL_b, and RL_c, then the cumulative releases over 10,000 years shall be limited so that the following relationship exists:

$$\frac{Q_a}{RL_a} + \frac{Q_b}{RL_b} + \frac{Q_c}{RL_c} \leq 1$$

APPENDIX B - GUIDANCE FOR IMPLEMENTATION OF SUBPART B

[NOTE: The supplemental information in this appendix is not an integral part of 40 CFR 191. Therefore, the implementing agencies are not bound to follow this guidance. However, it is included because it describes the Agency's assumptions regarding the implementation of Subpart B. This appendix will appear in the Code of Federal Regulations.]

The Agency believes that the implementing agencies must determine compliance with 191.13, 191.15, and 191.16 of Subpart B by evaluating long-term predictions of disposal system performance. Determining compliance with 191.13 will also involve predicting the likelihood of events and processes that may disturb the disposal system. In making these various predictions, it will be appropriate for the implementing agencies to make use of rather complex computational models, analytical theories, and prevalent expert judgment relevant to the numerical predictions. Substantial uncertainties are likely to be encountered in making these predictions. In fact, sole reliance on these numerical predictions to determine compliance may not be appropriate; the implementing agecies may choose to supplement such predictions with qualitative judgements as well. Because the procedures for determining compliance with Subpart B have not been formulated and tested yet, this appendix to the rule indicates the Agency's assumptions regarding certain issues that may arise when implementing sections 191.13, 191.15, and 191.16. Most of this guidance applies to any type of disposal system for the wastes covered by this rule. However, several sections apply only to disposal in mined geologic repositories and would be inappropriate for other types of disposal systems.

Consideration of Total Disposal System. When predicting disposal system performance, the Agency assumes that reasonable projections of the protection expected from all of the engineered and natural barriers of a disposal system will be considered. Portions of the disposal system should not be disregarded, even if projected performance is uncertain, except for portions of the system that make negligible contributions to the overall isolation provided by the disposal system.

Scope of Performance Assessments. Section 191.13 requires the implementing agencies to evaluate compliance through performance assessments as defined in Section 191.12(q). The Agency believes that such performance assessments need not consider categories of events or processes that are estimated to have less than one chance in 10,000 of occurring over 10,000 years. Furthermore, the performance assessments need not evaluate in detail the releases from all events and processes estimated to have a greater likelihood of occurrence. Some of these events and processes may be omitted from the performance assessments if there is a reasonable expectation that the remaining probability distribution of cumulative releases would not be significantly changed by such omissions.

Compliance with Section 191.13. Whenever practicable, the implementing agency should assemble all of the results of the performance assessments to determine compliance with 191.13 into a "complementary cumulative distribution function" that indicates the probability of exceeding various levels of cumulative release. When the uncertainties in parameters are considered in a performance assessment, the effects of the uncertainties considered can be incorporated into a single such distribution function for

each disposal system considered. The Agency assumes that a disposal system can be considered to be in compliance with 191.13 if this single distribution function meets the requirements of 191.13(a).

Compliance with Sections 191.15 and 191.16. When the uncertainties in undisturbed performance of a disposal system are considered, the implementing agencies need not require that a very large percentage of the range of estimated radiation exposures or radionuclide concentrations fall below limits established in 191.15 and 191.16, respectively. The Agency assumes that compliance can be determined based upon "best estimate" predictions (e.g., the mean or the median of the appropriate distribution, whichever is higher).

Institutional Controls. To comply with 191.14(a), the implementing agency will assume that none of the active institutional controls prevent or reduce radionuclide releases for more than 100 years after disposal. However, the Federal Government is committed to retaining ownership of all disposal sites for spent nuclear fuel and high-level and transuranic radioactive wastes and will establish appropriate markers and records, consistent with 191.14(c). The Agency assumes that, as long as such passive institutional controls endure and are understood, they: (1) can be effective in deterring systematic or persistent exploitation of these disposal sites; and (2) can reduce the likelihood of inadvertent, intermittent human intrusion to a degree to be determined by the implementing agency. However, the Agency believes that passive institutional controls can never be assumed to eliminate the chance of inadvertent and intermittent human intrusion into these disposal sites.

