

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
Subcommittee on Waste Management

- - - - -

Room 1046
1717 H Street, N.W.
Washington, D.C.

Friday, March 18, 1983

The Subcommittee on Waste Management met at
8:30 a.m., pursuant to notice.

ACRS MEMBERS PRESENT:

D. Moeller, Chairman of the Subcommittee.
J. Mark, Member.

ACRS CONSULTANTS PRESENT:

R. Foster
D. Orth
S. Parker
S. Philbrick
M. Steindler
G. Thompson

DESIGNATED FEDERAL EMPLOYEE:

R. Tang

EPA MEMBERS PRESENT:

Mr. Egan
Mr. George

*TR 04
delete B. White*

8303220021 830318
PDR ACRS PDR
T-1191

P R O C E E D I N G S

(8:30 a.m.)

MR. MOELLER: The meeting will now come to order.

This is an open meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Waste Management.

I'm Dave Moeller, the Subcommittee Chairman, and with me today is Carson Mark, a fellow member of the ACRS.

We also have with us a team of consultants who have assisted the subcommittee for some time. They are Dick Foster, Don Orth, Frank Parker, Shailer Philbrick, Martin Steindler, and George Thompson.

The purpose of the meeting is to review and comment on the DOE-proposed Rule 10 CFR, Part 960, Agency Guidelines for Recommendation of sites for Nuclear Waste Repositories.

Having said that, that we are here to review it and comment on it, I think several comments may be in order. For example, for me, I think we need to clearly specify just what it is -- or the exact approach that we are to take.

Several examples in my mind: Should we review these guidelines relative to the requirements of the

1 Nuclear Waste Policy Act of 1982 and see whether they
2 meet what we gather the Congress requested, or are we to
3 review the guidelines in comparison to the EPA standards
4 to the NRC criteria, or are we to review them primarily
5 as a means for comparing various geographical areas that
6 have been identified as possible sites for repository.

7 You know, there are a variety of ways in which
8 we could comment. So I think when the DOE representative
9 is here, we will certainly ask that that be clarified.

10 The meeting is being conducted in accordance
11 with the provision of the Federal Advisory Committee Act
12 and the Government in the Sunshine Act. R. C. Tang,
13 seated on my right, is the designated federal employee
14 for the meeting.

15 The rules for participation in the meeting have
16 been announced as part of the notice previously published
17 in the Federal Register on March 3, 1983, and a transcript
18 of the meeting is being kept, and it is requested that
19 each speaker first identify himself or herself, and speak
20 with sufficient clarity and volume so that he or she
21 can be readily heard.

22 We have received no written statements relative
23 to the subject matter for this meeting, nor have we
24 received any requests from members of the public to make
25 oral statements. However, we have been provided with

1 written comments on the DOE Guidelines that were submitted
2 to the Department of Energy by the following groups and
3 organizations, and I want to mention them specifically,
4 because each of these organizations has taken time to
5 review and comment in depth on the proposed guidelines.
6 These organizations are: The Natural Resources Defense
7 Council, Incorporated; the Sierra Club; the Public Citizens
8 Critical Mass Energy Project; the Nuclear Information
9 and Resource Service; Friends of the Earth; the Council
10 of Energy Resource Tribes; and the Environmental
11 Policy Institute. And there may be others, but these --
12 I tried to be careful, and these were the ones whose
13 comments were provided to me.

14 And I gather, or I understand from Ms. Tang,
15 that the comments were sent to the hotels of each of you
16 last evening.

17 However, if you have not had time to read these,
18 I will declare a recess prior to the DOE presentation, you
19 know, maybe a half-hour or something, so that each of you
20 would have time to read them.

21 Let me just take a poll. Have you had time to
22 read those comments?

23 MR. FOSTER: I read about two-thirds of them.

24 MR. MOELLER: Okay.

25 MR. PARKER: I read them.

1 MR. MOELLER: All right.

2 Well, we may still take a few minutes to look
3 at them again.

4 I think they are very helpful. These people
5 have been conscientious in their reviews, and I view us as,
6 of course, a subcommittee, but I view us as an organization
7 that in a sense looks over the shoulders of the NRC and
8 perhaps of DOE and keeps abreast and stays aware of the
9 public's interest in these subjects; so these are
10 comments from public interested groups and so we
11 should treat them very seriously.

