MAY 4 1201

Mr. Edward F. Tuerk
Acting Assistant Administrator
for Air, Noise and Radiation
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Tuerk:

Thank you for the opportunity to review Draft #19 of the EPA High-Level Waste Standard. My major concerns regarding Subpart B of this draft standard are:

1. The direction in Subpart B of the standard to use "quantitative performance assessments" as the sole basis for evaluating compliance with the numerical release limits of the standard should be deleted. Reorganization Plan No. 3 of 1970 clearly limited EPA's authority to the establishment of generally applicable environmental standards and left the responsibility for implementation and enforcement of such standards with the AEC (now NRC). The NRC must have the flexibility to use whatever assessment methods are most appropriate for evaluating a particular license application. The wording of Subpart B implies a degree of numerical precision which is incompatible with evaluations of geologic processes and human interactions far into the future. The NRC staff intends to use such analyses to the extent practicable, but recognizes that non-quantitative analyses must play a significant role in evaluating the acceptability of a waste disposal concept. I do not consider the standard to be implementable by the NRC without the flexibility to use whatever assessment methods are most appropriate.

2. The current definition of the term "accessible environment" should be modified. The present definition, which is linked to Part 146 of Title 40, appears unworkable. Further, the one mile exclusion distance in the definition is inappropriate. The key to what is the "accessible environment" is that which is in direct contact with or readily available for use by human beings. The Secretary of Energy should identify in DOE's license application the physical boundaries of that part of the environment "in direct contact with or readily available for use by human beings." Such an identification is a very site specific environmental issue involving long-term commitments of resources (land, groundwater and, possibly, human resources for monitoring or other protective measures). This issue will be reviewed by the Commission in accordance with NEPA in the course of the licensing process. The definition of the "accessible environment" should be changed to specify that the Secretary of Energy will identify the limits of the "accessible environment" for a particular site.

ENCLOSURE 2

3. Our contractor (Sandia National Laboratory) has begun an independent analysis of the release limits proposed by the standard. The results to date indicate that EPA's analytical methods for estimating repository releases are appropriate but, because of large uncertainties in some of the input data, the release limits proposed in the standard may not be as readily achievable as EPA has indicated, and the resulting number of health effects may be somewhat larger than EPA's estimate. I recommend that EPA proceed with publication of the draft standard with the current release limits, but note that some revisions may be recommended when our analyses are more complete.

We are continuing to review the standard with respect to one or two procedural items which I believe can be modified easily and will make the standard more readily implementable. The overall approach adopted by EPA in developing this standard appears to be reasonable for establishment of an environmental standard. This standard is an important part of the national waste management program and will establish the overall performance objective for our regulation, 10 CFR 60. With incorporation of comments 1 and 2 above, the standard will be technically sound and I urge EPA to proceed with publication of the standard for public comment.

Sincerely,

/s/

John B. Martin, Director
Division of Waste Management, NMSS

NUCLEAR REGULATORY COMMISSION

ORIGINAL

In the Matter of: COMMISSION MEETING

BRIEFING ON SECY-81-262 - 10 CFR
DISPOSAL OF HIGH-LEVEL RADIOACTIVE
WASTES IN GEOLOGIC REPOSITORIES:
TECHNICAL CRITERIA

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ALDERSON REPORTING

400 Virginia Ave., S.W. Washington, D. C. 20024

Telephone: (202) 554-2345

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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BRIEFING ON SECY-81-267 - 10 CFR 60

DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES

IN GEOLOGIC REPOSITORIES: TECHNICAL CRITERIA

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Nuclear Regulatory Commission
Room 1130
1717 H Street, N.W.
Washington, D.C.

Tuesday, May 12, 1981

The Commission met, pursuant to notice, at 10:07 a.m., JOSEPH M. HENDRIE, Chairman, presiding.

PRESENT:

JOSEPH M. HENDRIE, Chairman

VICTOR GILINSKY, Commissioner

PETER A. BRADFORD, Commissioner

JOHN F. AHEARNE, Commissioner

ALSO PRESENT:

SAMUEL J. CHILK	MICHAEL BELL
JOHN HOYLE	JAMES R. WOLF
LEONARD BICKWIT	DENNIS RATHBUN
WILLIAM J. DIRCKS	MARTIN MALSCH
JOHN B. MARTIN	JOHN DAVIS
PAT COMELLA	DONALD MAUSSHARDT

DISCLAIMER

This is an unofficial transcript of a meeting of the United States Nuclear Regulatory Commission held on May 12, 1981 in the Commission's offices at 1717 H Street, N. W., Washington, D. C. The meeting was open to public attendance and observation. This transcript has not been reviewed, corrected, or edited, and it may contain inaccuracies.

The transcript is intended solely for general informational purposes. As provided by 10 CFR 9.103, it is not part of the formal or informal record of decision of the matters discussed. Expressions of opinion in this transcript do not necessarily reflect final determinations or beliefs. No pleading or other paper may be filed with the Commission in any proceeding as the result of or addressed to any statement or argument contained herein, except as the Commission may authorize.

P R O C E E D I N G S

CHAIRMAN HENDRIE: If the Commission will come to order, please.

We meet this morning to continue our discussion on SECY-81-267, the proposed technical criterial for high-level radioactive wastes in geologic repositories, the Part 60 rule.

The last time we had considerable discussion about the subject and when we ended, Jack Martin was going to bring us some language touch-ups which have come through in a May 11th paper and also some other materials for which we give our thanks.

There will be a number of questions to continue the discussion from the last time. I wonder, to get started, if you would tell us about the materials you have supplied and make any comments you may wish. I was interested in staff responses to some of the DOE comments.

MR. MARTIN: We have dealt with the DOE staff on their April 24th letter and went through each and every one of the comments. As I mentioned last time, I think we reached resolution on all of them and around half of them had already been resolved in the version that was sent to the Commission on April 27th. Of the other half, we agreed to make some changes or in those cases where we did not reach agreement on precise language, there were four or five items like that where it was left with the DOE staff, why not see what light is shed on these remainingissues during the comment period and see

if that will help and that was agreeable to them.

We have sent you a copy of the DOE letter as Attachment 1 to the new paper. Attachment 2 is a mark-up of the paper we sent down on April 27th with the changed pages already incorporated. Attachment 3 is a little guide document on what the DOE comment was and how we resolved it. Attachment 4 is a half dozen things in going through all of this the last few days, there were some minor modifications that it looked like to us ought to be made as long as we are making some changes.

I would not characterize any of these changes as big issues. They are mainly clarifications and making clearer our intent.

The whole thing is a bit more complicated by the fact that the DOE comments were made to a version of the document that you do not have.

COMMISSIONER AHEARNE: I am not sure having it would be of any help.

MR. MARTIN: If we are going to do an one for one comparison, it gets to be a bit tenuous. They had commented on a version of the document we had used for review at a meeting a couple of months ago, which was subsequently revised to be the April 27th document.

COMMISSIONER AHEARNE: I gather there are a number of the points that really are the same in the two documents,

for example, performance standards that they were commenting on.

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: John?

COMMISSIONER AHEARNE: I have a number of relatively minor questions that probably can be handled very quickly. I will start out with the 267 document. Some of them you may have already taken care of in the revision.

What is a vadose zone?

MR. MARTIN: It is essentially an unsaturated zone where frequently out West you can find some places that may be several hundred feet before you hit the water table. One of the characteristics of a zone like this is there is frequently no recharge to underground aquifers where the rainfall is evaporated just by diffusion, it comes back up to the surface and is evaporated before it ever recharges the aquifers. That is the technical definition.

COMMISSIONER AHEARNE: Your point in the 267 document, you say additional or alternative criteria may need to be developed for the vadose zone.

MR. MARTIN: We have not totally thought it through whether all of the definitions and the precise wording of this document would be applicable to a situation where you do not have --

COMMISSIONER AHEARNE: How serious a problem is that in the sense that many of the repository sites that at least

have been talked about are in the West?

MR. MARTIN: None of them that are being pursued are in the vadose zone at the moment.

COMMISSIONER AHEARNE: They are all deeper than that?

MR. MARTIN: Unless DOE makes a change to the program, we may not have to address this.

COMMISSIONER AHEARNE: On page seven, under the role of the site, you mention you are mending the previous rule, or the contents of the safety analysis report.

MR. MARTIN: As we went through this, our "technical rule," we had a lot of internal discussion about whether many of the requirements we had in the advance Notice were not in fact procedural type requirements. After lots of discussion we agreed that yes, many were, so would it not make sense to consolidate all of the paperwork requests and contents of applications and safety reports and put them in the procedural document.

There are several additions to the procedural document. This is a reference to one of them, as to what the safety report ought to contain.

COMMISSIONER AHEARNE: It will not carry with it the sense that there is some threshold for release?

MR. MARTIN: No. This simply adds you should do this type of analysis to support the application.

COMMISSIONER AHEARNE: Can you say a few words about

your readily retrievable criteria? You have two sets of criteria. One is it should last for 50 years after the repository is closed and the second, the time span in which the retrieving should be done is approximately equal to the time span that it took to go through and build it and put it in.

MR. MARTIN: This has been probably the most difficult thing we have had to deal with in the sense of being able to communicate it to other people.

What we mean is it is our view that the period of retrievability or the period during which you want to maintain the ability to go in and do corrective action is hard to know in the beginning. It will undoubtedly be the result of a monitoring program that will unfold during repository development.

On the other hand, decisions have to be made early that will affect the ability to hold the facility open; waste loading, stresses in the rock, that sort of thing will have to be decided long before monitoring and surveillance program is put in place.

We are saying the initial design should contemplate maintaining the option for future people to watch this thing without closing it up for a period of time. We picked 50 years. That does not mean it is readily retrievable like a retrievable storage facility.

If DOE can make the case that backfilling the repository and the tunnels and what not can be done while still

maintaining the ability to go back in in a reasonable period of time and take corrective action, fine. The reasonable period of time we thought we would define by saying about the same overall timeframe as it took to develop and fill up the repository in the first place.

COMMISSIONER AHEARNE: That could be 10 to 15 years?

MR. MARTIN: Or longer; 25 to 30 years. What we did not want to do is have a situation where one could claim it is theorectically possible to go back in but it may take several hundred years.

The way we have defined things and the way it is understood by DOE and most of the contractors, they seem to be satisfied.

COMMISSIONER AHEARNE: Related to that is a requirement on the packaging, to be able to be available for retrievability. I guess that would end up meaning certain criteria on the external corrosion resistance.

MR. MARTIN: Essentially that it be intact and locatable.

COMMISSIONER AHEARNE: That also does not seem to be much of a problem.

MR. MARTIN: As long as it does not entail essentially an open readily retrievable storage facility, most of the contract people working in this area do not seem to be concerned. I think we have removed that. I think the advance

Notice was confusing in that it led people to think we wanted essentially a long term storage facility.

Also the regulation does not require it be held open. The people at any time, if they are satisfied and know enough about it, they can close it up. We do not want to have a situation where the initial design is such that either the heat loadings or presses are such that it is impossible to go do anything later.

COMMISSIONER AHEARNE: On page 20, under "HLW facility," you have an asterisk and you drop down picking up the definition out of the Atomic Energy Act, primarily for the receipt and storage of high-level radioactive wastes.

Where is the word "long term"? Is that not there because it is not in the Act or does this intend in some way to pick up the short term storage facilities?

MR. WOLF: We decided to start with the broadest and most fundamental definitional source which was the section of the Act that is reproduced here, and that is an HLW facility. We would use that definitional term. Then the question became what class of HLW facilities ought we be addressing in Part 60.

That would be in the beginning of the procedural rule, where we attempted to define the scope. That class of facilities would be covered by Part 60.

We set out a geologic repository operations area. That takes you back. We have it tied down to geologic repositories intended for or may be used for long term --

COMMISSIONER AHEARNE: You are saying if I follow the thread through here, it will end up not covering short term storage?

MR. WOLF: There is a caveat there. The scope ties you into geologic repository operations areas, if a short term facility were co-located, then it is not so clear that it would not be on its face subject to regulation under Part 60 unless exempted.

Unless there ia tie-in with disposal operations, Part 60 would not apply.

COMMISSIONER AHEARNE: On page 24 under (F), this is talking about the description and assessment of a site and it talks about the anticipated response. Is that an analytic calculation you are looking for or the response characteristics of the media? Is it a measurement you are asking for or an analytic calculation?

MR. MARTIN: I think it will be a combination of both. There are some of these things that can be measured, like the geochemechanical stuff.

COMMISSIONER AHEARNE: These are the response from thermal loading?

MR. MARTIN: Yes. Some of it will be directly measurable. Some of it will not. I think that is going to vary from site to site.

COMMISSIONER AHEARNE: That leads me to conclude that

you are saying the SAR should include an analytic calculation based upon actual measurements of the properties.

MR. MARTIN: Yes, which was done during site characterization.

COMMISSIONER AHEARNE: On page 25 at the bottom, (E), you have a confirmation, the analyses and models will be confirmed. Perhaps that is just a standard state-of-the-art term. What do you have in mind?

MR. MARTIN: It means one should present the bases for believing this model mimics reality. We use the word "confirm" advisedly rather than "validate," which is a much more rigorous term. What we want to do is all of the different models used should either be validated or confirmed, using natural analogs or lab tests or monitoring data. There ought to be some basis for convincing us those models indeed will predict reality. Some can be validated and some cannot.

COMMISSIONER AHEARNE: Is it correct to conclude that it is whether or not the experiment gives you confidence in the models?

MR. MARTIN: Yes.

MS. COMELLA: I think we wanted to make certain that we understood very clearly the basis for DOE's choice of a particular model or set of models, that they were using as aprt of their application. We wanted to understand what the basis for it was; what they felt it was and what they believed was

appropriate for the use of that particular model.

COMMISSIONER AHEARNE: On page 26, in the middle of the page you have a section which is underlined. You are asking for the analysis to include an evaluation of the alternatives. I would have thought one of the important things you would want is the basis for their selection.

Do you assume when they provide the comparative evaluation they will then clarify what is the basis for that?

MS. COMELLA: Yes. I think that was implicit in what we had intended. Perhaps we ought to make it explicit. I think whenever one is presenting alternatives, I guess it did not dawn on me that they would not deal with the bases.

MR. MARTIN: We looked this up for a different reason. I think there is another section in here that deals with presenting the bases. We will check that. I am pretty sure that is covered.

COMMISSIONER BRADFORD: While you are on that one, why did you drop the language having to do with alternatives that would provide longer periods of isolation?

MR. MARTIN: Mike?

MR. BELL: During our review, there was some confusion as to what types of things we wanted the alternative analyses done for. Some read it to mean every single system component and structure important to safety should have a cost benefit analysis done and what we are focusing on is those major parts of

the system, the waste package, the underground facility design, important to the long term isolation. We attempted to clarify that.

COMMISSIONER BRADFORD: It would seem you could have done that and still kept the emphasis on alternatives that would provide longer isolation.

MR. MARTIN: I do not think that was taken out for any strong reason. Is there any reason why we had to take that out?

MR. BELL: I guess we would be happy to discuss it. We did not see any significant change in the level of the analysis or requirement as a result of this change. If you see one, we should discuss it.

COMMISSIONER AHEARNE: You could always take a phrase that was taken out and put a comma after "isolation" and put in that phrase, which would then take care of the point Mike was worried about.

COMMISSIONER BRADFORD: Yes.

COMMISSIONER AHEARNE: At the bottom of page 26, going onto page 27, you talk about the identification and evaluation of undiscovered deposits, including you will describe physical factors as tonnage, grade, quality.

I guess I am a little puzzled about how you expect they are going to get this amount of detail for the undiscovered deposits.

MR. MARTIN: I had a feeling this was going to come

up. We discussed this during the Advance Notice and took it out. Since then, we have gone back and looked at the small resource question again and tried to deal with people who understand these types of resource assessments.

I think the way this is done is if you have a good understanding of the geologic setting, there are established ways when doing resource assessments of making estimates, including tonnage and grade and that sort of things.

COMMISSIONER AHEARNE: I am very familiar with one type of resource assessment and that is uranium. It may be much different from the others. The level of uncertainty even by the very best people on this kind of inference drawing is quite large.

MR. MARTIN: I agree. There will be quite a bit of uncertainty but on the other hand, I think we want some sort of an assessment done on the resources we know about and those that are inferred to be in the area.

COMMISSIONER AHEARNE: Do you not later point out that is one of the factors which could disqualify a site?

MR. MARTIN: Yes.

COMMISSIONER AHEARNE: My concern is having gone through very extensive debates on whether or not uranium can be found in areas, there is such a band of uncertainty that someone who is in favor of a site can very easily drive those inferences or the extrapolation very low and someone who is opposed to the

site can raise the extrapolation fairly high. Other than actually going out and doing a lot of drilling throughout the region, you are not going to find out.

COMMISSIONER GILINSKY: What page are you on?

COMMISSIONER AHEARNE: On page 26 and 27 of Enclosure A.

MR. MARTIN: Are we not in that pickle anyway? Having a resource conflict at the site is certainly a negative attribute. One is going to have to do the best possible. I kind of see that debate as being inevitable.

COMMISSIONER AHEARNE: Unless you were to link it into what is found in a test boring.

MR. MARTIN: One does not want to do test borings because of perforating the site.

MR. BELL: To understand this requirement, you have to understand the definition of "site" which is defined in Part 60 as a very large area. It is true that you will have an exploratory shaft and some information right from the location where the underground facility will be, the questions are always going to be coming up about someone coming in and solution mining ten miles away and changing all the groundwater characteristics.

There are all sorts of questions that we feel will come up during the licensing process. We think it is better to raise it and address it and basically the way this issue is put to bed is a finding that based on geological techniques, this

area is no more likely to have resources that would result in intrusion than many other similar areas and that resolves the issue.

COMMISSIONER GILINSKY: Are you worried about intrusion or giving up the value?

MR. BELL: About intrusion, not the value of the materials. These methods will be supplemented by some exploration techniques because there will be bore holes sunk and very widely spaced throughout.

COMMISSIONER GILINSKY: What control will there be over -- how big a site do you envision?

MR. MARTIN: Three or four square miles.

MR. BELL: The geological aquifer operation theory will be a few square miles. You are going to be depending on aquifers that may be of concern ten miles in either direction of the site.

COMMISSIONER GILINSKY: You are talking about activity some miles beyond that?

MR. BELL: Yes.

COMMISSIONER GILINSKY: How far beyond that?

MR. BELL: It will be site specific.

COMMISSIONER GILINSKY: A few more miles?

MR. BELL: A few more miles in each direction.

One additional clarification along Commissioner Ahearne's concern, this is not something that automatically

disqualifies a site, none of the potential adverse conditions are automatically exclusion conditions. There are things that have to be evaluated and dealt with in order to show the site can be licensed.

COMMISSIONER AHEARNE: I understand.

COMMISSIONER BRADFORD: This is not phrased as though the concern were solely intrusion, that is, the language at the bottom of the section is in terms of estimates of net value and current markets and what have you.

MR. BELL: The reason for that analysis is whether it is going to be attractive for exploitation.

COMMISSIONER GILINSKY: It is pretty hard to tell whether it will or will not be 100 years from now.

COMMISSIONER AHEARNE: They have picked that up. They have natural resources without current markets.

COMMISSIONER GILINSKY: Is there not any way to simply prohibit drilling for some distance around that?

MR. MARTIN: I think we deal with that later when we get to the good and bad attributes. Right now we are still in what you have in the application, what kind of information we want to see so we can judge. We do deal with this in the siting section. We have several requirements addressing drillings, subsurface mining, population pressure in the area.

We did make a change here. DOE had a problem with this also. They wanted to limit this to resources which are

characteristic of the area, which seems like a reasonable change to be made. This may be an area that could benefit from some more comment. So far everyone seems to agree.

COMMISSIONER AHEARNE: On the top of page 28 you talk about you are going to place the records in archives elsewhere in the world.

MR. MARTIN: We did also have "in languages which are likely to survive for a long time."

(LAUGHTER.)

COMMISSIONER AHEARNE: At the bottom, you have "omissions in this subpart do not relieve DOE from the requirement of providing necessary safety features..." Is this sort of a catch-all phrase, that if there is some other safety feature that later we think of?

MR. MARTIN: Yes. I think most regulations have an including but not limited to kind of feature.

MR. MALSCH: It depends on the regulation. Some of our regulations have been putting that in and others do not have that provision.

CHAIRMAN HENDRIE: Why is it in this one?

MR. MARTIN: It seemed like a good idea. I never objected to it.

MR. DIRCKS: The time is so much greater than anything we have dealt with. It is very difficult to predict if there are going to be any advances along the line. We are dealing with

something that goes almost to the year 2000 before we even see anything happening. I think it would be good sense to allow some flexibility.

MR. MARTIN: That was certainly the major reason, it seemed reasonable.

MS. COMELLA: I think the other aspect was the fact that the construction and design requirements which are contained in the technical criteria, we were not striving for comprehensiveness in terms of every single area that is important to safety being covered and we wanted to make certain it was clear there were omissions and there was not an inference being made that where there was an omission, it was not important to safety.

When you get down into the design and construction requirements, beginning on page 41, there are a lot of fairly detailed requirements there. The absence of the requirement on a component or subsystem, we did not wish there to be an inference that was not an area that was not important to safety.

CHAIRMAN HENDRIE: The first thing to do is to put this disclaimer over with the detailed requirements, along with language that says, here and after are certain more detailed requirements that struck us as useful but we do not intend in this part to hereby lay out everything. DOE has to design the facility to meet the conformance objectives stated previously and in doing that, ought to pick up these particular requirements

back here in this part but there will be other requirements they will have to pick up in their designs in order to meet the performance objectives.

The way it stands now we start out with technical criteria, scope; we purport to be the agency which establishes the criteria under the general guidelines from EPA for the radiological safety requirements of the repository. You have a great regulation here which says we do that but anything we do not say still counts.

People have a reasonable right to come to you and say, if you have not written down the requirements in some form or another, pray tell, who has? It is our responsibility. When this thing is issued, these ought to be the technical criteria for the repository.

Some areas of the repository design, you only cover in the most general way. It is inclusive and if you meet that general one, then our regulations say you can have a license.

In meeting it, you also have some specific steps saying, down here in this corner, in developing this area, we want you to paint it blue, make it vertical, square the corners and so on. That does not mean that the fact that we have not put that kind of detail in all other places under the umbrella means that does not count. That is covered by the general umbrella.

You really have to have a regulation that says here

are the requirements as far as radiological safety is concerned. If you meet those requirements, you get a license. You cannot say, meet these requirements and then there is some vague and totally undefined set of additional requirements we have not bothered to write down and you can guess what those are, and if you guess right, eventually you can have a license.

You cannot write it that way.

COMMISSIONER GILINSKY: What is the actual effect of this section? What difference does it make whether it is in or out?

CHAIRMAN HENDRIE: Relocate it and rewrite it to make clear what is next.

COMMISSIONER AHEARNE: I have been thinking about the archives elsewhere in the world. It suddenly occurred to me is what you are saying is they are supposed to include placement of the records in the archives of local and Federal Government agencies and archives elsewhere in the world who would likely be consulted by potential human intruders.

I guess the flow of logic is that if the United States is to disappear or the Government is overthrown or conquered, the DOE is supposed to figure out who is likely to be the conqueror and make sure the records are placed in the archives in that country because they would be the potential human intruder.

Is that correct?

MR. COMELLA: I do not think that is quite correct.

CHAIRMAN HENDRIE: It is clearly a foreign policy difficulty.

COMMISSIONER AHEARNE: It gives the DOE quite a challenge.

CHAIRMAN HENDRIE: We will have to have the advice of the Department of State.

MS. COMELLA: I had the thought that if it went into the Vatican Library, that would take care of everything.

(Laughter.)

COMMISSIONER AHEARNE: I see. On page 30 and 31, you say if specified conditions are met, the license may thereafter be terminated. This has to do with decommissioning.

I thought particularly in the procedural rule we were still leaving open the question of what might happen to the license. Are we now reaching a conclusion that given certain conditions, we would allow them to walk away?

MS. COMELLA: Jim, correct me, this is really completeness. We really do not have any specific criteria that deal with termination of the license. There is just a provision in the procedures that allow for termination of the license.

COMMISSIONER AHEARNE: I thought the way we came out on the procedural rule was to leave that a little open because it was not clear whether we would be going at that stage for termination or modification of the license, that they would still have to have some oversight responsibility.

MS. COMELLA: That is correct. Your concern is we have implied something that does not allow for that?

COMMISSIONER AHEARNE: Yes.

MS. COMELLA: I think we can modify the words.

CHAIRMAN HENDRIE: "Terminate" is only one of your options. A license may thereafter be modified as appropriate for a permanently closed facility.

COMMISSIONER AHEARNE: Yes.

CHAIRMAN HENDRIE: Our successors can decide what that means. Do you see how convenient a word like "appropriate" is, Peter?

COMMISSIONER PETER: That is exactly its nature.

COMMISSIONER AHEARNE: There is a point at the bottom. You pick up a lot of the definitions that I think you have already defined earlier.

MS. COMELLA: The idea in terms of the concept section was to put together how this all fits together. In the definitions section, it is alphabetical. In order to avoid the problem that, for instance, you encountered earlier, where you had a definition of "high-level waste facility," what does that mean and we had to track back to geologic repository operations area -- we are attempting to track it here in order that the person coming to this regulation can understand how we tried to put everything together.

COMMISSIONER AHEARNE: And need not read the

definitions section.

On page 33, under "Control of releases," you want the rate of release to be as low as reasonably achievable. You go on to say the minimum. I gather what you are saying is they should meet the 10^5 requirement but you would still expect the licensing review to see if you could achieve lower.

MR. MARTIN: My attempt here is to provide some incentive for the people doing research in this area to continue to think on this for the next few years. It is my personal conviction that these goals can be far exceeded at very little cost if people keep thinking about it and working on it. There has been considerable improvements just in the last year.

Those are the only two places in this whole standard where "as low as is reasonably achievable" appears. It is on the release rate and the package lifetime.

It is generally is an attempt to keep people thinking about this area and be prepared to make a case if they did a reasonable job.

COMMISSIONER AHEARNE: When you have a requirement, "the design shall provide the 10^5" and that release is above ground?

MR. MARTIN: No, from the engineered portion of the repository.

COMMISSIONER AHEARNE: It is only to the post-media?

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: To the geologic setting.

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: It is then 1,000 years.

COMMISSIONER AHEARNE: It is probably longer than that. The water transports 1,000 years.

MR. MARTIN: Yes.

COMMISSIONER AHEARNE: The legal requirement that you see being met providing, is this again engineering judgment or how tight an analysis would you expect to be able to be done to prove that 10^5 at any time after 1,000 years?

MR. MARTIN: This is the question we discussed last time, what exactly is the burden of proof to show you have met all this. This is something that the procedures and what not we would use that we have to work out with the technical people.

COMMISSIONER AHEARNE: You would expect as you write these technical documents that you would begin to develop methodology of analysis?

MR. MARTIN: Yes.

COMMISSIONER AHEARNE: On page 34 you talk about in "Isolation period," "...will not result in significant doses to any (individual)member of the public."

Does that include intruders?

MR. BELL: We have changed that to "member of the public."

COMMISSIONER AHEARNE: Same question.

MR. BELL: The intent is somebody in the general environment, not a potential intruder.

COMMISSIONER AHEARNE: Tectonic stability means-knowing the NRC invented the phrase "Tectonic Province," what does tectonic stability mean?

MR. MARTIN: Mike, is that not defined?

MR. BELL: "Stability is defined.

COMMISSIONER AHEARNE: I will leave that to be provided.

MR. MARTIN: Is that not covered by either showing that in the future that the tectonic activity either would not change or would favorably affect?

COMMISSIONER AHEARNE: I just wanted to make sure we do not have somewhere the idea that it is tied up to a tectonic province because that would be disasterous.

Going back to page 39, you pick up again the question of resources that have either greater gross value, net value or commercial potential than the average for other representative areas of similar size.

I assume you are linking this to commercial potential as reasonably can be estimated based upon current realistic estimates of commercial potential, because you are talking about a timeframe embedded throughout here of thousands of years.

MR. BELL: There is an one to one linkage between meeting this requirement and the pre-evaluation you are required to do in the safety analysis report. It is tied to those estimates

tonnages, et cetera.

COMMISSIONER AHEARNE: My concern is the type of material. I doubt whether you can make a creditable showing that we know what material is going to be valuable 1,000 years from now.

MR. BELL: That is right.

COMMISSIONER AHEARNE: This has to have implicit the idea and I guess it links back to that previous statement that there was an explicit statement of what can be reasonably estimated now to be commercially marketable.

MR. BELL: That is right.

COMMISSIONER AHEARNE: It is a very near term economic forecast.

MR. BELL: The economic forecast, yes.

COMMISSIONER AHEARNE: On page 43 under (3), you talk about protection against dynamic effects. Structures, systems and components important to safety shall be designed to resist dynamic effects that could result from equipment failure, missile impacts..."

What kind of missiles?

MR. MARTIN: Exploding air compressor.

CHAIRMAN HENDRIE: Do you want to say something like missiles from equipment accidents?

COMMISSIONER AHEARNE: Most people probably would not worry about it.

On page 45 and 46 you talk about compliance with mining regulations. You are saying nevertheless, the design shall include such provisions for worker protection as may be necessary. Who determines which of those provisions will be necessary?

MR. MARTIN: This is one where we had to do some careful crafting. The long and short of it is what we really want to try to do is make sure those parts of the mining regulations are applied here. Unless DOE mines this out for resale, then they do not strictly apply. This is a way of our requiring them to comply with the mining regulations by saying we are going to use them as the standard of judgment.

COMMISSIONER AHEARNE: All of the mining regulations?

MR. MARTIN: Title 30, Subchapters D, E and N.

COMMISSIONER AHEARNE: All of those?

MR. MARTIN: Yes, but not as an absolute requirement. Some of those regulations that are to achieve levels of worker safety would not fall within the scope of our mandate. To the extent they are requirements that do not have anything to do with health and safety responsibilities of this Commission, the rule could be rebutted. That is the purpose of the last sentence.

COMMISSIONER AHEARNE: Should I read this paragraph as saying the provisions for worker protection that will be necessary in our judgment are those contained in D, E and N?

MR. WOLF: It would be presumed those are the ones but any particular regulation there that is unrelated to protectin structures, systems and components important to safety --

COMMISSIONER AHEARNE: The way you want DOE to read this and the licensing board is those are the ones?

MR. WOLF: Yes, look at those regulations and presumptively all of those have to be met.

COMMISSIONER AHEARNE: They are going into this mining operation. What about the other kinds of mining operations that have been established, containment design, structural strength of tunnels and things of that sort?

MR. MARTIN: They are not in the mining regulations. The only thing one finds in the mining regulations is those things that have resulted from some kind of a disaster. I guess I was very jumpy. We are getting into an area that is really outside to a degree our expertise in this agency and we really should not ignore those kind of things that over the years have been found to be necessary to keep people alive.

This was the way we could do that, and being urged very much by the Bureau of Mines to do this.

COMMISSIONER AHEARNE: On page 51, under "Engineered barriers," I would like to talk about (A) and (C). I will pick up the point you have modified.

Section (A) has you will provide a barrier to groundwater movement into and from the underground facility.

The new (C) is reduce and control groundwater movement within the underground facility.

Those are different and if that is true, what is the significance of (C)?

MR. BELL: I think it reflects the fact that we are talking about very large facilities, probably 2,000 acres underground excavations. We are going to require them to do the best they can to keep the water out but given it eventually does come into one part of the facility, we want to have additional barriers to prevent the entire underground facility from becoming flooded very quickly. It is just to delay as long as possible the resaturation of the underground facility.

COMMISSIONER AHEARNE: I find my questions disappear as I check the new version.

MR. MARTIN: We aim to please!

COMMISSIONER AHEARNE: On page 62, you have the quality assurance program applying to systems, structures and components important to safety and to activities. I guess I would like to understand the rationale. I can understand why the QA program should first apply to systems, et cetera, important to safety. I guess my question is why should it not also apply to other systems?

MR. MARTIN: I think we looked at this out of Part 50.

MR. BELL: We are applying Appendix B criteria here,

to systems, structures and components important to safety. It would be like in reactor areas, where we would apply some lesser type of requirements to other components of the system that are not spelled out in the rule we developed as part of the regulatory program.

COMMISSIONER AHEARNE: Where in the rule would I find what kind of quality assurance requirement would be placed on those other systems?

MR. BELL: At the present time, you would not.

COMMISSIONER AHEARNE: In the reactor world we are finding an increasing number of cases where probably we should have applied some quality assurance to systems that were "not important to safety."

MR. MARTIN: This has been one of the comments we have gotten in the past, for example, what kind of quality assurance program would apply to geological exploration. This is one of the items we have targeted to work out some kind of protocol and breakdown with the geologists on.

COMMISSIONER AHEARNE: If I look at the DOE question they raise, I had a question with your response, in particular I am looking on page five of the DOE letter where they are questioning 60.132(c). The issue they are raising is why do we include one part and 10^5 per radionuclide as opposed to one part and whatever the rate is for the total inventory.

