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

OFFICE OF THE
SECRETARY

PDR

October 19, 1989

MEMORANDUM FOR: Teresa Neville, Acting Chief
Public Document Room

THRU: Sandy Showman, Chief
Correspondence and Records Branch

FROM: Andrew Bates, Chief
Operations Branch

SUBJECT: RELEASE OF DOCUMENT TO PDR

Attached for placement in the PDR is a copy of:

SECY-89-319 - Implementation of the U.S. Environmental Protection Agency's High-Level Waste Disposal Standards

This document is being placed in the PDR at Commissioner Curtiss' request and with other Commissioners' offices and EDO's concurrence.

Attachment:
As stated

cc: EDO
DCS - P1-124

IFOR
1/1

PDR

POLICY ISSUE

(Notation Vote)

October 17, 1989 SECY-89-319

For: The Commissioners

From: James M. Taylor
Acting Executive Director
for Operations

Subject: IMPLEMENTATION OF THE U. S. ENVIRONMENTAL PROTECTION AGENCY'S HIGH-LEVEL WASTE DISPOSAL STANDARDS

Purpose: In response to Staff Requirements Memoranda M890711A of July 21 and M890726B of August 8, 1989, this paper informs the Commission of: (1) the status of the U. S. Environmental Protection Agency's (EPA's) high-level waste (HLW) disposal standards development; (2) the U. S. Nuclear Regulatory Commission (NRC) staff's reevaluation of its views on implementation of probabilistic standards; and (3) the status of the staff's reevaluation of the use of such quantitative standards by development of procedures and rules that are needed for implementing the standards.

To request Commission approval of staff plans to pursue a continuing evaluation of the EPA standards by way of rulemakings and interactions with EPA's staff.

Summary: EPA, pursuant to the provisions of the Nuclear Waste Policy Act of 1982 (Pub. L. 97-425), is responsible for development of environmental radiation protection standards for disposal of HLW. NRC is responsible for licensing the disposal repository, but its licensing judgment must be based on compliance with the EPA standards. EPA promulgated its standards in 1985, but the standards were vacated in 1987 by the U. S. Court of Appeals. They are expected to be reissued for public comment in late 1989, and some parts of the standards are expected to remain unchanged from those promulgated earlier. Specifically, the probabilistic nature of the "containment requirements" section, which was initially opposed by the Commission, is expected to be retained. The staff's reevaluation of its views on implementation of probabilistic standards in a HLW repository licensing review and the basis for the staff's

CONTACT:
Daniel Fehringer, NMSS
492-0426

1A

~~8910230144~~ 68pp.

views are presented in this paper. This paper also discusses U.S. Department of Energy's (DOE's) plans for demonstrating compliance with the standards and the NRC staff's plans for rulemakings related to implementation of the standards.

Before EPA issues revised standards for public comment, the staff will provide the Commission an evaluation of the technical basis from which the revised standards were derived, and any comments the staff considers should be provided to EPA before publication of those standards.

Background:

HLW (including spent nuclear fuel) is highly radiotoxic and will remain hazardous for thousands of years. Projecting the performance of the natural and man-made components of a repository over such a long time will involve uncertainties that may be unprecedented in engineering and risk assessment practice. The challenge facing NRC and EPA is to develop a regulatory approach that will accommodate these uncertainties. Such a regulatory approach should allow licensing decisions to be reached on acceptance of suitable sites and designs and rejection of unsuitable ones, while avoiding reliance on overly conservative approaches that would excessively increase disposal costs or might eliminate suitable repositories from consideration.

In the late 1970's, EPA began development of environmental radiation protection standards for disposal of HLW. As the benchmark for overall repository system safety, those standards address: (1) the time period after disposal for which repository performance must be projected (at least 10,000 years); (2) the conditions for which performance is to be assessed (both expected performance and performance following reasonably foreseeable disruptive processes and events); and (3) the maximum allowable contamination of groundwaters, doses to individuals, and population impacts. The standards reflect an unprecedented societal concern over the perceived long-term hazards of HLW, and an apparent societal willingness to bear the cost of implementing the safest disposal technology that is reasonably achievable.

On December 29, 1982, EPA published its proposed standards (40 CFR Part 191, 47 FR 58196) and solicited public comment on them. Of particular note was the probabilistic nature of the standards, which endorsed a non-linear, inverse relationship between the allowable size of a release and the likelihood that a release would occur. NRC's comments

(dated May 10 and 11, 1983) objected to the probabilistic nature of the standards, stating, in part, that "[t]he numerical probabilities in [the standards] would require a degree of precision which is unlikely to be achievable in evaluating a real waste disposal system." The NRC comment went on to explain 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."

EPA retained its numerical standard, but in response to NRC's comments, EPA added wording to the final standards which was virtually identical to the wording of Section 101 of 10 CFR Part 60. This text recognized the long time involved and the associated substantial uncertainties in projecting HLW repository performance, and emphasized that a "reasonable expectation," rather than absolute proof, is to be the test of compliance with the standard.

In an additional attempt to provide flexibility for implementation of the standards, EPA also provided that quantitative predictions of releases from a repository were to be incorporated into an overall probability distribution only "to the extent practicable." This phrase appears to allow at least some additional discretion for NRC to incorporate qualitative considerations into its decision-making, rather than placing sole reliance on numerical projections of repository performance.

Based on these changes in EPA's standards, the NRC staff withdrew its objection to the standards. In SECY-85-272, dated October, 1985, the staff informed the Commission that "[a]lthough 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." The Commission did not disagree with the staff's assessment and, on September 19, 1985, EPA promulgated final environmental radiation protection standards for disposal of HLW (50 FR 38066). The final standards (40 CFR Part 191) included provisions for (1) groundwater protection; (2) individual protection; and (3) total release of radioactive material to the environment for 10,000 years after waste disposal. The latter requirement, the "containment requirements," retained its probabilistic format, imposing more restrictive release limits for relatively likely releases than for those less likely to occur. Included in the containment requirements was the

qualifying wording referred to previously, recognizing the need for non-quantitative considerations when evaluating compliance with the probabilistic standards. The requirements for groundwater and individual protection were much less encompassing, being limited to "undisturbed performance" for only the first 1,000 years after waste disposal.

A 1987 Federal court decision remanded these standards for further consideration by EPA. The basis for the remand involved the procedures used to issue the groundwater and individual protection requirements and inconsistencies between those requirements and other EPA standards. The probabilistic containment requirements were not found to be defective. A recent internal EPA (working) draft of the revised EPA standards indicates that most, but not all, changes under consideration are related to the court decision, and that the probabilistic portion of the standards is likely to be retained largely unchanged.[1]

EPA's pending revision and reissuance of its HLW standards has provided an opportunity for the NRC staff to reexamine its earlier views on implementation of those standards. In particular, the additional experience acquired by the staff since 1985 in probabilistic risk assessments for power plants and application of NRC's safety goals will be drawn on to determine whether the staff still retains its confidance that probabilistic standards can be implemented in an NRC licensing review.

Discussion:

EPA developed its standards by evaluating the performance of several hypothetical repositories and by considering the costs and benefits associated with alternatives such as improved engineered barriers. In describing the standards, EPA stated that ". . . the Agency [EPA] has been able to develop standards for the management and disposal of these wastes that are both reasonably achievable - with little, if any, effort beyond that already planned for commercial wastes - and that limit risks to levels that the Agency believes are clearly acceptably small" (50FR38070, September 19, 1985). EPA's standards are thus more a generic quantification of "as low as reasonably achievable" (ALARA) than a safety limit based solely on consideration of acceptable levels of risk.

[1] A second working draft is expected later this fall. The staff plans to provide specific written comments to EPA on the second working draft. The staff will inform the Commission of any problems and the staff's recommendations for resolving them prior to providing the comments to EPA.

The probabilistic portion of the EPA HLW standards was derived so that population impacts would be restricted to 1000 premature cancer deaths over 10,000 years for a repository inventory of 100,000 metric tonnes of spent fuel (the approximate inventory to be generated by all currently operating power plants in the U.S.). This average population risk (10^{-1}/yr) is intermediate between the population risk typically posed by a single commercial nuclear power plant (10^{-2}/yr) and that represented by all commercial nuclear power plants in the U.S. (10^{0}/yr). Thus, although the standards represent something of a generic quantification of ALARA, the level of impacts allowed by the standards does not appear to be significantly different from that currently presented by operating nuclear power plants.

However, it is important to recognize that the achievability of this risk level by a real repository has not yet been tested by analysis and thus achievability by a real repository is uncertain. DOE's current efforts in developing performance assessment capabilities for the civilian repository program may provide significant insights, as will DOE's experience in developing performance assessments for the proposed repository for defense transuranic wastes, i.e., the Waste Isolation Pilot Plant (WIPP). The EPA has proposed that the DOE publish the performance assessments for WIPP in a supplement to the Environmental Impact Statement for that facility, where all can see and comment on it.

An effort by a team of staff from the Offices of Nuclear Material Safety and Safeguards and Nuclear Regulatory Research to conduct preliminary analyses of repository performance will be a further step in answering this question. Meanwhile, the staff intends to give substantial attention to the proposed revisions of the EPA HLW standards. Prior to publication of EPA's revised standards, the staff will provide the Commission an evaluation of the technical basis from which those standards were derived, and any comments the staff considers should be provided to EPA before public comments are requested.

The Nature of the Problem

Differing views on implementation of the EPA HLW standards ultimately derive from different perceptions of the statistical rigor required for estimates of the probabilities of potentially disruptive events such as fault movement, volcanic activity and climate change.