12 If there is any person in the audience who would
13 like to have time to make a statement later in the meeting
14 today, please let us know and we will accommodate you.

15 Do any of the members of the subcommittee have
16 comments at this time, before we move ahead?

17 MR. MARK: All the other members of the
18 subcommittee have a question.

19 MR. MOELLER: All right.

20 They are unanimous in this. Go ahead, Carson.

21 MR. MARK: You said we had no presentations for
22 the public. Is Dr. Miller not going to appear?

23 MS. TANG: He will.

24 MR. MOELLER: All right.

25 Let's correct that, then. He is going to appear.

1 He will be a member of the public, and he was invited
2 specifically by us because he had information on
3 transportation problems. But, yes, you are correct.

4 MR. MARK: Another question. You may have
5 mentioned it and I missed it. The relationship of what we
6 are talking about today must also be close to 10 CFR 60.
7 What is the status of 60 at this moment and what is the --
8 I think you mentioned we should review this in comparison
9 perhaps with EPA and in comparison with other things; and
10 I don't know to what extent you made an emphasis of
11 10 CFR 60.

12 MR. MOELLER: Well, when I referred to the NRC
13 criteria, I was thinking of 10 CFR 60, and we understand
14 that a final version of 10 CFR 60 has been submitted to the
15 Commission and that they will vote near the end of this.

16 MR. MARK: It is not yet out for public comment?

17 MR. MOELLER: It has been commented upon in
18 draft.

19 MS. TANG: But this version contains a lot of
20 changes, as you know

21 MR. MARK: Right. So while we will review 60 at
22 some point, that is not today's concern.

23 MR. MOELLER: That is correct. No. 60 is not
24 today's concerns.

25 Dick.

1 MR. FOSTER: You are beginning to clarify some
2 of the questions that I had relative to what we do today,
3 and that is whether we stick just to the new DOE rule or
4 whether we go back to the original perpetrators of this
5 strange and mysterious language.

6 MR. MOELLER: I think that we want, of course,
7 to end up the day with some draft comments on the DOE
8 Guidelines. However, feel free at any time to go back
9 either to the EPA standards or to the NRC criteria.
10 They are all interrelated, so you can't deal with one
11 without commenting on the other.

12 Yes, Frank.

13 MR. PARKER: Many of those papers that we received
14 last night point out that we are really looking at a
15 shifting target. Neither EPA or NRC or DOE are final.
16 So they may very well be changed from what we are
17 looking at right now.

18 MR. MOELLER: Martin.

19 MR. STEINDLER: Is this review part of the
20 concurrence process that is required by the Act?

21 MR. MOELLER: That is an interesting question.
22 I had the same one. I tend personally to view it, yes,
23 that any way in which we can assist in fostering
24 communication among the various organizations, then we
25 should do it. I don't think officially we are part of that

1 process.

2 Having said that, I really don't know. But
3 certainly let's help in any way we can.

4 Okay. We will now proceed with the meeting,
5 and I'll call on Dan Egan of the EPA Staff to begin the
6 discussion, and Dan is going to be addressing the EPA
7 proposed environmental standards for management and
8 disposal of nuclear waste, and this is their 40 CFR 191.

9 Dan, it is a pleasure to have you back after,
10 I'm sure it has been more than a year.

11 MR. EGAN: Thank you. I'm glad to be here
12 and talk to you all.

13 Another one of these space-aged gismos.

14 Can you get the front lights down without
15 taking away the rest of it?

16 I'm very glad to be able to come and talk to you
17 all and talk about a regulation that is now something we
18 can review and comment on openly in public forum. The last
19 time I was here to talk to you we were still under OMB
20 review, I'm quite sure.