Your response is DOE misinterpreted the requirement

and no action is needed. I am not sure what requirement they misinterpreted.

MR. MARTIN: I can explain each isotope.

MR. BELL: The part they misinterpreted primarily was the fact they thought they had to apply the one part and 10^5 to an inventory that was decreasing exponentially after the 1,000 years for all time. They had misread that part of the requirement.

We have clarified that what we are talking about is a fixed point for something is decreasing exponentially, it is maximum concentration that occurs at 1,000 years and it is these rates should not exceed one part and 100,000 of that number.

There are few nuclides that grow in with time, some of the radium and others that peak after 1,000 years. In that case, it is based on one part and 100,000 of the peak concentration.

DOE still has a residual concern about the fact that there were a number of nuclides that at the time of 1,000 years are still there but because of the laws of radioactive decay, there may be only 10 to the 12 left and we would never be able to detect them and show we have met the criteria. That is not what we intended. We will still have to come up with some clarifying language.

We were interested in the things that are left after 1,000 years in large concentrations.

CHAIRMAN HENDRIE: It sounds like you could have a diminuous quantity. If your repository contains less than "X" curies in this isotope in 1,000 years, never mind.

MR. MARTIN: That is exactly what we mean to say. I think we agreed in our meeting that we can work this out.

MR. BELL: The write up should have had one more sentence that said what are the significant things that are left after 1,000 years as still being considered.

COMMISSIONER AHEARNE: Would that be perhaps the list of isotopes that EPA has? As we discussed last time, what you are really trying to do is guarantee you can meet that detailed list.

MR. BELL: We think we need to have a little more discussion and give it more thought. There are probably several ways you could do it. You could do it based on half life perhaps as well as concentration and basically we had two days to turn these around.

COMMISSIONER AHEARNE: I notice in your definition of the "accessible environment" you have struck a large section.

MR. MARTIN: This is consistent with our comment to EPA. We are hoping they are going to accept our comment and if they do, this new definition would be an appropriate one.

COMMISSIONER AHEARNE: This is on page 17. Does our definition have to track their definition? For consistency, it should.

MR. MARTIN: That is our intention.

CHAIRMAN HENDRIE: It would make life a lot easier.

MR. MARTIN: The definition of "accessible environment" is still very much important. At some point they will have to be made the same. If they accept our suggestion, we are there.

COMMISSIONER AHEARNE: On page 22 of the revision, you have changed the TRU definition to go from the half life greater than one year to half life greater than five years.

MR. MARTIN: This is to conform it to the low level waste rule which you should be getting next week.

What exactly was the reason for that?

MR. BELL: It is for consistency with the methodology that the people are using in Part 61 to develop what you might loosely call their classification system. As far as transuranics are concerned, whether you cut it off at one year or five years, it is not very significant. They want to have a cutoff point that they can apply to fission products and activation products as well and five years makes a big difference for some isotopes like cobolt and some of the fission products.

COMMISSIONER AHEARNE: The shift from one to five would be consistent with respect to our low level wastes.

MR. BELL: Yes.

COMMISSIONER AHEARNE: Does EPA end up using the same definition?

MR. BELL: I do not even think there is a time cutoff in their definition. That is one of the technical concerns we have to discuss with them during the comment period.

COMMISSIONER AHEARNE: We obviously will be hoping to get a similar definition for both us and EPA.

MR. BELL: Yes.

COMMISSIONER AHEARNE: I see "archives elsewhere in the world" is still surviving. I guess I will submit a public comment.

In your performance of the engineered system, containment of wastes, as I understand it, what you are saying is the waste package which is part of the engineered system has the 1,000 year criteria and the rest of the engineered facility then has the 10^5?

MR. MARTIN: Yes. We have defined the waste package. For shorthand, we say the cannister. That is not strictly what we mean. We mean the cannister and the overpack and the discretely placed backfill that form a reasonably portable unit.

CHAIRMAN HENDRIE: I thought the backfill went with the engineered system.

MR. MARTIN: We are saying if you can imagine a hole drilled in the floor with a cannister in it and it is packed with some engineered backfill around it, that is all now considered a package. It is all a discrete unit. It is all

engineered as a module.

Whereas the just unqualified word "backfill" is the stuff you fill back into the tunnels and that sort of thing which can also be an engineered portion.

This is a change we made primarily because of some of the developments in the last year or so have shown some of these discretely placed backfills can be every bit as effective as metallic cannisters and perhaps more so, at a vastly reduced cost.

We did not want to overly constrain what we mean by the package.

COMMISSIONER AHEARNE: In your discussion of the basic rule, when you start talking about pros and cons, you talk about that an example of an otherwise satisfactory site which must be rejected is one that is too close to an area of high population density.

I wondered what in your view for rejecting this kind of a site, what is high population density?

MR. BELL: I think you are twisting the requirement around somewhat. What the rule really says --

COMMISSIONER AHEARNE: I am reading it. It says "Another example is that of an otherwise satisfactory site which must be rejected because it is too close to an area of high population density."

MR. BELL: The rule itself treats low population

density as a favorable condition. This is the discussion of the supplementary information from the Advance Notice. I think our thinking is modified somewhat since then.

COMMISSIONER AHEARNE: This is a synopsis of public comments and comments of the staff on the public comments.

MR. BELL: I think we may want to go back and make it more consistent.

COMMISSIONER AHEARNE: I am reading on page seven of Enclosure C.

MR. BELL: That is inconsistent with the rule and should be changed.

MR. MARTIN: I think maybe we can come back to that. I am sure there is an answer.

MS. COMELLA: I know what that means. What I think we are trying to do is contrast doing a strictly numerical calculation and have that be the primary decision tool.

COMMISSIONER AHEARNE: I understand that. Obviously there is some kind of a population density threshold. I was curious about whether the staff had thought about what that was.

MS. COMELLA: We have not thought about quantifying what we mean by "low population density." We have not really discussed that in terms of a number.

MR. MARTIN: We had a number in there.

MS. COMELLA: We took it out. We were not ready to commit to something like that. I would have to take issue with

the way this particular sentence is written. I have read it a number of times and apparently I read what I wanted to read and not what is written there.

COMMISSIONER BRADFORD: You are not saying-it is inconceivable that you would reject a site on grounds of population alone.

MS. COMELLA: It is conceivable we would reject a site on grounds of population alone.

COMMISSIONER BRADFORD: In that case, why is this sentence wrong?

MS. COMELLA: It is almost categorical in the way it is stated.

COMMISSIONER AHEARNE: My question is if we say that black statement, then there must be a threshold.

MS. COMELLA: We would have to be able to speak to this in a far more definitive way than we have in the technical criteria. We have not done that.

COMMISSIONER AHEARNE: Underlying it is a very difficult aspect that population density when, for example, the Southwest of the United States is an area of very low population density. It is not all obvious that 1,000 years from now given techniques of water control and so forth that this could be a substantial population.

COMMISSIONER GILINSKY: Have they set any standard for earthquakes that would apply to the previous sentence?

MR. MARTIN: We had a figure in the Advance Notice but it was some number per square mile which we thought would be a useful thumbrule as to when low population ceases to be low. I cannot find it.

COMMISSIONER GILINSKY: Do you have a seismic standard?

MR. MARTIN: No.

MR. BELL: There is not a strict numerical number. Most of the potential adverse conditions are phrased so that they are comparative, compare the site with the frequency and magnitude of earthquakes and such. The criteria mainly requires an evaluation rather than a particular number.

CHAIRMAN HENDRIE: You are really only interested in population over the period the repository is open.

MR. BELL: That is true.

CHAIRMAN HENDRIE: Once it is closed and you get started on into the indefinite future, you become progressively less able to project and less interested.

MR. BELL: Yes, you try to favor an area with a low population density;initially, we feel it is favorable in terms of reducing doses during the operating period but then there would be less potential for people doing things like digging wells and pumping large amounts of water for irrigation and such that might change groundwater conditions and we realize as time goes by, population --

CHAIRMAN HENDRIE: You do not convince me. Let me

tell you the once place in the world where as long as there is a population resident in the area, no one will ever bore deeply as you would have to, to get to a sealed repository, without people knowing about it, and that is the Island of Manhattan.

If you had a repository under Manhattan and it was all sealed up and you had somehow gotten through the operational period, which is the clumsy part, why that would be a good place for it. People are not going to drill around there without somebody noticing it. They notice practically everything!

MR. MARTIN: That leads to a very good example using Manhattan where in years past they used to pump for drinking water in the island. After they built the subway system and started piping water from the Adarondacks, they quit pumping and simply started to flood. They have to continue to pump those wells for no other reason than to keep the subways from flooding.

CHAIRMAN HENDRIE: When you deal with population density, I think someplace out in the outlying literature of this rule, you are going to have to make clear you are concerned primarily with the period while they are emplacing waste. It simply is not practical to bore a big shaft in a populated area and truck stuff in and process it as you may need to or shuffle it back and forth between cans in the middle of a densely populated area.

Beyond that, I do not think you have much concern nor should you.

COMMISSIONER AHEARNE: Your heat loading when you have the kilowatts breaker, I assume that is heat loading from your storage?

MR. MARTIN: That was a convenient figure. I do not think anybody is talking about that kind of heat loading.

COMMISSIONER AHEARNE: Why is the higher temperature reached for a lower heat loading?

MR. MARTIN: Where?

CHAIRMAN HENDRIE: Figure six in J.

MR. MARTIN: You start out with aged waste versus fresh waste.

COMMISSIONER AHEARNE: There are two curves.

CHAIRMAN HENDRIE: You either have the curves misplaced or mislabeled.

MR. MARTIN: The lower curve is for 20 year old waste.

CHAIRMAN HENDRIE: I think you just have the 60 and 150 kilowatt labels reversed.

MR. MARTIN: That could well be.

COMMISSIONER AHEARNE: That would be the obvious answer but I did not know.

MR. MARTIN: That is the answer.

CHAIRMAN HENDRIE: Yes.

COMMISSIONER AHEARNE: That is all I have. Thank you.

CHAIRMAN HENDRIE: Peter?

COMMISSIONER BRADFORD: I will have some questions

but I will do it by memorandum.

CHAIRMAN HENDRIE: Vic?

COMMISSIONER GILINSKY: On the point of heat loading, why did you not have a standard for heat loading?

MR. MARTIN: That is what we started with. That is the most obvious starting point. I guess the more we got into it, it became clear that different geologic media can withstand much different heat loadings, hard rock granite, for example, could have a much higher kilowatt per acre loading and still remain stable and do the things you want it to than clay.

That is not even simple if you take two different kinds of granites, one type that has a very high initial residual stress where the cracks and joints are closed up and could take a much lower thermal loading than one that is still sort of loose and the joints are open.

The initial heating and expansion just closes the joints and there are no stresses built up.

The more we scratched our heads about that, the more it seemed like the real way to get at the heat loading problem is to tell the people, here is what I want the repository to do and then they have to figure out what sorts of heat loadings would be an upper limit to still give you confidence that you would have to do that.

That is one of the major reasons why we wanted the test facilities and the site characterization, to determine

just what that limit might be. Most of the test facility results that I have seen do not comport with predictions, pre-test predictions, because for example, at STRIPA, it could take a much higher thermal loading than predicted at the beginning. It had a lot of joints that were not closed up.

You had a non-linear stress strain problem and it is not clear what the relationship is so you do the testing.

On a first approximation, we would have to figure out different heat loadings probably for each media but that is if it is an ideal media, then once you get to specific cases, it seemed to be too complicated and it seemed better to step back and say, here is what I want it to do and you make the case what is the appropriate heat loading.

COMMISSIONER GILINSKY: I would like to ask about the definition of "high-level waste" which you define as radiated fuel or product of reprocessing.

What about the kind of material we are running into as sort of the remains after accidents?

MR. MARTIN: I am glad you brought that up. This will be taken care of in the low level waste rule, which essentially defines --

CHAIRMAN HENDRIE: We have gotten by pretty good so far without a definition of "low level waste" by saying low level waste is everything that is not high level waste.

What I imply from what you just said is high level

waste is defined as all that material that is not low level waste.

MR. MARTIN: It sounds like you are catching up with us.

(Laughter.)

CHAIRMAN HENDRIE: There has to be a way to break the circle.

MR. MARTIN: This is what we are doing, to put an upper limit on those things that can be dealt with in shallow land burial or near surface burial. There are curie limits on it, curies per cc.

COMMISSIONER GILINSKY: How would this rule pick up the rest?

MR. MARTIN: It would be the only home the rest of it would have, to the high level waste repository, unless someone wanted to invent and convince us that some intermediate form of disposal was satisfactory.

COMMISSIONER GILINSKY: Do you not want to leave some reference to the other category of material here? The only thing I see is if DOE chooses to put other material in the repository, it would have to also meet the standards.

MR. WOLF: The term "high level waste" has a statutory foundation. The question we were dealing with was to apply a definition of the term "high level radioactive waste" which is consistent with --

COMMISSIONER GILINSKY: What is the statutory

foundation?

MR. WOLF: In Section 202 of the Energy Reorganization Act --

CHAIRMAN HENDRIE: Stuff from the reprocessing plants.

COMMISSIONER AHEARNE: It certainly does not mean radiated reactor field.

MR. WOLF: Yes, that has been the position the Commission has taken.

COMMISSIONER AHEARNE: The statute does not say that.

MR. WOLF: The statute talks about high level radioactive waste which as a term in the statute the Commission has understood to comprehend --

COMMISSIONER AHEARNE: Why can't we also interpret it to mean the high level wastes from an accident?

MR. WOLF: There was some other statutory history and other statutes did include radiated reactor fuel within the definition of high level radioactive waste.

COMMISSIONER GILINSKY: Is that definition in the law or our regulations, of high level waste?

MR. WOLF: In the Marine Sanctuaries Act, it does include --

CHAIRMAN HENDRIE: Who has a copy of the Energy Reorganization Act?

MR. WOLF: It is not defined in there.

COMMISSIONER GILINSKY: There is a definition in our

regulations but I do not believe there is a definition in the Atomic Energy Act.

MR. WOLF: But the other statutes were referred to in the determination that was made for purposes of Section 202 of the Energy Reorganization Act. It was reasonable to include radiated fuel within the scope of the term "high level radioactive waste."

COMMISSIONER GILINSKY: It seems to me the only sensible definition is the waste is the fission products and if you get above a certain concentration, you worry about.

MR. MARTIN: We are coming at it from the opposite direction, rather than take the high level repository and put some sort of floor on it, we are going at it from what is suitable for near surface burial and put a ceiling on it and everything over that does not have a home and has to go to either the high level waste repository --

COMMISSIONER GILINSKY: Why here?

MR. MARTIN: It could go somewhere else, like sea dumping, if we ever get around to that, or intermediately mined cavities.

COMMISSIONER GILINSKY: What is the difficulty of referring to it here, you would have to pick a number, a concentration that you are not sure how to pick yet?

MR. MARTIN: I am not sure this is the right rule to have the concentration in. We are going to have the concentration in

the low level waste rule.

COMMISSIONER AHEARNE: How would you handle some of the liners from Three Mile Island?

MR. MARTIN: Let's take the SDS liners, they will not have a home. They will have to go either to the high level waste repository or some other special scheme that has not yet been proposed. At the moment, the only outlet for them will be the high level waste repository.

COMMISSIONER GILINSKY: What is the difficulty about saying in this rule that anything above the ceiling of a forthcoming rule on low level waste would have to go to this repository?

MR. MARTIN: I am not sure that -- let me say this. We thought through what is suitable for near surface land burial. It is clear what the boundaries are on that. For the moment, everything outside of that, the only obvious home is here.

There are other options. For example, radiated thermal shields in reactor vessels with a lot of Nickel 63 probably could not go to near surface burial but it is not clear yet whether the repositories are the places for them to go.

COMMISSIONER GILINSKY: Because this is a too high priced solution?

MR. MARTIN: Yes. What we prefer to do is first put the limit on the near surface burial, then run down these other abnormal things like thermal shields, sort of leave the high level

waste repository as the outlet for everything that is not explicitly dealt with somewhere else.

I think we would be going to the wrong end of the system to use this to put the upper limit on things. It would be better to put the limit on near surface burial which is either the repository or for someone to come up with some other proposal.

COMMISSIONER BRADFORD: I am not sure why that issue arises in terms of the definition here. There is nothing in this rule that says all high level waste has to go to a repository. If you define high level waste in the way Commissioner Gilinsky is suggesting, it would not affect your ability to put the liners or the thermal shields wherever you thought they belonged.

MR. MARTIN: Maybe I am getting confused.

I do not believe this rule precludes you putting other things, spent fuel and reprocessed waste, in it.

COMMISSIONER BRADFORD: If it does make sense to have definitions that go by curies, you do not lose anything by having the definition in here that is complimentary to the definition that you will use for low level waste because neither one of them tells you put any type of material in either type of repository. It may preclude you from putting high level waste in a low level repository.

MR. MARTIN: If it is permissive to put things down to a

certain concentration?

COMMISSIONER BRADFORD: The rule is not structured to say that now anyway so that what was puzzling me was I did not understand your point about the thermal shields or the liner wastes. It did not seem to me that whatever was said in the definition here would affect what one did with those one way or the other.

MR. MARTIN: There is really not an one to one correspondence between low level and high level. Those are misnomers. There are wastes suitable for near surface burial and wastes suitable for other kinds of disposal and wastes that might go to geologic repositories.

Once you puzzle through all these limits and what not, I think you will see there really are more than just these two categories and the right way to do it is put the caps on the lesser disposal methods which makes everything left over -- in a practical sense, it is only spent fuel and high level waste and a few other things that look like high level waste like some of the TMI accident waste and perhaps some of the very highly radiated components.

COMMISSIONER GILINSKY: You are really talking about the fission products and things that contain fission products, in fairly high concentrations.

MR. MARTIN: Yes.

I am not sure the number you would put in this rule

would be to compliment it in a low level rule. There may be some intermediate level of fission products, for example, if one wanted to do like the Swedes and build an intermediate disposal facility in a rock cavern 200 or 300 feet deep, you might have some intermediate level waste that we have not yet dealt with in this country. I am not sure what those numbers are.

CHAIRMAN HENDRIE: What do we do with hulls?

MR. MARTIN: To date, they have been put in the nation's only high level waste burial ground in West Valley. I am not sure what the half life is. I think they would clearly using the technology of a few years ago, they would be classified as transuranic waste.

CHAIRMAN HENDRIE: The Tramp uranium pulls them over into TRU.

MR. MARTIN: There was a considerable amount, like one percent or so, not that much, several thousands or hundreds of thousands of manacuries. It has been years since I have looked at that.

CHAIRMAN HENDRIE: Even after getting chopped and dissolved and washed.

MR. MARTIN: My recollection was there was still sufficient contamination that would be classified as transuranic waste by anybody's definition.

COMMISSIONER GILINSKY: I would approve this rule for publication.

CHAIRMAN HENDRIE: All right. In view of the hour, I would propose to take up the discussion once again at another meeting. There are some things I would like to discuss at some length, such as the performance objectives. I think this is more usefully done in a discussion format than in a writing fashion.

COMMISSIONER AHEARNE: I notice the copy you sent down to us of the EPA draft makes note that it has not been released by EPA to the public. I gather that means it is inappropriate for us to try to go into any detail in a public meeting on it?

MR. MARTIN: That is what I have interpreted it to mean. It has not been passed around very much.

CHAIRMAN HENDRIE: All right. Thank you very much.

(Whereupon, the meeting was adjourned at 11:50 a.m.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

NUCLEAR REGULATORY COMMISSION

in the matter of: Briefing on SECY-81-267 - 10 CFR 60, Disposal of High-Level Radioactive Wastes in Geologic Repositories

Date of Proceeding: Tuesday, May 12, 1981

Docket Number:

Place of Proceeding: Room 1130, 1717 H St., N.W., Wash., D

were held as herein appears, and that this is the original transcrip thereof for the file of the Commission.

Marilynn M. Nations

Official Reporter (Typed)

Marilynn M. Nations

Official Reporter (Signature)

NUCLEAR REGULATORY COMMISSION

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In the Matter of: PUBLIC MEETING

BRIEFING ON SECY-82-257 -- 10 CFR 60
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IN GEOLOGIC REPOSITORIES -- TECHNICAL [illegible]

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PUBLIC MEETING
BRIEFING ON SECY-81-267 - 10 CFR 60
DISPOSAL OF HIGH-LEVELRADIOACTIVE WASTES
IN GEOLOGIC REPOSITORIES:
TECHNICAL CRITERIA

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Nuclear Regulatory Commission
1717 H Street, N.W.
Room 1130
Washington, D.C.

Wednesday, May 20, 1981

The meeting of the Nuclear Regulatory Commission was convened, pursuant to notice, at 10:05 a.m.

NRC COMMISSIONERS PRESENT:

JOSEPH M. HENDRIE, Chairman
VICTOR GILINSKY, Commissioner
PETER A. BRADFORD, Commissioner
JOHN F. AHEARNE, Commissioner

NRC STAFF PRESENT:

SAMUEL J. CHILK, SECRETARY
LEONARD BICKWIT, GENERAL COUNSEL
SHELDON TRUBATCH
PATRICIA A. COMELLA
JAMES R. WOLF
JOHN G. DAVIS
JACK MARTIN
MICHAEL J. BELL
FRANK A. COSTANZI
WILLIAM DIRCKS
DENNIS RATHBUN
HOWARD SHAPAR
MARTIN MALSCH

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P R O C E E D I N G S

CHAIRMAN HENDRIE: If we could come to order, please, the Commission continues a series of meetings here discussing a proposed rule on the technical criteria for disposal of high-level wastes in geologic depositories.

The last time we met there were a number of questions and some useful discussion. We are today in effect continuing that, as soon as I can find the appropriate papers.

(Pause.)

CHAIRMAN HENDRIE: Since my paper has flipped up into it, since we were curious last time, did Figure 6 turn out to have a reverse labeling?

MR. MARTIN: Yes, it did.

CHAIRMAN HENDRIE: Well, that happily restores the configuration to one in which one's expectations of nature are reasonably met.

COMMISSIONER AHEARNE: At least it's understandable.

CHAIRMAN HENDRIE: Now, John, you had a number of questions last time.

COMMISSIONER AHEARNE: They've been pretty well answered, or I got them all asked.

CHAIRMAN HENDRIE: You got them asked for the first round.

One of the reasons I scheduled this meeting was so that I could ask some questions, some more questions. But before I launch, Dick, do you or Peter have anything?

COMMISSIONER GILINSKY: No.

CHAIRMAN HENDRIE: Then let me go ahead.

COMMISSIONER AHEARNE: I will have a few after yours.

CHAIRMAN HENDRIE: Well, I expect as one or another of us asks questions they will generate some interest from others.

There is a footnote on page 20. Let's see, a high-level waste facility means --

COMMISSIONER AHEARNE: The earlier or the later version of it?

CHAIRMAN HENDRIE: Let's see. That's a good question. Are they different?

MR. MARTIN: I think not. We talked about this a little last time.

CHAIRMAN HENDRIE: The citation is not different, I think. There's a difference in that -- is that right? Well, maybe not. Anyway, let's see. I put marks on it. These are DOE facilities used for the receipt and storage from activities licensed from the Act, and then there is a clause that includes retrievable surface storage facilities and others authorized for long-term -- in case they ever go

way. Okay?

MR. MARTIN: Yes, I think these words are listed tly out of the Act.

CHAIRMAN HENDRIE: So let me put a slash after the s in the third line. We say, "High-level waste ity means a facility subject to licensing and related rity." Okay, and then the asterisk says, "These DOE ities used primarily for receipt and storage of level radioactive waste resulting from activities sed under such Act."

Wouldn't that pull in an AFR?

COMMISSIONER AHEARNE: This is one of the ions I asked last time, and they were promising, at the legal representatives who were sitting at the last time, not being here this time.

CHAIRMAN HENDRIE: They said they would mull on it.

COMMISSIONER AHEARNE: They said they would try ake sure it tracked through there.

CHAIRMAN HENDRIE: My note didn't reveal that I atisfied with the answer.

COMMISSIONER AHEARNE: There was no answer.

CHAIRMAN HENDRIE: Aha, that's why I wasn't fied with the answer.

MR. MARTIN: I think I'll defer to legal counsel is one.

MR. SHAPAR: Am I going to answer?

MR. WOLF: That's --

CHAIRMAN HENDRIE: You may answer, Howard. Whether you can answer is something we will find out, which means in the near future.

MR. WOLF: The question was asked last time, and the answer offered at the time in dialogue was that if you tracked all the definitions you could indeed determine that unless a facility included at least the geological repository as a part of the facility, there would be no licensing jurisdiction under Part 60.

COMMISSIONER AHEARNE: Yes, and that was the statement of belief, and at least I left the meeting with the understanding that someone was going to actually try to track through and ensure that that's correct.

MR. WOLF: That is correct. I haven't done so, but I would be happy to do so separately for the record, if you would like.

COMMISSIONER AHEARNE: Okay. So I guess the way to say it is if one does that careful analysis of tracking, then you find out that that is what that refers. But the reader of the footnote just reading through is not likely to be able to understand.

MR. WOLF: Not from that footnote alone, and the question of the AFR, if co-located, is not completely

resolved by that issue.

CHAIRMAN HENDRIE: I would think not, because it seems to me that the way the proposition reads here you've got the paragraph at the top of page 20, and the footnote at the bottom, and it seems to me that they form in fact a closed definition set that you can't get out of.

It says HLW facility means a facility subject to -- and then the footnote says these facilities are at, and you create a problem with respect to co-located AFRs and even co-located waste tanks, as a matter of fact

MR. WOLF: That's right. If they are co-located, then they would be included in Part 60, except to the extent that an exemption were granted. It would provide a mechanism to determine whether or not the relationship to the geologic repository activities are such that there should be --

CHAIRMAN HENDRIE: Ah, you would tend to include them?

MR. WOLF: That's the way it's presently written. As long as there is a geologic repository that we are licensing, everything at that repository site, by the terms of the scope and everything else --

CHAIRMAN HENDRIE: Part 60?

MR. WOLF: Is included. To the extent it doesn't make any sense, then the facility -- the co-located AFR

would have to be exempted on a case-by-case basis. That is the way it is -- it is currently literally set up.

COMMISSIONER AHEARNE: Was that the intent?

MR. MARTIN: This is the point that we thrashed through for an hour or so over the procedural rules just this issue. My recollection is that it was left, if they were co-located, to the extent that they are intricately bound together, they are covered. If not, then they would not be covered. Then we would have to just leave it to the case that presents itself at the time, and exercise a reason if there are.

CHAIRMAN HENDRIE: But you've got some rules for AFRs, right?

MR. DIRCKS: Yes, Part 72, isn't it?

MR. RATHBUN: Yes, Part 72.

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: Would the intent be to license under Part 72 for the AFR if there were one co-located? Or would it be licensed under Part 60? Would there be two licenses on the site, or would there be one?

MR. WOLF: Presumably there would be a Part 72 license. The point is that before any kind of a waste could be received at a geologic repository site, Part 60 would apply. In other words, if they are thinking about using the site for a geologic repository, they wouldn't be able to

bring any high-level waste there for whatever purpose without at least having made a submission to NRC so that it would give us a possibility to see that the activities they are proposing to do aren't going to interfere for the use of the site for geologic repository purposes.

Having been satisfied that the proposed activities aren't going to louse up the site for purposes of a geologic repository, then if we propose to go ahead and have these facilities, AFR for example, licensed under Part 72, if an appropriate technical determination is made that it is truly independent and it's not going to interfere with the use of the site under Part 60, then there would be an exemption given from the requirement that you have to go through all the Part 60 procedures before you bring any material on-site.

CHAIRMAN HENDRIE: Good. Where in the supplementary considerations or the rule itself does it say just that?

MR. WOLF: In the discussion of comments on the procedural rule, the question arose as to whether or not the language, as written, would cover AFRs at the site of a geologic repository. I believe, in response to that specific question, this concept was presented, although in a very shorthand sort of a way.

I think that's the only place where it is addressed.

COMMISSIONER BRADFORD: In the procedural rule?

MR. WOLF: That's my recollection, that there was some correspondence on this point at that time. I would be happy to pursue this and try to recapture some of these things.

CHAIRMAN HENDRIE: Well, yes. This isn't particularly a sticking point with me, but I have the following observation.

It makes me uneasy to put out rules which appear to have certain logical, either inconsistencies in them or overlaps in licensing authority or other pedimentia of that kind, with simply the understanding in the sponsoring staff and the approving commission that oh, well, when a case arises why we will grant exemptions and fix that all up. Because, first of all, it doesn't seem to me that it can possibly be very clear to an observing, interested audience what the intent of the agency is. And on the other, suppose all of us reasonable people aren't here at some future time and some bunch of mud-headed clods who are determined to make mischief use the regulation as written, with all of the clumsies that were built into it?

Now I am sure that won't happen. I'm sure that at least some of us reasonable people will still be around to preserve sanity and save the day. But, after all, as regulators prudence is indicated and I would very much like

to see in the tracks which this proposition leaves as it goes through the forest a fairly clear indication of what we had in mind and how we would handle cases like that.

Now I don't' know whether it's worth discussing it in the supplementary discussions or whether -- I suspect that you are going to get a comment on it when we put this out for comment. And that would give you an opportunity in the reply to that comment to expand upon the comments made in connection with the procedural rule.

Or, if you didn't get a comment directly, why it's no great shakes to take the closest one and expand the answer to it to cover the point.

MR. SHAPAR: It might be best to include a paragraph in the statement of considerations and the proposed rule to flag it and state what our theory is.

CHAIRMAN HENDRIE: Well, whatever. It just --

MR. MARTIN: If it's not covered already. We have discussed this at great length the last time.

MS. COMELLA: I don't believe it's in the supplementary information to the final procedures. I just don't think we put it in there.

CHAIRMAN HENDRIE: No, no. I just think it's just in the agency's response to comments, which is in the staff paper.

MR. WOLF: That's right.

CHAIRMAN HENDRIE: It's at least there in the files.

MS. COMELLA: This footnote is probably the easiest way to deal with it, to elaborate on that footnote.

MR. WOLF: We can work on that.

CHAIRMAN HENDRIE: I leave that to the ... .

COMMISSIONER AHEARNE: Vic, I hope you are listening carefully, because I think you are the only one of when you said "us" who are likely to be left here when this thing comes back, when they have applied for their application.

(Laughter.)

COMMISSIONER GILINSKY: I ceased listening when you said "mudhead."

(Laughter.)

CHAIRMAN HENDRIE: You concluded he was talking to someone else, so why listen?

COMMISSIONER AHEARNE: He then went on to say, "we reasonable."

COMMISSIONER BRADFORD: What Vic is doing is improving the document retrieval system to a point where he will be able to find the comments and responses on the procedural rule.

CHAIRMAN HENDRIE: A question which grows out of things that the safety analysis report is to include. Page

25, actually, but starting a page earlier, this is in 6021, the content of application. There is a requirement here for estimates of the likely maximum individual doses which could result.

Now I keep thumbing because it's where my notes are on the old one --

MR. MARTIN: It's page 25, item C.

CHAIRMAN HENDRIE: Yes. Also page 25, it's a new one. Yes, paragraph C there.

Now doses are nowhere else. Dose calculations aren't required anywhere else in the rule. And when DOE calculates the doses and puts them in the SAR and you look at them, as far as I know, nothing happens to them. You don't do anything. That is, if the calculated likely maximum individual dose is 17.5 R, you say aha, it's 17.5 R.

On the other hand, if you say it's 107, you aha, it's 107. If it's 3 millirem, you say aha, it's 3 millirem.

I think that's right. Is it?

MR. MARTIN: Well, I think --

CHAIRMAN HENDRIE: There's no regulatory criteria attached to the likely maximum individual dose?

MR. MARTIN: This is correct. The governing EPA standard does not deal with individual doses.

CHAIRMAN HENDRIE: Right.

MR. MARTIN: The only real reason that we ask that

that be in there is that in comparing, at this point, that they submit their application, undoubtedly there will be several tradeoffs that they will have looked at. It would be nice to know how the different approaches they are looking at compare with regard to an individual dose.

And that's just another way to look at the problem. There was a lot of discussion internally among the staff as to whether we ought to do this or not, and the final resolution was that yes, we really ought to see at some point what the maximum individual doses would like be out of this system.

MS. COMELLA: One of the things that this does it assist in the assessment of the overall performance of the repository. How well is the repository working? Because one of the jobs of the repository in isolating the waste is really a release -- a very slow release -- over very long periods of time, and so by calculating this one gets a picture of how well the repository is working.

I think this is a way of --

CHAIRMAN HENDRIE: Wait. When you say "is working", you mean "is projected to work"?

MS. COMELLA: Is projected to work, yes.

CHAIRMAN HENDRIE: But as far as I know, the dose number can come out -- it just doesn't matter what it comes out in terms of the regulatory basis.

MR. MARTIN: This is true.

MS. COMELLA: That is correct.

MR. MARTIN: This is true.