A rigorous application of EPA's numerical standards would require estimates of the probabilities of potentially disruptive events that are derived from a statistical data base of previous occurrences of those events at the repository site. Some of the events of interest may be relatively rare compared to the length of the geologic record for a repository site. A recent National Research Council report[2] dealing with probabilistic seismic hazard analysis noted that the relatively short historical record of seismic activity requires reliance on other techniques when projecting seismic activity for thousands of years into the future. Moreover, some potential events may not even be evidenced in the geologic record (e.g., human-initiated events). Therefore, a rigorous application of the EPA standards would lead to the conclusion that the standards cannot be implemented in a licensing review. Indeed, this interpretation was exactly NRC's view of the standards when EPA proposed them for public comment in 1982.

EPA retained the numerical standard, but in response to NRC's concerns, EPA added text (previously mentioned), to its probabilistic containment requirements, recognizing the uncertainties involved in projecting repository performance over long time periods. Specifically, EPA stated that "[p]roof 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 . . . will be achieved." In Appendix B of the standards, EPA elaborated on its views on implementation of the standards. There, EPA stated:

> Determining compliance with [the standards] 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

[2] Panel on Seismic Hazard Analysis, Probabilistic Seismic Hazard Analysis, National Academy Press, Washington, D.C., 1988.

> predictions. In fact, sole reliance on these numerical predictions to determine compliance may not be appropriate; the implementing agencies may choose to supplement such predictions with qualitative judgments as well.

This text indicates that EPA did not intend to require that HLW repository licensing decisions be based solely on numerical probability estimates. Rather, EPA recognized that other, more qualitative considerations, such as the multiple-barrier, defense-in-depth concept imbedded in Part 60, would play a major role in evaluating the safety of a proposed repository. Although these statements by EPA characterize the use of non-quantitative factors as "supplemental to" the numerical standard and discuss flexibility in terms of treating uncertainties, the determination that must be made under EPA regulation is that there is a "reasonable expectation" that repository performance will comply with the numerical standard. Thus, while the language added by EPA to the rule and in the Supplementary Information tends to recognize qualitative considerations, an acceptable approach to implementation is still ambiguous and the governing standard is still the probabilistic numerical standard.

NRC Licensing Requirements

Part 60 currently contains language in Section 60.101 recognizing that "reasonable assurance" must have a somewhat different interpretation in repository licensing than it has in other NRC licensing decisions dealing with much shorter time periods. However, Part 60 does not now directly address implementation of the EPA standards, because those standards had not yet been developed when Part 60 was published. After promulgation of the EPA standards in 1985, the NRC published proposed "conforming amendments" to incorporate those standards into NRC's regulations (51 FR 22288, June 19, 1986). Those proposed amendments, which were withdrawn when the Court of Appeals remanded the EPA standard, would have added, to Part 60, text nearly identical to that cited from EPA's Appendix B, previously mentioned. In addition, a lengthy exposition on implementation of the EPA standards was presented in the Supplementary Information for the proposed amendments. The conforming amendments were intended to establish, through rulemaking, the regulatory basis to ensure that the EPA standards could be implemented in a workable manner in NRC's licensing process. As will be discussed later in this paper, the staff anticipates reinitiation of the

conforming amendments rulemaking (and initiation of one or more additional implementation rulemakings) when the EPA standards are reissued. The staff believes that the conduct of these rulemakings can and will ensure that the application of probabilistic analyses in NRC's licensing process will remain carefully judgmental, as intended by EPA and NRC.

Probability Estimates

As discussed previously, numerical probability estimates are not intended to be the sole basis for repository licensing decisions. However, neither are purely qualitative considerations. In the NRC staff's view, the EPA standards require a combination of the two types of information to be weighed when evaluating repository safety. Thus, the question still remains as to whether probability estimates for very unlikely events can be derived in any meaningful way.

The staff view is that probability estimates can be developed that are reasonably defensible -- at least for sites that are not unusually complex or geologically active. (Current information is not adequate to determine whether the Yucca Mountain, Nevada site is so geologically complex and active as to preclude meaningful probability estimates. This is a major issue to be resolved as soon as practicable during site characterization.) The basis for this view consists, in part, of an important distinction between the probability of occurrence of a potentially disruptive event and the probability that a release of radioactive material to the accessible environment will occur within the 10,000-year regulatory period addressed by the EPA standards. The very low probability contained in the standards -- one chance in 1,000, over 10,000 years -- refers to a release to the accessible environment rather than the occurrence of an event that might lead to the release. The probabilities of events and releases can be quite different because of three factors, referred to here as the resiliency, geometric, and time factors.

Resiliency factor. The nature of an HLW repository is such that it may be partially or totally resistant to some types of events. As an example, vibratory ground motion associated with fault movement is likely to be relatively unimportant because for most repository designs there are no components whose integrity is sensitive to vibratory ground motion. Similarly, drilling into a repository during the first 300 to 1000 years, when waste canisters

are required to be substantially intact, or drilling into an unsaturated zone repository, may cause little or no release unless the drilling directly strikes a canister. If a repository site were found with a groundwater travel time between the repository and the accessible environment approaching 10,000 years, that site would be resistant to most events other than those that could substantially shorten the groundwater travel time. The staff anticipates that, for some events, there will be no need for probability estimates, when it can be shown that the repository system is resistant to the disruptive effects of the events.

Geometric factor. Generally, the NRC and EPA regulations presume that a repository would be located within a larger, relatively homogeneous geologic setting. The geologic record of this larger area can provide the basis for estimating quite small probabilities of occurrence at the repository site. Consider, for example, a 10 km^2 repository site located within a 10,000 km^2 geologic setting. Events distributed randomly within the geologic setting, and with a recurrence interval of 10,000 years, would have a probability of occurrence at the repository site of only 10^{-7} per year. To the extent that potentially disruptive events can be considered random, the staff anticipates that this type of geometric consideration will be very significant in developing probability estimates.

Time factor. The time at which an event is postulated to occur is very important in evaluating its significance. First, radioactive decay rapidly reduces the radioactive inventory of some of the shorter-lived constituents of HLW. For events that disrupt only a very small fraction of a repository (e.g., drilling that strikes a waste canister) releases may not be significant unless the event occurs within the first few hundred years after repository closure. Second, the time lapse between the occurrence of an event and any resulting release may be quite long for a well-designed and sited repository. If, for example, the time for transport of released waste through the geosphere to the environment is 9000 years, only those events that occur within the first 1000 years after repository closure would be of regulatory significance in applying a 10,000-year standard. In both cases, the staff expects estimates of event probabilities to be more meaningful over these shorter time periods than they would be for 10,000 years.

In summary, there may be a difference of orders of magnitude between the probability that an event will occur and the probability that a release will result. Thus, in order to demonstrate that a release has a probability less than 1 chance in 1,000 over 10,000 years, it might only be necessary to show that the probability of an initiating event is less than 1 chance in 100,000 per year -- a short enough recurrence interval so that the geologic record should provide useful information. The predominant staff view is that meaningful, although not necessarily statistically rigorous, probability estimates can be made for repositories located at well-chosen sites -- i.e., sites that are not unusually complex or geologically active. In fact, the ability to develop the required probability estimates is a de-facto siting criterion for evaluating how well the site is understood and thus, how confident one can be of its future performance as part of a repository. As an example, the staffs of both DOE and NRC have been working to develop methods for predicting the probability of future volcanic activity at the Yucca Mountain, Nevada site, based on studies of the record of past volcanism near the site. These methods have been used to develop numerical estimates of site performance. The uncertainties in the probability estimates reflect technical concerns with the site which must be resolved before licensing, regardless of the standard which must be implemented to evaluate the site, rather than concerns with the ability to develop these numerical values. The NRC staff expressed its views in its comments on DOE's Site Characterization Plan (SCP), and additional discussions are planned for future meetings with DOE.

It is also possible to interpret the EPA standards to require a more rigorous statistical basis, in analyses incorporating significant conservatisms, for licensing. The only way to produce the required probability estimates would be to have available a site-specific geologic record approaching the age of the earth, and since such lengthy geologic records can seldom be found, rigid implementation of the EPA standards is likely to prove impossible. Also, the principal discussion has focused on geological examples. However, the EPA standard is not limited to geologic events but an entire spectrum of events that have the requisite likelihood. It can be extremely difficult to deal with the tail of a probability distribution of very large events with mean probabilities on the order of 10^{-7} to 10^{-8}/year. In the context of the EPA standard, it may also be difficult to deal with such things as climatic changes caused or affected by human activity over thousands

or years (e.g., greenhouse effect concerns resulting from increased fossil fuel use in recent decades).

Where from Here?

While the basic principles reflected in the EPA 1985 changes which recognized uncertainties and the need for non-quantifiable technical judgments in assuring repository performance remain valuable and important, additional clarification and guidance is required in order to deal with these issues. Specifically, additional clarification and guidance is needed to come to grips with how non-quantifiable technical judgments are to be used in assessing "reasonable expectation" of compliance with the governing numerical standard. The NRC staff has identified two basic courses of action available to the Commission -- (a) reaffirm its earlier acceptance of the probabilistic nature of the EPA standards provided that clarification of the treatment of key problem areas can be worked out (in this connection the staff will work closely with EPA to develop wording which could be used in either revised EPA standards or in NRC regulations, as appropriate, to minimize potential implementation problems and will remain alert to developments that could potentially alter this acceptance) or, (b) if the standards are now or subsequently judged not to be implementable, petition EPA to reissue the standards in an altered or non-probabilistic format. Combining these two basic courses of action with the prospect of developing implementing amendments to Part 60 has led the staff to identify the following four alternatives.