21 The regulation was finally proposed for public
22 review and comment on December 29. We are in the public
23 comment period right now. Our comment period officially
24 closes on May 2. Therefore, any comments you all give me
25 today, I will probably take some time to note and we will

1 docket it in our public docket for the rule-making.

2 After our comment period closes on May 2, we plan
3 to hold public hearings, one here in Washington and one out
4 in Denver, where we specifically will focus on the content
5 of the comments, review their applicability to their
6 standards, and build further comments on the comments
7 themselves. This is the process under this rule-making.
8 We will hold the public comment period open after the
9 hearings for some period of time to allow further comment
10 on that process, and I anticipate that sometime during
11 June the comment period will ultimately close for the rule.

12 We have one other process ongoing throughout this,
13 which Dr. Parker is well familiar with. We have an
14 independent review committee for technical bases of our
15 standards set up through our Science Advisory Board.
16 That committee is chaired by Dr. Collins, Dr. Parker, and
17 I believe 11 or 12 others are members of the subcommittee.
18 They are holding meetings approximately once a week.
19 Their next meeting is next week in San Francisco, the
20 next meeting in Washington.

21 We are encouraging as much technical process
22 as we can get in that process, as well.

23 What I will do this morning are primarily two
24 things. First of all, I will walk you through the content
25 of the standards that we proposed, and then the second

1 part of this I will discuss some of the issues that we
2 particularly sought public comment on in our Federal
3 Register notice.

4 The standards have two subparts: A and B.
5 Subpart A merely extends the exposure limits that we
6 established in 40 CFR 190 for the commercial fuel cycle,
7 to waste management and storage operations, both for
8 commercial and for national defense activities.

9 The numbers for the exposed limits are the
10 same. I don't plan to discuss this any further. There
11 has been very little controversy about this. The second
12 part of the standard is certainly more important
13 conceptually and has more impact on the national program.
14 These are our standards for disposal of which we have three
15 types.

16 The first set are design requirements, which
17 will be design requirements, repository, and other disposal
18 systems will have to meet for 10,000 years after disposal.

19 The second category is qualitative assurance
20 requirements that we feel are essential to establish the
21 context for application of the containment requirements.

22 The third set are procedure requirements which
23 are important to specify how analytically we mean
24 containment requirements to be required.

25 MR. MARK: You mentioned 10,000 years in

1 connection with part 14.

2 MR. EGAN: Part 13, but also part 14.

3 MR. MARK: Do these relate to the package itself
4 or some geological boundary away from the burial point?

5 MR. EGAN: The numerical containment requirements
6 relate to a boundary some distance away from the actual
7 workings of the repository itself.

8 MR. MARK: What sort of guarantee do you require
9 that there won't be a volcano right on that site in
10 7 years?

11 MR. EGAN: 7,502.

12 Let me come back to that and go through the
13 presentation. There is a good point later on to answer
14 that question.

15 What I'll do now in the next several slides is
16 walk through the specific provisions of each of these three
17 sections of the standard.

18 The containment requirements actually have two
19 provisions. The first is what we call reasonably
20 foreseeable releases, those that we feel have a probability
21 greater than one chance in a hundred in occurring over
22 10,000 years. Should be less than the limits of
23 radionuclide releases set in table 2 which I will talk about
24 in the next slide.

25 Secondly, we say for a category of releases

1 we call very unlikely releases with a probability between
2 1/100 and 1/10,000 over 10,000 years. We believe those
3 releases should be less than 10 times for the limits for the
4 foreseeable releases.

5 To get to Dr. Mark's question, for things that
6 would occur with less than this probability, we set no
7 standards at all. So we are saying that there are some
8 releases that are so incredible in a quantitative sense that
9 we don't think it is appropriate to set standards.

10 I can apply that as best I could to your volcano
11 analogy. Assuming that the volcano will meet anybody's
12 release limits. What we are saying, that probability needs
13 to be smaller than the bottom probability in this range.

14

15

16

17

18

19

20

21

22

23

24

25

-2-1
1 MR. MARK: My question was, what sort of guarantee
2 you require that a volcano may not occur there. You can,
3 of course, ascertain that no volcano has occurred. That
4 is really rather different.