CHAIRMAN HENDRIE: Now, presumably, if the facility meets the three -- the limiting criteria for the subsections, a thousand-year container, a Part in 100,000 leak rate, and the thousand-year travel time, water travel time, and also meets the EPA's standard of not more than so many carries of a certain isotope over the first 10,000 years, then it's hard to see how DOE could calculate out of a specific repository design and set of geology, doses which were any larger than EPA calculated for its generic one. Is that right, or wrong?

MR. MARTIN: I think that's right. The biggest doses, if everything is working the way it should, that we could find are in the order of, oh, a few millirem less than ten.

Now the thing, of course, that they would be looking at here is --

CHAIRMAN HENDRIE: But they might be less, if they found themselves with a really great site.

MR. MARTIN: Absolutely.

CHAIRMAN HENDRIE: About absorption in the media, why they might be able to show it, say, gee we not only meet the EPA standards but we're much better than that. We

project --

Now it might be nice to have that estimated individual dose number. I guess one might even speculate that if you went ahead without it in what you require by way of information, that you were going to end up asking that it be calculated anyway, because some Board member would be bound to say, by the way, what dose does this all turn out to be for the maximally exposed person?

So I can see some rationale for it. But it's also ---

MS. COMELLA: It was placed in there basically to assist in the understanding of the projected performance of the repository. I think that's a very important part of this regulation that we have before you right now, is the fact that, granted DOE will have to do a calculation in order to assess -- in order to evaluate whether it meets the EPA standard.

Part of the licensing decision is going to be an assessment of that evaluation, and all of the uncertainties attendant upon the performance of the geologic repository. And I do believe that this tends to assist in an understanding of how well a particular repository can be expected to perform.

COMMISSIONER AHEARNE: How would we --

CHAIRMAN HENDRIE: I guess I -- let me -- I guess

I don't follow that, because in order to meet the regulatory criteria you have to show the retention limits, the three retention limits, plus the overall EPA retention limit, right? So you are going to show those things. You have to demonstrate those things so that findings can be made by a Board eventually that those criteria are met.

Now, having made that showing, then the only other thing you do for the doses is say -- and having those leak rates out of the facility, I assume the following about a pathway, and then I get a dose. And I don't think there is anything you are going to show in your assumptions about the pathway and the conversion from -- and then the rest of the dose calculation that particularly illuminates how you met the regulatory criteria on a 1,000-year container, the EPA standard, et cetera.

I just seems to me that it is a downstream part of a series calculation and it's not going to, you know, do that much for you.

MR. MARTIN: I think that's correct. But, as you pointed out --

CHAIRMAN HENDRIE: Proving things you have to prove in order to meet the regulations.

MR. MARTIN: That's right. But on the other hand, I can't imagine getting into the licensing proceeding where we don't know what the doses to individuals might be. It's

going to come up and we are going to expand the analysis to include that so we have some visibility as to what is happening.

COMMISSIONER AHEARNE: How would you expect to calculate this likely maximum individual dose?

MR. MARTIN: Well, I think this gets to a -- there are plenty of codes for doing that. We have some; DOE has some.

COMMISSIONER AHEARNE: I guess more specifically what I am asking, oft times in the reactor case you put in a theoretical individual at the site boundary and have him stand there for forty years.

MR. MARTIN: I think it would be that same kind of a calculation, given the site and the population patterns and the way you think they are going to be for a while, what is the most realistic? Where are people living? Where are they drawing their water?

CHAIRMAN HENDRIE: Steady now. You have just run back and forth across a barbed wire fence. If you use the words "likely maximum", okay, do you mean "likely maximum"?

MS. COMELLA: That's exactly what is meant.

CHAIRMAN HENDRIE: Or do you mean we will take a realistic look? And what is a "likely maximum" anyway?

MS. COMELLA: We --

COMMISSIONER AHEARNE: If you remember, an

individual's lifetime is at least the same order of magnitude of a reactor's lifetime, but it isn't for the repository.

CHAIRMAN HENDRIE: True, but --

COMMISSIONER AHEARNE: Well, I'm not sure if they are going to hypothesize Methuselah.

CHAIRMAN HENDRIE: Well, no, I guess this will be the root mean standard, 76-year-old human being. And you're right. I can see where one would have to look and see when in the history of the repository a 76-year receiving period would accumulate the maximum dose, right? Because clearly on day zero nothing has come out and on day 1 million, why what comes out never mind, and somewhere in-between there is a maxiumum. And I guess you could do all of that.

Suppose the likely maximum dose occurs at about the 2400th year of the repository?

MR. MARTIN: That's probably about when it would occur.

CHAIRMAN HENDRIE: That's why I selected it.

(Laughter.)

MR. MARTIN: Well, I think the way you do that calculation is to assume that somebody living there would use the water from the contaminated aquifer and what dose would he get over a fifty-year dose commitment. You know, we've done that hypothetically. It comes out a few hundred

millirem over his lifetime.

CHAIRMAN HENDRIE: I suspect that is the way it's going to have to come out.

MR. MARTIN: And as time goes on that gets better.

CHAIRMAN HENDRIE: I guess by "maximum" you are going to have to mean he lives relatively close to the boundary and that he gets his principal water intake from that aquifer. I guess the "likely" part means that he doesn't spend at least forty hours a week down in a mine shaft drilled into the repository. Okay?

It used to be in releases during normal operation from reactors, there was a time of great interest in that, in the regulatory process, Appendix I time, and we used to have the "fencepost cow." There was an infant which went with the fencepost cow. The cow was tethered to the site boundary, post at the site boundary, hence "fencepost cow," and the infant was cradled beside the cow. The cow ate the grass at the fencepost, and the infant drank the milk, and that's how we calculated how much iodine was allowed to come out.

And I guess what you are going to have here is the fencepost resident, and I wish you well with it. At one time I formed the Society of the Fencepost Cow, and it was a select group. You may remember it, Mike. You were active in this. We had a rather good time. I wish you well with

your enterprises. On with it.

On to Subpart (e). Now we've got performance of geologic repository after permanent closure. And what I am wondering about the overall system performance and then the engineering system performance, the subgroups, we don't anywhere in here include the kinds of words that have been useful in other regulatory aspects of our work -- like there is reasonable assurance the waste packages will contain all radionuclides for the first 1,000 years.

I hear some complaint from the DOE side and contractors who have worked on it and looked at the draft regulations that phrases like on page 33 in the old one, performance of engineered system, sub (i), containment of wastes, "The waste packages will contain all radionuclides for 1,000 years after permanent closure." Okay?

And the concern is that that may be intrinsically unestablishable; that the best we can hope for in this imperfect world is that there can be a reasonable showing of laboratory data and of general metalurgical and geochemical reaction theory and analysis to tell us that for the particular package design that they propose that we have a good, sound basis for believing in fact that they will hold up for at least 1,000 years.

Now is that identical to proving that packages will contain all radionuclides for 1,000 years? And the

answer is no, it's not. Okay? And I wonder then why in these sections, since the same is sort of true for each one of them, why you have avoided such language as, you know, the engineered system shall be designed so that there is reasonable assurance that the packages will contain all radionuclides for 1,000 years and so on?

MR. MARTIN: Well, first of all, let me say I think it's the staff's intent to do just exactly what you described, and we have massaged these words around considerably to get some language that we think does that.

Some of the wording that has been complained about we think has been fixed, and DOE agreed have been fixed, by the current version that you have where we used the words "designed" rather than "shall be capable of". There is a difference there. I think "designed" means, or has implicit in it, some of the connotation that you were discussing. And also notice that we have "assuming anticipated processes and events" to further get this into a more reasonable grove.

And at some point in the past we had the words "reasonable assurance" in there, which I personally liked, but were taken out, judged being not really necessary. But I would have no objection personally to putting them back in. But I think the intent is to do just exactly what you described. We think that this does that.

COMMISSIONER AHEARNE: Howard?

MR. SHAPAR: I think it's our viewpoint you could make the argument, if you use the word "designed", "designed" has no guarantee that it will perform that way.

CHAIRMAN HENDRIE: If it's got to be designed to contain all radionuclides, people are going to argue with you that you have not met that standard unless you can show that materials and the way in which you have done the design, that a case can be made that nothing comes out, maybe.

Now you can also argue that by saying "design" you can say, no, design means the best we can here and have high assurance but not absolute assurance.

MR. SHAPAR: You could go through our mass of regulations and find it done both ways.

CHAIRMAN HENDRIE: I think that's probably right. My feeling here was, if we mean "reasonable assurance", then we ought to say it, because I think these are going to be hard enough propositions to make the case on in any event on the one hand, and on the other, I think it is just clearer to people who are more nearly the informed lay public what precisely your standard is if you say "reasonable assurance".

MR. MARTIN: I thought that back in the procedural rule the basis for finding a favorable finding was "reasonable assurance" that those requirements of subpart (e) are met.

MS. COMELLA: Yes, that was just the point I was trying to recollect. I think you are right. It's in the decision standard itself in the procedural rule.

MR. MARTIN: Do we need to repeat it again here?

CHAIRMAN HENDRIE: I don't know whether we do or not. Is it clear?

MR. SHAPAR: I think it is. We can put a generic thing in this one to make it understandable rather than repeating it in each section.

CHAIRMAN HENDRIE: That is a possible approach. I would appreciate a recommendation on that that looks both at the procedural rule and what it says and what the practicalities are. What I am afraid of is that if you leave it to the procedural rule you have the interesting configuration that you have a technical criteria regulation which we say, now here are the technical criteria, and if a repository meets these, why, then, the implicit assumption is that it is acceptable to us.

The technical criteria say "will contain all" and everybody says, by God, those are good criteria. But over here we've got a procedural rule that says well, actually, when we make the decision we don't want the technical criteria to be met as written. All we want is reasonable assurance that they will be met. And it seems to me that that may sort of hold up in a logical way, and through the

Commission's administrative procedures as a basis, but it just seems to me that it would be clear to everybody if the technical criteria themselves said now, look, here are technical criteria. We want to have reasonable assurance that the container design is such that nothing will get out for 1,000 years.

And then right at the immediate level where nobody can, you know, if they quote the section sub(i) here, the containment of wastes, you've just got to fill it in. You don't have to know that somewhere either in the preamble to this rule or over in the procedural rule it says well, well, now wait a minute. You know, our decision basis is just reasonable assurance that those great criteria are met.

So I don't know. I wish you would think some on that.

MR. MARTIN: Yes, we'll take a look at it.

CHAIRMAN HENDRIE: I don't know whether the Commissioners have a point of view on it.

COMMISSIONER AHEARNE: I don't see how practically one is going to ever do anything more than have some standard met, that with a degree of confidence. But you certainly aren't going to prove a 1,000-year behavior.

COMMISSIONER GILINSKY: But the sense of it is that you want to have high confidence that the material is going to stay there for 1,000 years.

CHAIRMAN HENDRIE: Yes.

COMMISSIONER GILINSKY: Now when you come to evaluating it, you are going to have to apply some reasonable standards, because you can't do anything but calculate and make some judgment.

COMMISSIONER BRADFORD: Well, I think that's right. And it may be possible to say it -- that one wants the sum total to be high assurance and that that is going to be the product of a number of reasonable assurance judgments that have to be made at the individual steps.

I agree with your point, Joe, that whatever the standard is it is well to say it in both rules so that if one reads one and not the other they won't feel we are not putting anything over on them.

CHAIRMAN HENDRIE: I just have a feeling that at some later time when some future set of Commissioners and staff officers are trying to explain to the Congress or a hearing board what was meant here, it's all going to sound rather patched together, and it would be better if it was fairly straightforward here.

MR. DIRCKS: I think something got lost in the shuffle here. As I recall, when we got into this last year, that "reasonable assurance" was in there, and, Jack, I remember us talking about this. So I think we started off with that intent. Somehow or other the words got lost.

CHAIRMAN HENDRIE: I think there was this business about saying it once in the procedural rule and then there were words like "designed" and "assuming anticipated processes and events", which helped the ability to make the case.

In having "assurance," -- and please stick to "reasonable assurance." The last time you used "high assurance." Do you remember what happened?

COMMISSIONER GILINSKY: It was, what, "physical security," or something like that?

CHAIRMAN HENDRIE: Yes.

MR. DIRCKS: We wound up with three degrees of "high assurance."

(Laughter.)

CHAIRMAN HENDRIE: We wound up patting everybody down, remember, and promptly had to retreat before a storm of protest, so be careful about "high assurance", please.

In this organization a "reasonable assurance" is an extraordinarily difficult standard to meet. I was going to say there are two aspects to the proveability of these things. On the one hand you want a design which can be analyzed or judged, because it isn't going to be so complicated you are going to do great structural analyses, but just be judged to be a fairly conservative design and that the supporting information on materials, properties,

and interactions and so on indicate that it is probably going to hold up in great shape for a long, long time. You certainly want that.

Another part of it is, good, I've got this design and the supporting information, and every indication is that it will really do the job. Okay? Now I have to manufacture a number of these -- some thousands, probably -- and how do I prove that my manufacturing processes and so on, that the quality assurance will be so good that there will be -- that all the containers will be absolutely as good as the design suggests?

Well, you know, in the real world you get a distribution of quality in the produced product and you hope that your inspection standards are tight enough to cut off the tail on the low side -- the unacceptable side -- but there is still going to be a distribution of quality in the packages and that also introduces a variability, which makes it exceedingly difficult to prove one hundred percent of anything.

(Whereupon, at 10:54 a.m., Commissioner Bradford left the room.)

CHAIRMAN HENDRIE: And that is another reason, another part, then, of the reason, why some reasonable assurance that some of the places help the standard in the sense of making it one that is practical and for good design

that can be improved.

COMMISSIONER GILINSKY: I gues what bothered me, where you were heading on this paragraph was if you stick it in here, it seems as if the goal, the design goal, is to be able to contain it with reasonable assurance, which is a little bit different than saying our evaluation will be based on reasonable assurance --

COMMISSIONER AHEARNE: -- assurance that the design goal is met.

COMMISSIONER GILINSKY: That's right. Reasonable assurance on the part of the regulatory staff. It seems to me that the design goal ought to be to contain all, or all but a relatively small --

CHAIRMAN HENDRIE: One could say it that way in fact, but that's not the way it is said here. If one said the design goal of the engineered system shall be, so that even if it saturates and so on, the packages will contain all radionuclides for the first 1,000 years.

(Whereupon, at 10:56 a.m., Commissioner Bradford returned to the room.)

CHAIRMAN HENDRIE: That's one way of saying it. But what this says is the engineered system shall be designed so that that is true. And I'm just not sure that the word "designei" and the anticipated events, together with "reasonable assurance" over in the procedural part of

the rule, gets you (a) what will I call it, the adjudicability that I think it needs, on the one hand; or (b) on the other, be as clear about what we mean, as it might be.

Why don't we let them think on it, because, Peter, you said you wanted to scratch on this thing some more.

COMMISSIONER BRADFORD: Yes, I assume we are not going to vote today.

CHAIRMAN HENDRIE: You would prefer not to be asked to yay or nay on a final vote this morning?

COMMISSIONER BRADFORD: Yes.

CHAIRMAN HENDRIE: So, for that reason, I did not expect to come to a vote. We will have time to scratch a little more. Why don't we see what they suggest?

But I think your point is correct. That is, one goes into the design effort and says: My objective is a containment that will not leak anything for 1000 years. Okay? Now we have to find a way to say also, however, as part of that standard, that when we all sit down in the hearing to see where we are with the proposition before the house, that the standard is going to be a reasonable assurance that the radionuclides will be contained. Okay, enough said.

Now that is a principal --

COMMISSIONER GILINSKY: I thought that was what

was meant here.

MS. CONELLA: It is what we mean. That's exactly what we meant.

MR. MARTIN: Yes, if we say --

CHAIRMAN HENDRIE: I think that's what they meant too, but I have talked to some folk who have been working and trying to figure out -- you know, looking at the draft and so on and trying to figure out how would we deal with that and so on. And there's a lot of headscratching. Part of it's a communication problem and some of it gets cleared up as time goes on, as you talk to people and so on. But some of the concern, I think, has a reasonable basis.

Okay. The next piece I would like to talk about is a little further, on page 34 on the old one, "performance of the geologic setting." In the new one it is -- this is in ii, the isolation period paragraph. We've got a proposition here that following the containment period the geologic setting, et cetera, shall be capable of isolating radioactive waste. Here again is a place, you know, that's one of your reasonable assurance places, either built in here or elsewhere.

But then it goes on to say, so that the transport of radionuclides to the accessible environment shall be in amounts and concentrations that perform to such generally applicable environmental standards that may have been

established by the Environmental Protection Agency. That's fine. We have to conform to those generally applicable EPA standards.

But it goes on and says, and thereby will not result in significant doses to any of the individuals.

COMMISSIONER AHEARNE: To any member of the public.

MR. MARTIN: We've changed it to members of the public.

CHAIRMAN HENDRIE: Have resulted in significant doses to any members of the public. Okay.

Why do you want that tag on there about the doses and the criteria?

MS. COMELLA: Well, once again we get back to the point that the purpose of the geologic repository is to isolate the wastes. And, practically speaking, that transfers into a release of all of the material over very long periods of time. So one really wants to talk about the rate, as it were -- the amount released at any particular point in time to make certain that it does not work for a time, hold it up, and then it's released to the accessible environment in a slug. I can't think of a better way to describe it.

So that was a way of coming at an understanding of whether or not, indeed, the repository was going to function at or as projected.

COMMISSIONER BRADFORD: I'm sorry. Where are you now, Joe?

COMMISSIONER AHEARNE: Page 34, 2, near the bottom.

CHAIRMAN HENDRIE: What are the doses you calculate under this paragraph? Do you calculate doses under the paragraph? Or is the comment about doses meant as a sort of parenthetical remark along the lines of you've got to meet these EPA standards and we just note in passing that if you do, why members of the public won't get significant doses.

MS. COMELLA: No.

CHAIRMAN HENDRIE: Or do you mean meet the EPA standards and also show that no member of the public receives significant doses?

MS. COMELLA: It implies a dose calculation. That is what is asked for there.

CHAIRMAN HENDRIE: What do you mean by "significant"? The EPA has, under their authority, decided that if this repository doesn't -- or they will decide, I trust. They have in draft decided that if this repository doesn't let out more than so many curies of this isotope and so many curies of that isotope in the first 1,000 years that doses to the individuals are not significant.

MS. COMELLA: That's correct, but part of it was a desire -- part of it is for completeness. We really don't

have an EPA standard yet, and what does a functioning repository mean? It means that -- what does isolation mean? It means limited release to the environment over very long periods of time.

And this was a way of coming at an understanding of how the repository was operating and whether it could operate.

CHAIRMAN HENDRIE: Well, but I don't know what you are going to do with the dose calculation that you made here. In the first place, is it the same dose calculation you made back in the "likely maximum"?

MS. COMELLA: Yes, it is the same.

MR. MARTIN: Both are the same.

MS. COMELLA: Dose calculation.

CHAIRMAN HENDRIE: But you didn't propose to do anything with that one, except to have it handy when the inevitable question arose. Okay, enough of this hanky panky about geology, what does it really mean in terms of doses to people as an information item?

Here it cracks a little tougher. Here there is a comment, "will not result" -- "requirement will not result in significant doses to any member of the public." In a section which is part (e), here are the requirements for technical criteria for geologic repositories. Here, having it appear over here, it suggests we are going to do

something with the dose.

Furthermore, it suggests, when we say "will not result in a significant dose", it suggests we know what a significant dose is. And not only that, but even if they meet the EPA release standards, we have in mind some different radiologic health standard. All right?

MR. MARTIN: True.

CHAIRMAN HENDRIE: Let me suggest, if they meet the EPA standards then they meet the radiological health standards established by the appropriate authority of the Federal government.

MR. SHAPAR: Maybe the word "thereby" is intended to convey just that.

COMMISSIONER GILINSKY: That's what I understood it to mean. I'm surprised.

CHAIRMAN HENDRIE: No, a minute ago I said does this phrase mean just fellows, you've got to meet the EPA standards and, by the way, if you do, then we all understand there is no significant dose.

I asked, is that the interpretation, or is the interpretation that we are going to use the dose and look at it? And the answer was the latter, not the former. So, good, strike your comment.

COMMISSIONER GILINSKY: Well, what does "an thereby" mean?

CHAIRMAN HENDRIE: It apparently means "and show that there will not result significant dose to any member of the public". What I am saying is, wait a minute. You are now on the one hand, if you really mean that you've gone across the line into EPA's area of responsibility.

MS. COMELLA: I did not understand your line of questioning exactly. When I said we would use the calculation I know I am not getting across what I am trying to.

The repository, if it is functioning properly, ought not to release a large quantity of radioactive material at any instant of time, and a way of seeing how the repository is -- how well it's projected to work, is to look at this very calculation in order to have a better understanding and have greater confidence in whether or not the repository is likely to work as projected. That is why that is there.

Now it is not meant to imply that we are setting a standard that is different from EPA's. It is not meant to imply that at all.

CHAIRMAN HENDRIE: But the proposition as to whether it is working, whether the design is such that there is reasonable expectation that it will work the way we want it to, and within limits and so on, is determined here by whether or not the analysis of the design says we will or

will not hold the emission rate of radionuclides out of the total repository area down to the EPA 10,000-year numbers.

If you do, if your review does say yep, by George, there's every expectation that it will be held down to those limits, then you've met the standard established by that other group of Feds who have been told off to do that kind of standard-setting.

Now as part of their standard-setting, they have calculated some doses and decided that that's the way they set their curie numbers, but they've done. That's their responsibility. They've done that. What I am saying is, it's really not our business to come along and say we are going to meet the EPA standards and, in addition, we are going to meet the dose calculation, and we've got some ideas about what our requirements are on that.

MR. DIRCKS: Could you say, "and thereby demonstrate that no significant doses to members of the public would occur?"

COMMISSIONER AHEARNE: I guess, Bill or Pat, what Joe is stressing --

CHAIRMAN HENDRIE: I want a "." after "agency."

COMMISSIONER AHEARNE: Right. See, what he is asking is: In a licensing review, either internally or externally to the agency's review, that phrase must have application to what is being required to be proved, and it's

not sounding like a requirement that we are --

MR. DIRCKS: Well, I think the point was that if you prove you meet the EPA standards, you thereby prove that no member of the public would receive a significant dose.

COMMISSIONER AHEARNE: Your interpretation then is that it is a parenthetical statement.

COMMISSIONER GILINSKY: You mean the follow-on, "and thereby."

COMMISSIONER AHEARNE: Yes.

COMMISSIONER GILINSKY: It's just an additional explanation.

MR. DIRCKS: You can leave it in or take it out.

COMMISSIONER GILINSKY: That's the way I understood it.

MR. DIRCKS: But if you meet one, you thereby meet the other.

COMMISSIONER GILINSKY: And thus you have met it.

MR. SHAPAR: Which means you don't need it.

CHAIRMAN HENDRIE: Which means you don't need it in a section that is called specifically "technical criterial." You know, this is not a section that says: Here is an explanation of how everything is going to work. It says these are the technical criteria, one, two, three, four, five. The explanations about "thereby the significant doses" won't be significant because so on and so on are

appropriate elsewhere.

COMMISSIONER AHEARNE: A statement of consideration type of statement?

CHAIRMAN HENDRIE: Yes, or a footnote.

COMMISSIONER AHEARNE: Or this rule puts in place criteria which by meeting not only our own standards but by meeting the EPA standards will then have developed a repository which will not result in significant doses to the public.

MR. DIRCKS: So you can put a "." there and take it out.

CHAIRMAN HENDRIE: Well, I would think so. I recommend the staff gather on the point before we meet again, because I sort of -- There seem to be some different points of view.

MS. COMELLA: That's right.

MR. MARTIN: I think this is about as close to the gathering as we are going to get on this point. We have "gathered" interminably.

COMMISSIONER BRADFORD: Let me ask that question another way.

CHAIRMAN HENDRIE: Maybe some people want to calculate doses and use them for something in a regulatory requirement sense, and other people think if you meet the EPA standards then the doses are just automatically not

significant, and that's that. I see a hand. Yes.

MR. COSTANZI: Mr. Chairman, the calculation --

COMMISSIONER AHEARNE: Would you use the mike, please?

MR. COSTANZI: Oh, I'm sorry. The calculation of the dose to any member of the public is a way of measuring or evaluating the potential or expected performance of the site under the particular conditions that performance objective calls to, namely that there is no longer a reliance on the engineered portion of the repository system. And it is a way of obtaining confidence that even in the period when the engineering features are no longer being relied upon, that the site will still serve a function to assure that the amount and concentrations of nuclides reaching the environment will not be significant, will not be of significant harm.

And that is why --

CHAIRMAN HENDRIE: Yes, but isn't all of that assured if you find that you can make a reasonable case that the EPA radionuclide limits over the first 10,000 years are, in fact, met?

MR. COSTANZI: When this was written, of course, as it is now, there was no EPA standard.

CHAIRMAN HENDRIE: I guess there still isn't in a formal sense.

MR. COSTANZI: No, it's not. And the fact that over the period beyond 10,000 years there will be a significant in-growth of dollars within the repository and there will still be significant amounts of radiation in the waste, and the draft EPA standards that we have of course don't speak to any period beyond 10,000 years.

CHAIRMAN HENDRIE: That's right.

COMMISSIONER AHEARNE: So you are saying you would interpret this as a, as far as a required calculation -- It wasn't clear to me whether you were saying that I can interpret it as two requirements -- one, that EPA talks about 10,000 years, and we would want to look at slices within that, or say yearly, or a ten-year period. And, second, that we would want to look at past 10,000 years.

MR. COSTANZI: I think that is correct. That's the way I would see it.

COMMISSIONER AHEARNE: So you do see it as an additional regulatory requirement?

MR. COSTANZI: Without an additional -- the EPA standard I can't say whether it's additional or not.

COMMISSIONER AHEARNE: But, given that the EPA standard is in draft, it would be an additional standard?

MR. COSTANZI: Yes.

MR. DIRCKS: That poses a problem.

COMMISSIONER AHEARNE: That's an interesting

question.

MR. DIRCKS: Then we should have raised that with the EPA, I guess.

CHAIRMAN HENDRIE: I'm not sure that when the EPA was empowered under the transfer authority back, when was it, '73 or something like that?

MR. DIRCKS: Yes.

CHAIRMAN HENDRIE: To establish generally applicable radiological standards, that there was conferred upon the AEC and then devolving upon us and authority to (a) conform to their standards in their area of applicability, certainly, but (b) also go them one better in those areas, if we liked.

MS. COMELLA: I think part of this represents a belief on the part of some members of the staff that the 10,000-year period, when scrutinized in the formal standard-setting period, is not probably going to survive; and that if it does, obviously that this would be truncated at 10,000 years, or perhaps a requirement change.

But if, in reality, that does not stand up --

CHAIRMAN HENDRIE: Doesn't stand up where?

COMMISSIONER BRADFORD: In EPA.

CHAIRMAN HENDRIE: We don't have an EPA --

CHAIRMAN HENDRIE: In the EPA rulemaking?

MS. COMELLA: In the EPA rulemaking. We don't

have an EPA standard.

CHAIRMAN HENDRIE: But whatever the EPA produces from its rulemaking --

MS. COMELLA: Yes.

CHAIRMAN HENDRIE: Be it two years --

MS. COMELLA: Yes, that's correct.

CHAIRMAN HENDRIE: Or to the end of the universe, is covered by, "as may have been established by the Environmental Protection Agency." So you've got it built in. I don't see, you know --

COMMISSIONER BRADFORD: No, but I think what Pat is saying, is that if in fact they said "two years," ridiculous though that might be, then the staff does not want to be bound by that.

CHAIRMAN HENDRIE: A party to it.

COMMISSIONER BRADFORD: Or a party to it. And there I guess you had another question of just whether we have the power to set a standard.

CHAIRMAN HENDRIE: That is exactly the question I raised.

MS. COMELLA: Yes, and my understanding is that we don't have that.

CHAIRMAN HENDRIE: Good, then why are you talking about a time period longer than the EPA has judged necessary--

MS. COMELLA: Because we don't have --

CHAIRMAN HENDRIE: -- to establish these generally applicable environmental standards? Don't tell me that we haven't got the standard. I know we haven't got the standard. We are basing this criterion on the proposition that there will be one.

MS. COMELLA: All right.

CHAIRMAN HENDRIE: And we adopt what our requirements are to whatever that EPA standard may be by saying, "as may have been established by the EPA." So you have anticipated whatever they may do.

COMMISSIONER BRADFORD: Is it true, as a legal matter, that if EPA cuts their standard off at any given point in time we not only do not have the power to establish a different standard within that period of time, but also cannot address a desirable standard for the period of time they haven't addressed?

CHAIRMAN HENDRIE: I don't know. It would seem to me that that would intrinsic in the transfer of that authority which, let's see, was by Executive Order, I think.

MR. DIRCKS: Yes.

CHAIRMAN HENDRIE: It isn't statutory.

MR. DIRCKS: I worked on it in '73, and I think the rule was --

COMMISSIONER BRADFORD: You drafted it.

MR. DIRCKS: -- to make the distinction. They have what's out in the environment; we have what is within. Now the lawyers can always come in and say what we had in mind when we did this.

MR. SHAPAR: I think it was done by the reorganization plan and I think it's more complicated than the simple question that has been raised. They have two sets of authorities. They have the authority they got from the reorganization plan, which is generally applicable, and standards applicable to the general environment. They also have the old FRC authority, the question about whether that is binding on us without the Presidential imprimateur being added to it.

However, you've got the concept, "as low as practicable." You've got the concept that the EPA standards are supposed to be ambient standards, about which there has been some quarrel in the past. And that our standards are, in essence, emission standards.

Now how that all fits into this posture I think I would have to say that any reasonable steps we took to meet the EPA standards, remembering that they are different kinds of standards -- one is supposed to be ambient and ours are supposed to be emissions standards -- So I would say we have considerable flexibility, but the general goal ought to be the EPA "generally applicable" standards, and we ought not

to try to rewrite those certainly.

CHAIRMAN HENDRIE: Sheldon, you about to explain?

MR. TRUBATCH: There have been situations in which EPA has not acted, and we have acted, though. One example was the Appendix I to Part 50.

CHAIRMAN HENDRIE: Yes, that's right.

MR. TRUBATCH: So at least the answer to Commissioner Bradford's question to the point that say after the 10,000 years, when EPA no longer has any standard, I don't think that precludes the NRC from then having a standard.

CHAIRMAN HENDRIE: But if the EPA has determined that for purposes of estabishing these radiological safety requirements for geologic repositories, it is necessary and it is sufficient to have considered the first 10,000 years. Then why are we mucking around out after that?

MR. TRUBATCH: Well, that's a separate question --

COMMISSIONER GILINSKY: Did they put it in that form?

MR. TRUBATCH: -- from whether as a matter of law--

CHAIRMAN HENDRIE: I don't know that they did, Vic.

MR. TRUBATCH: That's a separate question from whether as a matter of law we can't go beyond EPA standard.

CHAIRMAN HENDRIE: Well, it would seem to me peculiar if we could, and if so, something of a little idiosyncracy in the federal regulatory scope. I would hope that federal agencies, you know, have authorities which match along the interfaces so we are not in their pockets and they are not in ours, and on the other hand, so there are not gaps.

I would think if they are told to do it we would take their product and that's that, and we work on our side of the line.

MR. DIRCKS: There was the reason for the '73 meeting, because there had been a history of one moving back and forth across the line.

CHAIRMAN HENDRIE: Yes, what you've got here is a proposition that goes beyond that. There is a question, first of all, about what are our appropriate authorities in the matter. Are we firmly bound by whatever EPA publishes as a final rule on the one hand? And, on the other hand, there is the policy question: If we may, should we?

Let me suggest to you that if the EPA could bring itself to think that the 10,000 years is an ample time to judge repositories, that as a policy matter I would be extremely reluctant to see us lunge further into the impenetrable future. The only thing we are going to do by establishing requirements out past that EPA required period

is to put ourselves in a regime where we aren't going to be able to say much of anything except to wave our hands and look honest and look honest and sincere.

COMMISSIONER BRADFORD: And talk about significant doses.

CHAIRMAN HENDRIE: And let me tell you about long experience on the reactor licensing side, that's not the kind of regulation you want to write for yourself nor -- and I really think that if one can conclude that if you meet the 10,000 leakage requirement that you've got a system which is intrinsically as good as you are going to do and will hang together for whatever time you are interested in, why, then, I think you are not going to do better than that in a real safety sense, and I think you may make a lot of trouble for yourself by trying to project out into the distant millenia. And you're just going to have a very tough time making that case in court.

MR. MARTIN: That's why one of the major features of the EPA rulemaking is to get straight just that point -- that beyond 10,000 years you are just kidding yourself and you really know what's happening here.

CHAIRMAN HENDRIE: I know, but you have language here, at least one interpretation of it from a group that worked on it, which would suggest that you in fact want to, if they quit at 10,000 for what they regard are good and

sufficient reasons: Never mind, we'll go forth beyond that.