Consideration of Inadvertent Human Intrusion into Geologic Repositories. The most speculative potential disruptions of a mined geologic repository are those associated with inadvertent human intrusion. Some types of intrusion would have virtually no effect on a repository's containment of waste. On the other hand, it is possible to conceive of intrusions (involving widespread societal loss of knowledge regarding radioactive wastes) that could result in major disruptions that no reasonable repository selection or design precautions could alleviate. The Agency believes that the most productive consideration of inadvertent intrusion concerns those realistic possibilities that may be usefully mitigated by repository design, site selection, or use of passive controls (although passive institutional controls should not be assumed to completely rule out the possibility of intrusion). Therefore, inadvertent and intermittent intrusion by exploratory drilling for resources (other than any provided by the disposal system itself) should be the most severe intrusion scenario considered by the implementing agencies. Furthermore, the implementing agencies should assume that passive institutional controls or the intruders' own exploratory procedures are adequate for the intruders to soon detect, or be warned of, the incompatibility of the area with their activities.

Frequency and Severity of Inadvertent Human Intrusion into Geologic Repositories. The implementing agencies should consider the effects of each particular disposal system's site, design, and passive institutional controls in judging the likelihood and consequences of such inadvertent exploratory drilling. However, the Agency assumes that the likelihood of such inadvertent and intermittent drilling need not be taken to be greater

than 30 boreholes per square kilometer of repository area per 10,000 years for geologic repositories in proximity to sedimentary rock formations, or more than 3 boreholes per square kilometer per 10,000 years for repositories in other geologic formations. Furthermore, the Agency assumes that the consequences of such inadvertent drilling need not be assumed to be more severe than: (1) direct release to the land surface of all the ground water in the repository horizon that would promptly flow through the newly created borehole to the surface due to natural lithostatic pressure--or (if pumping would be required to raise water to the surface) release of 200 cubic meters of ground water pumped to the surface if that much water is readily available to be pumped; and (2) creation of a ground water flow path with a permeability typical of a borehole filled by the soil or gravel that would normally settle into an open hole over time--not the permeability of a carefully sealed borehole. Of course, the implementing agencies can develop less severe assumptions than these as appropriate to the expectations for particular disposal systems.

ENCLOSURE 4

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

OFFICE OF THE
SECRETARY

May 17, 1984 COMJA-84-4

MEMORANDUM FOR: William J. Dircks, Executive Director for Operations

FROM: Samuel J. Chilk, Secretary

SUBJECT: PROPOSED EPA HIGH-LEVEL WASTE STANDARDS

In accordance with Commissioner Asselstine's memorandum of April 25, 1984, subject as above, the Commission would like the staff to continue discussion with EPA on high-level waste standards. These discussions should include the assurance requirements in the EPA standard, the procedural requirements and other elements of concern. Regarding assurance requirements, since many of the seven EPA assurance requirements are already in NRC's Part 60 high-level waste regulations, the NRC staff and EPA should attempt to come to a mutual agreement on the remaining issues with the understanding that NRC would agree to incorporate the agreed upon requirements into Part 60.

Commissioner Roberts commented that staff should check with the Commission before anything is finalized -- also keep the jurisdiction question in context of overall EPA/NRC relationship.

Attachment:
4/25/84 Memo

cc: Chairman Palladino
Commissioner Gilinsky
Commissioner Roberts
Commissioner Asselstine
Commissioner Bernthal
OGC
OPE

Enclosure 1

REQUEST REPLY BY 5/2

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

April 25, 1984

OFFICE OF THE
COMMISSIONER

COMJA-84-4

MEMORANDUM FOR: Chairman Palladino
Commissioner Gilinsky
Commissioner Roberts
Commissioner Bernthal

FROM: James K. Asselstine

SUBJECT: PROPOSED EPA HIGH-LEVEL WASTE STANDARDS

On April 11, 1984, I met with Dan Egan of EPA along with Commissioner assistants, OGC and NMSS on the issues regarding the proposed EPA high-level waste standard and the status of resolving differences between NRC and EPA. The major sticking points between NRC and EPA appear to be disagreements over the assurance requirements, the procedural requirements and some of the definitions in the EPA standard.