Alternative 1 -- Current EPA Standards and Part 60. In this alternative, the probabilistic portion of the EPA standards would be reissued with the same format as in 1985. The specific wording of the standards and of Part 60 would be revised only as necessary to resolve potential implementation problems and to ensure consistency between the two regulations. The main advantage of this alternative is that a complete set of regulatory standards could be established quickly, providing guidance to DOE for its repository development program. The main disadvantage of this alternative is that it might leave many contentious issues, such as acceptable methods for estimating the probabilities of disruptive events, to be resolved during a licensing review. The absence of clarification may make it virtually impossible to resolve difficult licensing issues within the three-year statutory time frame.

Alternative 2 -- Revised EPA Standards and Current Part 60
Several possible revisions to the EPA standards have been considered as ways to make the standards easier to implement. These include substitution of qualitative terms (likely, unlikely, etc.) for the numerical probabilities in the standards, restating the numerical probabilities in a less precise way (e.g., combining the numerical probabilities with modifiers such as "on the order of"), and making the standards consequence-based rather than risk-based (i.e., completely removing all probabilistic aspects of the standards). Amendments of these types might allow more flexibility for implementation of the EPA standards, but would be accompanied by significant uncertainties about interpretation of the standards. These greater uncertainties raise a different obstacle for the licensing process, namely, the lack of a clear standard of acceptability. The predominant view of the staff is that the current wording of the EPA standards represents a reasonable compromise between the goal of precise statement of the regulatory requirements of the standards and the desire for flexibility in implementing the standards. But, as discussed above, additional clarification and guidance is needed to address more clearly how non-quantifiable technical judgment may be used in lieu of or to fulfill the numerical standard. Since the fundamental issue is one of clarifying the EPA standard, this should be the responsibility of EPA, with substantial input from NRC concerning the specific nature of such clarification.

Alternative 3 -- Current or Revised EPA Standards and Revised Part 60. This alternative, which is currently being pursued by the staff, involves two phases. First, the staff will pursue an aggressive interaction with EPA during reissuance of its standards aimed at identification and resolution of potential implementation problems. To the extent possible the staff seeks to have EPA expand on its interpretation of the EPA standard. Second, the staff will amend Part 60 before a licensing review so as to resolve, where practicable, any remaining potentially contentious issues on implementation.[3] The staff currently plans three rulemakings related to implementation of the EPA HLW standards (see SECY-88-285, October 5, 1988). One will provide the basis for making site-specific determinations on the potentially disruptive events and

[3] Development of technical positions or regulatory guides, and interlocutory review by a licensing board for resolution of issues, are variations of this alternative.

processes that will need to be considered in developing HLW release scenarios. It will revise the current definitions of "anticipated" and "unanticipated" processes and events in Part 60. The revisions will specify a non-probabilistic method to be used for categorizing processes and events as "anticipated" or "unanticipated." The staff proposes this method because of its view that categorization on the basis of numerical probability estimates would be too uncertain to use as the primary basis for preliminary screening of events and processes.

A second rulemaking, referred to as the "conforming amendments," will incorporate directly into Part 60 all the substantive provisions of the EPA standards and will adopt any changes in terminology necessary for conformance between the two regulations. An earlier conforming rulemaking, previously discussed, was terminated when the EPA HLW standards were remanded by a decision of a Federal Appeals Court. The amendments currently contemplated will serve the same purpose as those previously initiated -- i.e., to reproduce within Part 60 all of the substantive requirements of the EPA standards and to eliminate any differences in terminology that might otherwise cause confusion during a licensing review.

As discussed earlier, it is the staff's intention to work closely with EPA during reissuance of its standards to reduce or eliminate, to the extent practicable, potential sources of confusion or contention about acceptable means for implementing the EPA standards. Nevertheless, the staff recognizes that it likely will not be possible for EPA to resolve all issues regarding the standards, and that an additional initiative by the NRC may be necessary. Thus, the staff is planning to pursue a third rulemaking, called the "implementing amendments," which is now only in the initial scoping phase. Possible topics to be addressed by this rulemaking include:

1) identification of acceptable methods for validation of the models and computer codes to be used for projecting repository performance;

2) specification of acceptable methods for estimating the likelihood of potentially disruptive processes and events, either generically or on a site-specific basis;

3) further elaboration, beyond that currently provided in Part 60, of the conditions for evaluating potential human-induced disruptions of a repository and of the need for incorporation of human-initiated releases into an overall probabilistic distribution of releases from a repository;

4) endorsement of an acceptable method for identifying potentially disruptive scenarios for analysis, and specification of criteria for screening out scenarios with low likelihood or consequences; and

5) elaboration on the meaning of the Section 60.122 requirements for evaluation of "favorable" and "potentially adverse" conditions -- especially the requirement to show that a potentially adverse condition does not compromise the ability of the geologic repository to meet the performance objectives relating to isolation of the waste.

The advantage of this alternative is that it permits resolution of certain potentially contentious issues before a licensing review, so that those issues will not delay or prevent a licensing decision on repository acceptability. The disadvantage of this alternative is the significant amount of time and staff resources required to develop and promulgate the necessary amendments to Part 60. Since the purpose and effect of these NRC rules is the implementation of the EPA standards, EPA endorsement of such NRC implementation would minimize the potential for protracted litigation over whether such NRC rules are consistent with NRC's statutory obligation to be consistent with EPA standards. Preferably, EPA should clarify its standards or amplify the Supplementary Information accompanying its regulation in a manner consistent with the thrust of NRC's "implementing regulations."

Alternative 4 -- No EPA Standards and Current or Revised Part 60. This alternative is included because of the possibility that EPA might be significantly delayed in reissuing its standards, or that the standards might again be found legally inadequate by a court. If there should be no EPA HLW standards in place at the time a repository license application is received, NRC could still carry out its licensing review, relying on Sections 60.31 and 60.41 as the criterion for overall system performance (no unreasonable risk to public health and safety). Doing so would, however, inject a significant uncertainty concerning the level of risk that would be considered "unreasonable."

To prevent this from occurring, NRC could add to Part 60 a more precise criterion for overall system performance. The staff does not now favor this alternative, and assumes that the EPA standards will be available when they are needed. The staff will monitor EPA's progress in reissuing its standards and, if significant delays become evident, will reevaluate the desirability of pursuing this alternative. The staff will also keep abreast of developments regarding implementation of the EPA standards for DOE's WIPP as part of its continuing evaluation of the standards.[4]

Evaluation of Alternatives

As previously discussed, the EPA standards already contain wording allowing considerable flexibility for implementation. Alternatives that further increase flexibility suffer from a lack of precision in their statements of the safety levels to be achieved (e.g., replacing numerical probabilities with "likely," "unlikely," or "credible"). Additional flexibility might prove counterproductive because a licensing review would need to interpret the meaning of the standards as well as consider whether compliance with the standards has been achieved. What is needed is clarification of how the flexibility provided by some of the wording in the rule and in the Supplementary Information accompanying the 1985 revision may be used in satisfying the governing numerical standard. Rather than petition EPA for major revisions to the probabilistic format, the staff recommends an aggressive effort to work closely with EPA to identify potential implementation problems in the standards and to develop solutions to those problems which can be incorporated by EPA in the standards when they are reissued. To the extent that this strategy is successful, the breadth of issues needing NRC resolution as discussed in Alternative 3, above, will be minimized.

[4] The EPA standards also apply to facilities used for disposal of transuranic wastes -- the type of wastes to be emplaced at WIPP -- and DOE must prepare probabilistic analyses to demonstrate compliance of WIPP with the standards. EPA's comments on a draft Supplemental Environmental Impact Statement (EIS) for WIPP urge DOE to publish an additional supplemental EIS or similar compliance document for public review and comment after the planned five-year test phase and before initiation of the final disposal phase of operations. NRC staff review of DOE's iterative performance assessments for WIPP, which will be necessary to support the compliance document, could provide additional valuable insights into the implementability of the EPA standards.

The NRC staff recommends continued pursuit of Alternative 3, and approval of this recommendation is requested.

DOE's Plans

The SCP for the Yucca Mountain site, recently reviewed by NRC staff, describes in general terms DOE's plans for implementing the EPA standards. These plans involve identification of potentially disruptive processes and events (several dozen are described in the SCP), grouping these into scenarios or "scenario classes," evaluating radionuclide releases to the environment for each scenario or scenario class, and combination of the resulting information into a "complementary cumulative distribution function" (CCDF), for evaluation of compliance with the EPA standards. DOE's plans correspond well with the staff's views of the requirements of the EPA standards. It should be noted that the Technical Review Board's (TRB) Subcommittee on Performance Assessment is reviewing DOE's plans for implementing the EPA standards.

If the Standards Are Not Implementable

Although EPA considers its standards to be implementable, EPA recognizes that doubts continue to remain about implementation of the EPA standard. As a result, provisions for development of alternative standards have been incorporated. The Federal Register text (50 FR 38074, September 19, 1985) describing the alternative standards provision, stated:

> There are several areas of uncertainty the Agency [EPA] is aware of that might cause suggested modifications of the standards in the future. One of these concerns implementation of the containment requirements for mined geologic repositories. This will require collection of a great deal of data during site characterization, resolution of the inevitable uncertainties in such information, and adaptation of this information into probabilistic risk assessments. Although the Agency is currently confident that this will be successfully accomplished, such projections over thousands of years to determine compliance with an environmental regulation are unprecedented. If -- after substantial experience with these analyses is acquired -- disposal systems that clearly provide good isolation cannot reasonably be shown to comply with the containment requirements, the Agency would

consider whether modifications to [the standards] were appropriate.

Any NRC staff position that the EPA standards can be implemented depends upon the flexibility for NRC to develop and apply non-probabilistic criteria consistent with the Commission's traditional multiple-barrier, defense-in-depth licensing philosophy, and the ability to work with EPA to identify and resolve potential issues regarding implementation. The staff anticipates that this resolution will consist of modifications to the EPA standards and NRC rulemakings. However, if this strategy should fail to resolve open issues and if implementation of the EPA standards should prove unworkable for a repository that otherwise appears suitable, EPA appears to be committed to reexamine its standards and, presumably, to modify those standards as needed to allow a reasoned licensing decision to be reached. Application of the standards to WIPP will be an additional test of the standards and should help to resolve questions about the standards, independent of a formal NRC licensing review.

