TV/6/23/88

JUN 24 1988 -

MEMORANDUM FOR: John J. Linehan, Acting Chief
Operations Branch, HLWM

FROM: Ronald L. Ballard, Chief
Technical Review Branch, HLWM

SUBJECT: SCOPE, MILESTONES AND TIMEFRAMES FOR POTENTIAL RULEMAKING

As requested in the June 14, 1988, briefing on assignments for potential rulemakings within the HLWM program, scopes and timeframes for the following proposed rulemakings have been prepared by assigned Task Leaders and are attached.

- Disturbed Zone
- Groundwater Travel Time
- Anticipated/Unanticipated Processes and Events
- Definition of Substantially Complete Containment
- Criteria for Greater than Class C Low-Level Waste

The Task Leaders will be prepared to elaborate on the attachments on Monday, June 27, 1988.

/s/

Ronald L. Ballard, Chief
Technical Review Branch, HLWM

Attachments:
As stated

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RULEMAKINGS - SCOPE, SCHEDULES AND MILESTONES

DISTURBED ZONE RULEMAKING

PURPOSE OF RULEMAKING

Purpose of this rule making is to establish technical criterion for determining the external boundary of the disturbed zone.

REGULATORY UNCERTAINTY THAT NEEDS RESOLUTION

In the groundwater travel time criterion (10 CFR 60.113(a)(2)), disturbed zone is defined as "that portion of the controlled area physical or chemical properties of which have changed as a result of underground facility construction or as a result of heat generated by the emplaced radioactive wastes such that the resultant change of properties may have a significant effect on the performance of the geologic repository." The disturbed zone definition is intended to establish the inner boundary from which the groundwater travel time is estimated. This definition needs clarification so that some distance value from the edge of the repository can be estimated for estimating groundwater travel time. Of particular concern is the extent of the thermal effects (buoyancy) on groundwater movement.

LINKAGE WITH OTHER RULEMAKINGS OR ACTIVITIES

Disturbed zone rulemaking is closely associated with groundwater travel time rulemaking.

SIGNIFICANT INFORMATION FROM PART 60 RULEMAKING RECORD

The Disturbed Zone definition in 10 CFR 60 was provided in connection with the pre-emplacement groundwater travel criterion. No additional details related to the disturbed zone for the intent of the rule and rationale are provided in the Staff Analysis of Public Comments on Proposed Rule 10 CFR Part 60, NUREG-0804. However, in the Proposed Rules (51 FR 22295, June 19, 1986) for the amendments to 10 CFR Part 60, additional discussion to clarify the Commission's concepts of disturbed zone is provided. The Commission defined a disturbed zone for determining an inner boundary from which to estimate groundwater travel time, because the physical and chemical processes which isolate the wastes are "especially difficult to understand in the area close to the emplaced wastes because that area is physically and chemically disturbed by the heat generated by those wastes." The Commission did not intend to use thermal buoyancy effects to serve as the basis for defining the extent of the disturbed zone.

TIMEFRAME IN WHICH RULEMAKING IS NEEDED

Resolution is needed immediately but must be completed prior to site characterization.

RESOURCES TO DEVELOP REGULATORY POSITION AND TECHNICAL REPORT

A detailed schedule and assessment of resources needed will be developed following management decisions based on staff recommendations provided in the options paper.

Schedules (Optimal)

Prepare Draft Technical Position	+ 5 weeks
Internal Review	+ 8 weeks
Develop Written Basis	+ 18 weeks
Complete Revised Draft Position	+ 26 weeks

RULEMAKING-SCOPE SCHEDULE, AND MILESTONES

PRE-WASTE-EMPLACEMENT GROUNDWATER TRAVEL TIME

PURPOSE OF RULEMAKING

The staff will be developing an options paper assessing possible alternatives for the final disposition of the guidance position on groundwater travel time. One option envisioned is for the staff to recommend rulemaking. However, the specific nature of such a rulemaking or even whether to conduct rulemaking will depend on management decisions based on the technical discussions, alternatives, and recommendations presented in the options paper. The staff is planning to have a draft options paper by Aug. 1, 1988. Preparation of the final options paper will be coordinated with Research and OGC.