5 They keep on happening in spots, and nobody knows the
6 probability. So you could say we will ask ourselves
7 that there be no evidence today, or in one million years
8 before the accident of their having been a volcano.

9 That is about all you could expect to have
10 data for.

11 MR. EGAN: Obviously, we are forcing a
12 quantitative calculation of some projection of that
13 potential frequency over this 10,000-year period. That would
14 be done, I'm sure, by people expert in the field to give
15 some scoping assessment of what that number might be.

16 My own assessment from the people I've talked to --

17 MR. MARK: I question if there are experts in that
18 particular field.

19 Now, what is this 1 over 10,000 very unlikely
20 that you've got there? Does that mean you are coming to
21 ask about things with a likelihood of 10 to the minus 8th
22 per year? That is, to be one chance in 10,000 integrated
23 over 10,000 years?

24 MR. EGAN: One chance in 10,000; that is correct,
25 over a period of time.

1-2-2 1 It is an average rate of 10 to the minus 8 per year
2 or below, which would not be considered.

3 MR. MARK: Is it realized by the people who
4 administer this that is absolutely no way of discussing such
5 things at all?

6 MR. EGAN: The fact that they are too incredibly
7 small to talk about.

8 MR. MARK: That there won't be any data concerning
9 them, or any means of forecasting the uncertainty of what
10 they might be or what might occur.

11 MR. EGAN: Certainly that is not our
12 belief, that you cannot make any calculation of these things
13 at all.

14 MR. MARK: Making calculations is perhaps a waste
15 of money. It can't be any basis for assurance.

16 MR. EGAN: How else would you distinguish
17 between a site -- we can certainly qualitatively between
18 us suggest that a site, say, in southern Washington, might
19 have a higher chance of a volcano occurring than, say, a
20 site in L.A.

21 MR. MARK: That is for sure.

22 MR. EGAN: Can we make no other discrepancy between
23 that and the qualitative judgment of those things?

24 MR. MOELLER Use the microphone.

25 MR. PHILBRICK: You've got a question of timing.

j-2-3 1 If you go in upper New York state, you've got nothing
2 cretaceous, and if you get to Washington, you've got
3 something like last year, or this year. So that you are
4 way less liable to get things in one area than you are
5 in the other.

6 MR. MARK: I will certainly buy that. But
7 what is troubling me is the attempt to quantify things
8 down to this level of probability. These numbers are
9 actually put down to be real numbers.

10 MR. PHILBRICK: On the basis of history, you can't.
11 When was the last time something of that nature
12 occurred at a given site?

13 MR. MARK: At Los Alamos. It's around 10 million
14 years.

15 MR. PHILBRICK: I'm talking about a good many other
16 years.

17 MR. MARK: I understand that you can go back and
18 say there hasn't been one here in the last very large number
19 of years, and you can take that data and regard it as
20 assuring you that there is no reason to expect one in the
21 next small piece of the future. But that is quite different
22 from having a means of saying there won't be one in
23 5,000 or 10,000 years.

24 MR. PHILBRICK: If the geological conditions
25 haven't changed, and they don't change overnight, then the

j-2-4 1 use of history is a reasonable place --

2 MR. MARK: I regard it as absolutely reasonable
3 and sufficient.

4 MR. MOELLER: Dick.

5 MR. FOSTER: Can you tell us why you came to these
6 containment requirements as they are? Is this tied in
7 to some acceptable health risk, eventually, or do these
8 numbers have some primary significance just by themselves?

9 MR. EGAN: Let me address that as I go through
10 about four or five more slides.

11 I have some things that will set the proper
12 framework for that, and I'll come back to that question
13 later.

14 MR. MOELLER: In the two descriptions here, were you
15 trying to have the risk be the same? Is that why you went
16 to 10 times the limit?

17 MR. EGAN: No. As a matter of fact, we made two
18 junkets. One, the numbers were in fact picked largely
19 on the basis of the analyses we did, which appeared to be
20 reasonably achievable.