Conclusions: The predominant view of the staff is that the technical scope of a repository licensing review will be the same regardless of the way in which the EPA standards are formulated. If one is to reevaluate the use of quantitative licensing standards for the HLW repository, such a reevaluation cannot be done separately, but only by a thorough evaluation of the procedures and controls for use of such standards in the regulatory process. Thus, it is the further view of the staff that resolution of implementation concerns through close interaction with EPA during reissuance of its standards, followed by the technical development and rulemaking process described in SECY 88-285 is the essential path of such reevaluation.

Regarding potential releases from a repository, the fundamental purpose of the licensing review is to answer the questions:

--What can go wrong with a repository?

--What are the effects on public health and the environment if these things happen?

--How likely is it that they will occur?

The likelihood of potential repository disruptions must be evaluated in some manner, and EPA's approach of combining numerical probabilities with wording allowing substantial reliance on qualitative considerations appears to be workable in a licensing review. DOE bears the "burden of proof" of compliance with the standards. If NRC's or DOE's experience in attempting to implement EPA's standards demonstrates serious difficulties in implementing the standards, EPA appears to be committed to reexamine the standards and to modify them, as needed, to allow a reasoned licensing decision to be reached. NRC staff will ensure that EPA is promptly informed of any such difficulties based on NRC's experience.

Recommendation: That the Commission approve staff plans to pursue a long-term, ongoing evaluation of the EPA standards by way of its implementing rulemakings and, as it does so, to maintain close contact with EPA to identify and resolve, within the EPA standards, potential implementation issues to the extent practical.

Coordination: The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of Nuclear Regulatory Research has also reviewed and concurred in this paper. The Advisory Committee on Nuclear Waste (ACNW) and its predecessor, the Waste Management Subcommittee of the Advisory Committee on Reactor Safeguards (ACRS) have expressed reservations about the implementability and about the stringency of the EPA HLW standards. Pertinent correspondence is enclosed.

James M. Taylor
Acting Executive Director
for Operations

Enclosure:
ACRS and ACNW Correspondence Related
to EPA HLW Standards

Commissioners' comment or consent should be provided directly to the Office of the Secretary by COB Tuesday, October 31, 1989.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Tuesday, October 24, 1989, 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.

DISTRIBUTION:
Commissioners
OGC
OIG
LSS
GPA
REGIONAL OFFICES
EDO
ACRS
ACNW
ASLBP
ASLAP
SECY

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

WM

July 17, 1985

Honorable Nunzio J. Palladino
Chairman
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Palladino:

SUBJECT: ACRS COMMENTS ON EFA STANDARDS FOR HIGH-LEVEL RADIOACTIVE WASTE DISPOSAL

During its 303rd meeting, July 11-13, 1985, the Advisory Committee on Reactor Safeguards discussed the proposed "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191), being developed by the U. S. Environmental Protection Agency (EPA). This was also the subject of a meeting of our Waste Management Subcommittee on June 18, 1985, during which discussions were held with staff members from both the EPA and the NRC. The Committee also had the benefit of the documents referenced.

Although we noted a number of questions relating to the proposed standards, a key issue pertains to the application of probabilistic conditions on the proposed radionuclide release limits. In this regard, we wish to call attention to a particular recommendation made by the High-Level Radioactive Waste Disposal Subcommittee of the EPA Science Advisory Board, namely:

> "We recommend that use of a quantitative probabilistic condition on the modified Table 2 release limits be made dependent on EPA's ability to provide convincing evidence that such a condition is practical to meet and will not lead to serious impediments, legal or otherwise, to the licensing of high-level-waste geologic repositories. If such evidence cannot be provided, we recommend that EPA adopt qualitative criteria, such as those suggested by the NRC." (Reference 2)

It is our understanding that the NRC Staff has concurred with the proposed EPA standards, including the use of a probabilistic approach on radionuclide release limits. In view of the importance of the ability of the NRC to determine compliance with the EPA standards in licensing a high-level waste repository, we recommend that the Commission assure itself that the NRC Staff is correct in endorsing this approach. We believe that demonstration of such compliance will be extremely difficult and that the proposed standards are unduly restrictive.

Dr. David Okrent, ACRS member, and Drs. Konrad Krauskopf and Frank Parker, ACRS consultants, who participated in the ACRS discussions on this matter, were

also involved in the review conducted by the EPA Science Advisory Board of an earlier version of the proposed standards.

Sincerely,

David A. Ward
Chairman

References:

1. EPA Working Draft No. 6 -- Final 40 CFR 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," dated June 15, 1985
2. Letter from H. E. Collier, Subcommittee Chairman, to W. D. Ruckelshaus, EPA Administrator, dated February 17, 1984 forwarding, "Report on the Review of Proposed Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191)" by the High-Level Radioactive Waste Disposal Subcommittee, Science Advisory Board, EPA, dated January 1984
3. SECY-84-320 for the Commissioners from W. J. Dircks, EDO, Subject: NRC Staff Comments to Environmental Protection Agency (EPA) on the Science Advisory Board Report on Proposed EPA Standard for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Waste (40 CFR Part 191), dated August 9, 1984
4. Letter from J. G. Davis, NRC Staff, to EPA, Subject: Response to EPA's request for comments on their proposed environmental standards for management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes, dated May 10, 1983
5. Letter from N. J. Palladino, Chairman, NRC, to L. Verstandig, Acting Administrator, EPA, Subject: Commission's concerns about sections of the proposed standards that deal with means of implementation, dated May 11, 1983

406.3.3/DJF/85/09/09

SEP 11 1985 - 1 -

MEMORANDUM FOR: R. F. Fraley, Executive Director
Advisory Committee on Reactor Safeguards

FROM: Robert E. Browning, Director
Division of Waste Management

SUBJECT: NRC STAFF VIEWS ON IMPLEMENTATION OF THE EPA HLW STANDARDS

Your memorandum of July 29, 1985 to William J. Dircks forwarded the ACRS comments on the EPA standards for disposal of high-level radioactive wastes. I would like to provide you with additional information regarding the staff's views on EPA's standards and on implementation of those standards by the NRC.

The ACRS's concerns are capsulized in the following paragraph from David A. Ward's July 17, 1985 memorandum to Chairman Palladino:

> It is our understanding that the NRC Staff has concurred with the proposed EPA standards, including the use of a probabilistic approach on radionuclide release limits. In view of the importance of the ability of the NRC to determine compliance with the EPA standards in licensing a high-level waste repository, we recommend that the Commission assure itself that the NRC Staff is correct in endorsing this approach. We believe that demonstration of such compliance will be extremely difficult and that the proposed standards are unduly restrictive.

The NRC staff recognizes that use of numerical probabilities by EPA represents a novel approach for setting environmental standards. NRC comments on the proposed standards 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." In discussions following publication of the proposed standards, the NRC staff explained to EPA the difficulties foreseen in trying to implement a standard containing numerical probabilities. As a result of these discussions, EPA has added a new paragraph to Section 191.13 of the standards which reads 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

OFC	WMRP	WMRP	WMRP	WM	WM		
NAME	DFehringer	SCoplan	HMiller	MBell	RBrowning		
DATE	85/09/06	09/ /85	09/ /85	09/ /85	09/ /85		

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 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.

I hope that this information proves helpful in explaining the staff's views regarding implementation of the EPA standards by the NRC.

[redacted]

Robert E. Browning, Director
Division of Waste Management

FC	:WMRP	:WMRP	:WMRP	:WM	:WM	:	:
AME	:DFehringer	:SCoplan	:HMiller	:MBell	:RBrowning	:	:
ATE	:85/09/06	:09/09/85	:09/ /85	:09/11/85	:09/11 /85	:	:

Distribution: EDO 000881
WM File: 406.3.3
WMRP r/f
NMSS r/f
CF
DFehringer & r/f
JLinehan
RBoyle
SCoplan
JKennedy
MBell
RBrowning
JBunting
MKnapp
JGreeves
HJMiller
JDavis
DMausshardt
JWolf
EDO r/f
EDO
EDO File 000891
JHoffman
CCudd
JRoe
TRehm
VStello
GCunningham
MTaylor
CHletemes
JDircks
Central Files

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

October 16, 1985

Honorable Nunzio J. Palladino
Chairman
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Palladino:

SUBJECT: ADDITIONAL ACRS COMMENTS ON THE EPA STANDARDS FOR A HIGH-LEVEL RADIOACTIVE WASTE REPOSITORY

During its 306th meeting, October 10-12, 1985, the Advisory Committee on Reactor Safeguards met with you and the other Commissioners to offer comments regarding the Environmental Protection Agency (EPA) Standards for a High-Level Radioactive Waste (HLW) Repository, which was the subject of our report to you dated July 17, 1985. In response to the request made during this meeting, we are pleased to submit the following additional comments on the EPA standards which were published as a final rule on September 19, 1985. These standards will apply to the facilities being proposed by the Department of Energy and must be met in the associated licensing review conducted by the NRC.

Our purpose in writing you at this time is to highlight the fact that the standards being promulgated by the EPA are unreasonably restrictive and contain serious deficiencies. This will undoubtedly introduce unnecessary obstacles into the licensing process for an HLW repository, with only minimal benefit to the public health and safety. Our justifications for these comments are outlined below.