REGULATORY UNCERTAINTY TO BE RESOLVED

The meaning of the Groundwater Travel Time Performance Objective is uncertain because the 10 CFR 60 Rulemaking was deficient in describing the performance objective in unambiguous terms that could be readily understood and implemented in a defensible technical fashion. Items in question include:

- determination of the disturbed zone
- pre-waste-emplacement conditions
- fastest path of likely radionuclide travel
- travel time velocity

LINKAGE WITH OTHER RULEMAKINGS OR ACTIVITIES

The groundwater travel time and the disturbed zone guidance positions are interrelated, with the groundwater travel time position being dependent on the disturbed zone position. Technical concerns with the disturbed zone position must be addressed and the final disposition of the groundwater position will depend on how and to what extent these concerns are resolved.

SIGNIFICANT INFORMATION PERTINENT TO THE RULEMAKING

A significant amount of information related to groundwater travel time is contained in the following documents:

- NUREG-0804, Subparts B and C, December 1983
- NUREG-1046, and Staff Analysis to Public Comments On Amendments to 10 CFR 60 Related to the Unsaturated Zone, December 1984
- Draft GTP On Groundwater Travel Time, June 1986

- ° Draft GTP: Interpretation and Identification of the Extent of the Disturbed Zone, June 1986
- ° Public comments on June 1986 Draft GTP on disturbed zone
- ° Public comments on June 1986 Draft GTP on groundwater travel time
- ° April 25, 1988 Memo. on Draft Technical Position on GWTT
- ° NRC staff and TA contractor comments on 4/25/1988 Draft TP on GWTT

TIMEFRAME IN WHICH RULEMAKING IS NEEDED

Resolution is needed immediately but must be completed prior to site characterization

RESOURCES TO DEVELOP THE REGULATORY POSITION AND TECHNICAL BASIS

A detailed schedule and assessment of resources needed will be developed following management decisions based on staff recommendations provided in the options paper.

SCHEDULE

Prepare an Options Paper for Management	+ 5 weeks
Formulate Position	+ 20 weeks
Write the Basis for Position	+ 30 weeks
Complete the Draft of the Rule	+ 35 weeks

RULEMAKINGS-SCOPE, SCHEDULE AND MILESTONES

DEFINITION OF "SUBSTANTIALLY COMPLETE CONTAINMENT"

Purpose of Rulemaking

Part 60 of Title 10 of the CFR states that one of the performance objectives shall be that containment of radionuclides within the waste package shall be substantially complete for a specified period of years after permanent closure of the geologic repository in which the waste packages have been emplaced. It has become evident that the phrase "substantially complete containment (SCC)" needs clarification.

Regulatory Uncertainty to be Resolved

Various interpretations have been placed on SCC. The containment might be 100% or something less than 100%. The period of time might be 300 to 1000 years, or some other period of time that the Commission might approve. The conditions are anticipated events and processes. Demonstration of compliance has been conceded to be less than with complete assurance, considering the long periods of time involved. What will constitute a demonstration of compliance? What will the degree of uncertainty be for this demonstration? Perhaps also, what is reasonable assurance?

Linkage with Other Rulemakings or Activities

The rulemaking on SCC could interface with those on anticipated/unanticipated events and processes, and groundwater travel time. It impacts potential test work by DOE and NRC.

Significant Information from Part 60

60.101(a)(2)	While these performance objectives and criteria (to be stated below) are generally stated in unqualified terms, it is not expected that complete assurance that they will be met can be presented. For such long-term objectives and criteria, what is required is reasonable assurance, making allowance for the time period, hazards, and uncertainties involved, that the outcome will be in conformance with those objectives and criteria.

Time Frame in which Rulemaking is Needed

Because of the potential impact on test programs in connection with site characterization work, the rule should be promulgated (1) as soon as possible, (2) within one year, and in any case (3) before the start of test work.

Resources for Rulemaking

1. Text of 10 CFR Part 60
2. NUREG-0804
3. Rulemaking record (M. Delligatti)
4. OGC

Schedule

Work on this Rule will be carried on concurently with work on a Rule for Greater Than Class C Waste. Milestones and cumulative calendar times are:

0	Start work	
1	Complete major portion of review of background material	+ 6 weeks
2	Formulate position	+15 weeks
3	Write basis for position	+18 weeks
4	Complete the draft of the rule	+25 weeks