And I suggest that I wouldn't want to go that way as a matter of policy. I also think as a matter of authority it is not right. But I recommend that you think on it.

Now, let's see. For the purpose of -- the rest of that paragraph is, "for the purposes of this paragraph, the evolution of the site is based on the assumption that those processes operating are those" et cetera, "those that are operating on it during the" -- Is that quaternary or quarternary? How do you pronounce it?

MR. MARTIN: Quarternary.

CHAIRMAN HENDRIE: I know there had to be a variation on it.

COMMISSIONER BRADFORD: How many years is that?

MR. MARTIN: It's about the last 2 million -- you know, nothing much has happened. That's the definition of the quarternary. Nothing much has happened geologically except the ice ages and the mountain-building is over.

CHAIRMAN HENDRIE: You have to learn to take a long view, Peter.

COMMISSIONER BRADFORD: Well, I was thinking of that in the context of your last few minutes of discussion, Joe. I wondered how much time the Phoenicians had spent wondering about what they were doing to us.

(Laughter.)

CHAIRMAN HENDRIE: Not much.

COMMISSIONER BRADFORD: On the other hand, they may not have been creating much by way of isotopes.

(Laughter.)

COMMISSIONER BRADFORD: May I ask a question or two, if you are about finished?

CHAIRMAN HENDRIE: Pray do. I am trying to puzzle-- I know what the staff is trying to do here is to provide some guidance because you are going to have to try and guess what is going to happen, project what is going to happen over some period of time, whether it is 1000 or 10,000 or 100,000 or whatever we end up with, and you are trying to provide some reasonable basis for them to make those projections about what the geological events are going to do. So let me mull on that while Peter asks his questions.

COMMISSIONER BRADFORD: With regard to the EPA standard, and let's leave out the other half of that controversy, are you saying here that the repository in and of itself just during the first few thousand years should be sufficient to assure that the EPA standard is met -- I'm sorry -- that the geologic setting should be sufficient to assure that even if the engineered aspects and the waste package themselves don't perform up to your expectations?

Is the repository an independent barrier that assures the EPA standard even if the others fail?

MR. MARTIN: No.

CHAIRMAN HENDRIE: I don't read it that way but I'm interested.

MR. MARTIN: What this says is that after the engineered design life and the engineered system, that the geologic portion alone must be sufficient.

CHAIRMAN HENDRIE: This is the post-1000 years.

COMMISSIONER BRADFORD: Why wouldn't you say it the other way? Why wouldn't you want the repository to be sufficient in itself?

CHAIRMAN HENDRIE: Because I don't think you make the grade.

MR. MARTIN: I think you would like to but I don't think that could be done. Furthermore, I don't think it could ever be proven. That is why we have come at it from the other --

CHAIRMAN HENDRIE: I differ from that. I think it could be done but I don't think you could ever prove it.

COMMISSIONER BRADFORD: Even to a reasonable assurance level?

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: Well, no, because in this case the reasonable assurance has -- there is a broader --

COMMISSIONER BRADFORD: The uncertainties are broader?

CHAIRMAN HENDRIE: Yes, the uncertainties are broader. One of the things they are trying to do with this waste container is to tie up high specific activity

materials until they are pretty well decayed out. That is what the waste form and the package container concept is for. And if you do not have a container or waste form which has a very low leach rate over the period that those high specific activity materials are there, there are just a whale of a lot of curies of cesium and strontium. And if you leach that stuff into the groundwater and then launch it and wait for adsorption or other processes and the travel time to protect you, I think you might have a tough time showing that that wasn't a risky proposition.

COMMISSIONER BRADFORD: So the right way to take this is in terms -- if I were just visualizing this process in terms of years, when is it that you really come to rely on the geologic setting as the primary barrier to migration?

MR. MARTIN: Well, if everything works the way it has been designed to work, after the first thousand years you start depending upon it, because that is when you start releasing the stuff from the repository hopefully at a limited rate, and after the far distant future you rely on it.

COMMISSIONER BRADFORD: So the way you have written the standard now, you don't intend it to say anything about the repository performance during the first one thousand years?

MR. MARTIN: No.

COMMISSIONER BRADFORD: "No" you don't? Or "no" I have just stated it wrongly?

CHAIRMAN HENDRIE: You mean the performance of the geologic setting?

COMMISSIONER BRADFORD: I'm sorry. I keep mixing up "geologic setting" and "repository."

CHAIRMAN HENDRIE: I think the inference is that it is performing superbly, but it has gotten nothing to perform on for 1000 years.

COMMISSIONER BRADFORD: Well, that is what I was asking, essentially.

MR. MARTIN: Well, that is not quite -- That is true if everything is working right. Now the EPA standard also covers -- you know, the limits apply to if everything works right and also those reasonably foreseeable events like people drilling into it, for example, which is almost a certainty if you believe the probabilistic calculations.

Well, there is a case where one or a number of the canisters will very likely be destroyed or chewed up, and the geology then would have to provide the protection for that. So that for the different credible accident conditions, the geological system, or the geologic setting would have to provide ample protection if you had premature failure of the engineered barriers.

CHAIRMAN HENDRIE: But not all of them.

MR. MARTIN: No.

CHAIRMAN HENDRIE: Because on these kinds of intrusions, why you are saying: Well --

MR. MARTIN: That's partially why we did it.

CHAIRMAN HENDRIE: -- some of these people who are on the one hand, bright enough to drill 1500 feet, but on the other hand, nothing has survived and so on, and they go down and get themselves a drill bit full of radioactive material and they get out.

MR. MARTIN: This is correct, and it is another reason why we sort of went for the engineered systems. It provides some sort of a discrete nature to the repository, that there are only so many things you can wreck at one try and the rest of it is not effective. So for those kinds of off-normal things, where I think will be the bulk of a debate or in any sort of a licensing procedure, the geologic setting is all important.

COMMISSIONER BRADFORD: But in terms of the significant performance below expectations of either the repository itself or the waste package, the geologic setting isn't required to function as a barrier in those first one thousand years. I am not saying now that it won't. I'm just saying that in terms of your not assessing its ability to do that in terms of your requirements here.

CHAIRMAN HENDRIE: Can you say it again, Peter? I

lost the front end of the sentence.

COMMISSIONER BRADFORD: In terms of a really significant failure of either the package or the engineered repository to perform up to expectations, the geologic setting isn't for regulatory purposes being assessed on the basis of its ability to be a barrier to that failure in the first one thousand years.

MR. MARTIN: I think that is right. It is recognized as some sort of a very large, albeit unquantifiable reserve, and one of the major reasons why we have selected to emphasize the engineering portion of it is because the geologic settting is inherently unknowable to a large degree. I think the Chairman expressed it right. Most everyone feels it will work, but our despair is to how you prove very much beyond. If too big a demand is put on it, you get into a very hard proof problem.

COMMISSIONER GILINSKY: Let's see. The one thousand year water travel problem is a backup to that failure of the container, the repository.

MR. MARTIN: Just exactly right, but --

CHAIRMAN HENDRIE: But it at least postponed things.

MR. MARTIN: That is the one feature that we have selected that is reasonably provable as a backup, but we have not, for example, said, well, if all of the engineering

fails, the setting alone must be capable, because I don't think we could prove that.

COMMISSIONER AHEARNE: That also goes back to the IRG approach not to have any one facet be responsible for everything.

COMMISSIONER BRADFORD: Well no, the IRG approach would have said don't make the setting alone responsible for everything. I don't think it in itself would have precluded saying that you have three levels, each of which you consider to be responsible independently. It may make no sense to do that for other reasons, but I don't think their approach would have ruled out saying that it if step one and step two don't work out, you still have step three that you think will contain it.

COMMISSIONER AHEARNE: I think it would have. I think it says you don't design. That says that all geologic settings must be able to handle all or that the container must be able to handle all.

COMMISSIONER BRADFORD: It doesn't really matter. I had read it to say that you don't rely on any one of those things to handle it all.

Go ahead.

CHAIRMAN HENDRIE: Can I charge off in a new direction? On this general -- well, we will let you think about it, and we will hear whether or not you would like to

put in a "."

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: Or which side wins that debate on the staff side. The Commissioners can express their views.

Now we get back to design and construction requirements. The stuff about radiological protection, natural phenomena looks good. We begin to get to a place as one goes on back through this part of the rule where I wonder if we have run out of regulation material and have begun to put regulatory guide material into the Code of Federal Regulations?

MR. MARTIN: I think we are wondering that too, and that is one of the things we call out to particularly ask some comment on in the introduction. Almost all of this stuff has been lifted out of either the existing Part 50 or Part 72, or there are a couple of things in there I have had some bad experiences with in the past that I felt ought to be in there, and in the aggregate it looks a bit ponderous, but there is very little in here that is sort of invented out of whole cloth. Most all of it is an adaptation in design and construction from sort of our corporate collection of the stuff we have found that you really ought to do. There are a few additions but not too many.

CHAIRMAN HENDRIE: Are there Reg Guides that go

with this?

MR. MARTIN: There will be, and maybe that is one of the things we thought it would be useful to focus the comments on, how much of this stuff are there really strong feelings one way or the other. There hasn't been too much in the past.

CHAIRMAN HENDRIE: Yes. Well, whether it is a unique manifestation in this part of the rule or not, you know, I'm not sure that the nuclear safety regulations of this Commission need to include the requirement for two independent indicators on hoists to indicate when waste packages are in place, grappled and ready for transfer.

MR. MARTIN: That is one of those bad experiences that I have told you that I have personally had with fueling unloading.

CHAIRMAN HENDRIE: Shaft conveyances used in radioactive waste handling.

MR. MARTIN: That's the second one.

(Laughter.)

MR. MARTIN: If you have ever had an experience of seeing a spent fuel cask dropped into the bottom of the dry dock, you do not soon forget that. And to my mind, having had that kind of experience, it is very important to --

CHAIRMAN HENDRIE: But after you have already made the regulations to read that hoists important to safety

shall be designed to preclude cage refall, reliable cage location system -- you know, it just seems to me there are some places in here, and this one struck my eye in particular, where one reaches down to a level of detail which is sort of regulatory guide stuff.

MR. MARTIN: Well, there was some discussion on those two points. We have had significant bad experience in the nuclear business that I think it merits a bit.

CHAIRMAN HENDRIE: Well, I'll tell you, you have to think some about those bad experiences and how much of a guidance there should be about regulations.

MR. MARTIN: Well, for example these two points.

CHAIRMAN HENDRIE: There must be some sort of hoist standards that the Bureau of Mines uses or various people use. There are hoist standards for fuel handling, cask handling stuff, for instance, in the Standard Review Plan for reactor facilities, and it seems to me that some of this is at about that level of detail where it is better handled in the staff guidance documents where the regulation says, you know, the shaft conveyance --

MR. MARTIN: I agree with you in principle.

CHAIRMAN HENDRIE: -- or conveyances shall meet appropriate safety standards. They'll say, Oh, boy, what does that mean? What that means is some staff guidance which gives you a little more flexibility to adapt to

developments in codes, standards, practice and so on.

MR. MARTIN: I agree with you.

CHAIRMAN HENDRIE: I just say that as a comment since you are going to get comment on it.

MR. MARTIN: That is what we are particularly asking about already.

CHAIRMAN HENDRIE: Now, I think the last area I want to pursue this morning is the 50-year-after-closure retrievability question. I guess the question is -- well, there are several questions. Fifty years seems like a long time, on the one hand, in some ways at least.

COMMISSIONER AHEARNE: They have got two requirements. One is for 50 years, but the other is how long it would take. You would have to be able for the operation to go in order to do the retrieval, and that is a pretty long time.

CHAIRMAN HENDRIE: Yes, that is probably another 20 to 50 years.

MR. MARTIN: Right.

CHAIRMAN HENDRIE: And for the place for wastes which are emplaced during the operating period of the facility, then those wastes are there until the facility closes, which is, I don't know, 20, 30 years, 50 years. I don't know how long the damn thing will be open. But say 30 years for round numbers, and then 50 years after that. And

then since you are going to allow them, I think quite reasonably, and extended period to take the stuff out if it ever had to come back out, then as John points out, there is another 30-year period out on the end of that.

The first stuff that goes in, you need to have some reasonable basis that you can mine it for 100 years. It seems kind of a long time. Not long on the time scale of the expected operation of the facility, I grant you, but I am wondering what sort of effects that has on facility design, among other things, as I look at the temperature profiles and that "J" thing which you sent along.

A question. Does the retrievability requirement in and of itself compel a very much reduced thermal loading?

MR. MARTIN: Well, it could.

CHAIRMAN HENDRIE: Which then would be perfectly reasonable on all other grounds except retrievability.

MR. MARTIN: Well, each of these performance objectives has tried to be somehow tied to temperature and thermal. We have discussed this point extensively with DOE and several of the industries groups, and their feeling is that no, it would not be the controlling item on repository design, particularly after we got over the hump of what do we mean by retrievability.

It does not mean ready retrievability or ready to go pluck it out at a moment's notice or it's an extended

storage facility. It can be backfilled, it can be done a number of things with it as long as one could make the case that the design is such that if things start going wrong, you can still do something about it.

But once you got over that hump, the concern with this is a very disruptive type of requirement has subsided considerably. What we are trying to guard against here, I guess what I had in mind is how, say, 50 years from now, whoever is in charge of this facility will probably want some time to monitor how it is working and, you know, I can't even imagine what all things they will be concerned about at the time, but they would like some time to consider whether they have enough confidence to close up and walk away.

What we want to make sure of is that design decisions being made today don't make it impossible for people to know they want to watch it, either for longer or shorter, further downstream. I guess in an extreme case if one designed it so that the temperature ramp was such that it reached a point where it was just too hot to go back in and re-mine or do anything with it, I think that would be a rather very unsatisfactory situation if it happened anytime soon.

The industrial people we have talked to feel, well, with any other kind of temperatures they have been

talking about that shouldn't be a problem; that adequate heating paths could be established, that things could be re-mined, and it should not be a major issue as long as you are not saying it has to be standing there open in a ready retrievable mode.

CHAIRMAN HENDRIE: What sort of thermal loadings are contemplated these days for reasons of package integrity and engineered system integrity rather than retrievability?

MR. MARTIN: Well, that sort of varies as the design work on the packages has been advancing. Two or three years ago people were talking about canisters that would reach, oh, in the order of 300 or 400 degrees. That took a sharp downturn to where a year or so ago the people I talked to at Savannah River were thinking about 100 degrees as the right number, at least for openers.

That seems to be creeping back up a little bit lately as they get some more confidence, but it is in the order of a canister picture of, oh, 200 to 300 degrees.

CHAIRMAN HENDRIE: Do you know what that turns out to be for ten-year old waste? Does that look like 60? Is that more like 60 kilowatts an acre than 150?

MR. MARTIN: Well, there are two different curves you have to look at. One is the canister wall temperature, which I think has the most to do with the retrieval.

CHAIRMAN HENDRIE: I'm not so sure if you are

going to have to go down and mine, if you have got the whole media coming up in temperature so that you have got to provide cooling, that's going to be kind of burdensome. I guess people just are not going to want to deal with that.

MR. MARTIN: That's true, but the heat capacity of most of these rocks is such that the bulk temperature of the repository rises relatively slowly compared to the peak temperatures of the canisters. They peak out at about 50 years, where the bulk temperature doesn't hit its max until about 500 years.

CHAIRMAN HENDRIE: Yes, but it's pretty well up by about 100.

MR. MARTIN: It's up around 100 degrees or so.

CHAIRMAN HENDRIE: And it seems to me the retrievability requirement extends, at least the front-loaded canisters, extends that long.

MR. MARTIN: That's right. So the types of temperatures, just for other reasons that are being kicked around now, are on the order of maybe a canister wall temperature of maybe about 100. Lately I've heard some talk, maybe 150. If you were to take a ten-year old spent fuel element and encapsulate it, it's hard to get over 100 degrees. If you take reprocessed waste and load it very high, then of course you can design any temperature you like.

Now, retrievability, of course, was an extreme

case that sort of envelopes a whole bunch of more likely things that you might want to do, some sort of maintenance action, perhaps you have some wrong heats of material in there that you want to fix up, or some better kind of backfill you want to put in. I really would doubt that you would ever get in a situation where you would want to retrieve it. But it is a shorthand way of covering just about everything you can think of.

CHAIRMAN HENDRIE: Is the nature of the retrievability that clear in the statement of consideration?

COMMISSIONER AHEARNE: When you say the "nature of retrievability"?

CHAIRMAN HENDRIE: That they have in mind. Well, you know, things like being able to backfill holes and rooms that have been filled and so on?

COMMISSIONER AHEARNE: Somewhere in there --

MR. MARTIN: We say in there that we don't require ready retrievability, but I would have no problem with it. I think we discussed it in great detail in the rationale document.

CHAIRMAN HENDRIE: Maybe that's where --

COMMISSIONER AHEARNE: There is a discussion somewhere.

MR. MARTIN: I wouldn't have any trouble with putting some more of that in.

CHAIRMAN HENDRIE: If you don't do it now, you will probably get a chance in responding to the comments.

MR. MARTIN: This has been the single hardest concept to get across, because some people think this is just a scheme to promote reprocessing; other people feel it is a show of no confidence in being able to design repositories. You know, everybody just looked at it from a different vantage point, but when we finally got across what we were talking about, most of the concern seems to have subsided.

The words that we have in here have been discussed explicitly with DOE and several of the industrial people and they seem to be satisfied with it.

CHAIRMAN HENDRIE: What happens in -- Does this rule out bedded salt?

MR. MARTIN: No.

COMMISSIONER AHEARNE: How about EPA?

MR. MARTIN: Well, the EPA had some -- You mean their comments about salt?

COMMISSIONER AHEARNE: Yes.

MR. MARTIN: Well, their comments were more from the -- they didn't have -- let's see. Were their comments specifically related to retrievability?

COMMISSIONER AHEARNE: Yes, I thought they had something about salt.

MR. MARTIN: Their comments I think were--

COMMISSIONER AHEARNE: Not bedded salt; salt domes.

MR. MARTIN: Salt domes?

COMMISSIONER AHEARNE: Yes; that's right.

MR. MARTIN: They had some statements in the draft, their equivalent of statement of considerations, that I would doubt survive to see the light of day, but there were some gratituous comments.

CHAIRMAN HENDRIE: I think they commented that salt domes were in their view --

MR. MARTIN: Rather inferior --

CHAIRMAN HENDRIE: -- a resource, something that attracted the people interested in getting salt; whereas bedded salt wasn't in that category. I dimly remember something like that.

MR. MARTIN: Yes, well, it said --

CHAIRMAN HENDRIE: But I was asking because there was this proposition about canisters. Let's see, do they migrate up or down the thermal gradient?

MR. MARTIN: At low temperatures they really don't do either. If you are talking several hundred degrees, then there are a lot of strange brine migration phenomena and that sort of thing that tend to -- You know, there are asyntotic types of things at temperatures of 100 or 150 degrees. I think that is one of the reasons motivating

people towards lower temperatures --

CHAIRMAN HENDRIE: I see.

MR. MARTIN: -- because there are a lot of strange things you don't have to deal with. Maybe as more confidence is developed over the years, the temperatures will go back up.

CHAIRMAN HENDRIE: I see. Okay, that runs me out for the moment.

Peter?

COMMISSIONER BRADFORD: No, nothing now. For one thing, we are out of time. I would propose to get you a memo by the end of the week and be ready for a discussion and vote next week, if that suits you.

CHAIRMAN HENDRIE: Okay. Other questions? Are you at an end, John?

COMMISSIONER AHEARNE: No. I guess when we come back, I know they have done a fair amount of work on looking at EPA standards and how they fold into the criteria they are proposing. I think that those who are still uncomfortable about it might ask them to go into a little bit of detail on that, because I think they have a fairly sound case they can make to show at least the logic of the criterion.

I would like Bill to consider when we come back, since that does seem to be a point of major concern in some

quarters about the criteria, perhaps he ought to consider one of the issues being asked for comment is putting it into the statement of considerations, and later into a guide versus embedding it into the rule. That might at least get it out for comment.

COMMISSIONER BRADFORD: What is the EPA timetable at this point? When do they hope to have their standard finalized?

COMMISSIONER AHEARNE: About a year ago.

COMMISSIONER BRADFORD: A year "ago"?

(Laughter.)

MR. MARTIN: Yes. It has been two weeks away ever since I have been --

COMMISSIONER BRADFORD: Do they still have to go through a publication and comment period?

MR. MARTIN: That's right. And it is --

MR. DIRCKS: I believe they have to go to OMB, now, too.

COMMISSIONER AHEARNE: At the moment it is still in the interagency group.

CHAIRMAN HENDRIE: Is it out of EPA yet?

MR. DIRCKS: I think they want to give the new administrator a chance to take a look at it.

CHAIRMAN HENDRIE: Yes, because they have this great thing where, like the Office of Radiation Program, it

is all thrashed out among themselves. And then it takes six months minimum or likely a year to get it out of EPA by the time it cycles through the various other offices.

MR. DIRCKS: The last time we saw them over there I think we met with Wolf Barber and he indicated that would be one of the things that the new administrator or deputy administrator would get involved in.

COMMISSIONER BRADFORD: Well, if the process ran smoothly, let me put it that way, how long would it be before they had a final standard?

MR. DIRCKS: I think they have a package ready to go and they do only want to have this checked, and how long he or she might take on this matter is uncertain.

COMMISSIONER BRADFORD: But then they would still have to go through a comment process?

MR. DIRCKS: Then they would have to go -- I think what they --

COMMISSIONER BRADFORD: What are they proposing for the length?

MR. MARTIN: On the order of a year. That is usually the -- about like ours, nine months to a year.

COMMISSIONER BRADFORD: The comment process itself? That is the whole process; that is not just the comment period.

MR. MARTIN: Well, I think they have a comment

period similar to ours --

COMMISSIONER BRADFORD: Ninety days.

MR. MARTIN: -- maybe 120 days and then some more massaging.

MR. DIRCKS: But I think even before they go out for comment, as an Executive Branch agency they will have to go to OMB where they have this interagency review.

COMMISSIONER BRADFORD: I think you have answered the concern that underlay my question. It sounds as though we are talking about a schedule that contemplates our publishing a final rule before the EPA standards are finalized.

MR. DIRCKS: Yes.

MR. MARTIN: Which, of course, we have done many times.

COMMISSIONER BRADFORD: Yes. No, but I was thinking of leaving open some of these questions that have come up this morning for resolution, in light of the ultimate EPA standard. That clearly cannot be done unless we are prepared to leave our own rule open for longer than I would like to.

CHAIRMAN HENDRIE: Well, it seems to me that we can certainly go out for comment.

COMMISSIONER BRADFORD: Oh yes, yes.

CHAIRMAN HENDRIE: And then people have to

struggle with whether we want to go final before EPA? Or semi-final, saying: Folks, this --

COMMISSIONER BRADFORD: Fill in the numbers.

CHAIRMAN HENDRIE: -- isn't final, but here is what it will be as soon as the EPA does something. I don't know. Something like that. Okay, look. Let us meet again on this subject next week just to keep it going and so it doesn't fall apart.

COMMISSIONER AHEARNE: How about perhaps finishing it?

CHAIRMAN HENDRIE: Well, very possibly maybe finish it. What I would like to hear from you on next time is some discussion on the points that I have raised and that other Commissioners have raised here this morning, but I am obviously interested in the ones that I punched at.

COMMISSIONER BRADFORD: So am I.

CHAIRMAN HENDRIE: And presumably by the next go 'round you will be in shape to --

COMMISSIONER BRADFORD: Yes.

CHAIRMAN HENDRIE: -- be ready to vote, so the prospects are we might be able to vote next week. I will have to look at the schedule and see when that best comes.

COMMISSIONER BRADFORD: Later is better than earlier. It is a calendar problem.

CHAIRMAN HENDRIE: Well, the chances are it is

Thursday afternoon, isn't it, Sam?

MR. CHILK: Yes.

MR. DIRCKS: It is Wednesday that Jack has to be out in Santa Fe to talk to the people about uranium mill tailings.

MR. CHILK: Friday may be a possibility?

CHAIRMAN HENDRIE: When are you going to be around?

MR. DIRCKS: Will you be here Friday?

CHAIRMAN HENDRIE: Or Wednesday?

MR. MARTIN: Tuesday would be good.

COMMISSIONER BRADFORD: Tuesday is not so good for me, at least if I wind up circulating anything substantial on Friday night.

MR. MARTIN: I am not sure I can get back from Santa Fe by Friday.

CHAIRMAN HENDRIE: You need a meeting before Wednesday? When are you going?

MR. MARTIN: Well, I haven't set the reservations yet, but it is a Thursday meeting at Santa Fe. I think you can leave Thursday morning and still get there. Coming back is harder. There is a plane that leaves at 7:00 and gets there at 10:00.

COMMISSIONER AHEARNE: Gets to Santa Fe or Albuquerque?

MR. MARTIN: Albuquerque, so that's another hour.

So that could be done.

CHAIRMAN HENDRIE: All right. I just have to look at it first and the Commissioners' schedule. I could bounce things around on Tuesday, but that is not good for you.

COMMISSIONER BRADFORD: Well, we can bounce some things around some more but I'm not sure we can vote on Tuesday. I will try, but I am not sure.

CHAIRMAN HENDRIE: That's right. It also moves up your time.

COMMISSIONER BRADFORD: Yes.

CHAIRMAN HENDRIE: If we have to slip to the yellow, why, let's see. Sam will look at the schedule.

COMMISSIONER GILINSKY: What happens Wednesday?

CHAIRMAN HENDRIE: Well, if he's got to be there Thursday, I would hate to -- You know, we could run it, but there is an emergency drill warning Wednesday morning that other things being equal, I ought to be out there for. Wednesday afternoon we were going to talk about the operator qual rule, but we could slide that. But if he is going to be in Santa Fe Thursday, why, it is sort of cruel and inhuman treatment to keep him here through Wednesday afternoon.

MR. MARTIN: If we could get a vote on this, I would be willing to be abused.

(Laughter.)

CHAIRMAN HENDRIE: I wouldn't allow you to put yourself in that position lest it create a feeling of obligation over on this side.

COMMISSIONER BRADFORD: Well, if Jack is willing to be abused I think it might be worth trying Wednesday.

CHAIRMAN HENDRIE: Let's see what we can --

MR. CHILK: I will work something out.

CHAIRMAN HENDRIE: But normally you would have been traveling Wednesday afternoon?

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: I just don't know that you can get there without going Wednesday afternoon.

COMMISSIONER BRADFORD: Although flying west you may be able to leave fairly late on Wednesday afternoon and still --

MR. MARTIN: I think you can.

COMMISSIONER BRADFORD: -- get there at a reasonable hour.

MR. MARTIN: Yes.

CHAIRMAN HENDRIE: Okay, thank you very much.

(Whereupon, at 12:06 p.m. the meeting was adjourned.)

* * *

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

COMMISSION MEETING

in the matter of: Public Meeting - Briefing on SECY-81-267 - 10 CFR 60 Disposal of High-Levelradioactive Wastes in Geological Repositories - Technical Criteria

Date of Proceeding: May 20, 1981

Docket Number:

Place of Proceeding: Washington, D. C.

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Jane W. Beach

Official Reporter (Typed)

Jane W. Beach

Official Reporter (Signature)

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

OFFICE OF THE
COMMISSIONER

June 4, 1981

MEMORANDUM FOR: Chairman Hendrie
Commissioner Gilinsky
Commissioner Bradford

FROM: John Ahearne

SUBJECT: PART 60 ALTERNATIVE

In order to move forward with the Part 60 proposed rule, I propose we incorporate explicitly a request for comments regarding use of a single overall performance standard. Attached is a section that can be added at the end of the Supplementary Information Section of the proposed rule.

Attachment

cc: EDO
OGC
OPE
Secretary

8106190046 4pp.

Alternative Approach

In the course of the Commission's deliberation, it becomes evident that in order to have confidence in the ability of a geological repository to contain and isolate the wastes for an extended period of time, the repository must consist of multiple barriers. The Commission believes the uncertainties inherent in reliance on the geological setting alone are too great to be reconciled in an adjudicatory process. The Commission further believes the staff presumptions that a respository would consist of two major engineered barriers (waste packages and underground facilities) in addition to the natural barrier provided by the geological setting are correct and reasonable. Having reached these conclusions, the Commission considers next whether or not and to what level of details the performance criteria for a geological repository should be prescribed. In this regard, the Commission considers the following three alternatives*:

1. Prescribe a single overall performance standard that must be met. The Standard in this case would be the EPA standard;

2. Prescribe minimum performance standards for each of the major elements, in addition to requiring the overall system to meet the EPA standards; and

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* Detailed discussions on the advantages and disadvantages of each of these alternatives are given in Appendix J to Commission Paper SECY-81-267, April 27, 1981.

3. Prescribe detailed numerical criteria on critical engineering attributes of the repository system.

Alternative 3 is considered overly restrictive on the design flexibility and judged to be inappropriate at this stage of the technological development. Therefore, this Alternative is quickly eliminated as a viable regulatory approach.

The Alternative 1 has as its principal advantage the fact that it provides maximum flexibility and, thus, is able to incorporate and to apply up-to-date technological innovations and knowledges to the repository design. Notwithstanding the concern over its practicality in the regulatory framework, the Commission cannot at this time eliminate it from further consideration. The Commission is, therefore, specifically requesting the general public, particularly those from the technical communities, to comment on this point.

In relation to the first and the third alternatives that are briefly discussed above, Alternative 2 appears to offer a reasonable and practical compromise. In addition to retaining the single overall performance standard in Alternative 1 as the final performance objective, this approach establishes the minimum performance objectives for each of the three subelemental barriers. While the Commission does not view these three numerical criteria as the absolute yardsticks that the licensee has to meet, the Commission does believe that meeting these minimum

subelemental design goals when coupled with the geochemical sorption processes of the host media would be essential to enhance the Commission's staff confidence that the final EPA standard will be met. Therefore, the proposed technical rule is established upon this approach.

It should be noted that, in the event that the Commission decides to adopt the Alternative 1 approach in the final rulemaking, portions of the proposed rule (e.g., Section on requirements for the geological setting) would have to be further studied and possibly revised.

IN RESPONSE, PLEASE
REFER TO: M810602A

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

OFFICE OF THE
SECRETARY

June 4, 1981

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

FROM: Samuel J. Chilk, Secretary

SUBJECT: STAFF REQUIREMENTS - BRIEFING ON SECY-81-267, 10 CFR PART 60, DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC REPOSITORIES: TECHNICAL CRITERIA, 10:05 A.M., TUESDAY, JUNE 2, 1981, COMMISSIONERS' CONFERENCE ROOM, D.C. OFFICE (OPEN TO PUBLIC ATTENDANCE)

The staff continued their briefing of the Commission on the proposed rule on Technical Criteria for High-Level Waste Repositories.

The Commission directed the staff to ask for public comment on the need to consider or include a low population density as a condition for selecting a repository site.

The Commission requested that public comment be sought on possible alternative ways to deal with human intrusion, one of which may be to eliminate intrusion as a consideration.

Chairman Hendrie suggested that the staff ask for public comment on whether the proposed rule should contain individual subelement requirements or a more general requirement on total system performance that would be in compliance with the EPA Regulations on radionuclide releases to the accessible environment. The Commission reached no decision on this proposition.

Commissioner Bradford indicated he would review the version of the proposed rule submitted by the staff on June 1, 1981 to see which of the items in his previous memos remain open. He will then issue a new memo. (Subsequently, he issued a memo dated June 2, 1981.)

The clarifying statement provided by the ELD in his June 1, 1981 memo discussing the relationship of 10 CFR 60 to other NRC regulations was approved by the Commission.

The staff should review the proposed rule to make sure the present language is consistent with the removal of the requirement to do a dose calculation (i.e., page 12).

The Commission discussed, but left unresolved, the question of the application of this rule beyond the 10,000-year period covered by the EPA draft rule.

8106120216 2pp.

The Commission did not reach a decision on SECY-81-267 at the meeting. The Chairman indicated that further consideration would be given to the proposed rule.

cc: Chairman Hendrie
Commissioner Gilinsky
Commissioner Bradford
Commissioner Ahearne
Commission Staff Offices
Public Document Room

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

CHAIRMAN

June 9, 1981

MEMORANDUM FOR: Commissioner Gilinsky
Commissioner Bradford
Commissioner Ahearne

FROM: Joseph M. Hendrie

SUBJECT: HLW TECHNICAL RULE—SECY-81-267

As promised, I have marked up the proposed rule. I have compiled the base for the markup from Enclosure A of SECY-81-267, replacing pages from that version with the new pages from the EDO's June 1 memo as appropriate. I have attached a complete rule package, although there are no changes on many pages, in order to have the whole text convenient to hand.

In the balance of this memo, I will try to comment on the reasons for the significant changes I propose, taking them in page order.

P. 1 — A long comment period is appropriate--I have changed the 90 days to 150, but even 180 would not be unreasonable. In part, that is because DOE needs some time for policy evolution in their HLW plans to be reflected in their comments.

P. 5 — Peter's change--from his June 2 memo. (I don't think I have all of Peter's comments included, but this is due to oversight rather than disagreement in most cases.)