Development of these standards has been under way within the EPA since December 1978. During this period, the ACRS and its Subcommittee on waste management were briefed periodically by EPA representatives, and at each such meeting comments and suggestions were discussed on an informal basis. In early 1983 the EPA submitted the then-current draft of the proposed standards to its Science Advisory Board (SAB) for review. Detailed comments by the High-Level Radioactive Waste Disposal Subcommittee of the SAB included the following:

> The Subcommittee recommended "that the release limits specified in . . . the proposed standards be increased by a factor of ten, thereby causing a related tenfold relaxation of the proposed societal objective (population risk of cancer)."
>
> The Subcommittee recommended "that use of a quantitative probabilistic condition on the . . . release limits be made dependent on EPA's ability to provide convincing evidence that such a condition is practical to meet and will not lead to serious impediments, legal or otherwise, to the licensing of high-level-waste geologic

repositories. If such evidence cannot be provided, we recommend that EPA adopt qualitative criteria, such as those suggested by the NRC."

Of particular concern to the SAB Subcommittee, in terms of meeting the conditions of the standards, was the fact that containment requirements should be such that the cumulative releases of radionuclides from a repository to the accessible environment for 10,000 years after disposal, from all significant processes and events that may affect the disposal system, shall:

"have a likelihood of less than one chance in 10 of exceeding" the quantities (given in an accompanying Table); and

"have a likelihood of less than one chance in 1,000 of exceeding ten times" these same quantities.

The SAB Subcommittee also recommended specific changes in the probabilistic aspects of the draft standards to help make it more practical for an applicant to make a case that the quantitative probabilistic criteria had been met.

Although the wording in the standards includes the statement that "performance assessments need not provide complete assurance" that these requirements will be met, there remains the basic fact that the standards, as published, are far too restrictive. In our opinion, the establishment of overly restrictive standards, relieved by leniency in their implementation, is not an appropriate approach. The proper approach would have been to develop reasonable standards that could have been more definitively enforced.

The problems cited above were but a few of those observed and commented upon by the SAB Subcommittee. Additional problems in Working Draft No. 6 of the EPA standards were discussed with an EPA representative during a meeting of the ACRS Subcommittee on waste management on June 18 and 19, 1985. These included the following:

The standards, as published, do not appear to be internally consistent. Although the latest data were used for estimating the biological effects of various radionuclides, the associated dose limits for individual body organs were not based on appropriate risk criteria.

The health risks associated with the release limits specified in the standards are much lower (by factors of a thousand or more) than the risks considered acceptable by the EPA for other environmental stresses, such as hazardous toxic chemicals.

The overly restrictive standards may result in the rejection of some sites proposed for an HLW repository that otherwise might be acceptable.

As indicated above, the standards will definitely complicate the processes, both technical and legal, of demonstrating that a given site is acceptable.

We realize that both the NRC Staff and the DOE Staff have accepted the EPA standards. Although we can understand, to some degree, the desires of both staffs to complete this step, we are troubled by the serious deficiencies that exist in the standards. The compromises that have been made at this stage will lead to extended delays and an uncertain outcome in the licensing process for an HLW repository, with only slight benefit to the public health and safety.

Although the ACRS could undertake a more detailed review and critique of the EPA standards, we believe that the SAB Subcommittee has already done this in a professional manner. A copy of the Executive Summary of their report is attached for your information.

We hope this letter is helpful. Although we realize that the EPA standards have been published, we believe that they contain such serious deficiencies that the NRC should take prompt action to voice these concerns.

Sincerely,

David A. Ward
Chairman

Attachment:
Section II, "Executive Summary" of Report on the review of Proposed Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191) by the SAB, EPA, dated January 1984

References:

1. Letter from Herman E. Collier, Jr., Chairman, EPA High-Level Radioactive Waste Disposal Subcommittee, to Mr. William D. Ruckelshaus, Administrator, EPA, dated February 17, 1984 transmitting Report on the review of Proposed Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes by the High-Level Radioactive Waste Disposal Subcommittee, Science Advisory Board, EPA, dated Janaury 1984
2. SECY-84-320, "NRC Staff Comments to EPA on the SAB Report on Proposed EPA Standard for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Waste (40 CFR Part 191)," dated August 9, 1984, including Working Draft No. 8, Final 40 CFR 191, Subchapter F - Radiation Protection Programs, dated July 19, 1985

3. SECY-85-272, "Report on the EPA's Environmental Standards for High-Level Radioactive Waste Disposal," dated August 13, 1985
4. Memorandum from R. E. Browning, Director, Division of Waste Management, to R. F. Fraley, ACRS, Subject: NRC Staff Views on Implementation of the EPA HLW Standards, dated September 11, 1985

NRC STAFF VIEWS
REGARDING THE FINAL
EPA HIGH-LEVEL WASTE STANDARDS
OCTOBER 21, 1985

EPA HIGH-LEVEL WASTE STANDARDS ISSUES

- ARE THE EPA STANDARDS OVERLY CONSERVATIVE, ESPECIALLY COMPARED WITH STANDARDS IN OTHER AREAS?

- CAN THE PROBABILISTIC FEATURES OF THE STANDARDS BE IMPLEMENTED IN A FORMAL LICENSING REVIEW?

SUMMARY

- NRC WAS INTENSELY INVOLVED FOR NINE YEARS IN REVIEWING THE DEVELOPMENT OF THE EPA HIGH-LEVEL WASTE STANDARDS.

- INDEPENDENT NRC STUDIES HAVE SHOWN THE STANDARDS TO BE ACHIEVABLE.

- EPA SIGNIFICANTLY MODIFIED THE STANDARDS TO ALLOW QUALITATIVE JUDGMENTS IN LICENSING REVIEWS.

- AS NOTED IN SECY-85-272, EPA HAS BEEN RESPONSIVE TO NRC'S CONCERNS REGARDING THE ABILITY TO IMPLEMENT THE STANDARDS.

- SINCE SECY-85-272, NO NEW ISSUES HAVE ARISEN WHICH WOULD ALTER THE CONCLUSIONS OF THAT PAPER.

WHO HAS REVIEWED THE STANDARDS

NRC -- REVIEWED THROUGHOUT EPA'S DEVELOPMENT. COMMISSION REVIEWED AND REVISED STAFF COMMENTS ON PROPOSED STANDARDS.

DOE -- INTERACTED WITH EPA, PARALLEL TO THE NRC'S REVIEWS.

STATES AND TRIBES -- INTENSE SCRUTINY FOLLOWING PUBLICATION OF PROPOSED STANDARDS.

OMB -- SIGNIFICANT SCRUTINY OF THE PROPOSED STANDARDS PRIOR TO PUBLICATION. LESS INVOLVEMENT PRIOR TO FINAL PUBLICATION.

EPA SCIENCE ADVISORY BOARD -- SUBCOMMITTEE WAS FORMED TO REVIEW PROPOSED STANDARDS. SAB REPORT REVIEWED BY NRC STAFF, AND COMMENTS FORWARDED TO COMMISSION (SECY-84-320).

ACRS -- ACRS AND ITS WASTE MANAGEMENT SUBCOMMITTEE PERIODICALLY BRIEFED ON STANDARDS.

BASES FOR NRC STAFF POSITIONS

CONSERVATISM

- EPA HAS LEGAL RESPONSIBILITY TO DETERMINE ALLOWABLE LEVEL OF HEALTH EFFECTS.

- NRC STAFF CONSIDERS STANDARDS TO BE ACHIEVABLE BASED ON NUREG/CR-3235.

- STANDARDS CAN BE VIEWED AS A QUANTIFICATION OF "AS LOW AS REASONABLY ACHIEVABLE," GIVEN CURRENT UNCERTAINTIES.

PROBABILISTIC FEATURES

- NRC STAFF PROPOSED WORDING TO PERMIT QUALITATIVE LICENSING FINDINGS WHERE NECESSARY. EPA INCORPORATED WORDING IN STANDARDS. WORDING IS NOT VIEWED AS COMPENSATION FOR EXCESS CONSERVATISM IN THE STANDARDS.

- EPA RULE CONFORMS TO COMMISSION'S DISTINCTION BETWEEN QUANTITATIVE PERFORMANCE STANDARDS AND QUALITATIVE STATEMENTS REGARDING LEVELS OF CONFIDENCE (48 FR 28204).

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

OFFICE OF THE COMMISSIONER

DOCKET CONTROL CENTER

'85 OCT 30 P3:51

October 25, 1985

Dircks
Roe
Rehm
Stello
Davis
Denton
Minogue
GCunningham
EDO R/F

WM Record File
100.3.3

WM Docket No.
PDR
LPDR

Distribution:

(Return to WM, 623-SS)

MEMORANDUM FOR: Samuel J. Chilk, Secretary

FROM: Lando W. Zech, Jr.

SUBJECT: SECY 85-272

I have reviewed and carefully considered the ACRS' advice that the EPA standards, in the opinion of the ACRS, are "unreasonably restrictive and contain serious deficiencies" together with their conclusion that the standards "will undoubtedly introduce unnecessary obstacles into the licensing process." I have also considered the DOE and EPA statements in support of the standards and their conclusion that the standards are reasonable and achievable. The NRC staff has concluded that the EPA standards are reasonable, achievable and flexible enough that they can be implemented.

In view of the conflicting advice provided to the Commission, OGC has provided options which the Commission may exercise and concluded that since "the ACRS concerns [are] governed by the policy and technical issues we have described rather than any strictly legal considerations, we make no recommendation on how the Commission should proceed, other than that it should not act without hearing from the NRC staff and fully assessing all the factors we have described." The staff has responded to the Commission at the October 21, 1985 public meeting and addressed the ACRS concerns. The staff has advised the Commission that the staff, as well as DOE and EPA, do not agree with the ACRS that the standards are overly restrictive and contain serious deficiencies. The staff stated that they believed, as did DOE and EPA, that the standards were flexible enough and could be executed.