RULEMAKINGS-SCOPE, SCHEDULE AND MILESTONES

CRITERIA FOR CONTAINMENT OF "GREATER THAN CLASS C" LOW-LEVEL WASTE IF IT GOES INTO A REPOSITORY

Purpose of Rulemaking

Part 61 of Title 10 of the CFR provides for disposal of low-level waste, which is limited by definitions to wastes containing certain maximum concentrations of radionuclides. Although wastes containing higher concentrations may be approved for near surface burial, these will be evaluated on a case-by-case basis. Part 60 provides for disposal of high-level wastes, which, as of January 1, 1988, are defined in terms of origin of the wastes rather than on radionuclide content. By Federal Register notice dated 18 May 1988, pp 17709 -17711, the NRC has proposed modification of 10 CFR 61.55 to require all greater-than-Class-C waste to be disposed of in a geologic repository unless an alternative proposal is approved by the Commission. The proposed rule is to provide for disposal of wastes with radionuclide contents between those of Part 61 and those of Part 60.

Regulatory Uncertainty to be Resolved

Part 61 of Title 10 of the CFR covers Classes A, B, and C low-level wastes. These classes are defined in terms of half-lives of the radionuclides involved and their concentrations. All are suitable for shallow land burial, which is defined as being within 30 meters of the bottom of the site cover. Class C wastes will be given deepest burial, modifiable by the inclusion of an intrusion barrier having a 500-year life. Wastes having concentrations greater than those of Class C are generally unsuitable for near surface burial, but may be approved for such burial on a case-by-case basis.

Is there a basis for including the greater than Class C wastes in those wastes that may be disposed of in a geologic repository?

Linkage with Other Rulemakings or Activities

The proposed rulemaking could impact the revision of the Technical Position on Waste Form as well as the configuration and design of the high-level waste repository. It also relates to the proposed modification of 10 CFR 61.55.

Significant Information from Part 61

61.2	Low-level waste has the same meaning as in the LLWPA.

Time Frame in which Rulemaking is Required

Unless there is an accumulation of greater than Class C wastes on hand that must be disposed of in the near future, the time frame does not appear critical.

Resources for Rulemaking

1. Text of 10 CFR Part 61
2. Text of 10 CFR Part 60
3. Rulemaking record (D. Fehringer)
4. OGC

Schedule

Work on this rule will be carried on concurrently with work on the rule for SCC. Milestones and cumulative calendar times are:

0	Start work	
1	Complete major portion of review of background material	+12 weeks
2	Formulate position	+19 weeks
3	Write basis for position	+22 weeks
4	Complete the draft of the rule	+28 weeks

RULEMAKINGS-SCOPE, SCHEDULE AND MILESTONES

ANTICIPATED PROCESSES AND EVENTS AND UNANTICIPATED PROCESSES AND EVENTS

Purpose of Rulemaking

To clarify the usage and intent of the terms "anticipated processes and events" and "unanticipated processes and events".

Regulatory Uncertainty to be Resolved

The definition of anticipated processes and events and unanticipated processes and events includes non-specific terms such as 'reasonably likely' and 'sufficiently credible to warrant consideration' which have been interpreted in many different ways. DOE has attempted to provide a probabilistic definition which the NRC staff does not feel is consistent with the meaning and intent of these terms. The staff needs to supply working deterministic definitions.

- A least one acceptable methodology of selecting and categorizing processes and events needs to be specified.
- The interrelationship of the terms "anticipated" and "unanticipated" processes and events with the EPA's terminology needs definition.
- At least one acceptable methodology that could lead from processes and events determined deterministically, to resolution of the EPAs probabilistic standard needs to be defined.
- The use of anticipated processes and events in determining compliance with other performance objectives in 10 CFR 60 needs to be clarified.
- The use of unanticipated processes and events in the licensing process, specifically as related to 60.113(c), needs to be clarified.

The above uncertainties can be addressed through rulemaking and GTP or Regulatory Guide development. Specific rulemaking activities would include:

Require interlocutory review.
The statement of consideration for the final rule Part 60 suggests that during the licensing hearings "anticipated" and "unanticipated" processes and events could be separately identified during interlocutory review. Part 60 does not require this option. Consideration also needs to be given to requiring this review prior to actual submittal of the license application.

Make rule more explicit.
Minor wording changes in several sections of the rule could clarify when and how "anticipated" and "unanticipated" processes and events are to be used. These changes should include such things as specifically defining anticipated processes and events as design basis events for the post-closure. Potential changes could possibly include using the terms within the EPA standard while retaining the basic definitions. The choice of the terms anticipated and unanticipated was quite unfortunate, and by

itself creates confusion, as the public wants to use these terms as defined in the dictionary, not as specified in Part 60.