P. 8 — "Many" rather than "hundreds of" thousands--to avoid giving the impression that anything very quantitative can be said of hundreds of thousands of years.

P. 9, 9a — The retrievability requirement continues to give me large problems because it is for so long a period--in effect, more than a hundred years. Since I had no clearly superior alternative to offer, I have chosen to insert a paragraph (the p. 9a insert) that points out how long the 50-year requirement really amounts to for the designer and ask for comments on the matter. I hope we can have a thorough discussion about retrievability with the staff in our coming meetings. It may help to see what we can do in the rule.

P. 11, 11a — This is Shapar's suggested insert to make clear how we would handle a spent fuel storage facility at a repository site, or any other activity licensed under another part of the regulations.

P. 15 — I still think there is too much design and construction detail in this rule, but rather than try to sort out what to keep and what to remove, have called for comments.

P. 16, 16a, b,c — This is John's call for comments on the overall performance standard vs. the rule's barrier-by-barrier approach. I have done some rewriting on John's text which I think (obviously) makes it clearer without changing the thrust. Inclusion of this section will silence me for the time being on this matter.

P. 28, 29, 29a — Here is a major point--on the reasonable assurance language. The heart of it is in my insert on p. 29a. I think it is essential to being able eventually to license a repository that we provide this kind of general guidance as to the "level of proof" required for positive findings. Just to say reasonable assurance that the performance criteria are going to be met simply will not do it. The repository issues have an absolutely unique time span to them. We have to recognize that reasonable assurance of things many thousands of years in the future is a different ball game than reasonable assurance that a reactor vessel will last 40 years (and we have enough trouble with that).

It strikes me that HLW disposal is a bit like cleaning up TMI-2. The public interest requires that something be done and what we want is very careful thinking about the options, possible problems, the best ways to do the job. But given that application of effort, then the public interest lies in getting on with the job rather than doing nothing. It is not like licensing a new power plant, where the option of doing nothing is the safest course, at least from a radiological safety standpoint.

So what we want to compel with this rule is a really thorough job by DOE in trying to anticipate and account for problem areas and in being quite conservative in the engineering design. I think the rule does that, in spades. When we finally get that thorough job in the form of an application (and the many amendments to it the staff will undoubtedly require), there are still going to be all sorts of uncertainties in these far-future projections. But if it looks as though the respository will probably work out satisfactorily, and there are on balance reasonable arguments that that will be the case, then the public interest is in going ahead in spite of the uncertainties. To allow that, we cannot ask for a very high "level of proof" of these far-future projections.

P. 34, 35 — I have attached the ALARA language on the waste package, the rate of release, and the corresponding TRU criterion.

On the waste package, I use "at least" 1000 years instead of 1000 years plus ALARA. This is to avoid arguments over whether there is not some better waste package than the one proposed. If the proposed package is 1-inch stainless steel, would not the Swedish hypothetical 4-inch copper container be reasonably achievable and hence required by the rule? And if the waste, package is changed to 4-inch copper, would not gold-plating be reasonably achievable, and hence required? I see no end to that debate. If DOE can produce a waste package good for at least 1000 years, that ought to be good enough.

The argument on the rate of release ALARA language is much the same. No matter how low the leach rate of the proposed design is, there will always be some further elaboration or scheme that can be proposed that may have a lower leach rate--and then the rule, with the ALARA language, blocks approval of an otherwise satisfactory design.

P. 39-42 — The "adverse conditions" sections worry me. I do not see why the presence of any of the listed conditions needs to be set up formally in the rule as a presumption that the proposed repository area is unsuitable. These conditions, if present, certainly need examination and accounting for, but why cannot the rule say that instead of erecting them as formal barriers? I have tried some alternate language for consideration, but am not sure I have cured the problem I sense in these sections. Again, discussion with the staff at the coming meetings may help.

Finally, my apologies for handwritten markups rather than a retyped comparative text. I did get my new inserts typed, however (pp. 9a, 29a). For the rest of my changes, the hand-marking should make them easy to identify, if not to read. Translations will be provided without charge for the ones you find illegible.

Enclosure:
Draft Rule

cc: SECY
OGC
OPE
OCA
OPA
EDO
J. Martin
P. Comella

[7590-01]

SMH markup
6-8-81

NUCLEAR REGULATORY COMMISSION

10 CFR Part 60 Subparts E, F, G, H

DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC REPOSITORIES: TECHNICAL CRITERIA

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed Rule.

SUMMARY: The NRC is publishing proposed amendments which specify technical criteria for disposal of high-level radioactive wastes (HLW) in geologic repositories. The proposed criteria address siting, design, and performance of a geologic repository, and the design and performance of the package which contains the waste within the geologic repository. Also included are criteria for monitoring and testing programs, performance confirmation, quality assurance, and personnel training and certification.

DATE: Comments received after [~~90~~ 150 days after publication] will be considered if it is practical to do so, but assurance of consideration cannot be given except for comments received on or before this date.

ADDRESS: Written comments or suggestions on the proposed amendments should be sent to the Secretary of the Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

Enclosure A

Copies of comments may be examined in the U.S. Nuclear Regulatory Commission Public Document Room, 1717 H Street NW., Washington, D.C.

FOR FURTHER INFORMATION CONTACT: Frank J. Arsenault, Director of the Division of Health, Siting and Waste Management, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Telephone (301) 427-4350.

SUPPLEMENTARY INFORMATION:

Background

On December 6, 1979 the Nuclear Regulatory Commission (Commission or NRC) published for comment proposed procedures for licensing geologic disposal of high-level radioactive wastes. The licensing procedures were published in final form on February 25, 1981 (46 FR 13971). On May 13, 1980 (45 FR 31393) the Commission published for comment an Advance Notice of Proposed Rulemaking (ANPR) concerning technical criteria for regulating disposal of high-level radioactive wastes (HLW) in geologic repositories. Included with the advance notice was a draft of the technical criteria under development by the staff. The public was asked to provide comment on several issues discussed in the advance notice and to reflect on the draft technical criteria in light of that discussion. The comments received were numerous and covered the full range of issues related to the technical criteria. The technical criteria being proposed here reflect some changes from the ANPR made in consideration of those comments. The Commission has prepared an analysis of the comments which explains the changes made from the ANPR, and intends to publish soon the comments and the analysis as a NUREG document. A draft of this NUREG has been placed in the Commission's Public Document Room for review.

The technical criteria being set forth here as proposed rulemaking are a result of the Commission's further effort in regulating geologic disposal of HLW by the Department of Energy (DOE). The rationale for the performance objectives and the Environmental Impact Assessment supporting this rulemaking are also being published separately and are available free of charge upon written request to Frank Arsenault at the above address. [also available in the Commission's Public Document Room:] In developing these criteria we have not reexamined DOE's programmatic choice of disposal technology resulting from its Generic Environmental Impact Statement, inasmuch as the Commission has expressly reserved until a later time possible consideration of matters within the scope of that generic statement (44 FR 70408). Accordingly, the technical criteria apply only to disposal in geologic repositories and do not address other possible or potential disposal methods. Similarly, in that DOE's current plans call for disposal at sufficient depth to be in the area termed the saturated zone, these criteria were developed for disposal in saturated media. Additional or alternative criteria may need to be developed for regulating disposal in the nonsaturated or "vadose zone".

Authority

Sections 202(3) and (4) of the Energy Reorganization Act of 1974, as amended, provide the Commission with licensing and regulatory authority regarding DOE facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from activities licensed under the Atomic Energy Act and certain other long-term HLW storage facilities of the DOE. Pursuant to that authority, the Commission is developing criteria appropriate to regulating geologic disposal of HLW by the DOE. The requirements and criteria contained in this proposed rule are a result of that effort.

Relation to Generally Applicable Standards for Radiation in the Environment Established by the Environmental Protection Agency

The Environmental Protection Agency (EPA) has the authority and responsibility for setting generally applicable standards for radiation in the environment. It is the responsibility of the NRC to implement those standards in its licensing actions and assure that the public health and safety are protected. Although no EPA standard for disposal of HLW yet exists, these proposed technical criteria for regulating geologic disposal of HLW have been developed to be compatible with a generally applicable environmental standard. Specifically, the performance objectives and criteria speak to the functional elements of geologic disposal of HLW and the analyses required to give confidence that these functional elements will perform as intended.

Disruptive Processes and Events

The NRC's implementing regulations assume that licensing decisions will be based, in part, on the results of analysis of the consequences of processes and events which potentially could disrupt a repository. Thus, throughout the criteria are requirements that the design basis take into account processes and events with the potential to disrupt a geologic repository. If the process or event is anticipated, i.e., likely, then the design basis requires barriers which would not fail in ~~any~~ a way that would result in the repository ~~not~~ not meeting ~~its~~ the performance objectives. Anticipated processes and events would include such items as waste rock interactions that result from emplacement of the wastes or the gradual deterioriation of borehole seals. Other processes and events in this category are expected to be site and design specific and would be identified

by DOE in its license application. If the process or event is unlikely, the the overall system must still limit the release of radionuclides[.], consist with the EPA standard ~~for unlikely events~~ as applied to such events.

Multiple Barriers

The proposed technical criteria were developed not only with the understanding that EPA's generally applicable environmental standard would need to be implemented, at least in part, by performing calculations to predict performance, but also with the knowledge that some of those calculations would be complex and uncertain. Natural systems are difficult to characterize and any understanding of the site will have significant limitations and uncertainties. Those properties which pertain to isolation of HLW are difficult to measure and the measurements which are made will be subject to several sources of error and uncertainty. The physical and chemical processes which isolate the wastes are themselves varied and complex. Further, those processes 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.

However, a geologic repository consists of engineered features as well as the natural geologic environment. Any evaluation of repository performance, therefore, will consider the waste form and other engineering which is elemental to the repository as a system. By partitioning of the engineered system into two major barriers, the waste package and the underground facility, and establishing performance objectives for each, the Commission has sought to exploit the ability to design the engineered

features to meet specific performance objectives as a means of reducing some of the uncertainties in the calculations of overall repository performance.

In addition, the requirements for containment, controlled release rate, and 1000-year groundwater transit time are three criteria which act independently of the overall repository performance to provide confidence that the wastes will be isolated at least for as long as they are most hazardous.

Containment and Isolation

During the first several hundred years following emplacement of the wastes, both the radioactivity of and the heat generated by the wastes are attributable mainly to the decay of the short-lived nuclides, primarily fission products. At about one thousand years after emplacement both the radioactivity and heat generated have diminished by about three orders of magnitude. As the decay of the long-lived isotopes, primarily actinides, begins to dominate, both the radioactivity and thermal output of the wastes continue to fall until almost one hundred thousand to one million years after emplacement. By that time both have diminished by about 5 orders of magnitude and both heat and radioactivity become roughly constant due to the ingrowth of daughter isotopes, primarily Ra-225, Ra-226 and their daughters.

The technical criteria would require the engineered system to be designed so that the wastes are contained within the waste package for the first thousand years following emplacement. Following this period, containment is no longer assumed and the function of the waste package and underground facility is to control the release of radionuclides from the underground facility. By requiring containment during the period

when the thermal conditions around the waste packages are most severe, evaluation of repository performance is greatly simplified to considerations of the degree of conservatism in the containment design relative to events and processes that might affect the performance during the containment period.

Although both the radioactivity of and heat generated by the decay of the wastes have diminished about 3 orders of magnitude during the containment period, the area surrounding the emplaced wastes will not return to temperatures near those before the wastes were emplaced until after about 10^4 years. As mentioned earlier, the thermal disturbance of the area near the emplaced wastes adds significantly to the uncertainties in the calculation of the transport of the radioisotopes through the geologic environment. The technical criteria are intended to compensate for uncertainties by imposing further design requirements on the waste package and underground facility, thereby limiting the source term by controlling the release rate.

Role of the Site

The Commission neither intends nor expects either containment to be lost completely at 1,000 years following emplacement or the engineered system's contribution to the control of the release of wastes to cease abruptly at some later time. However, the Commission recognizes that at some point the design capabilities of the engineered system will be lost and that the geologic setting--the site--must provide the isolation of the wastes from the environment, and has translated this requirement into a performance objective for the geologic setting. The Commission also recognizes that isolation is, in fact, a controlled release to the

environment which could span ~~hundreds of~~ many thousands of years, and that the release of radioisotopes, and the potential exposures to individuals which could result, should be addressed in the evaluation of a repository. A complement to the evaluation of the effects of design basis processes and events which might disrupt the repository is a projection of how the repository, unperturbed by discrete external events, will evolve through the centuries as a result of the geologic processes operating at the site. Hence, an amendment is being proposed to that portion of Subpart B of 10 CFR Part 60 which describes the contents of the Safety Analysis Report of DOE's application for geologic disposal of HLW which would require DOE to [(1)] project the expected performance of the proposed geologic repository noting the rates and quantities of expected releases of radioisotopes to the accessible environments as a function of time. [; and (2) estimate likely maximum individual doses to humans which could result from these releases;]

Retrievability

The licensing procedures of 10 CFR Part 60 were written assuming that there would be a program of testing and measurement of the thermal, mechanical, and chemical properties of the major engineered barriers to confirm their expected performance. The Commission would like to tie the requirement for retrievability of the wastes to the expected time needed to execute the performance confirmation program. However, at present it appears to the Commission that neither the specific nature nor the period needed for execution of the performance confirmation program will be certain until construction of the repository is substantially complete; that is, until the actual licensing to receive wastes at a geologic repository. Hence it is difficult at this time to use the performance confirmation program as

a basis for establishing a period of retrievability. Nonetheless, the DOE is now making critical decisions regarding the design of geologic repositories which will have a direct effect upon how long the option to retrieve wastes can be maintained, and upon the difficulty which will be encountered in exercising that option, should that be necessary for protection of the public health and safety. Therefore, ~~as a practical matter~~ to provide a suitable objective in this regard, the proposed rule sets forth a requirement that the engineered system be designed so that the option to retrieve the waste can be preserved for up to fifty years following completion of emplacement. Thus, the waste package and the underground facility would be designed so that ~~their ratings accordingly~~ the period of retrievability would not be the determinant of when the Commission would decide whether to permit closure of the repository. Rather, the Commission would be assured of the option to let the conduct of the performance confirmation program indicate when it is appropriate to make such a decision. In particular, the Commission is concerned that the thermo-mechanical design of the underground facility be such that access [the openings] can be maintained until the Commission either decides to permit permanent closure of the repository or to take corrective action, which may include retrieval. ~~The Commission does not want to approve construction of a design which will foreclose options for future decisionmakers.~~

insert on p. 9a

The retrievability requirement does not specify the form in which the wastes are to be retrievable or that wastes [by] are "readily retrievable. The requirement is simply that all the wastes by retrievable during a period equal to the period of construction and emplacement. The DOE's plans for retrieval are specifically requested as part of its license application and the practicability of its proposal will be considered by the staff. Waste may be retrieved upon NRC approval of a DOE application or upon order by NRC.

Insert to p.9

As it is now structured, the rule would require in effect that the respository design be such as to permit retrieval of waste packages for a period of up to 110 years. The components of this total period are as follows: the first waste packages to go in the repository are likely to be in place about thirty years before all wastes are in place; thereafter, a fifty-year period is required by the rule; finally, a retrieval schedule is suggested of about the same time as the original construction plus emplacement operations--another thirty-odd years. Since it is probably not practical to adjust the retrievability design aspects of the repository according to the order of emplacement of the waste packages, the 110-year requirement will apply to all of the waste. The Commission is particularly interested in comments on the degree to which this requirement will govern the thermal and mechanical design of the repository and on whether some shorter period would be adequate or whether there are other ways than an overall retrievability requirement to preserve options before permanent closure. The Commission does not want to approve construction of a design that will foreclose unnecessarily options for future decisionmakers, but it is also concerned that retrievability requirements not unnecessarily complicate or dominate repository design.

Human Intrusion

Some concern has been raised on the issue of human intrusion into a geologic repository. Human intrusion could conceivably occur either inadvertently or deliberately. Inadvertent intrusion is the accidental breaching of the repository in the course of some activity unrelated to the existence of the repository, e.g., exploration for or development of resources. For inadvertent intrusion to occur, the institutional controls, site markers, public records, and societal memory of the repository's existence must have been ineffective or have ceased to exist. Deliberate

existence must have been ineffective or have ceased to exist. Deliberate or intentional intrusion, on the other hand, assumes a conscious decision to breach the repository; for example, in order to recover the high-level waste itself, or exploit a mineral associated with the site.

Historical evidence indicates that there is substantial continuity of information transfer over time. There are numerous examples of knowledge including complex information, being preserved for thousands of years. This has occurred even in the absence of printing and modern information transfer and storage systems. Furthermore, this information transfer has survived disruptive events, such as wars, natural disasters, and dramatic changes in the social and political fabric of societies. The combination of the historical record of information transfer, provisions for a well-marked and extensively documented site location, and the scale and technology of the operation needed to drill deeply enough to penetrate a geologic repository argue strongly that inadvertent intrusion as described above is highly improbable, at least for the first several hundred years during which the wastes are most hazardous. Selecting a site for a repository which is unattractive with respect to both resource value and scientific interest further adds to the improbability of inadvertent human intrusion. It is also logical to assume that any future generation possessing the technical capability to locate and explore for resources at the depth of a repository would also possess the capability to assess the nature of the material discovered, to mitigate consequences of the breach and to reestablish administrative control over the area if needed. Finally, it is inconsistent to assume the scientific and technical capability to identify and explore an anomalous heat source several hundred meters beneath the earth's surface and not assume that those exploring

would have some idea of either what might be the cause of the anomaly or what steps to take to mitigate any untoward consequence of that exploration.

The above arguments do not apply to the case of deliberate intrusion. The repository itself could be attractive and invite intrusion simply because of the resource potential of the wastes themselves. Intrusion to recover the wastes demands (1) knowledge of the existence and nature of the repository, and (2) effort of the same magnitude as that undertaken to emplace the wastes. Hence intrusion of this sort can only be the result of a conscious, collective societal decision to recover the wastes.

In light of the above, the proposed technical criteria are written to direct site selection towards selection of sites of little resource value. Further, the proposed criteria would require reliable documentation of the existance and location of the repository and the nature of the wastes emplaced therein.

Intrusion for the purpose of sabotage or terrorism has also been mentioned as a possibility. However, due to the nature of geologic disposal, there seems to be very little possibility that terrorists or saboteurs could breach a repository. Breach of the repository would require extensive use of machinery for drilling and excavating over a considerable period of time. It is highly improbable that a terrorist group could accomplish this covertly.

Insert new section on p. 11a.

Major Features of the Proposed Rule

1. Overall Description

The proposed technical criteria have been written to address the following: performance objectives and requirements for siting, design and construction of the repository, the waste package, confirmation of repository performance, quality assurance, and the training and

Insert section for p. 11 :

Relation to Other Parts of NRC Regulations

The proposed rule contemplates that DOE activities at a geologic repository operations area may in appropriate cases be licensed under other parts of NRC regulations and would then not be governed by these technical criteria. We note, in this connection, that the scope section of the procedural rule specifically provides that Part 60 shall not apply to any activity licensed under another part. This allows an independent spent fuel storage installation to be licensed under Part 72, even though located at a geologic repository operations area (provided, of course, it is sufficiently separate to be classified as "independent"). Other DOE activities at the geologic repository operations area could be licensed under Parts 30 or 70 if an exemption from Part 60 is determined to be appropriate.

repository performance, quality assurance, and the training and certification of personnel. As appropriate, these topics are divided in turn to address separately requirements which apply during construction, waste emplacement, and after closure of the repository-the latter termed decommissioning. Although the licensing procedures indicate that there would be separate subparts for siting and design requirements, viz. Subparts E and F, respectively (cf. §60.31(a)(2)), the NRC now believes that the site and design are so interdependent that such a distinction is artificial and misleading. For example, although the requirement to place the underground facility at a minimum depth of 300 meters is clearly a design requirement, it is manifested as a siting requirement since unless the site has a host rock of sufficient thickness at sufficient depth, the above design requirement cannot be met. Hence the proposed subpart E to 10 CFR Part 60 contains both site and design requirements.

To enable the Commission to reach a finding as to whether the generally applicable environmental standard for disposal of HLW is met and that the public health and safety will be protected, a careful and exhaustive [analyse analysis of all the features of the repository will be needed. That analysis necessarily must be both qualitative and quantitative. The [analyses] analysis performed can and will be largely quantitative during the period that greatest reliance can be placed upon the engineered system, up to about 10,000 years after closure. Thereafter, although the issues of concern and certainly the physics of a repository itself, do not change, the numerical uncertainties begin to become so large that calculations become more indicati of expected repository behavior rather than definitive of actual performance. Hence, such calculations will be supplemented more heavily by qualitative

In sum, the technical criteria perform two tasks. First they serve to guide DOE in siting, designing, constructing, and operating a repository in such a manner that there can be reasonable confidence that the public health and safety will be protected. Second, they serve to guide DOE in those same areas in such a manner that there can be reasonable confidence that the analyses needed to determine whether the public health and safety is protected can be performed.

2. Performance objectives

The design and operation of the repository are prescribed to be such that during the period that wastes are being emplaced and performance assessed, exposure to workers and releases of radioactivity to the environment must be within limits set by the Commission and the EPA. Further, the repository is to be designed so that the option can be preserved to retrieve the emplaced wastes beginning at anytime up to 50 years following completion of emplacement. Following permanent closure, the repository must perform so that releases are within the limits prescribed by the generally applicable environmental standard which will be set by the EPA. Further, the design of the repository must include a waste package and an underground facility, as well as the site, as barriers to radionuclide migration.

The performance of the engineered system (waste package and underground facility) following permanent closure is specified to require containment of the wastes within the waste package for at least 1,000 years following closure, when temperatures in the repository are substantially elevated, and control of the release of nuclides to the geologic environment thereafter

Transuranic waste (TRU) may be disposed of in a geologic repository. Since transuranic waste does not generate significant amounts of heat,

there is no advantage to containment for any specified period. Hence, the requirement for TRU waste is simply a controlled release equivalent to that for HLW, provided they are physically separated from the HLW so that they wll not experience a significant increase in temperature.

3. Siting Requirements

Although no specific site suitability or exclusion requirements are given in the criteria, stability and minimum groundwater travel times are specified as required site characteristics. In addition, the technical criteria identify site characteristics considered favorable for a repository as well as characteristics which, if present at the site, would lead to a presumption that the site is not suitable for hosting a repository. The Commission has judged that these should not be made absolute requirements because the impact of these characteristics on overall performance would be site specific. The Commission's approach requires that the combination of conditions at the selected site provide reasonable assurance that the performance objectives will be achieved. Further, if adverse conditions are identified as being present, they must be thoroughly characterized and analyzed and it must be demonstrated that the conditions are compensated for by repository design or by favorable conditions in the geologic setting.

4. Design and Construction

In addition to the requirements on designing for natural phenomena, criticality control, radiation protection, and effluent control, the proposed technical criteria require the design of the repository to accommodate potential interaction of the waste, the underground facility, and the site. Requirements are also placed upon the design of the equipment to be used for handling the wastes, the performance and purpose of the

backfill material, and design and performance of borehole and shaft seals. Further, there are requirements related to the methods of construction. The Commission believes such requirements are necessary to assure that the ability of the repository to contain and isolate the wastes will not be compromised by the construction of the repository.

The proposed technical criteria would require that the subsurface facility be designed so that it could be constructed and operated in accordance with relevant mining regulations, which specify design requirements for certain items of electrical and mechanical equipment and govern the use of explosives.

These criteria are a blend of general and detailed prescriptive requirements. They have been developed from Commission experience and practice in the licensing of other nuclear facilities such as power plants and fuel cycle facilities. While there are differences in the systems and components addressed by these criteria from those of power plants or fuel cycle facilities, and the criteria have been written to be appropriate for a geologic repository, the proposed criteria represent a common practice based on experience which has shown that the above items need to be regulated. The level of detail of these criteria reflects the Commission's current thinking on how to regulate effectively geologic disposal of HLW. However, the Commission continues to examine other possibilities for promulgating the more detailed of these requirements. Comments are invited on formulations for the design and construction criteria that would,

OK (staff-made).

5. Waste Package

The proposed requirements for the design of the waste package emphasize its role as a key component of the overall engineered system. Besides being required to contribute to the engineered system's meeting

retain essential elements of the criteria in the rule, perhaps in more concise form, with the more detailed and subsidiary elements to be published in staff guidance documents such as Regulatory Guides.

containment and controlled release performance objectives, both compatibility with the underground facility and the site and a method of unique identification are required of the waste package. Included in the section of the proposed technical criteria which deals with the waste package are requirements that the waste form itself contained within the package be consolidated and non-pyrophoric.

6. Performance Confirmation

The proposed technical criteria include requirements for a program of testing and measurement. The main purpose of this program is to confirm the assumptions, data, and analyses which led to the findings that permitted construction of the repository and subsequent emplacement of the wastes. Further, the performance confirmation program includes requirements for monitoring of key geologic and hydrologic parameters throughout site characterization, construction, and emplacement to detect any significant changes in the conditions which supported the above findings during, or due to operations at the site. Also included in the program would be tests of the effectiveness of borehole and shaft seals and of backfill placement procedures.

Insert on pg. 16 a,b,c →

REGULATORY FLEXIBILITY CERTIFICATION: In accordance with the Regulatory Flexibility Act of 1980, 5 U.S.C. 605(b), the Commission hereby certifies that this rule will not, if promulgated, have a significant economic impact on a substantial number of small entities. This proposed rule affects only the Department of Energy, and does not fall within the purview of the Act.

Alternative Approach

In the course of the Commission's deliberation, it becomes evident that in order to have confidence in the ability of a geological repository to contain and isolate the wastes for an extended period of time, the repository must consist of multiple barriers. The Commission believes the uncertainties inherent in reliance on the geological setting alone are too great to be reconciled in an adjudicatory process. The Commission further believes the staff presumptions that a respository ~~would~~ should consist of two major engineered barriers (waste packages and underground facilities) in addition to the natural barrier provided by the geological setting are correct and reasonable. Having reached these conclusions, the Commission considers next whether or not and to what level of detail the performance criteria for a geological repository should be prescribed. In this regard, the Commission considers the following three alternatives*:

1. Prescribe a single overall performance standard that must be met. The standard in this case would be the EPA standard;

2. Prescribe minimum performance standards for each of the major elements, in addition to requiring the overall system to meet the EPA standards; and

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* Detailed discussions on the advantages and disadvantages of each of these alternatives are given in Appendix J to Commission Paper SECY-81-267, April 27, 1981, "Rationale for Performance Objectives and Required Characteristics of the Geologic Setting." This Appendix is being published separately and is available without charge on request to the Commission.

in apportioning credit for containment and not to the several elements of the repository. 2 also allows the designer

3. Prescribe detailed numerical criteria on critical engineering attributes of the repository system.

Alternative 3 is considered overly restrictive on the design flexibility and judged to be inappropriate at this stage of the technological development. Therefore, this Alternative is quickly eliminated as a viable regulatory approach.

The Alternative 1 has as its principal advantage the fact that it provides maximum flexibility ~~and, thus, is able~~ to incorporate and ~~to~~ apply new ~~to date~~ technological ~~innovations~~ developments and knowledge from the site characterization phase to the repository design. Notwithstanding ~~the~~ some concern over its practicality in the regulatory framework, the Commission cannot at this time eliminate it from further consideration. The Commission is, therefore, specifically requesting the general public, particularly those from the technical communities, to comment on this point. [Comments expected - F.B. add.

In relation to the first and the third alternatives that are briefly discussed above, Alternative 2 appears to offer a reasonable and practical compromise. In addition to retaining the single overall performance standard in Alternative 1 as the final performance objective, this approach establishes the minimum performance objectives for each of the three ~~subelements~~ major barriers & the repository. This approach limits the repository designer's flexibility, it is clear that ~~three numerical criteria as the absolute yardsticks that the licensee has to meet, the Commission does believe that~~ meeting these minimum

~~subelements~~ design goals ~~when coupled with the geochemical sorption processes of the host media~~ would substantially enhance the Commission's ~~staff~~ confidence that the final EPA standard will be met. Therefore, the ~~proposed~~ technical rule ~~is~~ established upon this approach.

It should be noted that, in the event that the Commission decides to adopt the Alternative 1 approach in the final rulemaking, portions of the proposed rule (e.g., Section on requirements for the geological setting) would have to be further studied and possibly revised.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, the National Environmental Policy Act of 1969, as amended, and sections 552 and 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments to Title 10, Chapter I, Code of Federal Regulations is contemplated.

1. The authority citation for Part 60 reads as follows:

Authority: Secs. 51, 53, 62, 63, 65, 81, 161b., f., i., o., p., 182, 183, Pub. L. 83-703, as amended, 68 Stat. 929, 930, 932, 933, 935, 948, 953, 954, as amended (42 U.S.C. 2071, 2073, 2092, 2093, 2095, 2111, 2201, 2232, 2233); Secs. 202, 206, Pub. L. 93-438, 88 Stat. 1244, 1246 (42 U.S.C. 5842, 5846); Sec. 14, Pub. L. 95-601 (42 U.S.C. 2021a); Sec. 102(2)(c), Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332).

2. Section 60.2 is amended to read as follows:*

§60.2 Definitions

For the purposes of this Part--

"Accessible Environment" means those portions of the environment directly in contact with or readily available for use by human beings. It includes the earth's atmosphere, the land surface, surface waters, and the oceans. It also includes presently used potable aquifers and those which have been designated as underground sources of drinking water by the Environmental Protection Agency.

~~"Anticipated Processes and Events" means those natural processes and events that are reasonably likely to occur during the period the intended~~

*Comparative text in which deletions are struck through and additions are underscored has been used for the proposed amendments to Section 60.2, 60.10, 60.21, and 60.51. This is done for the Commission's convenience and comparative text will not be used in the Federal Register Notice.

"Anticipated Processes and Events" means 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.

"Barrier" means any material or structure that prevents or substantially delays movement of water or radionuclides.

"Candidate area" means a geologic and hydrologic system within which a geologic repository may be located.

"Commencement of construction" means clearing of land, surface or subsurface excavation, or other substantial action that would adversely affect the environment of a site, but does not include changes desirable for the temporary use of the land for public recreational uses, site characterization activities, other preconstruction monitoring and investigation necessary to establish background information related to the suitability of a site or to the protection of environmental values, or procurement or manufacture of components of the geologic repository operations area.

"Commission" means the Nuclear Regulatory Commission or its duly authorized representatives.

"Containment" means the [act-of-keeping] confinement of radioactive waste within a designated boundary.

"Decommissioning," or "permanent closure," means final backfilling of subsurface facilities, sealing of shafts, and decontamination and dismantlement of surface facilities.

"Disposal" means the isolation of radioactive wastes from the biosphere.

"Director" means the Director of the Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards.

"DOE" means the U.S. Department of Energy or its duly authorized representatives.

"Engineered system" means the waste packages and the underground facility.

"Far field" means the portion of the geologic setting that lies beyond the disturbed zone.

"Floodplain" means the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands and including at a minimum that area subject to a one percent or greater chance of flooding in any given year.

"Geologic repository" means a system [which-is-intended-to-be-used for;-or-may-be-used] for the disposal of radioactive wastes in excavated geologic [formations] media. A geologic repository includes (1) the geologic repository operations area, and (2) the geologic setting.

"Geologic repository operations area" means an HLW facility that is part of a geologic repository, including both surface and subsurface areas, where waste handling activities are conducted.

"Geologic setting" or "site" is the spatially distributed geologic, hydrologic, and geochemical systems that provide isolation of the radioactive waste.

"High-level radioactive waste" or "HLW" means (1) irradiated reactor fuel, (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing

irradiated reactor fuel, and (3) solids into which such liquid wastes have been converted.

"HLW facility" means a facility subject to the licensing and related regulatory authority of the Commission pursuant to Sections 202(3) and 202(4) of the Energy Reorganization Act of 1974 (88 Stat 1244).*

"Host rock" means the geologic medium in which the waste is emplaced.

"Hydrogeologic unit" means any soil or rock unit or subsurface zone that has a distinct influence on the storage or movement of ground water by virtue of its porosity or permeability.

"Important to safety," with reference to structures, systems, and components, means those structures, systems, and components that provide reasonable assurance that radioactive waste can be received, handled, and stored without undue risk to the health and safety of the public.

"Indian Tribe" means an Indian tribe as defined in the Indian Self-Determination and Education Assistance Act (Public Law 93-638).

"Isolation" means inhibiting the transport of radioactive material so that amounts and concentrations of such material entering the accessible environment will be kept within prescribed limits.

~~"Medium" or "geologic medium" is a body of rock characterized by lithologic homogeneity.~~

~~"Overpack" means any buffer material, receptacle, wrapper, box or other structure, that is both within and an integral part of a waste~~

*These are DOE "facilities used primarily for the receipt and storage of high level radioactive wastes resulting from activities licensed under such act (the Atomic Energy Act)" and "Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive wastes generated by (DOE), which are not used for, or are part of, research and development activities."