The meeting with Mr. Egan focused mainly on the assurance requirements. EPA maintains that the assurance requirements are an important part of their rule. As you will recall, NRC has taken the position in letters to EPA dated May 10 and 11, 1983 that the assurance requirements are a matter of implementation and thus are beyond EPA's jurisdiction. Mr. Egan laid out three options on how to deal with this jurisdictional issue. The first option was to keep the assurance requirements in the EPA standard with the understanding that this standard for high-level waste is unique and is in no way intended to set a precedent for EPA setting assurance requirements in other areas such as low level waste. The second option was to remove the assurance requirements from the EPA standard and issue them as Federal Radiation Council guidance. EPA expressed doubts as to the likelihood of receiving OMB clearance for this approach. The third option was to remove the assurance requirements from the rule altogether. If this option were adopted, EPA would feel compelled to reduce the release limits in the standard in order to protect the public health and safety. This approach would mean the EPA would have to renotice the rule which could extend the process for at least a year. Therefore, EPA is presently proceeding with the first option. I suggested a fourth possible approach. Since many of the seven EPA assurance requirements are already in NRC's Part 60 high-level waste regulations, the NRC staff and EPA should attempt to come to a mutual agreement on the remaining issues with the understanding that NRC would agree to incorporate the agreed upon requirements into Part 60. This would eliminate the jurisdictional confrontation.

On the following day, I met with Bob Browning and Mike Bell of NMSS and Bill Olmstead of ELD to get the staff's views on the various options as

elements of the EPA Standard can be worked out at the staff levels. It has become apparent to me that the staff feels bound by the Commission's May 10 and 11, 1983 letters to EPA which challenge their authority to set assurance and procedural requirements. I recommend that the Commission direct the staff to continue discussion with EPA in an attempt to work out these differences and come to a common position. I would suggest that these discussions include the assurance requirements in the EPA standard, the procedural requirements and other elements of concern to the staff. With regard to the assurance requirements, I recommend that the Commission direct the staff to pursue the fourth option described above with the understanding that the Commission will incorporate the agreed upon requirements into Part 60. Some sort of breakthrough in this impasse could be timely in view of the Chairman's upcoming meeting with Administrator Ruckelshaus.

SECY, please track responses.

cc: OGC
OPE
EDO
SECY

ENCLOSURE 5

EPA ASSURANCE REQUIREMENTS AND

PROPOSED CHANGES TO PART 60

1.a. EPA Assurance Requirement:

(a) Active institutional controls over disposal sites should be maintained for as long a period of time as is practicable after disposal; however, performance assessments that assess isolation of the wastes from the accessible environment shall not consider any contributions from active institutional controls for more than 100 years after disposal.

(In Working Draft No. 8 "active institutional control" means: (1) controlling access to a disposal site by any means other than passive institutional controls, (2) performing maintenance operations or remedial actions at a site, (3) controlling or cleaning up releases from a site, or (4) monitoring parameters related to disposal system performance.)

b. Discussion:

The Commission's existing provisions (§60.52) related to license termination will determine the length of time for which institutional controls should be maintained, and there is therefore no need to alter Part 60 based on the first part of this assurance requirement.

The second part of this assurance requirement would require that "active" institutional controls be excluded from consideration (after 100 years) when the Commission assesses the isolation characteristics of a repository. The staff understands that remedial actions (or other active institutional controls) would not be relied upon under Part 60 to compensate for a poor site or inadequate engineered barriers. However, in the definition of "unanticipated events and processes," Part 60 expressly contemplates that, in assessing human intrusion scenarios, the Commission would assume that "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" (emphasis added). Therefore, it might appear at first blush that Part 60 is at odds with the draft EPA standards.

The "remedial action" is not, however, the same in the two documents. The EPA standards have in mind a planned capability to maintain a site and, if necessary, to take remedial action at a site in order to assure that isolation is achieved. The staff agrees that such a capability should not be relied upon. The extent to which corrective action may be taken after an unanticipated intrusion occurs is an entirely different matter. The Commission may wish to consider, for example, the extent to which the application of the limited societal response capability assumed by the rule (e.g., sealing boreholes consistent with current petroleum industry practice) could reduce the likelihood of releases exceeding the values specified in the EPA standards, or could eliminate certain hypothetical scenarios such as systematic and persistent intrusions into a site.

The NRC and EPA staffs are in substantive agreement that planned remedial capabilities should not be relied upon for repository safety, and agree that the wording below should be proposed for public comment. The EPA staff may provide comment on this wording to help clarify the distinction between expected societal responses versus planned capabilities for remedial actions.

c. Proposed Changes to Part 60:

Add definitions to §60.2 as follows:

"Active institutional control" means: (1) controlling access to a site by any means other than passive institutional controls, (2) performing maintenance operations or remedial actions at a site, (3) controlling or cleaning up releases from a site, or (4) monitoring parameters related to geologic repository performance.