List specific processes and events to be considered.
The processes and events which must be considered as "anticipated" and "unanticipated" processes and events and for Implementation of the EPA standard could be stipulated in a rule. The primary concern, or area of contention, is the degree of prescription needed.

Linkage with Other Rulemakings or activities

Conforming Part 60 to the EPA Standard.
Implementing the EPA Standard.
Definition of "Substantially Complete Containment".

Significant Information from Part 60 Rulemaking Record

See attached.

Timeframe in which Rulemaking is Needed

Preliminary guidance is needed prior to development of the final Site Characterization Plan.
"Substantially complete" guidance is needed prior to finalization of SF&CG and SRPs.

Resources Needed for Rulemaking

Interlocutory review amendment = 7 staff weeks
Specific definitions amendment = 4 staff weeks
Specific processes and events = 12 staff weeks

Milestones and Timeframes

Complete draft final GTP	+ 0 weeks
Draft amendment for internal review	+ 20 weeks
Receipt of internal comments	+ 22 weeks
Final draft amendment to RES	+ 26 weeks

wastes had not been created in the first place. Efforts to reduce releases further would have little, if any, demonstrable value commensurate with their costs.

The EPA limits require the performance of geologic repositories to be effective over a long period of time. There will always be substantial uncertainties in predicting the long-term performance of geologic repositories. The Commission will insist upon the adoption of a variety of design features, tests, or other measures in order to be able to conclude with confidence that the EPA standard is met. The result may be the same as if the Commission were to impose similar requirements in the name of keeping releases as low as reasonably achievable. Given the substantial uncertainties involved with predicting long-term performance, the already low EPA limits and the already stringent geologic performance requirements, it is doubtful that the ALARA concept could be applied in a meaningful way.

When the Commission finds that certain measures are needed to improve confidence in dealing with uncertainties, it is making a substantial safety judgment. The same kinds of balancing that are undertaken in ALARA determinations may be appropriate. That is, if confidence in the performance of the geologic repository is sensitive to a particular source of uncertainty, it will be in order for the Commission to take into account both the significance of the factor involved and the costs of reducing or eliminating it.

In short, the Commission has conclued that the long-term performance requirements should not explicitly be tied to an ALARA principle, and the rule remains as it was when proposed. The Commission believes the concerns of the commenters in support of the ALARA approach will be largely accommodated in connection with its treatment of uncertainties in the course of the licensing process.

EPA's proposed rule (Part 191) indicates that appropriate measures must be taken, in light of the uncertainties involved in predicting repository performance, to assure that the "containment requirements" will be met. One of the measures identified by EPA would be the selection and design of disposal systems to keep releases to the accessible environment as small as reasonably achievable, taking into account technical, social, and economic considerations. The Commission is recommending to EPA that the assurance requirements, including the ALARA provision, be omitted from the final rule. The Commission emphasizes that its rules accommodate the underlying concerns of EPA, as articulated in its statement of considerations, that measures must be taken to assure confidence that the numerical release limits will be met.

Human Intrusion

The Commission observed, in the preamble of the proposed rule, that everything that is reasonable should be done to discourage people from intruding into the geologic repository. Those measures which its believed to be reasonable included directing site selection toward sites having little resource value and marking and documentation of the site. Beyond that, the Commission felt there would be no value in speculating on the "virtual infinity of human intrusion scenarios and whether they will or will not result in violation of the EPA standard." The Commission explained that inadvertent intrusion was highly improbable, at least for the first several hundred years during which time the wastes are most hazardous; and even if it should occur, it is logical to assume that the intruding society would have capability to assess the situation and mitigate consequences. The Commission recognized that deliberate intrusion to recover the resource potential of the wastes could result in elevated releases of radioactivity, but concluded that the acceptability of such releases was properly left to those making the decision to undertake resource recovery operations. It noted that comment on its proposal and alternative approaches would be welcome.