With all due respect to the advice of the ACRS, I reaffirm my approval of SECY-85-272 in support of the DOE, EPA and staff recommendation.

However, I suggest that the staff be directed to address the ACRS' concerns when developing the package conforming Part 60 to the EPA standards. I understand they may do this by defining the basis for their assurance that adequate flexibility exists in the standards for them to be implemented.

cc: Chairman Palladino
Commissioner Roberts
Commissioner Asselstine
Commissioner Zech
EDO
ACRS

LANDO,
I AGREE.
10-25-85

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

November 14, 1985

'85 N 15 P2:43

WM Record File 406.3.3 WM Project
Docket No.
PDR
LPDR
Distribution:
REB M-R
JOB *ACRS
(Return to WM, 623-SS)

Honorable Nunzio J. Palladino
Chairman
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Palladino:

SUBJECT: ADDITIONAL ACRS COMMENTS ON EPA STANDARDS FOR A HIGH-LEVEL RADIOACTIVE WASTE REPOSITORY

During its 307th meeting, November 7-9, 1985, the Advisory Committee on Reactor Safeguards met with members of the NRC Staff and the Environmental Protection Agency (EPA) for additional discussions on the nature and implementation of the EPA Standards for a High-Level Radioactive Waste (HLW) Repository. This was also the subject of a meeting of the NRC Commissioners with the ACRS on October 10, 1985; of a meeting of the NRC Commissioners with representatives of the NRC Staff, the Department of Energy (DOE), EPA, and the ACRS on October 21, 1985; and of a combined meeting of our subcommittees on Waste Management and Metal Components on October 24-25, 1985. In addition, we reported to you on this subject in our letters of July 17, 1985 and October 16, 1985.

As a result of these meetings and associated discussions, we offer the following additional comments.

1. It is generally recognized that there is essentially no prospect that compliance with the EPA Standards can ever be demonstrated by actual observations. Determination of compliance will have to be based on the results of calculations using some agreed-upon set of release scenarios, environmental transport models, and their underlying assumptions. As stated in our letter of October 16, 1985, we believe that this has the potential for introducing obstacles in the licensing process, and it was for this reason that we recommended in our letter of July 17, 1985, that the Commission assure itself that the Staff's endorsement of this approach was correct.

2. We continue to believe that the EPA Standards contain deficiencies and inconsistencies, e.g., that the dose limits for single organs are not risk-based, and that different dose limits are being applied to NRC-licensed HLW facilities than to similar DOE facilities. Although we understand that time constraints did not permit the EPA Staff to correct these deficiencies, they nonetheless exist. In addition, there are errors in the recommended methods for the analysis and interpretation of data collected in the evaluation of the performance of a repository.

The NRC Staff is proposing an approach that may prove successful. However, we have no confidence that it will succeed. Our basic concern continues to be whether a formal determination can be made that a licensee is complying with the EPA Standards. To help resolve this problem, we encourage the NRC Staff to accelerate their efforts to develop analytical methods based on both deterministic and probabilistic approaches, and we recommend that a consensus be sought on these methods as they are developed. We also encourage the NRC Staff to use rule-making as a mechanism for implementing these methods, and we support the approaches being developed by the NRC Staff to utilize outside experts to help identify relevant issues and information needs.

Additional comments by ACRS Members Harold W. Lewis and Dade W. Moeller are presented below.

Sincerely,

David A. Ward
Chairman

Additional Comments by ACRS Member Harold W. Lewis

It is worth repeating and extending the statement in the ACRS letters of July 17, 1985 and October 16, 1985, that the EPA Standards are too stringent. All these problems of compliance determination derive from the fact that the EPA risk limits are far below any reasonable likelihood of detection. It is that that drives the dependence on models and calculations.

I know of no rational basis (though recognize the political constraints) for a standard involving one-tenth of a fatality per year for ten thousand years, beginning in a few hundred years. If one uses cost/benefit analysis with any reasonable estimate of the benefit of the repository; if one uses reasonable discounting of future costs against current benefits, a procedure understood by all surviving businesses and nations; if one compares with the risk or even the radioactive effluents from coal burning, the only viable alternative to nuclear power; if one compares with cosmic rays or other natural radiation; however one makes the comparison, these are unreasonably stringent standards.

I recognize that they are the product of EPA, and the result of a necessary political process, but think that the NRC should develop regulatory procedures in such a way as to make the best of a bad set of standards by moving the assessment of the risk in the direction of realism. To add the usual regulatory conservatism to the implementation of standards which are already too stringent would not be in the national interest.

I know of no risk issue (perhaps excepting UFOs) in which the discrepancy between perceived risk and actual risk is so high. That seems to be what has put us in this position, but it is still the responsibility of scientific advisors to remain rational and to deal with real risk. That is extraordinarily small here.

Additional Remarks by ACRS Member Dade W. Moeller

I recognize that many of the issues associated with the EPA Standards are controversial and subject to a range of interpretations. A primary example is the estimation of the average annual societal risk to an individual as a consequence of the operation of an HLW repository constructed and operated in accord with the EPA Standards. Depending on the number of people assumed to be exposed, one can "demonstrate" that the Standards are either comparable to the risks associated with some other existing radiation standards, or that the risks are several orders of magnitude lower. Since, at the present time, there appear to be no acceptable guides for use by Federal agencies in making risk estimates for radionuclide sources that have the potential for exposing large numbers of people at extremely low dose rates over long periods of time, I would encourage the NRC to request that the Committee on Interagency Radiation Research and Policy Coordination (CIRRPC) undertake to develop such guides. I understand that the CIRRPC would be receptive to such a request.

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

OFFICE OF THE COMMISSIONER

Dircks
Roe
Rehm
Stello
~~Davis~~
Minogue
GCunningham
~~EDO R/F~~
PDR
LPDR

November 20, 1985 WM Record File 406.3.3

WM Project
Docket No.

Distribution:
REB MJB HJM Fehringer
JOB JJS MRK
(Return to WM, 623-SS) JTG

MEMORANDUM FOR: Samuel J. Chilk, Secretary

FROM: Frederick M. Bernthal

SUBJECT: REAFFIRMATION OF VOTE ON SECY-85-272

Upon extensive examination of the ACRS objections to the EPA standard (including their most recent comments presented in a letter of 11/14/85) and of the analysis of avilable Commission options presented by OGC, I reaffirm my approval of SECY-85-272.

The ACRS has cricized the EPA standard on the grounds that

1. it is overly stringent, mandating a level of protection that is far in excess of that provided by other existing environmental standards, and

2. implementation of the standard by NRC in licensing a repository will be difficult if not impossible.

My review of the question suggests that the momentary confusion over the EPA standard arose from imprecise wording on the part of EPA and Staff in attempting to explain the origin of the cumulative probability distribution function of repository releases upon which the interpretation of 40 CFR 191 is based. Nevertheless, I continue to have reservations, both as to the application of the EPA standard, and as to the reasonableness and consistency of the standard when viewed in light of other societal risks (cf. comments of ACRS Members Dade Moeller and Hal Lewis).

Be that as it may, the Nuclear Waste Policy Act clearly assigns to the EPA the responsibility for establishing the environmental standard. Given that our staff has repeatedly asserted that the standards as published can be implemented, there appears to be little basis on which to challenge a policy decision that is, strictly speaking, that of EPA.

But I agree with the suggestion of ACRS Member, Dr. Dade Moeller that the Commission request the Committee on Interagency Radiation Research and Policy Coordination (CIRRPC) to develop guidelines for use by Federal agencies that would foster consistency in the risk estimates and risk management of low doses of radiation.

I also agree with Commissioner Zech and the Chairman that any remaining ACRS concerns should be addressed to the fullest extent possible in the rulemeking that will be necessary to conform Part 60 to the EPA standard. In particular, care should be taken to avoid any ambiguity in the application of probabilistic conditions placed on the post-closure containment requirements.

The application of these conditions should not impose any further conservatism on an already highly conservative standard.

It is unfortunate that the ACRS comments on the EPA standards were made available at a time when Commission options to act without seriously delaying the repository program had, for the most part, been foreclosed. I would hope that in future reviews of NRC activities under the NWPA the ACRS could be involved at an earlier stage so that valuable technical advice and input could be used to timely and best advantage by the Commisssion.

cc: Chairman Palladino
Commissioner Roberts
Commissioner Asselstine
Commissioner Zech
OGC
OPE
EDO

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

OFFICE OF THE SECRETARY

WM DOCKET CONTROL CENTER

'85 DEC -2 P12:05

November 27, 1985

Action: Minogue, RES/Davis, NM
Cys: Dircks
Roe
Rehm
Stello
GCunningham
Denton
Kerr, SP
Fehringer, NMSS
Prichard, RES
Philips

MEMORANDUM FOR: William J. Dircks
Executive Director for Operations

FROM: Samuel J. Chilk, Secretary

SUBJECT: STAFF REQUIREMENTS - NOTATION VOTE ON SECY-85-272 - REPORT ON THE ENVIRONMENTAL PROTECTION AGENCY'S ENVIRONMENTAL STANDARDS FOR HIGH-LEVEL RADIOACTIVE WASTE DISPOSAL

On September 19, 1985, the Commission (with all Commissioners agreeing) approved the proposed letter to EPA, as attached. Immediately following Commission approval, the ACRS requested that this matter be discussed with the Committee. On October 21, 1985, the Commission met with the staff, ACRS and others to discuss conflicting views.

Upon due consideration of the concerns expressed by the ACRS and the responses by the staff, the Commission reaffirmed releasing the letter to EPA.

The letter has been forwarded to the Chairman for his signature.