"Passive institutional control" means: (1) permanent markers placed at a site, (2) public records and archives, (3) government ownership and regulations regarding land or resource use, and (4) other methods of preserving knowledge about the location, design, and contents of a geologic repository.

Add a new §60.114 as follows:

§60.114 Institutional Controls

Neither active nor passive institutional controls shall be deemed to assure compliance with the overall performance objective set out at § 60.112 for more than 100 years after disposal. However, the effects of institutional controls may be considered in assessing, for purposes of that section, the likelihood and consequences of processes and events affecting the geologic setting.

2.a. EPA Assurance Requirement:

(b) Disposal systems shall be monitored after disposal to detect any substantial and detrimental deviations from expected performance. This monitoring shall be done with techniques that do not jeopardize the isolation of the wastes and shall be conducted until there are no significant concerns to be addressed by further monitoring.

b. Discussion:

Part 60 currently requires completion of a performance confirmation program prior to repository closure, but does not require monitoring during the period following closure but prior to license termination. The Commission chose not to require post-closure monitoring because of doubts about the usefulness of such monitoring and because of fears that monitoring in or near a repository after closure could degrade repository performance. The type of monitoring envisioned by EPA does not involve direct monitoring of the repository itself (which might degrade repository performance). Rather, EPA proposes monitoring of such parameters as regional groundwater flow characteristics. The staff agrees that such monitoring may, in some cases, provide desirable information beyond that which would be obtained in the performance confirmation program which Part 60 now requires to be continued until permanent closure. The staff therefore proposes to require monitoring as an extension of performance confirmation, as appropriate, when such monitoring can be conducted without degrading repository performance.

c. Proposed Changes to Part 60:

Add to §60.21(c) a new ¶ (9) as follows:

(9) A general description of the program for post-permanent closure monitoring of the geologic repository.

Renumber the current ¶ (9) through (15) accordingly.

Revise §60.51(a)(1) to read:

(1) A detailed description of the program for post-permanent closure monitoring of the geologic repository in accordance with §60.144. As a minimum, this description shall:
(i) identify those parameters that will be monitored;
(ii) indicate how each parameter will be used to evaluate the expected performance of the repository; and
(iii) discuss the length of time over which each parameter should be monitored to adequately confirm the expected performance of the repository.

Add to §60.52(c) a new ¶ (3) as follows:

(3) That the results available from the post-permanent closure monitoring program confirm the expectation that the repository will comply with the performance objectives set out at §60.112 and §60.113; and

Renumber the current ¶ (3) as ¶ (4).

Add a new §60.144 as follows:

§60.144 Monitoring After Permanent Closure

A program of monitoring shall be conducted after permanent closure to monitor all repository characteristics which can reasonably be expected to provide material confirmatory information regarding long-term repository performance, provided that the means for conducting such monitoring will not degrade repository performance. This program shall be continued until termination of a license.

Include in the Supplementary Information of the Federal Register notice proposing these changes the following paragraph:

Part 60 currently requires DOE to carry out a performance confirmation program which is to continue until repository closure. Part 60 does not now require monitoring after repository closure because of the likelihood that post-closure monitoring of the underground facility would degrade repository performance. The Commission recognizes, however, that monitoring such parameters as regional groundwater flow characteristics may, in some cases, provide desirable information beyond that which would be obtained in the performance confirmation program. The proposed requirement for post-permanent closure monitoring requires that such monitoring be continued until termination of a license. The Commission intends that a repository license not be terminated until such time as the Commission is convinced that there is no significant additional information to be obtained from such monitoring which would be material to a finding of reasonable assurance that long-term repository performance would be in accordance with the established performance objectives.

3.a. EPA Assurance Requirement:

(c) Disposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.

b. Discussion:

No revisions to Part 60 are needed. §60.21(c)(8), 60.51(a)(2), and 60.121 contain equivalent provisions.

4.a. EPA Assurance Requirement:

(d) Disposal systems shall use several different types of barriers to isolate the wastes from the environment. Both engineered and natural barriers shall be included.

b. Discussion:

The staff considers that Part 60 already requires use of both engineered and natural barriers. Nevertheless, in order to avoid any possible confusion regarding the provisions of §60.113(b), the staff proposes to add additional clarifying language to §60.113.

c. Proposed Changes to Part 60:

Add a new ¶ (d) to §60.113 as follows:

(d) Notwithstanding the provisions of (b) above, the geologic repository shall incorporate a system of multiple barriers, both engineered and natural.