Commenters generally accepted the approach outlined. A number of commenters did emphasize the importance of intrusion scenarios as having the potential to lead to releases of radionuclides to the environment, but they suggested no alternative means for dealing with the prospect. One commenter correctly calls attention to the possibility of a third category of intrusion—that which is "intentional yet indifferent"—which was not covered in the earlier discussion of "inadvertent" or "deliberate" intrusion. This behavior presupposes knowlege (albeit imperfect) of the existence and nature of the geologic repository and a level of technology that could be applied to remedial action as well as to the intrusion itself, yet makes no judgment as to whether a societal decision has been made concerning the intrusion. The Commission has addressed this and other concerns in the revised language that is being adopted, as explained below.

Although the discussion accompanying the proposed rule indicated that intrusion scenarios need not be considered, the rule itself was not explicit on this point. The Commission considers it necessary to clarify its position and, in doing so, allows for examination of intrusion under appropriate bounding conditions. After careful consideration of the public comments received on questions relating to human intrusion, the Commission is of the view that while the passive control measures it is requiring will reduce significantly the likelihood of inadvertent intrusion into a geologic repository, occasional penetration of the geologic repository over the period of isolation cannot be ruled out, and some provision should be made in the final rule for consideration of intrusion should these measures fail. Its objective is to provide a means for evaluating events that are reasonably of concern, while at the same time excluding speculative scenarios that are inherently implausible. The Commission will not require this generation to design for fanciful events which the Commission has an abiding conviction will never occur; on the contrary, it will grant a license if it is satisfied that the risk to the health and safety of future generations is not unreasonable.

The rule now incorporates a definition of "unanticipated processes and events" which are reviewable in a licensing proceeding: such processes and events expressly include intrusion scenarios that have a sufficiently high likelihood and potentially adverse consequence to exceed the threshold for review. The scenarios must be "sufficiently credible to warrant consideration." The Commission is requiring that certain assumptions be made in assessing this likelihood. First, the monuments required by the rule are assumed to be sufficiently permanent to serve their intended purpose. The Commission takes this position because of its confidence that monuments can be built to survive. While it assumes that the monuments will last, it does not automatically assume that their significance will continue to be understood. Second, the Commission requires an assumption that the value to future generations of potential resources can be assessed adequately at this time. Consistent with its previously stated views, it thinks that the selection of a site with no foreseeably valuable resources could so reduce the likelihood of intrusion as to reduce, or eliminate, any further need for it to be considered. Third, the Commission requires the assumption that some functioning institutions—though not necessarily those undertaking the intrusion—

understand the nature of radioactivity and appreciate its hazards. The extent of intergenerational transfer of knowledge is, of course, debatable; it is conservative, in the light of human history to date, to predict this minimal level of information and to take it into account in assessing the likelihood that intrusion will occur. Fourth, the Commission provides that relevant records are preserved, and remain accessible, for several hundred years after permanent closure. While perhaps this period could not be justified on the basis of historic precedents alone, the Commission considers the required deposit in land records and archives, together with current data handling technology, to provide a sufficient basis for assuming that information about the geologic repository will continue to be available for several hundred years.

The definition of "unanticipated processes and events" also implicitly bounds the consequences of intrusion scenarios. This is accomplished not only by the assumption of continued understanding of radioactivity and survival of records, but also by the further assumptions that if there are institutions that can cause intrusion at depth in the first place, there will also be institutions able to assess the risk and take remedial action. It need not be assumed that today's technology would be used—merely that a level of social organization and technological competence equivalent to that applied in initiating the processes or events concerned would be available to deal with the situation.

It was suggested that another way to reduce the likelihood of human intrusion would be to adopt additional design criteria for the waste form or waste package. These would prohibit, or at least discourage, the emplacement of materials which themselves might attract recovery operations—for example, operations to recover the residual energy resource value in spent fuel or scarce and expensive materials in the waste package. But, under the definition of "unanticipated processes and events" in the final rule, intrusion for such proposes would have to be reviewed in the licensing process if the particular circumstances are sufficiently credible to warrant consideration. This imposes a reasonable constraint. The Commission believes that any further limitation would unduly interfere with the flexibility of DOE as a designer and could, in the case of spent fuel disposal, conflict with other national objectives.

In summary, the Commission has retained the principle that highly speculative intrusion scenarios should not be allowed to become the driving force in license reviews, but has introduced some flexibility to permit consideration of intrusion on a case-by-case basis where circumstances warrant.