"Medium" or "geologic medium" is a body of rock characterized by lithologic homogeneity.

"Overpack" means any buffer material, receptacle, wrapper, box or other structure, that is both within and an integral part of a waste package. It encloses and protects the waste form so as to meet the performance objectives.

"Public Document Room" means the place at 1717 H Street NW., Washington, D.C., at which records of the Commission will ordinarily be made available for public inspection and any other place, the location of which has been published in the FEDERAL REGISTER, at which public records of the Commission pertaining to a particular geologic repository are made available for public inspection.

"Radioactive waste" or "waste" means HLW and any other radioactive materials other than HLW that are received for emplacement in a geologic repository.

"Site" means the geologic setting.

"Site characterization" means the program of exploration and research, both in the laboratory and in the field, undertaken to establish the geologic conditions and the ranges of those parameters of a particular site relevant to the procedures under this part. Site characterization includes borings, surface excavations, excavation of exploratory shafts, limited subsurface lateral excavations and borings, and in situ testing at depth needed to determine the suitability of the site for a geologic repository, but does not include preliminary borings and geophysical testing needed to decide whether site characterization should be undertaken.

"Transuranic wastes" or TRU wastes" means radioactive waste containing alpha emitting transuranic elements, with radioactive half-lives greater than one year, in excess of 10 nanocuries per gram.

"Tribal organization" means a Tribal organzation as defined in the Indian Self-Determination and Education Assistance Act (Public Law 93-638).

"Underground facility" means the underground structure, including openings and backfill materials, but excluding shafts, boreholes, and their seals.

"Unrestricted area" means any area access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

"Waste form" means the radioactive-waste materials and any encapsulating or stabilizing materials, exclusive of containers.

"Waste package" means the airtight, watertight, sealed container which includes the waste form and any ancillary enclosures, including shielding, discrete backfill and overpacks.

3. Section 60.10 is amended by adding paragraph (d) to read as follows:

§60.10 Site characterization.

(a) Prior to submittal of an application for a license to be issued under this part the DOE shall conduct a program of site characterization with respect to the site to be described in such application.

~~§60.10 Site characterization.~~

~~(a) Prior to submittal of an application for a license to be issued under this part the DOE shall conduct a program of site characterization with respect to the site to be described in such application.~~

(b) Unless the Commission determines with respect to the site described in the application that it is not necessary, site characterization shall include a program of in situ exploration and testing at the depths that wastes would be emplaced.

(c) As provided in §51.40 of this chapter, DOE is also required to conduct a program of site characterization, including in situ testing at depth, with respect to alternative sites.

(d) The program of site characterization shall be conducted in accordance with the following:

(i) Investigations to obtain the required information shall be conducted to limit adverse effects on the long-term performance of the geologic repository to the extent practical.

(ii) As a minimum the location of exploratory boreholes and shafts shall be selected so as to limit the total number of subsurface penetrations above and around the underground facility.

(iii) To the extent practical, exploratory boreholes and shafts in the geologic repository operations area shall be located where shafts are planned for repository construction and operation or where large unexcavated pillars are planned.

(iv) Subsurface exploratory drilling, excavation, and in situ testing before and during construction shall be planned and coordinated with repository design and construction.

* * * * *

4. Paragraph (c)(1) of §60.21 is amended to read as follows:

§60.21 Content of Application.

* * * * *

(c) The Safety Analysis Report shall include:

(1) A description and [analysis] assessment of the site at which the proposed geologic repository operations area is to be located with appropriate attention to those features of the site that might affect facility design and performance. The description of the site shall identify the limits of the accessible environment with respect to the location of the geologic repository operations area.

(i) The description of the site shall also include the following information regarding subsurface conditions in the vicinity of the proposed underground facility--

(A) The orientation, distribution, aperture in-filling and origin of fractures, discontinuities, and heterogeneities;

(B) The presence and characteristics of other potential pathways such as solution features, breccia pipes, or other permeable anomalies;

(C) The bulk geomechanical properties and conditions, including pore pressure and ambient stress conditions;

(D) The bulk hydrogeologic properties and conditions;

(E) The bulk geochemical properties; and

(F) The anticipated response [characteristics] of the bulk geomechanic hydrogeologic, and geochemical systems to the maximum design thermal loading given the pattern of fractures and other discontinuities and the heat transfer properties of the rock mass and groundwater.

(ii) The assessment shall contain--

(A) An analysis of the geology, geophysics, hydrogeology, geochemistry, and meteorology of the site;

(B) .[Realistic] Analyses [using-conservative-assumptions] to determine the degree to which each of the favorable and adverse conditions, if present, has been characterized, and the extent to which it contributes to or detracts from isolation.

(C) [A-projection] An evaluation of the expected performance of the proposed geologic repository noting the rates and quantities of expected releases of radioisotopes to the accessible environment as a function of time. and-estimates-of-the-likely-maximum-individual-doses-which-could result-from-those-releases: In executing this evaluation DOE shall assume that those processes operating on the site are those which have been operating on it during the Quaternary Period and superpose the perturbations caused by the presence of emplaced radioactive waste on the natural processes

(D) An analysis of the expected performance of [and] the major design structures, systems, and components, both surface and subsurface, that bear significantly on the suitability of the geologic repository for disposal of radioactive waste [with-respect-to] assuming the anticipated processes and events and natural phenomena from which the design bases are derived. For the purposes of this analysis, [I]it [will] shall be assumed that operati: at the geologic repository operations area will be carried out at the maximum capacity and rate of receipt of radioactive waste stated in the application.

(E) An explanation of measures used to confirm the models used to perform the assessments required in paragraphs (A) through (D). Analyses and models that will be used to predict future conditions and changes in

the geologic setting shall be confirmed by using field tests, in situ tests, field-verified laboratory tests, monitoring data, or natural analog studies.

* * * * *

5. Paragraph (c)(3) of §60.21 is amended to read as follows:

(c) The Safety Analysis Report shall include:

* * * * *

(3) A description and analysis of the design and performance requirements for structures, systems, and components of the geologic repository which are important to safety. [The] This analysis [and evaluation] shall consider--(i) the margins of safety under normal conditions and under conditions that may result from anticipated operational occurrences, including those of natural origin; (ii) the adequacy of structures, systems, and components provided for the prevention of accidents and mitigation of the consequences of accidents, including those caused by natural phenomena; and (iii) the effectiveness of engineered and natural barriers, including barriers that may not be themselves a part of the geologic repository operations area, against the release of radioactive material to the environment. The analysis shall also include a comparative evaluation of alternati to the major design features that are important to radionuclide containment isolation, with particular attention to the alternatives that would provide longer radionuclide containment and isolation.

* * * * *

6. Paragraph (c)(13) of §60.21 is amended to read as follows:

(c) The Safety Analysis Report shall include:

* * * * *

(13) An identification and evaluation of the natural resources at the site, including estimates as to undiscovered deposits, the exploitation of which could affect the ability of the site to isolate radioactives wastes. Undiscovered deposits of resources characteristic of the area shall be estimated by reasonable inference based on geological and geophysical evidence. Such evaluation of resources, including undiscovered deposits, shall be conducted for the disturbed zone and for areas of similar size that are representative of and are within the geologic setting. For natural resources with current markets the resources shall be assessed, with estimates provided of both gross and net value. The estimate of net value shall take into account current development, extraction and marketing costs. For natural resources without current markets, but which would be marketable given credible projected changes in economic or technological factors, the resources shall be described by physical factors such as tonnage or other amount, grade, and quality.

* * * * *

7. Paragraph (a)(2) of §60.31 is amended to read as follows:

§60.31 Construction authorization.

* * * * *

(2) The site and design comply with the criteria contained in Subpart[s] E [and-F-of-this-part].

* * * * *

8. Paragraph (a)(2) of §60.51 is amended to read as follows:

§60.51 License amendment to decommission.

* * * * *

(a)(2) A detailed description of the measures to be employed--such as land use controls, construction of monuments, and preservation of records--to regulate or prevent activities that could impair the long-term isolation of emplaced waste within the geologic repository and to assure that relevant information will be preserved for the use of future generations. As a minimum, such measures shall include --

(i) Identification of the geologic repository operations area by monuments that have been designed, fabricated, and emplaced to be as permanent as is practicable; and

(ii) Placement of records of the location of the geologic repository operations area and the nature and hazard of the waste in the archives of local and Federal government agencies, and archives elsewhere in the world, that would be likely to be consulted by potential human intruders.

9. New Subpart E, "Technical Criteria," Subpart F "Performance Confirmation," Subpart G, "Quality Assurance" and Subpart H, "Training and Certification of Personnel" are added to 10 CFR Part 60.*

SUBPART E--DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC REPOSITORIES: TECHNICAL CRITERIA

§60.101 [Scope] Purpose and Nature of Findings.

(a) Subpart B of this part prescribes the standards for issuance of a license to receive and possess source, special nuclear, or byproduct material at a geologic repository operations area. In particular, §60.41(c) requires

*Comparative text is neither needed nor used for Subparts E, F, G, or H, because they are composed entirely of new material.

a finding that the issuance of a license will not constitute an unreasonable risk to the health and safety of the public. The purpose of this subpart is to set out performance objectives and site and design criteria which, if satisfied, will support such a finding of no unreasonable risk. ~~While these objectives and criteria are stated, in many cases, in unqualified terms, rigorous proof of their satisfaction may not always be achievable, for the Commission to find that is no unreasonable risk, it must have reasonable assurance on the basis of the record before it that these objectives and criteria will be met.~~

Insert from p. 29a

(b) Subpart B of this part also lists findings that must be made in support of an authorization to construct a geologic repository operations area. In particular, §60.31(a) requires a finding that there is reasonable assurance that the types and amounts of radioactive materials described in the application can be received, possessed, and disposed of in a repository of the design proposed without unreasonable risk to the health and safety of the public. As stated in that paragraph, in arriving at this determination, the Commission will consider whether the site and design comply with the criteria contained in this subpart. Once again, while the criteria may be written in unqualified terms, the demonstration of compliance may take uncertainties and gaps in knowledge into account, provided that the Commission can make the ~~specified~~ finding of reasonable assurance, as specified in ~~the preceding~~ (a) of this section.

(a) ~~[This subpart states the performance objectives to be achieved and the technical criteria to be met by the DOE in order for the Commission to make the findings called for in Subpart B of this part.]~~

Insert to p.29

While these performance objectives and criteria are generally stated in unqualified terms, it is not expected that ~~rigorous proofs~~ that they will be met can ~~or will~~ be presented. A reasonable assurance, on the basis of the record before the Commission, that the objectives and criteria will be met is the general standard that is required. For §60.111, and other portions of this subpart that impose objectives and criteria for repository performance over long times into the future, there will inevitably be greater uncertainties. Proof of the future performance of engineered systems and geologic media over time periods of a thousand or many thousands of years is not to be had in the ordinary sense of the word. For such long-term objectives and criteria, what is required is reasonable assurance, ~~based on the record before the Commission,~~ that the ~~probable~~ outcome will be conformance with those objectives and criteria.

[(b)--The-Commission-will-apply-the-technical-criteria-in-this-subpart-in-making-findings-that-the-activities-authorized-by-a-license;-or any-amendment-thereof;-will-not-constitute-undue-risk-to-the-health-and safety-of-the-public:]

[(c)--The-Commission-will-also-apply-the-technical-criteria-in-this-subpart-in-making-determinations-with-respect-to-the-issuance-of-a-construction-authorization:]

[(d)--Omissions-in-this-subpart-do-not-relieve-DOE-from-the-requirement of-providing-necessary-safety-features-in-the-design-of-a-specific-facility:

§60.101 Concepts.

(a) The HLW facility.

NRC exercises licensing and related regulatory authority over those facilities described in section 202(3) and (4) of the Energy Reorganization Act of 1974. Any of these facilities is designated an HLW facility.

(b) The geologic repository operations area.

(1) This part deals with the exercise of authority with respect to a particular class of HLW facility -- namely a geologic repository operations area.

(2) A geologic repository operations area consists of those surface and subsurface areas that are part of a geologic repository where radioactiv waste handling activities are conducted. The underground structure, includi openings and backfill materials, but excluding shafts, boreholes, and their seals is designated the underground facility.

[(c)--Function-of-the-geologic-repository-operations-area:]

[(i)] (3) The exercise of Commission authority requires that the geologic repository operations area be used for storage (which includes disposal) of high-level radioactive wastes (HLW).

[(ii)] (4) HLW includes irradiated reactor fuel as well as reprocessing wastes. However, if DOE proposes to use the geologic repository operations area for storage of radioactive waste other than HLW, the storage of this radioactive waste is subject to the requirements of this part. Thus, the storage of transuranic-contaminated waste (TRU), though not itself a form of HLW, must conform to the requirements of this part if it is stored in a geologic repository operations area.

[(c)] (c) Areas adjacent to the geologic repository operations area.

Although the activities subject to regulation under this part are those to be carried out at the geologic repository operations area, the licensing process also considers characteristics of adjacent areas. First, there is to be an area, within which DOE is to exercise specified controls to prevent adverse human actions. Second, there is a larger area, designated the geologic setting or site which includes the spatially distributed geologic, hydrologic, and geochemical systems that provide isolation of the radioactive waste from the accessible environment. The geologic repository operations area plus the geologic setting make up the geologic repository. Within the geologic setting, particular attention must be given to the characteristics of the host rock as well as any rock units surrounding the host rock.

[(d)] (d) Stages in the licensing process.

[The] There are several stages in licensing process. [takes into account activities and processes that may occur over a long span of time] The site characterization stage, though begun before submission of a

license application, may result in consequences requiring evaluation in the license review. The construction stage would follow, after issuance of a construction authorization. A period of operations follows the issuance of a license by the Commission. The period of operations includes the time during which emplacement of wastes occurs; and any subsequent period prior to permanent closure during which the emplaced wastes are retrievable; and permanent closure, which includes final backfilling of subsurface facilities, sealing of shafts, decontaminating and dismantling of surface facilities. Permanent closure represents the end of active human activities with the geologic repository operations area and engineered systems. [If-specified-conditions-are-met,-the-license-may-thereafter-be terminated] [Decision-in-the-licensing-process-take-future-events-and processes-into-account.]

[(f)] (e) Containment.

Early during the repository life, when radiation and thermal levels are high and the consequences of events are especially difficult to predict rigorously, [then] special emphasis is placed upon the ability to contain the wastes by waste packages within an engineered system. This is known as the containment period. The engineered system includes the waste packages as well as the underground facility. A waste package includes:

(1) The waste form which consists of the radioactive waste materials and any associated encapsulating or stabilizing materials.

(2) The container which is the first major sealed enclosure that holds the waste form.

(3) Overpacks which consist of any buffer material, receptacle, wrapper, box or other structure, that is both within and an integral part of a waste package. It encloses and protects the waste form so as to meet the performance objectives.

[(g)] (f) Isolation.

Following the containment period special emphasis is placed upon the ability to achieve isolation of the wastes by virtue of the characteristics of the geologic repository. Isolation means the act of inhibiting the transport of radioactive material to the accessible environment in amounts and concentrations within [specified] prescribed limits. The accessible environment means those portions of the environment directly in contact with or readily available for use by human beings. [It includes the earth's atmosphere; the land surface; surface waters; and the oceans. It also includes presently used potable aquifers and those which have been designated as underground sources of drinking water by the Environmental Protection Agency.]

§60.111 Performance objectives.

(a) Performance of the geologic repository operations area through permanent closure.

(1) Protection against radiation exposures and releases of [radiologic] radioactive material. The geologic repository operations area shall be desi so that until permanent closure has been completed, radiation exposures and radiation levels, and releases of radioactive materials to unrestricted area will at all times be maintained within the limits specified in Part 20 of th Chapter and any generally applicable environmental standards established by the Environmental Protection Agency.

(2) Retrievability of waste. The geologic repository operations area shall be designed so that the entire inventory of waste could be

retrieved on a reasonable schedule, starting at any time up to 50 years after waste emplacement operations are complete. A reasonable schedule for retrieval is one that requires no longer than about the same overall period of time than was devoted to the construction of the geologic repository operations area and the emplacement of wastes.

(b) Performance of the geologic repository after permanent closure.

(1) Overall system performance. The geologic setting shall be selected and the subsurface facility designed so as to assure that releases of radioactive materials from the geologic repository following permanent closure conform to such generally applicable environmental radiation protection standards as may have been established by the Environmental Protection Agency.

(2) Performance of the engineered system.

(i) Containment of wastes. The engineered system shall be designed so that even if full or partial saturation of the undergrounc facility were to occur, and assuming anticipated processes and events, the waste packages will contain all radionuclides for at least the first 1,000 years after permanent closure, ~~and for as long thereafter as is reasonably achievable.~~ This requirement does not apply to TRU waste unless TRU waste is emplaced close enough to HLW that the TRU release rate can be significantly affected by the heat generated by the HLW.

(ii) Control of releases.

(A) For HLW, the engineered system shall be designed so that, after the first 1,000 years following permanent closure, ~~the rate of release of radionuclides from the underground facility is as low as is reasonably achievable. As a minimum, the design shall provide that,~~ assuming anticipated processes and events, the annual release from the engineered systems into th

geologic setting of any radionuclide does not exceed one part in 100,000 of the maximum amount of that radionuclide calculated to be present in the underground facility (assuming no release from the underground facility) at any time after 1,000 years following permanent closure. This requirement does not apply to radionuclides whose contribution is less than 0.1% of the total annual curie release as prescribed by this paragraph.

(B) For TRU waste, the engineered system shall be designed so that following permanent closure, ~~the rate of release of radionuclides from the underground facility is as low as is reasonably achievable. As a minimum, the design shall provide that,~~ assuming anticipated processes and events, the annual release from the engineered systems into the geologic setting of any radionuclide does not exceed one part in 100,000 of the maximu amount calculatec to be present in the uncerground facility (assuming no rele from the underground facility) at the time of permanent closure. This requirement does not apply to radionuclides whose contribution is less than 0 of the annual curie release as prescribed by this paragraph.

(3) Performance of the geologic setting.

(i) Containment period. During the containment period, the geologic setting shall mitigate the impacts of premature failure of the engineered system. The ability of the geologic setting to isolate wastes during the isolation period, in accordance with paragraph (b)(3)(ii) of this section, shall be deemed to satisfy this requirement.

(ii) Isolation period. Following the containment period, the geolcgic setting, in conjunction with the engineered system as long as that system is expected to function, and alone thereafter, shall be capable of isolating radioactive waste so that transport of radionuclides to the accessible environment shall be in amounts and concentrations that conform to such

generally applicable environmental standards as may have been established by the Environmental Protection Agency. [and-thereby-will-not-result-in-significant-doses-to-any-[individual]-member-of-the-public.] For the purpose of this paragraph, the evolution of the site shall be based upon the assumption that those processes operating on the site are those which have been operating on it during the Quaternary Period, with perturbations caused by the presence of emplaced radioactive wastes superimposed thereon.

§60.112 Required characteristics of the geologic setting.

(a) The geologic setting shall have exhibited structural and tectonic stability since the start of the Quaternary Period.

(b) The geologic setting shall have exhibited hydrogeologic, geochemical, and geomorphic stability since the start of the Quaternary Period.

(c) The geologic repository shall be located so that pre-waste emplacement groundwater travel times through the far field to the accessible environment are at least 1,000 years.

§60.121 Requirements for ownership and control of the geologic repository operations area.

(a) Ownership of the geologic repository operations area.

The geologic repository operations area shall be located in and on lands that are either acquired lands under the jurisdiction and control of the DOE, or lands permanently withdrawn and reserved for its use. Such lands shall be held free and clear of all encumbrances, if significant, such as: (i) rights arising under the general mining laws; (ii) easements for right-of-way; and (iii) all other rights arising under lease, rights of entry, deed, patent, mortgage, appropriation, prescription, or otherwise.

(b) Establishment of controls.

Appropriate controls shall be established outside of the geologic repository operations area. The DOE shall exercise any jurisdiction and control over surface and subsurface estates necessary to prevent adverse human actions that could significantly reduce the site or engineered system's ability to achieve isolation. The rights of the DOE may take the form of appropriate possessory interests, servitudes, or withdrawals from location or patent under the general mining laws.

ADDITIONAL REQUIREMENTS FOR THE GEOLOGIC SETTING

§ 60.122 Favorable conditions.

Each of the following conditions may contribute to the ability of the geologic setting to meet the performance objectives relating to isolation of the waste. In addition to meeting the mandatory requirements of §60.112, a geologic setting shall exhibit an appropriate combination of these conditions so that, together with the engineered system, the favorable conditions present are sufficient to provide reasonable assurance that such performance objectives will be met.

(a) The nature and rates of tectonic processes that have occurred since the start of the Quaternary Period are such that, when projected, they would not affect or would favorably affect the ability of the geologic repository to isolate the waste.

(b) The nature and rates of structural processes that have occurred since the start of the Quaternary Period are such that, when projected, they would not affect or would favorably affect the ability of the geologic repository to isolate the waste.

(c) The nature and rates of hydrogeological processes that have occurred since the start of the Quaternary Period are such that, when

projected, they would not affect or would favorably affect the ability of the geologic repository to isolate the waste.

(d) The nature and rates of geochemical processes that have occurred since the start of the Quaternary Period are such that, when projected, they would not affect or would favorably affect the ability of the geologic repository to isolate the waste.

(e) The nature and rates of geomorphic processes that have occurred since the start of the Quaternary Period are such that, when projected, they would not affect or would favorably affect the ability of the geologic repository to isolate the waste.

~~(f)--A-low-population-density:~~

(f) [~~(g)~~] A host rock that provides the following ground water ~~characteristics~~ (1) low groundwater content; (2) inhibits groundwater circulation in the host rock; (3) inhibits groundwater flow between hydrogeologic units or along shafts, drifts, and boreholes; and (4) groundwater travel times, under pre-waste emplacement conditions, between the underground facility and the accessible environment that ~~by far~~ substantially exceed 1,000 years.

(g) [~~(h)~~] Geochemical conditions that (1) promote precipitation or sorption of radionuclides; (2) inhibit the formation of particulates, colloids, and inorganic and organic complexes that increase the mobility of radionuclides; and (3) inhibit the transport of radionuclides by particulates colloids, and complexes.

(h) [~~(i)~~] Mineral assemblages that, when subjected to anticipated thermal loading, will remain unaltered or alter to mineral assemblages having increased capacity to inhibit [waste] radionuclide migration.

(i) [(j)] Conditions that permit the emplacement of waste at a minimum depth of 300 meters from the ground surface. (The ground surface shall be deemed to be the elevation of the lowest point on the surface above the disturbed zone.)

(j) [(k)] Any local condition of the disturbed zone that contributes to isolation.

§60.123 Potentially adverse conditions.

The following are potentially adverse conditions. The presence of any such conditions will require careful analysis and such measures ~~give rise to a presumption that isolation of~~ or are necessary to compensate for them. ~~wastes in the geologic setting will not meet the performance objectives.~~

(a) Adverse conditions in the geologic setting:

(1) Potential for failure of existing or planned man-made surface water impoundments that could cause flooding of the geologic repository operations area.

(2) Potential, based on existing geologic and hydrologic conditions, that planned construction of large-scale surface water impoundments may significantly affect the geologic repository through changes in the regional groundwater flow system.

(3) Potential for human activity to significantly affect the geologic repository through changes in the hydrogeology. This activity includes, but is not limited to planned groundwater withdrawal, extensive irrigation, subsurface injection of fluids, underground pumped storage facilities, underground military activity, or mining.

(4) Earthquakes which have occurred historically that if they were to be repeated could affect the geologic repository significantly.

(5) A fault in the geologic setting that has been active since the start of the Quaternary Period and which is within a distance of the disturbed zone that is less than the smallest dimension of the fault rupture surface.

(6) Potential for adverse impacts on the geologic repository resulting from the occupancy and modification of floodplains.

(7) Potential for natural phenomena such as landslides, subsidence, or volcanic activity of such a magnitude that large-scale surface water impoundments could be created that could affect the performance of the geologic repository through changes in the regional groundwater flow.

(8) Expected climatic changes that would have an adverse effect on the geologic, geochemical, or hydrologic characteristics.

(b) Adverse conditions in the disturbed zone.

For the purpose of determining the presence of the following conditions[;] within the disturbed zone, investigations should [is-assumed-to] extend to the greater of either its calculated extent or a horizontal distance of 2 km from the limits of the underground facility and from the surface to a depth of 500 meters below the limits of the repository excavation.

(1) Evidence of subsurface mining for resources.

(2) Evidence of drilling for any purpose.

(3) Resources that have either greater gross value, net value, or commercial potential than the average for other representative areas of similar size that are representative of and located in the geologic setting.

(4) Evidence of extreme erosion during the Quaternary Period.

(5) Evidence of dissolutioning of soluble rocks.

(6) The existence of a fault that has been active during the Quaternary Period.

(7) Potential for creating new pathways for radionuclide migration due presence of a fault or fracture zone irrespective of the age of last movement

(8) Structural deformation such as uplift, subsidence, folding, and fracturing during the Quaternary Period.

(9) More frequent occurrence of earthquakes or earthquakes of higher magnitude than is typical of the area in which the geologic setting is located.

(10) Indications, based on correlations of earthquakes with tectonic processes and features, that either the frequency of occurrence or magnitude of earthquakes may increase.

(11) Evidence of igneous activity since the start of the Quaternary Period.

(12) ~~Potential for~~ Expected changes in hydrologic conditions that would significantly affect the migration of radionuclides to the accessible environment including but not limited to changes in hydraulic gradient, average interstitial velocity, storage coefficient, hydraulic conductivity, natural recharge, potentiometric levels, and discharge points.

(13) Conditions in the host rock that are not reducing conditions.

(14) Groundwater conditions in the host rock, including but not limited to high ionic strength or ranges of Eh-pH, that could affect the solubility and chemical reactivity of the engineered systems.

(15) Processes that would reduce sorption, result in degradation of the rock strength, or adversely affect the performance of the engineered system.

(16) Rock or groundwater conditions that would require complex engineering measures in the design and construction of the underground facility or in the sealing of boreholes and shafts.

(17) Geomechanical properties that do not [provide-stability-o] permit design of stable underground openings during construction, waste emplacement or retrieval operations.

§60.124 Analysis of a potentially adverse condition ~~Results of presumption that the geologic repository will not meet the performance objectives~~

The ~~presumption that the geologic repository will not meet the performance objectives can be rebutted upon showing that~~ analysis to be performed with regard to a potentially adverse condition or combination of conditions cited in §60.123 of this subpart should include the following elements: ~~will significantly affect the ability of the geologic repository to isolate the radioactive waste. In order to make this showing, the following must be demonstrated:~~

(a) The potentially adverse human activity or natural condition should be ~~has been~~ adequately characterized, including the extent to which the condition may be present and still be undetected taking into account the degree of resolution achieved by the investigations; and

(b) The effect of the potentially adverse human activity or natural condition on the geologic setting should be ~~has been~~ adequately evaluated using conservative analyses and assumptions, and the evaluation should be ~~used is~~ sensitive to the adverse human activity or natural conditions; and

(c)(i) The potentially adverse human activity or natural condition should be ~~is~~ shown by analysis in (b) above ~~to~~ not to affect significantly ~~effect~~ the ability of the geologic setting to isolate waste, or

(ii) The effect of the potentially adverse human activity or natural condition should be shown to be ~~is~~ compensated by the presence of a combination of the favorable characteristics cited in §60.122 of this subpart, or

(iii) It should be shown that the potentially adverse human activity or natural condition can be remedied.

DESIGN AND CONSTRUCTION REQUIREMENTS

§60.130 General design requirements for the geologic repository operations areas.

(a) Sections 60.130 through 60.134 specify minimum requirements for t design of, and construction specifications for, the geologic repository ope tions area. Requirements for design contained in sections 60.131 through 60.133 of this subpart must be considered in conjunction with the requirements for construction in §60.134 of this subpart. Sections 60.130 through 60.134 are not intended to contain an exhaustive list of design and constru requirements. Omissions in sections 60.130 through 60.134 do not relieve DO from providing safety features in a specific facility needed to achieve the performance objectives contained in section 60.111. All design and construction criteria must be consistent with the results of site characterization activities.

(b) Systems, structures, and components of the geologic repository operations area shall satisfy the following:

(1) Radiological protection.

As required to maintain radiation doses, levels, and concentrations of radioactive material in air in restricted areas within the limits specified in Part 20 of this chapter, [and-as-low-as-is-reasonably-achievabl structures, systems, and components located within such restricted areas sha be designed to include--

(i) Means to limit concentrations of radioactive material in air;

(ii) Means to limit the time required to perform work in the vicinity of radioactive materials, including, as appropriate, designing equipment for ease of repair and replacement and providing adequate space for ease of operation;

(iii) Suitable shielding;

(iv) Means to monitor and control the dispersal of radioactive contamination;

(v) Means to control access to high radiation areas or airborne radioactivity areas; and

(vi) A radiation alarm system to warn of increases in radiation levels, concentrations of radioactive material in air, and of increased radioactivity released in effluents. The alarm system shall be designed with redundancy and in situ testing capability.

(2) Protection against natural phenomena and environmental conditions.

(i) The structures, systems, and components important to safety shall be designed to be compatible with anticipated site characteristics and to accommodate the effects of environmental conditions, so as to prevent interference with normal operation, maintenance and testing during the entire period of construction and operations.

(ii) The structures, systems, and components important to safety shall be designed so that natural phenomena and environmental conditions anticipated at the site will not result, in any relevant time period, in failure to achieve the performance objectives.

(3) Protection against dynamic effects of equipment failure and similar events.

The structures, systems and components important to safety shall be designed to [resist] withstand dynamic effects that could result from equipment failure, such as missile impacts, and similar events and conditions that could lead to loss of their safety functions.

(4) Protection against fires and explosions.

(i) The structures, systems, and components important to safety shall be designed to [reduce-the-potential-for-impairment-of-their-ability

to perform their safety functions during and after fires or explosions in the geologic repository operations area.

(ii) To the extent practicable, the geologic repository operations area shall be designed to incorporate the use of noncombustible and heat resistant materials.

(iii) The geologic repository operations area shall be designed to include explosion and fire detection alarm systems and appropriate suppression systems with sufficient capacity and capability to reduce the adverse effects of fires and explosions on structures, systems, and components important to safety.

(iv) The geologic repository operations area shall be designed to include means to protect systems, structures, and components important to safety against the adverse effects of either the operation or failure of the fire suppression systems.

(5) Emergency capability.

(i) The structures, systems, and components important to safety shall be designed to maintain control of radioactive waste, and permit prompt termination of operations and evacuation of personnel during an emergency.

(ii) The geologic repository operations area shall be designed to include onsite facilities and services that ensure a safe and timely response to emergency conditions and that facilitate the use of available offsite services (such as fire, police, medical and ambulance service) that may aid in recovery from emergencies.

(6) Utility services.

(i) Each utility service system shall be designed so that essential safety functions can be performed under both normal and emergency conditior

(ii) The utility services important to safety shall include redundant systems to the extent necessary to maintain, with adequate capacity, the ability to perform their safety functions.

(iii) The emergency utility services shall be designed to permit testing of their functional operability and capacity. This will include the full operational sequence of each system when transferring between normal and emergency supply sources, as well as the operation of associated safety systems.

(iv) Provisions shall be made so that, if there is a loss of the primary electric power source or circuit, reliable and continued emergency power is provided to instruments, utility service systems, and operating systems, including alarm systems. This emergency power shall be sufficient to allow safe conditions to be maintained. All systems important to safety shall be designed to permit them to be maintained at all times in a functional mode.

(7) Inspection, testing, and maintenance. The structures, systems, and components important to safety shall be designed to permit periodic inspection, testing, and maintenance, as necessary, to ensure their continued functioning and readiness.

(8) Criticality control. All systems for processing, transporting, handling, storage, retrieval, emplacement, and isolation of radioactive waste shall be designed to ensure that a nuclear criticality accident is not possible unless at least two unlikely, independent, and concurrent or sequential changes have occurred in the conditions essential to nuclear criticality safety. Each system shall be designed for criticality safety under normal and accident conditions. The calculated effective multiplication factor (k_{eff}) must be sufficiently below unity to show at least a

5% margin, after allowance for the bias in the method of calculation and the uncertainty in the experiments used to validate the method of calculation.

(9) Instrumentation and control systems. Instrumentation and control systems shall be designed to monitor and control the behavior of engineered systems important to safety over anticipated ranges for normal operation and for accident conditions. The systems shall be designed with sufficient redundancy to ensure that adequate margins of safety are maintained.

(10) Compliance with mining regulations. To the extent that DOE is not subject to the Federal Mine Safety and Health Act of 1977, as to the construction and operation of the geologic repository operations area, the design of the geologic repository operations area shall nevertheless include such provisions for worker protection as may be necessary to provide reasonable assurance that all structures, systems, and components important to safety can perform their intended functions. Any deviation from relevant design requirements in Title 30, Chapter I, Subchapters D, E, and N will give rise to a rebuttable presumption that this requirement has not been met.