In addition, EDO is directed to submit to the Commission the rulemaking package which conforms 10 CFR Part 60 with the EPA Standard. The Commission also stresses the importance for the staff to clearly articulate, in the changes to Part 60, how we interpret the EPA's Standards and that the ACRS' concerns be addressed by clearly defining the basis for the assurance that adequate flexibility exists in the standards for their implementation. In particular, care should be taken to avoid any ambiguity in the application of probabilistic conditions placed on the post-closure containment requirements. (RES)

(EDO Suspense: 2/15/86)

WM Record File 406.3.3
WM Project
Docket No.
PDR
LPDR
Rec'd Off. EDO
Date 11-29-85
Time 4:45 p.m.

Distribution:
REB MJB MRK JTG
JOE HJM JJS Fehringer
(RETURN TO SECY)

The Commission also agrees that the staff and the ACRS should interact with each other early in the process of developing the package on 10 CFR Part 60 as well as in future reviews of NRC activities under the NWPA so that valuable technical advice and input can be used in a timely manner by the Commission.

Chairman Palladino requested, in line with ACRS comments, that EDO accelerate its efforts to develop analytical methods to be used in making a determination that a licensee is complying with the EPA Standards. These methods should receive as broad an input and review as possible. (NMSS)

Attachment:
As stated

cc: Chairman Palladino
Commissioner Roberts
Commissioner Asselstine
Commissioner Bernthal
Commissioner Zech
OGC
OPE
ACRS

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

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 10 CFR 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). Consistent with the provisions of the Administrative Procedure Act, the Commission will propose these changes for incorporation into Part 60 now that the final EPA high-level waste standards have been published. The NRC staff anticipates submittal of a rulemaking package, incorporating both these wording changes and other conforming amendments, to the Commission within 120 days.

The Commission appreciates the cooperation shown by the EPA staff in working to reach this agreement.

Sincerely,

Nunzio J. Palladino

Enclosure:
Proposed changes to
10 CFR Part 60

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 NRC 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 capable 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.

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 NRC 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 NRC 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.

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.

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 NRC 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.

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

CHAIRMAN

Cys: Dircks
Roe
Rehm
Stello
Davis
Minogue
Denton
GCunningham
Kerr, SP
Fehringer, NMSS
EDO R/F

December 2, 1985

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 10 CFR 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). Consistent with the provisions of the Administrative Procedure Act, the Commission will propose these changes for incorporation into Part 60 now that the final EPA high-level waste standards have been published. The NRC staff anticipates submittal of a rulemaking package, incorporating both these wording changes and other conforming amendments, to the Commission within 120 days.

The Commission appreciates the cooperation shown by the EPA staff in working to reach this agreement.

Sincerely,

Nunzio J. Palladino

Enclosure:
Proposed changes to
10 CFR Part 60

(Originated by NMSS)

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 (§60.62) 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.

DEC 23 1985

MEMORANDUM FOR: R. F. Fraley
Executive Director
Advisory Committee on Reactor Safeguards

FROM: William J. Dircks
Executive Director for Operations

SUBJECT: RESPONSE TO ACRS COMMENTS ON EPA HLW STANDARDS (FOLLOW-UP ITEMS FROM 306th and 307th ACRS MEETINGS)

In letters dated October 16 and November 14, 1985, David A. Ward transmitted to Chairman Palladino the comments of the ACRS regarding the high-level radioactive waste standards published by the Environmental Protection Agency (EPA) on September 19, 1985. As the NRC staff understands, these comments can be summarized as follows:

1. In comparison with other risks, the standards are unduly restrictive.

2. Because the standards are so restrictive, and because of the probabilistic nature of the standards, it will be very difficult, if not impossible, for the NRC to determine compliance with the standards in a licensing review for an actual repository.

3. The standards contain internal inconsistencies (e.g., the dose limits during repository operations are slightly different for licensed and unlicensed repositories) and the standards do not incorporate the latest ICRP recommendations regarding doses to individual organs.

Regarding the first item above, the ACRS has stated that the level of risk allowed by the EPA HLW standards is much lower than that allowed by other standards for radiological and non-radiological hazards. However, the staff has found that under certain reasonable scenarios and assumptions (e.g., the size of the population at risk) the EPA standards can be shown to be comparable to other standards now in place for other nuclear activities, as we discussed in our presentation to the ACRS on November 8, 1985. Since the risks allowed by the EPA standards can be viewed in such widely different ways, the staff has concentrated on the achievability of the standards rather than on comparisons with the risks allowed by other standards.

The ACRS is concerned that the low level of allowable risk, combined with the probabilistic nature of the standards, will make the standards difficult to implement in an actual repository licensing review. Previous NRC contractor

studies (documented in NUREG/CR-3235) demonstrated (1) that analytical techniques exist, or are under development, to evaluate potential releases from a geologic repository, and (2) that repository sites can likely be found for which repository performance can be demonstrated to be in compliance with the EPA HLW standards. The NRC staff will further develop its views regarding its ability to implement the EPA standards in the rulemaking package currently being prepared to incorporate the EPA standards into Part 60.

Regarding inconsistency within the standards, the NRC staff recognizes that EPA has, for pragmatic reasons, chosen to maintain consistency with other existing EPA standards including the uranium fuel cycle and drinking water standards. This has resulted in internal inconsistencies within the EPA HLW standards which, while not desirable, do not appear to endanger public health and safety nor to pose inordinate costs or difficulties for implementation of the standards by the NRC. In the NRC staff's view, a general overhaul of EPA's radiation protection standards would be needed to adopt the revised ICRP recommendations and to promote consistency between (and within) standards. The NRC staff would support such an initiative by the EPA.

The ACRS also recommended: (1) acceleration of NRC staff efforts to develop analytical methods for evaluating repository performance and (2) that a consensus be sought, possibly through rulemakings, on these methods as they are developed. With respect to the first recommendation, we note that, in a meeting on October 24, 1985, we briefed the ACRS Subcommittee on Waste Management on our HLW program plan and described how we have allocated resources to each major program element. As we described in this briefing, a major program element is development of licensing assessment methodologies; we believe this represents an aggressive effort. We will continue to seek ways to accelerate licensing assessment methodology development and still meet other requirements of the Nuclear Waste Policy Act and Commission priorities. As stated in our October program briefing, we look forward to receiving Subcommittee comment on our program strategies and specific feedback on the tradeoffs we have made among program elements in allocating resources and setting schedules. With respect to the second recommendation, the staff agrees that rulemaking may prove to be an appropriate means of developing consensus regarding certain aspects of the staff's analytical methods. We note that the staff has an on-going effort to identify licensing

issues and to seek early resolution through such means as public review and comment on technical positions developed by the staff. We will continue to pursue early resolution of licensing issues using technical positions and, as appropriate, rulemakings.

As suggested by the staff requirements memorandum for SECY-85-272, the staff would appreciate an opportunity to discuss the staff's proposed conforming amendments relating to proposed implementation procedures with the ACRS in the near future.

(Signed) Jack W. Roe

William J. Dircks
Executive Director for Operations

EDO
WJDircks
12/ /85

*See previous concurrence

FC	WMRP	WMRP	WMRP	DWM	DWM	NMSS	NMSS
AME	DFehringer*	RBoyle*	HJMiller*	MJRell*	RBrowning*	DMausshardt*	JGDavis
ATE	12/02/85	12/03/85	12/03/85	12/ /85	12/ /85	12/ /85	12/17/85

Bernero for Appropriate Action
(EDO Signature)
cys: Stello
Taylor
Thompson
Blaha
Murley, NRR
Beckjord, RES
Jordan, AEOD
Scinto, OGC
Central Files

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

May 3, 1989

The Honorable Lando W. Zech, Jr.
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Zech:

SUBJECT: PROPOSED WASTE CONFIDENCE DECISION BY THE WASTE CONFIDENCE REVIEW GROUP

During its ninth meeting, April 26-28, 1989, the Advisory Committee on Nuclear Waste (ACNW) met with members of the NRC Staff to discuss the preliminary draft of the proposed Waste Confidence Decision (see reference) by the Waste Confidence Review Group. This matter was also a subject of discussion during a meeting held on April 19, 1989 by an ACNW Working Group.

On August 31, 1984, the NRC issued a final decision on what has come to be known as its "Waste Confidence Proceeding." The current review is an update of that assessment, and a significant feature in this latest review is the incorporation of the changes brought about by the Nuclear Waste Policy Amendments Act of December 1987.

On the basis of our discussions on this matter, we offer the following comments:

1. We believe the present report appears to be technically sound, and in this assessment, we endorse both the expanded application of the generic approach to the majority of nuclear power plants and the incorporation into the proceedings of a more realistic timetable for the availability of a licensed repository and an extended time interval for the storage of spent fuel.

2. We continue to have concerns about the ability of the NRC staff to confirm that the repository complies with the probabilistic standards developed by the U.S. Environmental Protection Agency. The explanations given in the proposed Waste Confidence Decision on how this is to be accomplished do not illuminate the process nor do they provide convincing arguments that it can be accomplished.

The report also needs organizational and editorial changes to enhance the ease with which it can be read and assimilated.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

Reference:
Memorandum dated April 17, 1989 from Robert M. Bernero, Director, Nuclear Material Safety and Safeguards, to Dade Moeller, Chairman, ACNW, transmitting Preliminary Draft of Waste Confidence Review Group Proposed Waste Confidence Decision (PREDECISIONAL)

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

July 3, 1989

The Honorable Kenneth M. Carr
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Carr:

SUBJECT: ACNW REVIEW OF NRC COMMENTS ON DOE SITE CHARACTERIZATION PLAN

During its twelfth meeting, June 28-30, 1989, the Advisory Committee on Nuclear Waste (ACNW) completed its review of the Site Characterization Analysis (SCA) being prepared by the NRC staff on the Site Characterization Plan (SCP) developed by the U.S. Department of Energy (DOE) for the proposed high-level waste (HLW) repository at Yucca Mountain. During this meeting, the Committee had the benefit of discussions with staff members from the NRC and DOE. This matter was also a subject for discussion during the sixth through eleventh meetings of the ACNW, as well as during an ACNW Working Group meeting on April 19, 1989. During the seventh meeting, February 21-23, 1989, we had discussions and interactions with representatives from the State of Nevada's Nuclear Waste Project Office. The Committee also had the benefit of the documents referenced.