Other Principal Changes in the Final Rule Anticipated/Unanticipated Processes and Events

The proposed rule defined anticipated processes and events as "those natural processes and events that are reasonably likely to occur during the period the intended performance objective must be achieved and from which the design bases for the engineered system are derived" At the same time, the Commission was requiring that the facility be designed so as to assure that long-term releases conform to standards established by EPA. The statement of considerations pointed out that if the process or event is unlikely, the overall system must still limit the release consistent with the EPA standard as applied to such events. This created a contradition because on the one hand it was stated that the design bases should be derived from anticipated processes and events while, on the other hand, the design was to meet an EPA standard as applied to what was unanticipated.

The Commission has resolved this conflict by eliminating the reference to design bases from the definition of "anticipated processes and events." It has also included a definition of "unanticipated processes and events." In the final rule, numerical performance objectives are established for particular barriers, assuming "anticipated processes and events." Such numerical criteria are not established for "unanticipated processes and events." Rather, additional requirements may be found to be necessary to satisfy the overall system performance objective as it relates to unanticipated processes and events.

It should be noted that the distinction between anticipated and unanticipated processes and events relates solely to natural processes and events affecting the geologic setting. The Commission intends that a judgment whether a natural process or event is anticipated or unanticipated be based upon a careful review of the geologic record. Such processes or events would not be anticipated unless they were reasonably likely, assuming that processes operating in the geologic setting during the Quaternary Period were to continue to operate but with the perturbations caused by the presence of emplaced waste superimposed thereon. Unanticipated processes and events would include those that are judged not to be reasonably likely to occur during the period the intended performance objective must be achieved, but which nevertheless are sufficiently credible to warrant consideration. These include processes and events which are not evidenced during the Quaternary period or which, though evidenced during the Quaternary, are not likely to occur during the relevant time frame. Identification of anticipated and unanticipated processes and events for a particular site will require considerable judgment and will not be amenable to accurate quantification, by statistical analysis, of their probability of occurrence.[6]

Because the design basis for the engineered barrier system will be derived from the identification of anticipated and unanticipated processes and events, such identification will have a pervasive effect on the basic structure of the licensing proceedings. The Commission therefore contemplates directing that rulings made in the course of construction authorization hearings on the scope of anticipated and unanticipated processes and events be separately identified by the presiding officers and certified to the Commission for interlocutory review, pursuant to 10 CFR 2.718(i).

The license review will thus need to include a determination whether the proposed activities will meet the EPA standard as applied to anticipated processes and events and as applied to such unanticipated processes and events, if any, as have been found to warrant consideration. Each determination will be made in the light of assessments which will involve interpretation of the geologic record and consideration of credible humaninduced events as bounded by the assumptions set forth above. Worst-case scenarios would be analyzed to the extent they may be encompassed by the definition of unanticipated processes and events. Complex quantitative models will need to be employed, and a wide range of factors considered in arriving at a determination of whether there is reasonable assurance, making allowance for the time period and

[6] The Commission views the proposed EPA standard as being directed to the evaluation of releases arising out of the categories that we have defined as "anticipated processes and events" and "unanticipated processes and events." As EPA itself recognizes, there can only be estimates rather than rigorous demonstrations of probabilities of occurrence. The Commission's translation of the EPA language into qualitative terms provides a clearer basis for judging, under the Atomic Energy Act, whether there is unreasonable risk to the health and safety of the public.

hazards involved, that the EPA standard will be met. There are two principal elements that will go into the Commission's application of this "reasonable assurance" concept. First, the performance assessment which has been performed must indicate that the likelihood of exceeding the EPA standard is low. Second, the Commission must be satisfied that the performance assessment is sufficiently conservative, and its limitations are sufficiently well understood, that the actual performance of the geologic repository will be within predicted limits.

Transuranic Waste (TRU)

The proposed rule included a definition of transuranic waste and performance objectives that would apply to the disposal of TRU in a licensed geologic repository. This was widely misconstrued as a requirement that radioactive material conforming to the definition must be disposed of in this manner. This was not the intention, nor in fact did the rule so specify. Rather, the Commission was merely indicating what performance objectives would apply *if* TRU were disposed of in a licensed geologic repository. Some commenters also took exception to the definition of TRU in the rule.

Whether or not a geologic repository is subject to licensing depends upon the applicability of Sections 202(3) and 202(4) of the Energy Reorganization Act of 1974. (See definition of "HLW facility.") If a facility is licensed, then the Commission must consider the radiological hazards associated with whatever wastes may be emplaced. The Commission attempted, in the proposed rule, to address the requirements for one such kind of waste—TRU. But the Commission was too restrictive, in that its definition of TRU was too limited for present purposes and in that wastes other than HLW and TRU were not covered at all. For the time being, the Commission has concluded that the matter is best handled by eliminating all references to TRU. The remaining performance objectives provide adequate guidance to deal with TRU-related issues that may arise.