§60.131 Additional design requirements for surface facilities in the geologic repository operations area.

(a) Facilities for receipt and retrieval of waste. Surface facilities in the geologic repository operations area shall be designed to allow safe handling and storage of wastes at the site, whether such wastes are on the surface prior to emplacement or as a result of retrieval from the underground facility. The surface facilities shall be designed so as to permit inspection, repair, and decontamination of such wastes and their containers. Surface storage capacity for all emplaced waste is not require

(b) Surface Facility Ventilation. Surface facility ventilation systems supporting waste transfer, inspection, decontamination, processing, or packaging shall be designed to provide protection against radiation exposures and offsite releases as provided in §60.111.

(c) Radiation control and monitoring.

(1) Effluent control. The surface facilities shall be designed to control the release of radioactive materials in effluents during normal and emergency operations. The facilities shall be designed to provide protectic against radiation exposures and offsite releases as provided in §60.111.

(2) Effluent monitoring. The effluent monitoring systems shall be designed to measure the amount and concentration of radionuclides in any effluent with sufficient precision to determine whether releases conform to the design requirement for effluent control. The monitoring systems shall be designed to include alarms that can be periodically tested.

(d) Waste treatment. Radioactive waste treatment facilities shall be designed to process any radioactive wastes generated at the geologic repository operations area into a form suitable to permit safe disposal at the geologic repository operations area or to permit safe transportation and conversion to a form suitable for disposal at an alternative site in accordance with any regulations that are applicable.

(e) Consideration of decommissioning. The surface facility shall be designed to facilitate decommissioning.

§60.132 Additional design requirements for the underground facility.

(a) General criteria for the underground facility.

(1) The underground facility shall be designed so as to perform its s functions assuming [take-into-account] interactions among the geologic sett the underground facility, and the waste package.

(2) The underground facility shall be designed to provide for structural stability, control of groundwater movement and control of radionuclide releases, as necessary to comply with the performance objectives of §60.111.

(3) The orientation, geometry, layout, and depth of the underground facility, and the design of any engineered barriers that are part of the underground facility shall enhance containment and isolation of radionuclide to the extent practicable at the site.

(4) The underground facility shall be designed so that the effects of disruptive events such as intrusions of gas, or water, or explosions, will not propagate through the facility.

(b) Flexibility of Design. The underground facility shall be designed with sufficient flexibility to allow adjustments, where necessary to accommodate specific site conditions identified through in situ monitoring, testing, or excavation.

(c) Separation of excavation and waste emplacement (modular concept). If concurrent excavation and emplacement of wastes are planned, then:

(1) The design shall provide for such separation of activities into discrete areas (modules) as may be necessary to assure that excavation does not impair waste emplacement or retrieval operations.

(2) Each module shall be designed to permit insulation from other modules if an accident occurs.

(d) Design for retrieval of waste. The underground facility shall be designed to--

(1) Permit retrieval of waste in accordance with the performance objectives (§60.111);

(2) Ensure sufficient structural stability of openings and control of groundwater to permit the safe conduct of waste retrieval operations; and

(3) Allow removal of any waste packages that may be damaged or require inspection without compromising the ability of the geologic repository to meet the performance objectives (§60.111).

(e) Design of subsurface openings.

(1) Subsurface openings shall be designed to maintain stability throughout the construction and operation periods. If structural support is required for stability, it shall be designed to be compatible with long-term deformation, hydrologic, geochemical, and thermomechanical characteristics of the rock and to allow subsequent placement of backfill.

(2) Structures required for temporary support of zones of weak or highly fractured rock shall be designed so as not to impair the placement of permanent structures or the capability to seal excavated areas used for the containment of wastes.

(3) Subsurface openings shall be designed to reduce the potential for deleterious rock movement or fracturing of overlying or surrounding rock over the long term. The size, shape, orientation, and spacing of openings and the design of engineered support systems shall take the following conditions into considerations--

(i) natural stress conditions;

(ii) deformation characteristics of the host rock under normal conditions and thermal loading;

(iii) the kinds of weaknesses or structural discontinuities found at various locations in the geologic repository;

(iv) equipment requirements; and

(v) the ability to construct the underground facility as designed so that stability of the rock is enhanced.

(f) Rock excavation. The design of the underground facility shall [be-based-on-the-selection-of] incorporate excavation methods that will limit damage to and fracturing of rock.

(g) Control of water and gas.

(1) Water and gas control systems shall be designed to be of sufficient capability and capacity to reduce the potentially adverse effects of groundwater intrusion, service water intrusion, or gas inflow into the underground facility.

(2) Water and gas control systems shall be designed to [monitor-the composition-of-and] control the quantity of water or gas flowing into or from the underground facility, monitor the composition of gases and permit sampling of liquids.

(3) Systems shall be designed to provide control of water and gas in both waste emplacement areas and excavation areas.

(4) Water control systems shall be designed to include storage capability and modular layouts that ensure that unexpected inrush or flooding can be controlled and contained.

(5) If the intersection of aquifers or water-bearing geologic structures is anticipated during construction, the design of the underground facility shall include plans for cutoff or control of water in advance of the excavation.

(6) If linings are required, the contact between the lining and the rock surrounding subsurface excavations shall be designed so as to avoid the creation of any preferential pathway for groundwater or radionuclide migration.

(h) Subsurface ventilation.

The ventilation system shall be designed to--

(1) Control the transport of radioactive particulates and gases within and releases from the subsurface facility in accordance with the performance objectives (§60.111);

(2) Permit continuous occupancy of all excavated areas during normal operations through permanent closure;

(3) Accommodate changes in operating conditions such as variations in temperature and humidity in the underground facility;

(4) Include such redundant equipment and fail safe control systems as may be needed to assure continued function under normal and emergency conditions; and

(5) Separate the ventilation of excavation and waste emplacement areas.

(i) Engineered barriers.

(1) Barriers shall be located where shafts could allow access for groundwater to enter or leave the underground facility.

(2) Barriers shall create a waste package environment which favorably controls chemical reactions affecting the performance of the waste package.

(3) Backfill placed in the underground facility shall be designed as a barrier.

(i) Backfill placed in the underground facility shall [be compatible with] perform its functions assuming anticipated changes in the geologic setting.

(ii) Backfill placed in the underground facility shall serve the following functions:

(A) It shall provide a barrier to groundwater movement into and from the underground facility.

(B) It shall reduce creep deformation of the host rock that may adversely affect (1) waste package performance or (2) the local hydrological system.

(C) It shall reduce and control groundwater movement within the underground facility.

(D) It shall retard radionuclide migration.

(iii) Backfill placed in the underground facility shall be selected to allow for adequate placement and compaction in underground openings.

(j) Waste handling and emplacement.

(1) The systems used for handling, transporting, and emplacing radioactive wastes shall be designed to have positive, failsafe designs to protect workers and to prevent damage to waste packages.

(2) The handling systems for emplacement and retrieval operations shall be designed to minimize the potential for operator error.

(k) Design for thermal loads.

(1) The underground facility shall be designed so that the predicted thermal and thermomechanical response of the rock will not degrade significantly the performance of the repository or the ability of the natural or engineered barriers to retard radionuclide migration.

(2) The design of waste loading and waste spacings shall take into consideration--

(i) Effects of the design of the underground facility on the thermal and thermomechanical response of the host rock and the groundwater system;

(ii) Features of the host rock and geologic setting that affect the thermomechanical response of the underground facility and barriers, including but not limited to, behavior and deformational characteristics of the host

rock, the presence of insulating layers, aquifers, faults, orientation of bedding planes, and the presence of discontinuities in the host rock; and

(iii) The extent to which fracturing of the host rock is influenced by cycles of temperature increase and decrease.

§60.133 Design of shafts and seals for shafts and boreholes.

(a) Shaft design. Shafts shall be designed so as not to create a preferential pathway for migration of groundwater and so as not to increase the potential for migration through existing pathways.

(b) Shaft and borehole seals.

Shaft and borehole seals shall be designed so that:

(i) Shafts and boreholes will be sealed [along-their-entire-length] as soon as possible after they have served their operational purpose.

(ii) At the time of permanent closure, and for as long thereafter as reasonably achievable sealed shafts and boreholes will inhibit transport of radionuclides to at least the same degree as the undisturbed units of rock through which the shafts or boreholes pass. In the case of soluble rocks, borehole and shaft seals shall also be designed to prevent groundwater circulation that would result in dissolution.

(iii) Contact between shaft and borehole seals and the adjacent rock does not become a preferential pathway for water.

(iv) Shaft and borehole seals can accommodate potential variations of stress, temperature, and moisture.

(v) The materials used to construct the seals are appropriate in view of the geochemistry of the rock and groundwater system, anticipated deformations of the rock, and other in situ conditions.

(c) Shaft conveyances used in radioactive waste handling.

(1) Shaft conveyances used to transport radioactive materials shall be designed to satisfy the requirements as set forth in §60.130 of this subpart for systems, structures, and components important to safety.

(2) Hoists important to safety shall be designed to preclude cage free fall.

(3) Hoists important to safety shall be designed with a reliable cage location system.

(4) Hoist loading and unloading systems shall be designed with a reliable system of interlocks that will fail safely upon malfunction.

(5) Hoists important to safety shall be designed to include two independent indicators to indicate when waste packages are in place, grappled, and ready for transfer.

§60.134 Construction specifications for surface and subsurface facilities.

(a) General requirement. Specifications for construction shall conform to the objectives and technical requirements of Sections 60.130 through 60.133 of this subpart.

(b) Construction management program. The construction specifications shall facilitate the conduct of a construction management program that will ensure that construction activities do not adversely affect the suitability of the site to isolate the waste or jeopardize the isolation capabilities of the underground facility, boreholes, shaft, and seals, and that the underground facility is constructed as designed.

(c) Construction records. The construction specifications shall include requirements for the development of a complete documented history of repository construction. Such documented history shall include at least the following--

(1) Surveys of underground excavations and shafts located via readily identifiable surface features or monuments;

(2) Materials encountered;

(3) Geologic maps and geologic cross sections;

(4) Locations and amount of seepage;

(5) Details of equipment, methods, progress, and sequence of work;

(6) Construction problems;

(7) Anomalous conditions encountered;

(8) Instrument locations, readings, and analysis;

(9) Location and description of structural support systems;

(10) Location and description of dewatering systems; and

(11) Details, methods of emplacement, and location of seals used.

(d) Rock excavation. The methods used for excavation shall be selected to reduce to the extent practicable the potential to create a preferential pathway for groundwater or radioactive waste migration or increase migration through existing pathways.

(e) Control of explosives. If explosives are used, the provisions of §57.6 (Explosives) of Title 30 of the Code of Federal Regulations, Chapter I, Mine Safety and Health Administration, Department of Labor, shall be met, as minimum safety requirements for storage, use and transport at the geologic repository operations area.

(f) Water control. The construction specifications shall provide that water encountered in excavations shall be removed to the surface and controlled in accordance with design requirements for radiation control and monitoring (§60.131(c) of this subpart).

(g) Waste handling and emplacement. The construction specifications shall provide for demonstration of the effectiveness of handling equipment

and systems for emplacement and retrieval operations, under operating conditions.

§60.135 Requirements for the waste package and its components.

(a) General requirements of design.

The design of the waste package shall include the following elements:

(1) Effect of the site on the waste package. The waste package shall be designed so that the in situ chemical, physical, and nuclear properties of the waste package and its interactions with the emplacement environment do not compromise the function of the waste packages. The design shall include but not be limited to consideration of the following factors: solubility, oxidation/reduction reactions, corrosion, hydriding, gas generation, thermal effects, mechanical strength, mechanical stress, radiolysis, radiation damage, radionuclide retardation, leaching, fire and explosion hazards, thermal loads, and synergistic interactions.

(2) Effect of the waste package on the underground facility and the natural barriers of the geologic setting. The waste package shall be designed so that the in situ chemical, physical, and nuclear properties of the waste package and its interactions with the emplacement environment do not compromise the performance of the underground facility or the geologic setting. The design shall include but not be limited to consideration of the following factors: solubility, oxidation/reduction reactions, corrosion, hydriding, gas generation, thermal effects, mechanical strength, mechanical stress, radiolysis, radiation damage, radionuclide retardation, leaching, fire and explosion hazards, thermal loads, and synergistic interactions.

(b) Waste form requirements.

Radioactive waste that is emplaced in the underground facility shall meet the following requirements:

(1) Solidification. All such radioactive wastes shall be in solid form and placed in sealed containers.

(2) Consolidation. Particulate waste forms shall have been consolidated (for example, by incorporation into an encapsulating matrix) to limit the availability and generation of particulates.

(3) Combustibles. All combustible radioactive wastes must have been reduced to a noncombustible form unless it can be demonstrated that a fire involving a single package will neither compromise the integrity of other packages, nor adversely affect any safety-related structures, systems, or components.

(c) Waste package requirements.

The waste package design shall meet the following requirements:

(1) Explosive, pyrophoric, and chemically reactive materials. The waste package shall not contain explosive or pyrophoric materials or chemically reactive materials that could interfere with operations in the underground facility or compromise the ability of the geologic repository to satisfy the performance objectives.

(2) Free liquids. The waste package shall not contain free liquids in an amount that could impair the structural integrity of waste package components (because of chemical interactions or formation of pressurized vapor) or result in spillage and spread of contamination in the event of package perforation.

(3) Handling. Waste packages shall be designed to maintain waste containment during transportation, emplacement, and retrieval.

(4) Unique identification. A label or other means of identification shall be provided for each package. The identification shall not impair the integrity of the package and shall be applied in such a way that the information shall be legible at least to the end of the retrievable storage period. Each package identification shall be consistent with the package's permanent written records.

§60.137 General requirements for performance confirmation.

The geologic repository operations area shall be designed so as to permit implementation of a performance confirmation program that meets the requirements of subpart F of this part.

SUBPART F - PERFORMANCE CONFIRMATION

§60.140 General requirements.

(a) The performance confirmation program shall ascertain whether--

(1) Actual subsurface conditions encountered and changes in those conditions during construction and waste emplacement operations are [these] within the limits assumed in the licensing review; and

(2) Natural and engineered systems and components required for repository operation, or which are designed or assumed to operate as barriers after permanent closure are functioning as intended and anticipated.

(b) The program shall have been started during site characterization and it will continue until permanent closure.

(c) The program will include in situ monitoring, laboratory and field testing, and in situ experiments, as may be appropriate to accomplish the objective as stated above.

(d) The confirmation program shall be implemented so that:

(1) It does not adversely affect the natural and engineered elements of the geologic repository.

(2) It provides baseline information and analysis of that information on those parameters and natural processes pertaining to the geologic setting that may be changed by site characterization, construction, and operational activities.

(3) It monitors and analyzes changes from the baseline condition of parameters that could affect the performance of a geologic repository.

(4) It provides an established plan for feedback and analysis of data, and implementation of appropriate action.

§60.141 Confirmation of geotechnical and design parameters.

(a) During repository construction and operation, a continuing program of surveillance, measurement, testing, and geologic mapping shall be conducted to ensure that geotechnical and design parameters are confirmed and to ensure that appropriate action is taken to inform the Commission of changes needed in design to accommodate actual field conditions encountered.

(b) Subsurface conditions shall be monitored and evaluated against design assumptions.

(c) As a minimum, measurements shall be made of rock deformations and displacement, changes in rock stress and strain, rate and location of water inflow into subsurface areas, changes in groundwater conditions,

rock pore water pressures including those along fractures and joints, and the thermal and thermomechanical response of the rock mass as a result of development and operations of the geologic repository.

(d) These measurements and observations shall be compared with the original design bases and assumptions. If significant differences exist between the measurements and observations and the original design bases and assumptions, the need for modifications to the design or in construction methods shall be determined and these differences and the recommended changes reported to the Commission.

(e) In situ monitoring of the thermomechanical response of the [geologic-repository] underground facility shall be conducted until permane closure to ensure that the performance of the natural and engineering featu within design limits.

§60.142 Design testing.

(a) During the early or developmental stages of construction, a program for in situ testing of such features as borehole and shaft seals, backfill, and the thermal interaction effects of the waste packages, backfill, rock, and groundwater shall be conducted.

(b) The testing shall be initiated as early as is practicable.

(c) A backfill test section shall be constructed to test the effectiveness of backfill placement and compaction procedures against design requirements before permanent backfill placement is begun.

(d) Test sections shall be established to test the effectiveness of borehole and shaft seals before full-scale operation proceeds to seal boreholes and shafts.

§60.143 Monitoring and testing waste packages.

(a) A program shall be established at the repository for monitoring the condition of the waste packages. Packages chosen for the program shall be representative of those to be emplaced in the repository.

(b) Consistent with safe operation of the repository, the environment of the waste packages selected for the waste package monitoring program shall be representative of the emplaced wastes.

(c) The waste package monitoring program shall include laboratory experiments which focus on the internal condition of the waste packages. To the extent practical, the environment experienced by the emplaced waste packages within the repository during the waste package monitoring program shall be duplicated in the laboratory experiments.

(d) The waste package monitoring program shall continue as long as practical up to the time of permanent closure.

SUBPART G - QUALITY ASSURANCE

§ 60.150 Scope.

As used in this part, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that the repository and its subsystems or components will perform satisfactorily in service.

Quality assurance is a multidisciplinary system of management controls which address safety, reliability, maintainability, performance, and other technical disciplines.

§ 60.151 Applicability.

The quality assurance program shall apply to all [items] systems, structures and components important to safety and to activities which would prevent or mitigate events that could cause an undue risk to the health and safety of the public. These activities include: exploring, site selecting, designing, fabricating, purchasing, handling, shipping, storing, cleaning, erecting, installing, emplacing, inspecting, testing, operating, maintaining monitoring, repairing, modifying, and decommissioning.

§ 60.152 Implementation.

DOE shall implement a quality assurance program based on the criteria of Appendix B of 10 CFR Part 50 as applicable, and appropriately supplemented by additional criteria as required by § 60.151.

§ 60.153 Quality assurance for performance confirmation.

The quality assurance program shall include the program of tests, experiments and analyses essential to achieving adequate confidence that the emplaced wastes will remain isolated from the accessible environment.

SUBPART H - TRAINING AND CERTIFICATION OF PERSONNEL

§ 60.160 General requirements.

Operations that have been identified as important to safety in the Safety Analysis Report and in the license shall be performed only by trained and certified personnel or by personnel under the direct visual supervision of an individual with training and certification in such

operation. Supervisory personnel who direct operations that are important to safety must also be certified in such operations.

§60.161 Training and certification program.

The DOE shall establish a program for training, proficiency testing, certification and requalification of operating and supervisory personnel.

§60.162 Physical requirements.

The physical condition and the general health of personnel certified for operations that are important to safety shall not be such as might cause operational errors that could endanger the public health and safety. Any condition which might cause impaired judgment or motor coordination must be considered in the selection of personnel for activities that are important to safety. Such conditions need not categorically disqualify a person, so long as appropriate provisions are made to accommodate such defect.

Dated at Washington, D.C. this _____ day of _____, 1981.

For the U.S. Nuclear Regulatory Commission.

_____

Samuel J. Chilk
Secretary of the Commission.

EDISON ELECTRIC INSTITUTE
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June 9, 1981

The Honorable Joseph M. Hendrie
Chairman
U.S. Nuclear Regulatory Commission
1717 H Street
Washington, D.C. 20055

Dear Chairman Hendrie:

RE: SECY-81-267

We recommend that the draft regulation, 10 CFR Part 60, "Disposal of High-Level Radioactive Wastes in Geologic Repositories: Technical Criteria" not be issued, even for comment, in its present form. Our concern over this regulation is that there are potentially serious licensing pitfalls in setting quantitative numerical objectives which cannot be proven, such as the 1000 year package and 10^{-5} release criteria. In addition, such component criteria appear too arbitrary and may restrict trade-offs between component performance and total system safety.

Mr. John Martin has recently established a dialogue with various interested groups which we consider very constructive. We think that the further development of this dialogue is an effective mechanism for a resolution of outstanding differences regarding the proposed rule. We urge that Mr. Martin and his staff be given the time to further develop this dialogue with the expectation that it will result in a much better rule.

Sincerely,

John J. Kearney

JJK:rsl

6/9...To OGC for Appropriate Action...Cpys to: Chm,Cmrs,OPE,EDO,SECY
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 10, 1981

MEMORANDUM FOR: Samuel J. Chilk, Secretary

FROM: William J. Dircks, Executive Director for Operations

SUBJECT: SECY-81-267--10 CFR 60, DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE IN GEOLOGIC REPOSITORIES: TECHNICAL CRITERIA

In response to Commissioner Bradford's memoranda of June 1 and June 2, 1981, Commissioner Ahearne's memorandum of June 4,. 1981, the Staff Requirements memorandum of June 4, 1981, and in response to the issues raised at the June 2 Commission meeting on the subject Commission paper, the staff has taken the following action:

1. Appropriate changes to Enclosure A (the rule) and Enclosure J (the rationale) have been made in response to items 1 through 5 of the Commissioner Bradford's June 1 memorandum.

2. The changes to Enclosures A and J suggested in items 1 and 2 of Commissioner Bradford's June 2 memorandum have been made. Further, the staff has adopted Commissioner Ahearne's suggestion with respect to the reasonable assurance issue on Enclosure A.

3. Language regarding why ALARA has not been applied to site features, and an example of an unlikely event have been incorporated into the Supplementary Information Section of the Federal Register Notice for the proposed rule as suggested in items 3 and 4 of Commissioner Bradford's June 2 memorandum.

4. With regard to the issue of siting requirements dealing with population, raised during the June 2 Commission meeting, and in the Staff Requirements memorandum the staff has modified the Supplementary Information to indicate that because of the great lengths of time involved the Commission believes the preferred approach is to deal with population through the issue of resources in the geologic setting, but that comment particularly is sought on this matter.

5. With regard to the issue of how to deal with the Human Intrusion question noted in the Staff Requirements memorandum, the staff has modified the Supplementary Information to clearly indicate that the Commission would

require DOE to do all that is reasonable to discourage human intrusion, including the use of records and permenant markers, but that speculation on the adequacy of these measures or the consequences of the variety of possible intrusion scenarios would not be productive in the licensing process. The Supplementary Information explicitly invites comments on this issue also.

6. With regard to the favorable and unfavorable site characteristics, the staff has modified the Supplementary Information to clearly state that the lists are not absolute. That is, presence of all the favorable characteristics does not presume site acceptability. Presence of any unfavorable characteristic does not irrefutably condemn a site as unacceptable.

7. A clarifying statement based on the ELD's June 1, 1981 memorandum discussing the relationship of 10 CFR 60 to other regulations has been added to the Supplemantary Information.

8. The staff has reviewed the rule to make sure the present language is consistent with the removal of the requirement to do a dose calculation.

9. In response to Commissioner Ahearne's memorandum of June 4, 1981, a request for public comments regarding the use of a single overall performance standard has been added to the Supplementary Information Section of the proposed rule.

Note that we did not receive Chairman Hendrie's comments on the draft technical criteria in time to consider them with the enclosed changes. However, the staff will be prepared to discuss them at the June 11, 1981 Commission meeting.

William J. Dircks
Executive Director for Operations

Enclosures:
1. Changed pages to Enclosure A
2. Changed pages to Enclosure J

Relation to Generally Applicable Standards for Radiation in the Environment Established by the Environmental Protection Agency

The Environmental Protection Agency (EPA) has the authority and responsibility for setting generally applicable standards for radiation in the environment. It is the responsibility of the NRC to implement those standards in its licensing actions and assure that the public health and safety are protected. Although no EPA standard for disposal of HLW yet exists, these proposed technical criteria for regulating geologic disposal of HLW have been developed to be compatible with a generally applicable environmental standard. Specifically, the performance objectives and criteria speak to the functional elements of geologic disposal of HLW and the analyses required to give confidence that these functional elements will perform as intended.

Disruptive Processes and Events

The NRC's implementing regulations assume that licensing decisions will be based, in part, on the results of analysis of the consequences of processes and events which potentially could disrupt a repository. Thus, throughout the criteria are requirements that the design basis take into account processes and events with the potential to disrupt a geologic repository. If the process or event is anticipated, i.e., likely, then the design basis requires barriers which would not fail in any way that would result in the repository's not meeting its performance objectives. Anticipated processes and events would include such items as waste rock interactions that result from emplacement of the wastes or the gradual deterioriation of borehole seals. [Other-processes-and-events-in-this category-are-expected-to-be-site-and-design-specific-and-would-be-identified

which is elemental to the repository as a system. By partitioning of the engineered system into two major barriers, the waste package and the underground facility, and establishing performance objectives for each, the Commission has sought to exploit the ability to design the engineered features to meet specific performance objectives as a means of reducing some of the uncertainties in the calculations of overall repository performance.

In addition, the requirements for containment, controlled release rate, and 1000-year groundwater transit time are three criteria which act independently of the overall repository performance to provide confidence that the wastes will be isolated at least for as long as they are most hazardous.

Containment and Isolation

During the first several hundred years following emplacement of the wastes, both the radioactivity of and the heat generated by the wastes are attributable mainly to the decay of the short-lived nuclides, primarily fission products. At about one thousand years after emplacement both the radioactivity and heat generated have diminished by about three orders of magnitude. As the decay of the long-lived isotopes, primarily actinides, begins to dominate, both the radioactivity and thermal output of the wastes continue to fall until almost one hundred thousand to one million years after emplacement. By that time both have diminished by about 5 orders of magnitude and both heat and radioactivity become roughly constant due to the ingrowth of daughter isotopes, primarily Ra 225, Ra 226 and their daughters.

The technical criteria would require the engineered system to be designed so that the wastes are contained within the waste package for

~~by DOE in its license application.~~ If the process or event is unlikely, then the overall system must still limit the release of radionuclides[.], consistent with the EPA standard as applied to such events. An example of an unlikely event would be reactivation of a fault within the geologic setting which had not exhibited movement since the start of the Quarternary Period. In general, both likely and unlikely processes and events are expected to be site and design specific and would be identified by DOE in its license application.

Multiple Barriers

The proposed technical criteria were developed not only with the understanding that EPA's generally applicable environmental standard would need to be implemented, at least in part, by performing calculations to predict performance, but also with the knowledge that some of those calculations would be complex and uncertain. Natural systems are difficult to characterize and any understanding of the site will have significant limitations and uncertainties. Those properties which pertain to isolation of HLW are difficult to measure and the measurements which are made will be subject to several sources of error and uncertainty. The physical and chemical processes which isolate the wastes are themselves varied and complex. Further, those processes 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.

However, a geologic repository consists of engineered features as well as the natural geologic environment. Any evaluation of repository performance, therefore, will consider the waste form and other engineering

the first thousand years following emplacement. Following this period, containment is no longer assumed and the function of the waste package and underground facility is to control the release of radionuclides from the underground facility. By requiring containment during the period when the thermal conditions around the waste packages are most severe, evaluation of repository performance is greatly simplified to considerations of the degree of conservatism in the containment design relative to events and processes that might affect the performance during the containment period.

Although both the radioactivity of and heat generated by the decay of the wastes have diminished about 3 orders of magnitude during the containment period, the area surrounding the emplaced wastes will not return to temperatures near those before the wastes were emplaced until after about 10^4 years. As mentioned earlier, the thermal disturbance of the area near the emplaced wastes adds significantly to the uncertainties in the calculation of the transport of the radioisotopes through the geologic environment. The technical criteria are intended to compensate for uncertainties by imposing further design requirements on the waste package and underground facility, thereby limiting the source term by controlling the release rate.

Role of the Site

The Commission neither intends nor expects either containment to be lost completely at 1,000 years following emplacement or the engineered system's contribution to the control of the release of wastes to cease abruptly at some later time. However, the Commission recognizes that at some point the design capabilities of the engineered system will be lost

and that the geologic setting--the site--must provide the isolation of the wastes from the environment, and has translated this requirement into a performance objective for the geologic setting. The Commission also recognizes that isolation is, in fact, a controlled release to the environment which could span ~~hundreds of~~ many thousands of years, and that the release of radioisotopes, and the potential exposures to individuals which could result, should be addressed in the evaluation of a repository. A complement to the evaluation of the effects of design basis processes and events which might disrupt the repository is a projection of how the repository, unperturbed by discrete external events, will evolve through the centuries as a result of the geologic processes operating at the site. Hence, an amendment is being proposed to that portion of Subpart B of 10 CFR Part 60 which describes the contents of the Safety Analysis Report of DOE's application for geologic disposal of HLW which would require DOE to [(1)] project the expected performance of the proposed geologic repository noting the rates and quantities of expected releases of radioisotopes to the accessible environments as a function of time. ~~[; and (2) estimate likely maximum individual doses to humans which could result from those releases;]~~

Retrievability

The licensing procedures of 10 CFR Part 60 were written assuming that there would be a program of testing and measurement of the thermal, mechanical, and chemical properties of the major engineered barriers to confirm their expected performance. The Commission would like to tie the requirement for retrievability of the wastes to the expected time needed to execute the performance confirmation program. However, at present it

appears to the Commission that neither the specific nature nor the period needed for execution of the performance confirmation program will be certain until construction of the repository is substantially complete; that is, until the actual licensing to receive wastes at a geologic repository. Hence it is difficult at this time to use the performance confirmation program as a basis for establishing a period of retrievability. Nonetheless, the DOE is now making critical decisions regarding the design of geologic repositories which will have a direct effect upon how long the option to retrieve wastes can be maintained, and upon the difficulty which will be encountered in exercising that option, should that be necessary for protection of the public health and safety. Therefore, ~~as a practical matter,~~ the proposed rule sets forth a requirement that the engineered system be designed so ~~that the option~~ to retrieve the waste can be preserved for up to fifty years following completion of emplacement. Thus, the waste package and the underground facility would be designed so that ~~their natural degradation~~ would not be the determinant of when the Commission would decide whether to permit closure of the repository. Rather, the Commission would be assured of the option to let the conduct of the performance confirmation program indicate when it is appropriate to make such a decision. In particular, the Commission is concerned that the thermo-mechanical design of the underground facility be such that access [the openings] can be maintained until the Commission either decides to permanently close the repository or to take corrective action, which may include retrieval. The Commission does not want to approve construction of a design which will foreclose options for future decisionmakers.

The retrievability requirement does not specify the form in which the wastes are to be retrievable or that wastes [by] are "readily retrievable. The requirement is simply that all the wastes by retrievable during a period equal to the period of construction and emplacement. The DOE's plans for retrieval are specifically requested as part of its license application and the practicability of its proposal will be considered by the staff. Waste may be retrieved upon NRC approval of a DOE application or upon order by NRC.

Human Intrusion

Some concern has been raised on the issue of human intrusion into a geologic repository. Human intrusion could conceivably occur either inadvertently or deliberately. Inadvertent intrusion is the accidental breaching of the repository in the course of some activity unrelated to the existence of the repository, e.g., exploration for or development of resources. For inadvertent intrusion to occur, the institutional controls, site markers, public records, and societal memory of the repository's existence must have been ineffective or have ceased to exist. Deliberate or intentional intrusion, on the other hand, assumes a conscious decision to breach the repository; for example, in order to recover the high-level waste itself, or exploit a mineral associated with the site.

Historical evidence indicates that there is substantial continuity of information transfer over time. There are numerous examples of knowledge, including complex information, being preserved for thousands of years. This has occurred even in the absence of printing and modern information transfer and storage systems. Furthermore, this information transfer

has survived disruptive events, such as wars, natural disasters, and dramatic changes in the social and political fabric of societies. The combination of the historical record of information transfer, provisions for a well-marked and extensively documented site location, and the scale and technology of the operation needed to drill deeply enough to penetrate a geologic repository argue strongly that inadvertent intrusion as described above is highly improbable, at least for the first several hundred years during which the wastes are most hazardous. Selecting a site for a repository which is unattractive with respect to both resource value and scientific interest further adds to the improbability of inadvertent human intrusion. It is also logical to assume that any future generation possessing the technical capability to locate and explore for resources at the depth of a repository would also possess the capability to assess the nature of the material discovered, to mitigate consequences of the breach and to reestablish administrative control over the area if needed. Finally, it is inconsistent to assume the scientific and technical capability to identify and explore an anomalous heat source several hundred meters beneath the earth's surface and not assume that those exploring would have some idea of either what might be the cause of the anomaly or what steps to take to mitigate any untoward consequence of that exploration.

The above arguments do not apply to the case of deliberate intrusion. The repository itself could be attractive and invite intrusion simply because of the resource potential of the wastes themselves. Intrusion to recover the wastes demands (1) knowledge of the existence and nature of the repository, and (2) effort of the same magnitude as that undertaken to emplace the wastes. Hence intrusion of this sort can only be the result of a conscious, collective societal decision to recover the wastes.

Intrusion for the purpose of sabotage or terrorism has also been mentioned as a possibility. However, due to the nature of geologic disposal, there seems to be very little possibility that terrorists or saboteurs could breach a repository. Breach of the repository would require extensive use of machinery for drilling and excavating over a considerable period of time. It is highly improbable that a terrorist group could accomplish this covertly.