In approaching this task, the Committee assigned the responsibility for reviewing specific subject categories in the SCA to individual ACNW consultants. These consultants met with members of the NRC staff for in-depth discussions and then served as leaders for reviews of the assigned subject categories during the eleventh and twelfth meetings of the Committee. Throughout our reviews, we have interacted with the NRC staff on a continuing basis, and many of our comments are the culmination of this iterative process.

As a result of our review, we have reached certain conclusions and want to offer specific recommendations concerning the SCP and/or the SCA. Our more significant comments deal with:

- the absence in the SCP of statements addressing the systematic and early identification and evaluation of potentially disqualifying features at the Yucca Mountain Site;

- the apparent lack of sufficient attention to the limitations and uncertainties in the Yucca Mountain data bases, and the associated difficulties in demonstrating that the repository will comply with the Environmental Protection Agency (EPA) standard (40 CFR Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes"); and

- Delays by DOE in implementing satisfactory quality assurance (QA) programs.

Our specific comments follow:

1. Although the SCP is an action plan for site characterization, we believe that a much stronger focus should be placed on early detection of potentially disqualifying features. The SCA is not sufficiently emphatic in its critique of the lack of such a focus. We believe that the SCA should point out the need in the SCP for an integrated section of the plan that explicitly addresses the activities leading to an evaluation of characteristics of the site directly related to disqualifying features (e.g., groundwater travel time) as stated in the regulations.

2. Uncertainties and limitations in the data used to justify conclusions will be the center of most contentions. Since the ability to resolve these uncertainties experimentally may well be beyond the practicality of the program, planning for their management is required. We recommend that the NRC staff strengthen its treatment of this topic in the SCA.

   As was briefly discussed with the Commission during our meeting on April 27, 1989, we believe that the NRC staff should encourage DOE to develop a scoping Level 2 (Release Estimate) probabilistic risk assessment (PRA) for the proposed Yucca Mountain repository. Such a PRA should be useful in defining those parameters that are critical to the adequate performance of the proposed facility, and would help to set priorities for the accompanying investigations.

   Subsequent to our discussions with the Commission, we were pleased to learn that DOE plans to begin conducting in 1990 or 1991 probabilistic system performance assessments for the proposed repository. We recommend that the NRC allocate resources sufficient to develop the expertise necessary to conduct an adequate, independent evaluation of the probabilistic system performance assessments that will be submitted by DOE as part of its application for a construction permit for the proposed repository.

   The Committee was told by the NRC staff (and this view was supported by one of our consultants) that the DOE staff may have considerable difficulties in generating a complementary cumulative distribution function (CCDF) for the site and, if this is the case, they may not be able to demonstrate the required compliance with the EPA standard. This difficulty in demonstrating compliance could represent a disqualifying feature for the proposed repository location. We urge that this concern be addressed in the SCA.

3. We believe that the NRC staff has been extremely tolerant of the delays by DOE in establishing a satisfactory QA process by the Office of Civilian Radioactive Waste Management (OCRWM) for

the Yucca Mountain project. Although one of the Objections in the SCA being prepared by the NRC staff addresses this matter, we believe that this troublesome issue should be promptly resolved since continued absence of approvable QA systems will increase the burden on the participants in licensing processes when qualification of data is at issue.

4. Additional comments on selected topics include:

   a. Because the Calico Hills formation is intended to serve as a barrier between the radioactive waste and the underlying saturated zone, some form of compromise must be reached between maintaining this formation as a barrier and drilling into or exploring within it to determine its critical characteristics. The NRC staff should include in the SCA a recommendation that DOE be definitive on how they will obtain the data necessary to determine the characteristics of the Calico Hills formation.

   b. Because of the significance of the waste package in the containment of the associated radionuclides, it is important that decisions be made soon on the materials to be used in fabricating the waste packages and the manner in which they are to be sealed. Such information is essential in considering possible interactions between the packages and the repository materials with which they will be in contact. Consideration of these interactions will require determination of the specific chemical composition of the repository water, and the SCA should reflect this concern.

   c. One of the key parameters in determining the adequacy of the proposed site is the rate of groundwater flow. In this regard, the NRC staff should emphasize in the SCA the need to obtain information on whether matrix or fracture flow (or a combination of the two) will govern water movement.

   d. Current concerns with the location of the Exploratory Shaft Facility (ESF) pertain to its distance from faults and the appropriateness of the samples it will yield in providing data that are representative of the proposed repository location. We believe the SCA should emphasize the need for the application of a comprehensive range of techniques (e.g., subsurface mapping, geophysical surveys) to the study of this problem.

      In the development of the Title I design for the ESF, the DOE staff was supposed to have provided a conceptual approach for construction of the facility. Reviews by the NRC staff (and ACNW consultants) indicate that this was not the case. The staff should ensure that the SCA states that before DOE proceeds further with the Title II design, which will provide

additional details on the proposed ESF, DOE should promptly address the errors and deficiencies in the Title I design.

e. We believe that consideration should be given to extending the geoscience (hydrology, geology, geophysics) investigations to a distance sufficient to provide data on conditions within the region surrounding the site. Some of the existing investigations appear to be too limited in their geographical coverage. For example, because of the importance of the potential of volcanism, such an extension would appear mandatory to ensure that these studies have the potential for uncovering any disqualifying features.

f. A range of alternative conceptual models will be used in conducting performance assessments for the repository. In our opinion, there are two problems associated with these models, namely, they are incomplete and they are not integrated. The SCP should be constructed so as to provide data that identifies the correct model, rather than merely confirming the preferred model. Since modeling is essential in determining the performance of the proposed repository and for uncovering potential disqualifying features, these deficiencies must be corrected. Such determinations should be scheduled as early as possible in the site characterization process, and this should be reflected in the SCA.

g. The potential for natural resources in the area and the scenarios that are to be considered relative to possible human intrusion (some of which are related to exploration for such resources) need to be given more attention. A much more thorough assessment of potential mineral resources, including petroleum, should be required in the SCP, and the SCA should indicate this need.

With respect to human intrusion, the Committee notes that guidance on this matter is provided in EPA standard 40 CFR Part 191. We support the NRC staff recommendation that the DOE staff should consider this guidance in the development of the CCDF for the site.

h. The NRC staff has apparently accepted the lack of details in the SCP on test procedures and schedules for various site analyses since these are to be provided in the Study Plans being prepared by DOE. This places an increased burden for reviewing the Study Plans on the NRC staff. We recommend that the NRC staff note this problem in the SCA and that enhanced details of the characterization program be included in the periodic progress reports that will be submitted by DOE to supplement the SCP.

5. The SCA methodology and its basis are sharply focused on the individual sections of the SCP. Nevertheless, it might be useful if the NRC staff would produce an addendum that, among other items, contains those comments related to global or generic matters. For example, we believe that a useful comment in such a section would be to urge DOE to recognize that the licensing process and any decisional activities connected with it are adversarial. We also believe that this characteristic of the licensing proceedings should encourage DOE to ensure that its technical arguments are as much beyond challenge by responsible scientists as reasonable. The context of the SCA should be responsive to this need.

We trust these comments will be helpful in the development of the Site Characterization Analysis. In closing, we want to acknowledge and thank staff members of both the NRC and DOE for their cooperation and support during our review. All the people with whom we have interacted have been helpful and responsive to our questions.

Sincerely,

Dade W. Moeller

Dade W. Moeller
Chairman

References:

1. U. S. Department of Energy, DOE/RW-0199, "Site Characterization Plan - Yucca Mountain Site," December 1988
2. U. S. Nuclear Regulatory Commission draft Site Characterization Analysis, Sections 1, 2, and 3, received June 27, 1989 (Predecisional)
3. U. S. Department of Energy, DOE/RW-0206, "Site Characterization Plan - Public Handbook, Yucca Mountain, Nevada," January 1989
4. U. S. Department of Energy, DOE/RW-198, "Site Characterization Plan Overview, Yucca Mountain Site," December 1988
5. U. S. Nuclear Regulatory Commission, "Administrative Plan and Procedures for NRC Staff Review of DOE's Consultation Draft Site Characterization Plan," December 18, 1987
6. U. S. Nuclear Regulatory Commission, "Draft Technical Review Plan for NRC Staff Review of DOE's Site Characterization Plans," December 18, 1987
7. U. S. Nuclear Regulatory Commission, "Review Plan for NRC Staff Review of DOE's Site Characterization Plan," December 12, 1988
8. U. S. Nuclear Regulatory Commission, Regulatory Guide 4.17, "Standard Format and Content of Site Characterization Plans for High-Level-Waste Geologic Repositories," March 1987
9. Ross, B., Disposal Safety Incorporated, Prepared for Sandia National Laboratories, SAND 85-7117, "A First Survey of Disruption Scenarios for a High-Level-Waste Repository at Yucca Mountain, Nevada," December 1987

10. Letter dated June 1, 1989 from John J. Kearney, Edison Electric Institute, to C. P. Gertz, Yucca Mountain Project Office, DOE, regarding DOE Site Characterization Plan
11. Letter dated May 3, 1989 from R. Loux, Nevada Agency for Nuclear Projects, Waste Project Affairs, to C. Gertz, , DOE Yucca Mountain Project Office, Subject: State of Nevada Preliminary Comments on the Site Characterization Plan for the Yucca Mountain Candidate High-Level Nuclear Waste Repository Site