The Commission has also reviewed the waste package requirements, which as originally written would have applied to all emplaced radioactive waste. It is appropriate to include such requirements for HLW, which must necessarily be disposed of in a licensed facility. Since the Commission does not know what other radioactive wastes, if any, will also be emplaced, and what their chemical, radiological, thermal, and other characteristics may be, it has decided to leave pertinent waste package requirements to be determined on a case-by-case basis as the need arises.

Siting Criteria

Although provisions relating to site characteristics have been revised, the Commission has retained the same two basic concepts. First, a site should exhibit an appropriate combination of favorable conditions, so as to encourage the selection of a site that is among the best that reasonably can be found. By referring to a "combination" of conditions, it implies that the analysis must reflect the interactive nature of geologic systems. Second, any potentially adverse conditions should be assessed in order to assure that they will not compromise the ability of the geologic repository to meet the performance objectives. It is important to recognize that a site is not disqualified as a result of the absence of a favorable condition or the presence of a potentially adverse condition. The Commission emphasizes this point here because several commenters who characterized the siting criteria as unduly restrictive failed to appreciate that the presence of potentially adverse conditions would not exclude a site from further consideration while others mistakenly assumed that favorable conditions were requirements.

The changes do not reflect any departure from the Commission's original philosophy, but they are designed to express its purpose more clearly. Thus, its interest in specifying that the geologic setting shall have exhibited "stability" since the start of the Quarternary Period was to assure only that the processes be such as to enable the recent history to be interpreted and to permit near-term geologic changes to be projected over the relevant time period with relatively high confidence. This concept is best applied by identifying, as potentially adverse conditions, those factors which stand in the way of such interpretation and projection; this is the approach the Commission has chosen to follow.

One revision is the elimination of the classification of potentially adverse conditions into one set pertaining to the "geologic setting" (corresponding to "site" in the final rule) and one set pertaining to the "disturbed zone." The Commission has determined that by defining these conditions as potentially adverse only when they occur in the site or disturbed zone, respectively, some significant factors bearing upon waste isolation may not be assessed. The Commission has changed the siting criteria, therefore, so that the presence of any of the enumerated conditions is to be regarded as potentially adverse if it applies to the controlled area and, in addition, such a condition outside the controlled area is to be regarded as potentially adverse if it may affect isolation within the controlled area.

Another change, discussed under *Single vs. Multiple Performance Standards*, may have the effect of increasing the importance of the geological conditions. Under the final rule, the performance objectives for the engineered barrier system (§ 60.113(a)(1)) may be adjusted, on a case-by-case basis, if the overall system performance objective, as it relates to anticipated processes and events, is satisfied. This feature of the final rule may provide the designer additional incentive to select the site so as to maximize its isolation capabilities.

The Commission's review of the siting criteria, as modified, has led it to conclude that the isolation capabilities of the geologic repository will be given the emphasis that they merit. This review has included a consideration of suggestions that the rule require that a slate of sites be among the best that can be found on the basis of geological factors alone and that the geologic characteristics of the site provide the highest reasonably available degree of the site's isolation capabilities. These topics are discussed below, under the heading *Geologic Conditions*.

A detailed review of the siting criteria is contained in the Section-by-Section Analysis.[6]

Containment

Several commenters took exception to the performance objective calling for design of the waste packages to "contain all radionuclides" for a specified period after permanent closure. The objections were: first, that 100% performance cannot be expected in view of the very large number of containers that may be emplaced; second, that 100% performance cannot be justified as being needed in order to meet any likely EPA standard; and, third, that the adequacy of design to contain "all" radionuclides for long

[6] Under Section 112(a) of the Nuclear Waste Policy Act of 1982, DOE is required to develop guidelines for the recommendation of sites for repositories. Among other things, such guidelines are to "specify detailed geologic considerations that shall be primary criteria for the selection of sites in various geologic media." Issuance of these guidelines is subject to the concurrence of the Commission. The Commission has made no determination whether such guidelines, when issued, should in some manner be reflected in the technical criteria or licensing procedures portions of 10 CFR Part 60.