In light of the above, the Commission adopted the position that commonsense dictates that everything that is reasonable be done to discourage people from intruding into the repository. Thus, the proposed technical criteria are written to direct site selection towards selection of sites of little resource value[;], and for which there does not appear to be any attraction for future societies. Further, the proposed criteria would require reliable documentation of the existence and location of the repository and the nature of the wastes emplaced therein[;], including marking the site with the most permanent markers practical. However, once the site is selected, marked, and documented, it does no use to argue over whether these measures will be adequate in the future, or to speculate on the virtual infinity of human intrusion scenarios and whether they will or will not result in violation of the EPA standard. Of course, the Commission recognizes that there are alternative approaches to the Human Intrusion question. Accordingly, comment on this and alternative approaches is welcome.

Relation to Other Parts of NRC Regulations

The proposed rule contemplates that DOE activities at a geologic repository operations area may in appropriate cases be licensed under other parts of NRC regulations and would then not be governed by these

technical criteria. We note, in this connection, that the scope section of the procedural rule specifically provides that Part 60 shall not apply to any activity licensed under another part. This allows an independent spent fuel storage installation to be licensed under Part 72, even though located at a geologic repository operations area (provided, of course, it is sufficiently separate to be classified as "independent"). Other DOE activities at the geologic repository operations area could be licensed under Parts 30 or 70 if an exemption from Part 60 is determined to be appropriate.

Alternative Approac:

In the course of the Commission deliberation, it becomes evident that in order to have confidence in the ability of a geological repository to contain and isolate the wastes for an extended period of time, the repository must consist of multiple barriers. The Commission believes the uncertainties inherent in reliance on the geological setting alone are too great, ~~to be~~ reconciled in an adjudicatory process. The Commission further believes ~~the staff observation~~ that a respository should consist of two major engineered barriers (waste packages and underground facilities) in addition to the natural barrier provided by the geological setting are correct and reasonable. Having reached these conclusions, the Commission considers next whether or not and to what level of details the performance criteria for a geological repository should be prescribed. In this regard, the Commission considers the following three alternatives:*

*Detailed discussions on the advantages and disadvantages of each of these alternatives are given in Appendix J to Commission Paper SECY-81-267, April 27, 1981.

1. Prescribe a single overall performance standard that must be met. The Standard in this case would be the EPA standard;

2. Prescribe minimum performance standards for each of the major elements, in addition to requiring the overall system to meet the EPA standards; and

3. Prescribe detailed numerical criteria on critical engineering attributes of the repository system.

Alternative 3 is considered overly restrictive on the design flexibility and judged to be inappropriate at this stage of the technological development. Therefore, this Alternative is quickly eliminated as a viable regulatory approach.

Alternative 1 has as its principal advantage the fact that it provides maximum flexibility and, thus, is able to incorporate and to apply up-to-date technological innovations and knowledge to the repository design. Notwithstanding the concern over its practicality in the regulatory framework, the Commission cannot at this time eliminate it from further consideration. The Commission is, therefore, specifically requesting the general public, particularly those from the technical communities, to comment on this point. [P.B. addition]

In relation to the first and the third alternatives that are briefly discussed above, Alternative 2 appears to offer a reasonable and practical compromise. In addition to retaining the single overall performance standard in Alternative 1 as the final performance objective, this approach establishes the minimum performance objectives for each of the three subelemental barriers. While the Commission does not view these three numerical criteria as the absolute yardsticks that the licensee has to meet, the Commission does believe that meeting these minimum

subelemental design goals when coupled with the geochemical sorption processes of the host media would be essential to enhance the Commission's staff confidence that the final EPA standard will be met. Therefore, the proposed technical rule is established upon this approach.

It should be noted that, in the event that the Commission decides to adopt the Alternative 1 approach in the final rulemaking, portions of the proposed rule (e.g., Secion on requirements for the geological setting) would have to be further studied and possibly revised.

Major Features of the Proposed Rule

1. Overall Description

The proposed technical criteria have been written to address the following: performance objectives and requirements for siting, design and construction of the repository, the waste package, confirmation of repository performance, quality assurance, and the training and certification of personnel. As appropriate, these topics are divided in turn to address separately requirements which apply during construction, waste emplacement, and after closure of the repository-the latter termed decommissioning. Although the licensing procedures indicate that there would be separate subparts for siting and design requirements, viz. Subparts E and F, respectively (cf. §60.31(a)(2)), the NRC now believes that the site and design are so interdependent that such a distinction is artificial and misleading. For example, although the requirement to place the underground facility at a minimum depth of 300 meters is clearly a design requirement, it is manifested as a siting requirement since unless the site has a host rock of sufficient thickness at sufficient depth, the above design requirement cannot be met. Hence the proposed subpart E to 10 CFR Part 60 contains both site and design requirements.

To enable the Commission to reach a finding as to whether the generally applicable environmental standard for disposal of HLW is met and that the public health and safety will be protected, a careful and exhaustive [anelyses] analysis of all the features of the repository will be needed. That analysis necessarily must be both qualitative and quantitative[:] , [the-analyses] although the analysis [performed] can and will be largely quantitative during the period that greatest reliance can be placed upon the engineered system. [up-to-about-10,000-years-after closure:] Thereafter, although the issues of concern, and certainly the physics of a repository itself, do not change, the numerical uncertainties begin to become so large that calculations become a weak indicator [more indicative] of expected repository [behavior--rather--than--definitive--of expected] performance. [Hence--such-calculations-will-be-supplemented-more heavily-by-qualitative-descriptions;-arguments;-and-analogs-to-support confidence-in-the-success-of-a-repository:]

In sum, the technical criteria perform two tasks. First they serve to guide DOE in siting, designing, constructing, and operating a repository in such a manner that there can be reasonable confidence that the public health and safety will be protected. Second, they serve to guide DOE in those same areas in such a manner that there can be reasonable confidence that the analyses needed to determine whether the public health and safety is protected can be performed.

2. Performance objectives

The design and operation of the repository are prescribed to be such that during the period that wastes are being emplaced and performance

assessed, exposure to workers and releases of radioactivity to the environment must be within limits set by the Commission and the EPA. Further, the repository is to be designed so that the option can be preserved to retrieve the emplaced wastes beginning at anytime up to 50 years following completion of emplacement. Following permanent closure, the repository must perform so that releases are within the limits prescribed by the generally applicable environmental standard which will be set by the EPA. Further, the design of the repository must include a waste package and an underground facility, as well as the site, as barriers to radionuclide migration.

The performance of the engineered system (waste package and underground facility) following permanent closure is specified to require containment of the wastes within the waste package for at least 1,000 years following closure, when temperatures in the repository are substantially elevated, and control of the release of nuclides to the geologic environment thereafter.

Transuranic waste (TRU) may be disposed of in a geologic repository. Since transuranic waste does not generate significant amounts of heat, there is no advantage to containment for any specified period. Hence, the requirement for TRU waste is simply a controlled release equivalent to that for HLW, provided they are physically separated from the HLW so that they wll not experience a significant increase in temperature.

3. Siting Requirements

Although no specific site suitability or exclusion requirements are given in the criteria, stability and minimum groundwater travel times are specified as required site characteristics. ALARA principles have not been applied to the natural features of a site because they are not

amenable to modification once a site is chosen. However, [In addition, the technical criteria do identify site characteristics considered favorable for a repository as well as characteristics which, if present at the site, would lead to a presumption that the site is not suitable for hosting a repository. [The Commission has judged that these should not be made absolute requirements because the The impact of these characteristics on overall performance would be site specific. Thus, the Commission has judged that these should not be made absolute requirements. Presence of all the favorable characteristics does not lead to the conclusion that the site is suitable to host a repository. Neither is the presumption of unsuitability because of the presence of an unfavorable characteristic incontrovertible. Rather, the [The] Commission's approach requires [that the] a sufficient combination of conditions at the selected site to provide reasonable assurance that the performance objectives will be achieved. If [Further, if] adverse conditions are identified as being present, they must be thoroughly characterized and analyzed and it must be demonstrated that the conditions are compensated for by repository design or by favorable conditions in the geologic setting.

The Commission has not included any siting requirements which directly deal with population density or proximity to population centers. Rather, the issue has been addressed indirectly through consideration of resources in the geologic setting. The Commission believes this to be a more realistic approach given the long period of time involved with geologic disposal. Nonetheless, the Commission invites comment on whether population related siting requirements should be included in the final rule and how they might be implemented.

4. Design and Construction

In addition to the requirements on designing for natural phenomena, criticality control, radiation protection, and effluent control, the proposed technical criteria require the design of the repository to accommodate potential interaction of the waste, the underground facility, and the site. Requirements are also placed upon the design of the equipment to be used for handling the wastes, the performance and purpose of the backfill material, and design and performance of borehole and shaft seals. Further, there are requirements related to the methods of construction. The Commission believes such requirements are necessary to assure that the ability of the repository to contain and isolate the wastes will not be compromised by the construction of the repository.

The proposed technical criteria would require that the subsurface facility be designed so that it could be constructed and operated in accordance with relevant Federal mining regulations, which specify design requirements for certain items of electrical and mechanical equipment and govern the use of explosives.

These criteria are a blend of general and detailed prescriptive requirements. They have been developed from Commission experience and practice in the licensing of other nuclear facilities such as power plants and fuel cycle facilities. While there are differences in the systems and components addressed by these criteria from those of power plants or fuel cycle facilities, and the criteria have been written appropriate to a geologic repository, the proposed criteria represent a common practice based on experience which has shown that the above items need to be regulated. The level of detail of these criteria reflects the Commission's

current thinking on how to regulate effectively geologic disposal of HLW. However, the Commission continues to examine other possibilities for promulgating the more detailed of these requirements. [T. H. addition + staff mod to this

5. Waste Package

The proposed requirements for the design of the waste package emphasize its role as a key component of the overall engineered system.

a finding that the issuance of a license will not constitute an unreasonable risk to the health and safety of the public. The purpose of this subpart is to set out performance objectives and site and design criteria which, if satisfied, will support such a finding of no unreasonable risk. [White these objectives and criteria are stated, in many cases, in unqualified terms; rigorous proof of their satisfaction may not always be achievable.] For [for] the Commission to find that there is no unreasonable risk, it must have reasonable assurance on the basis of the record before it that these objectives and criteria will be met.

(b) Subpart B of this part also lists findings that must be made in support of an authorization to construct a geologic repository operations area. In particular, §60.31(a) requires a finding that there is reasonable assurance that the types and amounts of radioactive materials described in the application can be received, possessed, and disposed of in a repository of the design proposed without unreasonable risk to the health and safety of the public. As stated in that paragraph, in arriving at this determination, the Commission will consider whether the site and design comply with the criteria contained in this subpart. Once again, while the criteria may be written in unqualified terms, the demonstration of compliance may take uncertainties and gaps in knowledge into account, provided that the Commission can make the specified finding of reasonable assurance.

(a) [This subpart states the performance objectives to be achieved and the technical criteria to be met by the DOE in order for the Commission to make the findings called for in Subpart B of this part.]

(i) [(j)] Conditions that permit the emplacement of waste at a minimum depth of 300 meters from the ground surface. (The ground surface shall be deemed to be the elevation of the lowest point on the surface above the disturbed zone.)

(j) [(k)] Any local condition of the disturbed zone that contributes to isolation.

§60.123 Potentially adverse conditions.

The following are potentially adverse conditions. The presence of any such conditions will give rise to a presumption that isolation of wastes in the geologic setting will not meet the performance objectives.

(a) Adverse conditions in the geologic setting.

(1) Potential for failure of man-made surface water impoundments that could cause flooding of the geologic repository operations area.

(2) Potential, based on existing geologic and hydrologic conditions, that construction of large-scale surface water impoundments may significantly affect the geologic repository through changes in the regional groundwater flow system.

(3) Potential for human activity to significantly affect the geologic repository through changes in the hydrogeology. This activity includes, but is not limited to groundwater withdrawal, extensive irrigation, subsurface injection of fluids, underground pumped storage facilities, or underground military activity. [;-or-mining;]

(4) Earthquakes which have occurred historically that if they were to be repeated could affect the geologic repository significantly.

(5) A fault in the geologic setting that has been active since the start of the Quaternary Period and which is within a distance of the disturbed zone that is less than the smallest dimension of the fault rupture surface.

Groundwater travel times from repository depths to the accessible environment of 1,000 years are achievable in many hydrologic systems. For a groundwater travel time of 1,000 years, sorption equilibrium coefficients of 100 ml/g or less are sufficient to prevent most of the principal contributors to dose from reaching the accessible environment. Sorption equilibrium coefficients measured in the laboratory for the actinides and other nuclides that are principal contributors to dose are in the range of 10^2-10^4 ml/g, so that some margin is provided to compensate for the uncertainty in actual values of Kd under repository conditions. Because of the greater confidence in our ability to measure hydraulic rather than geochemical parameters, and the conservatism that is introduced, it seems prudent to select the water travel time rather than Kd to be the parameter to be regulated. [meet-the-overall-performance-standard.] Therefore, we have framed our site performance objective so that the travel time from the repository to the accessible environment be at least 1,000 years and we intend that DOE consider during site screening that sites with longer water travel time are preferred. It is likely that site geochemical parameters may need to reduce some of the radionuclides by an additional factor to meet the EPA standard, but no requirement can be quantified in rule form at this time. Gross estimates of this factor range from 10-100 and even beyond depending on what values are in the EPA standard and depending upon further analyses.

If sites with long enough water transport times are selected as potential repository sites, some of the major uncertainty in site evaluation can be resolved. Licensing issues will then mainly be restricted to ensuring that the proposed repository does not disrupt the hydrologic flow pathways such that shorter travel times to the environment are created, and the adequacy of engineered barriers dealing with disruptive events and natural processes that

PERFORMANCE OBJECTIVES

OF PART 60

I. Systems Approach

A. Advocates regulatory restrictions only on ultimate performance measure -- doses to humans.

B. Allows the licensee virtually unlimited flexibility in site selection and repository design.

C. Strongly advocated by DOE, industry groups and by many Europeans during development of Part 60.

II. Multiple Barrier Approach

A. Requires minimal levels of performance from each of specified barriers in addition to compliance with overall system standards.

B. Increases confidence in overall system performance by requiring "partial redundancy" of barriers.

C. Swedes, Swiss and others seem to be adopting this approach.

III. Performance Objectives of Part 60

A. EPA sets the overall system performance standards.

B. Subsystem performance objectives of Part 60 were based on:
1. Desire to have diversity of barriers and "partial redundancy" among barriers.
2. Ability to enhance confidence that the standards would be met.
3. Technical achievability for a real repository.
   a. Ability to build an engineered barrier or to find a natural barrier.
   b. Ability to demonstrate compliance.

C. Waste package containment:
1. Provides a fully redundant barrier during the first 300-1,000 years when wastes are most hazardous -- important for some disruption scenarios.
2. Reduces need to model repository performance under high heat load conditions.

D. Release rate from engineered barriers:
1. Allows additional decay of many radionuclides and dilutes those that are released.
2. May be achieved in several ways -- long-lived containers, low leach rates, etc.
3. Serves as the only complement (supplement?) to the natural barriers over the long term.

E. Groundwater travel time:
   1. Effective both during initial high-hazard period and over the long term.
   2. Only substantive site selection criterion of Part 60.

IV. Alternatives to performance objectives.

A. Systems approach

B. Qualitative objectives like 60.113(a)(1)

C. Alternative numerical objectives.
   1. More restrictive objectives likely to drive up costs.
   2. Less restrictive objectives would not be very effective.

D. Alternative barriers or functions.
   1. Groundwater flux criterion might not be relevant for saturated zone sites and might be more difficult to evaluate compliance than groundwater travel time.
   2. Objectives based on geochemical conditions seem very difficult to implement.

E. Alternative regulatory structure.
   1. Implement multiple barrier concept by requiring that releases from the engineered barriers not exceed a specified multiple of the releases allowed by the EPA standards at the environment. Also require that the natural barriers achieve the same performance assuming total "failure" of the engineered barriers.
   2. Allow reliance on multiple natural barriers rather than on a combination of natural and engineered barriers.

September 13, 1978 SECY-78-366A

UNITED STATES
NUCLEAR REGULATORY COMMISSION

INFORMATION REPORT

For: The Commissioners

From: Clifford V. Smith, Jr., Director
Nuclear Material Safety and Safeguards

Thru: Executive Director for Operations

Subject: IMPACT OF APPLICATION OF PROPOSED GENERAL STATEMENT OF POLICY (SECY 78-366) TO WIPP

Purpose: For Information

Discussion: During a policy session on September 6, 1978, the Commission reviewed SECY 78-366. That paper proposed that the Commission approve for publication for comment a proposed policy statement regarding licensing procedures for high-level waste repositories. While the Commission agreed in principle with the procedures set forth in the proposed policy statement, several Commissioners expressed an interest in the impact of applying the procedures, and the regulations based upon them, to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. This paper is intended to provide the Commission information on this subject.

A detailed discussion of these impacts is included as Attachment A. However, in brief, the impacts will be as follows:

1. Availability of Licensing procedures - The staff schedule calls for the licensing procedures to be available in final regulation form before an application for WIPP is received. In the alternative, the Commission can define the procedures in a Policy Statement well in advance of promulgating a regulation. Thus, the staff does not anticipate any adverse impact on the WIPP schedule attributable to failure to have the proposed licensing procedures in place prior to receipt of an application.

Contact: James Malaro, NMSS
427-4433

Jane Axlerad, OELD
492-7437

7809260014 11pp.

2. Impact of Application of Procedures to WIPP

Scheduling Impacts - If the proposed procedures are applied to WIPP, start of construction may be delayed by about six months. However, waiving application of the proposed licensing procedures for WIPP or licensing WIPP under present regulations would involve about the same delay in DOE's schedule.

Preliminary Site Evaluation - Since DOE is well into the site selection and evaluation process for WIPP, there is no way that the informal preliminary site review called for in the proposed licensing procedures can be accomplished for WIPP. However, the staff feels that an effective and complete review of WIPP can be accomplished without this informal preliminary review.

3. NEPA Reviews - There seems to be some question concerning the extent to which DOE has considered alternatives to the proposed WIPP site. Under existing NEPA law this issue must be addressed explicitly in an environmental impact statement supporting NRC's proposed licensing of the facility before start of construction regardless of what licensing procedures the Commission elects to use for WIPP. Therefore, although some problems for WIPP could arise in this area, the licensing procedures proposed by the staff will, themselves, have no effect.

Clifford V. Smith, Jr.
Director, Office of Nuclear
Material Safety and Safeguards

Attachments:

A - Impact of Application of Proposed Procedures
B - Preliminary NRC Licensing Schedule for WIPP
C - Letter from Hendrie to Domenici

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ATTACHMENT A

IMPACT OF APPLICATION OF PROPOSED GENERAL STATEMENT OF POLICY TO WIPP

Present Status of WIPP

The present status of WIPP was briefly discussed in SECY 78-366. The conceptual design stage has been completed and preliminary engineering design and site characterization drilling are now underway. Present plans for WIPP indicate that it will be used to dispose of transuranic (TRU) wastes from the defense program and for conduct of research and development activities.[1/] If these plans remain firm, in the absence of legislative action, WIPP will not be licensable by the NRC.[2/]

It has also been proposed that WIPP be used as a "moderate scale demonstration of the capability for ultimate disposal of spent fuel in salt."[3/] This proposal contemplates emplacing up to 1000 spent fuel assemblies "in a disposal mode."[4/] Disposal of such a small number of spent fuel assemblies would not bring the facility within

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1/ Draft Report of Task Force for Review of Nuclear Waste Management, DOE/ER-0004/D, February 1978, at 15 /hereinafter "Deutch Report"/.

2/ See Attachment C - Letter from Chairman Hendrie to Senator Domenici dated May 5, 1978.

3/ Deutch Report, at 16.

4/ Deutch Report, at 17. This proposal is under consideration by the Interagency Review Group on Waste Management.

the licensing jurisdiction of the NRC which covers facilities used "primarily" for receipt and storage of "high-level radioactive wastes

Thus, unless legislation is enacted giving the NRC specific licensing authority over WIPP, or unless the plans for utilization of the facility are substantially changed, WIPP will not be licensable by the NRC.[6/]

Availability of Licensing Procedures

The staff has proposed that the Commission publish a Proposed Statement of Policy for public comment. If the policy statement is published, the staff intends to circulate to the states, and to the ACRS, for review a staff working draft of the procedural portion of a proposed regulation, Part 60, which will reflect the licensing procedures approved by the Commission. The Commission will then have two options. One option is to publish the Policy Statement in final form as interim guidance while simultaneously publishing a proposed Part 60 for public comment. The other option is to dispense with finalizing the Policy Statement and, instead, simply publish a proposed Part 60. The staff plans to publish a proposed

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5/ Energy Reorganization Act, 42 U.S.C. 5801 (1974).

6/ In fact, while both DOE and NRC have recommended passage of such legislation, Congress has taken precisely the opposite position. A provision in the Public Works Appropriations Bill, H.R. 12928, which controls DOE and NRC appropriations, provides that no funds shall be made available for licensing WIPP in fiscal year 1979. This provision was passed as a floor amendment offered by Congressman Price and has been approved by House and Senate conferees. The conference report has not yet been approved by the full Congress.

regulation, in any event, by early 1979 and to have a final regulation in place by mid 1979 (see Attachment B). Thus, the procedures for licensing the first repository should be in place before receipt of an application for WIPP.[7/]

Impact of Application of Procedures to WIPP

Scheduling Impacts - Despite the fact that NRC's licensing jurisdiction over WIPP is uncertain, DOE now plans to submit an application for the WIPP site to NRC in August, 1979.[8/] DOE intends, subject to NRC approval, to sink the first shaft at the site in mid 1981. DOE's schedule calls for the repository to be completed and ready to receive wastes mid 1985.[9/]

7/ Promulgation of the technical criteria portion of Part 60 is expected to follow publication of the proposed licensing procedure portion. Proposed technical criteria should be published for comment in mid 1979. Although the criteria might not be finalized until after the receipt of an application for WIPP, sufficient NRC guidance should be available to enable DOE to prepare its application in a form that will be substantiably complete and accurate for review. It is thus unlikely that the publication of final technical requirements which would be applied in the licensing process, would result in any significant disruption or delay.

8/ The docketing and processing of a DOE application will require that NRC has received licensing jurisdiction over the project. Alternatively, it is possible that some informal NRC review process could be developed by interagency agreements if NRC does not have licensing jurisdiction and DOE wants NRC's opinion on the safety of the facility.

9/ However, much slippage in the schedule has already occurred and the Deutch report has acknowledged that the schedule is, even now, optimistic. (Deutch report, at 15).

Assuming DOE submits its application in August, 1979 use of the licensing procedures proposed by the staff in SECY 78-366 should result (assuming a positive finding by the Commission) in the issuance of a license to receive wastes at WIPP in early 1986.[10/] This is approximately six months later than the operating date now proposed by DOE.

Licensing of WIPP under existing regulations would also be likely to cause some delay in DOE's schedule. Under 10 CFR Parts 30 and 70, those portions of the Commission's regulations under which WIPP would be licensed, DOE would be required to submit an application and an environmental report nine months in advance of proposed commencement of construction. Further, commencement of construction prior to completion of the Commission's NEPA review may be grounds for denial of a license. While Parts 30 and 70 have never been applied in a contested initial licensing proceeding, they would likely be applied so as to preclude any commencement of construction prior to a favorable decision by a Licensing Board after hearings. Thus, the time required to do an environmental review, including hearings, would be the same under Parts 30 and 70 as under the staff's proposed procedures. Also, under both exist

10/ This assumes six month hearings at both the construction authorization and operating license stages. Given the controversial nature of nuclear waste disposal, this may prove to be optimistic.

regulations and under the new proposed licensing procedures, this review would have to be completed prior to the start of construction. Thus, licensing under existing regulations would probably not prevent a delay.

The possibility has been raised that NRC could waive application of the proposed licensing procedures to WIPP. However, if WIPP meets the criteria for a high-level waste repository this may be difficult to justify. Furthermore, even if such a waiver were possible, NRC would then have to license WIPP under existing regulations. Thus granting such a waiver would probably not prevent a delay.

Once construction commences, the NRC review will no longer be on DOE's critical path. The proceeding to determine whether DOE can receive wastes at WIPP will commence about three years before DOE hopes to receive wastes. Under the present schedule DOE plans to receive wastes in mid 1985. Thus, the staff's proposed licensing procedures are not expected to cause delays in DOE's plans for WIPP after sinking of the shaft.

Preliminary Site Review

Under the licensing procedures, the staff would perform an informal consultive review during DOE's site selection process and during its site evaluation process.[11/] The preliminary review is primarily for

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11/ Site selection refers to the process of selecting a geographical area. Site evaluation refers to the process of selecting a

the benefit of the applicant, to give them NRC's views on the suitability of the site early in the site selection process. F WIPP, the site selection process has been completed and the sit evaluation process is now underway. The licensing procedures require that DOE provide data during the site selection and evaluation phases for the NRC staff to review informally to det if there are any problems with a site. No such data has been r for WIPP but some members of the staff have visited the site an in contact with DOE. A project manager has been appointed.

The informal consultive review was designed by the staff princi to inform DOE early on of any problems that might become appare It was not designated as a formal review. In the staff's view, although the ideal situation would be to have early input to DO site selection, the fact that the review at the site selection s has been precluded and that the site evaluation process is alre underway would not effect NRC's ability to carry out a complete effective licensing review of WIPP.

NEPA Reviews

The staff's proposed licensing procedures require that DOE submi an environmental report and state that the staff will prepare dr and final environmental impact statements. Under existing law, environmental impact statement must contain an analysis of alter tives to the proposed action including analysis of alternative s For WIPP, an analysis of alternatives would arguably have to inc

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12/ Monroe County Conservation Society, Inc. v. Volpe, 472 F.2d

analysis of the option of leaving wastes stored where they are for a number of years, of disposing of wastes in other environments and geologic media, such as salt, basalt, granite, and shale, and, perhaps, analysis, though not in great detail, of options like seabed disposal. While analysis of each of these options could be accomplished for WIPP, an alternative site analysis might prove very difficult. There are indications that DOE did not consider other geographical locations or other environments (media combined with other site characteristics such as hydrology). This defect could be cured if DOE gathers additional data on other sites and makes a good faith effort to examine alternative sites now. The information would be reflected in DOE's environmental report and in our environmental statement.

The licensing procedures proposed by the staff do not set forth any requirements regarding the scope of the NEPA review. The NEPA review requirements are implied from the law and cannot be changed unless legislative changes are made. While the NRC is generally required by law to include an environmental review in its licensing procedures, the scope of that review in a particular case can be determined as an initial part of the case review. Thus, the staff's proposed procedures will not have an impact upon the environmental review for WIPP except insofar as they provide a forum for challeng

to the adequacy of the review prior to commencement of cons
It is possible that when and if an application is received
DOE will have given adequate consideration to alternative s
The Interagency Review Group is aware of the alternative si
and has informally indicated to DOE that the WIPP project w
encounter NEPA problems unless a better alternative site an
completed.

13/ There are other forums already available for such challe
can be challenged in court on the adequacy of its own NEI
to support its own actions.

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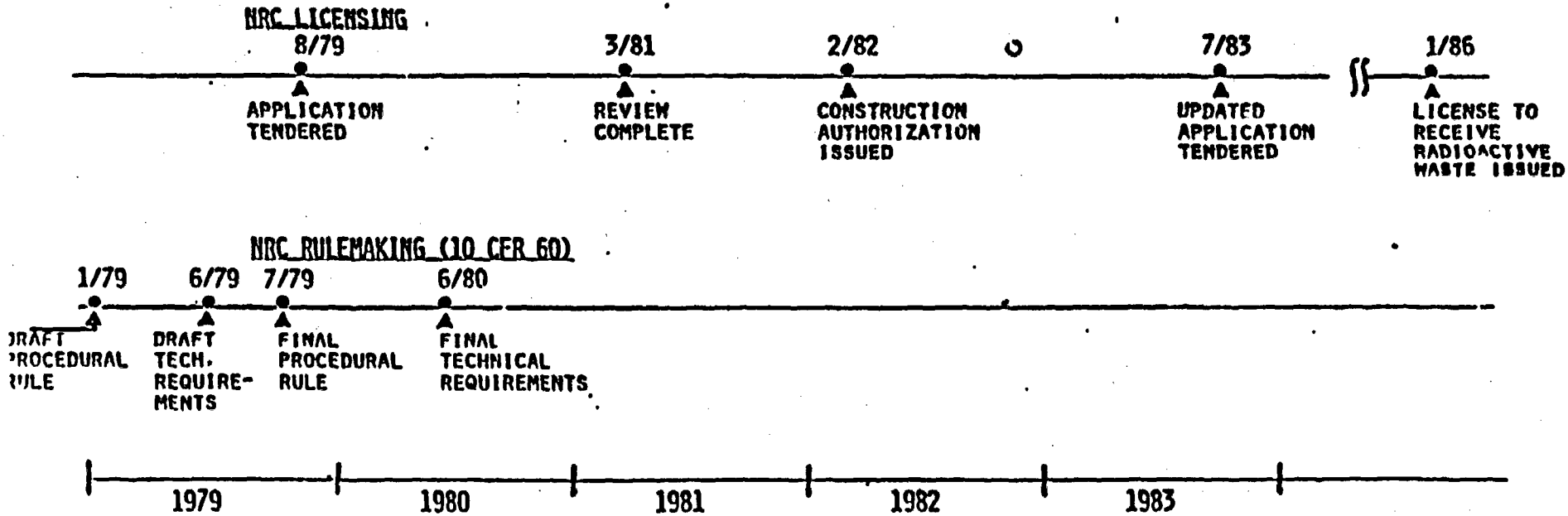
ATTACHMENT B

PRELIMINARY NRC LICENSING SCHEDULE FOR WIPP



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

May 5, 1978

OFFICE OF THE
CHAIRMAN

The Honorable Pete V. Domenici
United States Senate
Washington, D.C. 20510

Dear Senator Domenici:

I am pleased to respond to your letter, dated May 1, 19
the views of the Commission on whether NRC now has clea
unquestioned authority to license the DOE Waste Isolati
Plant (WIPP) facility for the following activities: (1
disposal of transuranic wastes from the defense program
disposal of up to 1,000 spent fuel rod assemblies; or (
disposal of high level wastes from the defense program.

NRC licensing authority over DOE waste management activ
derived from section 202(3) and 202(4) of the Energy Re
Act of 1974. These sections confine NRC licensing auth
waste management activities to certain DOE facilities f
and storage of "high level radioactive waste". This te
level radioactive waste" is not defined in the Act, and
no consistent guidance on the meaning of the term in the
history of the Reorganization Act.

Even though spent fuel which is to be disposed of in a g
repository may have some resource value, it contains rad
waste. Thus, it is clearly a "high level" radioactive w
because it contains all the toxic and long-lived radionu
contained in the liquid wastes from reprocessing that ha
traditionally been regarded as a form of high level radi
waste.

On the other hand, transuranic wastes have traditionally
distinguished from "high level radioactive waste" and tr
the regulations, as a separate category of radioactive w
(see, for example, the AEC-proposed rulemaking notice on
"Transuranic Waste Disposal", 39 F.R. 32921 (Sept. 12, 1

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ACHMENT C

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Thus, while the law is unclear on the point, it is the Com view that spent fuel to be disposed of in a geologic reposi could properly be regarded as "high level radioactive waste that transuranic wastes probably cannot be regarded as "hig radioactive wastes". This is despite the fact that for the of protecting the public health and safety, the distinction between high level radioactive wastes and transuranic waste limited significance. Both types of material contain signi quantities of long-lived transuranium elements which remain hazardous for periods of time which are extremely long in t human chronology.

In answer to your specific questions, if WIPP is to be used for disposal of transuranic wastes from the defense program commercial spent fuel rod assemblies, then WIPP might not b licenseable. While the 1000 commercial spent fuel rod asse would be "high level radioactive waste", the transuranic wa would not be, and the facility would not be used "primarily" receipt and storage of "high level radioactive wastes". Se 202(3) of the Energy Reorganization Act.

If WIPP is to be used for disposal of defense program high l wastes, then it would be licenseable under section 202(4) o Act provided it was not "used for, or ... part of, research development activities". It is possible that, depending upo exact program proposed by DOE, WIPP could be regarded as a r and development facility exempt from licensing.

The following amendment to section 202 of the Energy Reorgan Act, which we have drafted in response to your request, woul an unambiguous basis for licensing jurisdiction over WIPP.

> "(5) The Waste Isolation Pilot Plant proposed to be loc near Carlsbad, New Mexico"

Should there be a significant change in the WIPP proposal--f should the location be changed--then new legislation would b However, the language proposed above has the advantage of re the present language in section 202 and thereby avoiding any impact on future facilities other than WIPP.

The staff currently has under preparation a paper which addresses the need for additional legislative authority in the waste management area. This evaluation will include consideration of the desirability of extending NRC licensing authority over DOE waste managment activities. I expect that the Commission will consider this matter in the near future.

Sincerely,

Joseph M. Hendrie
Chairman