In the Supplementary Information of the Federal Register notice proposing these changes include the following:

Questions might arise regarding the types of engineered or natural materials or structures which would be considered to constitute barriers. The Commission notes that §60.2 now contains the definition: "'Barrier' means any material or structure that prevents or substantially delays movement of water or radionuclides." Thus, the Commission considers that the new paragraph to be added to §60.113 will confirm the Commission's commitment to a multiple barrier approach as contemplated by Section 121(b)(1)(B) of the Nuclear Waste Policy Act.

5.a. EPA Assurance Requirement:

(e) Places where there has been mining for resources, or where there is a reasonable expectation of exploration for scarce or easily accessible resources, or where there is a significant concentration of any material that is not widely available from other sources, should be avoided in selecting disposal sites. Resources to be considered shall include minerals, petroleum or natural gas, valuable geologic formations, and ground waters that are either irreplaceable because there is no reasonable alternative source of drinking water available for substantial populations or that are vital to the preservation of unique and sensitive ecosystems. Such places shall not be used for disposal of the wastes covered by this Part unless the favorable characteristics of such places compensate for their greater likelihood of being disturbed in the future.

b. Discussion:

Part 60 contains provisions equivalent to this assurance requirement in §60.122(c)(17), (18) and (19). Part 60 does not, however, address "a significant concentration of any material that is not widely available from other sources."

It is possible that the economic value of materials could change in the future in a way which might attract future exploration or development detrimental to repository performance. The staff proposes to add an additional potentially adverse condition to Part 60 related to significant concentrations of material that is not widely available from other sources. As with the other potentially adverse conditions, the presence of such a condition would require an evaluation of the effect of the condition on repository performance as specified in §60.122(a)(2)(ii), but would not preclude selection of a site for repository construction. (It should be noted that DOE's siting guidelines contain an identical provision in 10 CFR 960.4-2-8-1.)

c. Proposed Changes to Part 60:

Add a new ¶ (18) to §60.122(c) as follows:

(18) The presence of significant concentrations of any naturally-occurring material that is not widely available from other sources.

Renumber the current ¶ (18) through (21) accordingly.

6.a. EPA Assurance Requirement:

(f) Disposal systems shall be selected so that removal of most of the wastes is not precluded for a reasonable period of time after disposal.

b. Discussion:

EPA's concept of "removal" is significantly different from "retrieval" in Part 60. EPA wants to preclude disposal concepts such as deep well injection for which it would be virtually impossible to remove or recover wastes regardless of the time and resources employed. For a mined geologic repository wastes could be located and recovered, albeit at great cost, even after repository closure. EPA therefore considers that a repository complies with this assurance requirement, and no revision to Part 60 is needed.

ENCLOSURE 6

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

OFFICE OF THE
CHAIRMAN

The Honorable Lee Thomas
Administrator
U.S. Environmental Protection Agency
Washington, D. C. 20460

Dear Mr. Thomas:

On May 10 and 11, 1982 the Nuclear Regulatory Commission (NRC) submitted formal comments on the Environmental Protection Agency's proposed environmental standards for management and disposal of high-level radioactive wastes. Among other things, we stated our view that the proposed "assurance requirements" and "procedural requirements" contained in those proposed standards involved matters of implementation and thus went beyond the limits of EPA's jurisdiction.

In letters dated July 19 and August 15, 1984 Acting Chairman Roberts and Former Administrator Ruckelshaus, respectively, agreed that the staffs of EPA and NRC should attempt to develop modifications to Part 60 to incorporate the principles of EPA's proposed assurance and procedural requirements. EPA could then delete these requirements or make them applicable only to facilities not licensed by the NRC, eliminating any potential problems of jurisdictional overlap.

The NRC staff recently reported to the Commission several proposed changes to Part 60 which have been worked out by the NRC and EPA staff (text enclosed). The Commission finds the wording of these changes acceptable and, consistent with the provisions of the Administrative Procedure Act, will propose these changes for incorporation into Part 60 after publication of the final EPA high-level waste standards. The NRC staff anticipates submittal of a rulemaking package, incorporating both these wording changes and other conforming amendments, to the Commission within 120 days after publication of the final EPA standards.

I appreciate the cooperation shown by the EPA staff in working to reach this agreement.

Sincerely,

Nunzio J. Palladino, Chairman

Enclosure: Proposed changes to
10 CFR Part 60