21 In fact, there was an attempt to show some risk
22 aversion here, as well, in that the release limits go up
23 by a factor of 10 for a factor of 100-fold decrease in the
24 probability.

25 In other words, if you increase this range, you are

J-2-5 1 going here to a range of -- it's about two orders of magnitude
2 probabiistic different between these two categories versus
3 a factor of 10 on these release limits.

4 MR. MOELLER: Okay. I was looking at the midpoint,
5 I guess, the one in -- taking between one and 100
6 and one in 10,000 years, I assume, or one in 1,000 years.

7 I see what you mean. I see what you mean.

8 MR. EGAN: Back briefly to this point: On the low
9 end of this range, I find it interesting to note that the
10 guidelines for faulting and intrusives, the DOE has
11 chosen as a favorable condition sites where those particular
12 events would be likely to have a probability less than the
13 bottom end of this range; therefore, hoping that those
14 things would not in themselves have to enter into
15 rulemaking.

16 Let me proceed by talking what we mean by this
17 table 2 for a minute.

18 What this is is a set of radionuclide specific
19 release limits for the amount of wastes generated from
20 1,000 metric tons of heavy metalurgic equipment, and
21 cumulative over a 10,000-year period.

22 You can see this is part of the table that is in
23 the regulations. How these release limits are applied, this
24 looks complicated, but it is relatively straightforward.

25 They applied specifically to a particular repository

j-2-6 1 depending upon the amount of waste that is in that
2 repository.

3 We saw no benefit in scaling or in setting standards
4 that would encourage large repositories or small
5 repositories. In fact, we saw no scaling in the
6 environmental protection here. Such that to determine how
7 you apply those release limits for a specific repository, you
8 first calculate what we call a multiplier by determining
9 how much waste equivalent is in the repository of
10 high-level waste, plus if there is any transuranic waste
11 in that repository, to come up with a multiplier that
12 is repository specific based upon the inventory of
13 waste in that particular repository.

14 You then take the release limits on table 2 and
15 multiply them times that multiplier to come up with
16 repository specific release limits, and then to apply those
17 release limits to projected releases, you compare the
18 projected releases of various radionuclides to those release
19 estimates, and this is entirely conceptually similar to
20 part 20, to determine whether you are below one in the case
21 of foreseeable releases, or 10 in the case of very
22 unlikely releases.

23 MR. MOELLER: Now, are these presented -- and I don't
24 recall that you stressed it -- are they presented as design
25 guides? Because I presume you would never be able

1 to measure these releases.

2 MR. EGAN: They are certainly things that we
3 would implement, or expect NRC to implement for commercial
4 waste, and DOE for transuranic waste, and the basis of
5 analytical discretions. We are not trying to set
6 standards; in fact, cannot accept standards to sit and
7 measure, both because of the time frames involved and also
8 because you are talking about largely accidental things
9 occurring here.

10 That is conceptually not acceptable.

11 MR. MOELLER: Now, in one of the previous letters
12 that the committee wrote on high-level wastes, which this
13 subcommittee drafted, we called attention to the question,
14 do we have the models, do we have validated models for
15 even assessing this.

16 Do you believe that we do?

17 MR. EGAN: Yes. I have long felt that the work that
18 the NRC has funded at Sandia -- in fact, it started about
19 the same time we started our standards, to develop
20 analytical models, to develop releases, and risks in
21 repositories, is quite capable of showing compliance with
22 these standards.

23 In fact, we developed our standard very much having
24 been in close contact with that research effort to make
25 sure that there was compatibility between the two programs.

1-2-8
1 They in fact have much more sophisticated calculation
2 abilities than I have here. They are doing an analytical job
3 of judging specific sites, where we are trying to do
4 the analysis sufficient to determine whether a particular
5 set of release limits can be met.

6 MR. MOELLER: Martin.

7 MR. STEINDLER: Yes.

8 The addition of transuranic curies implies that
9 somehow you have taken into account in your table 1 and 2 the
10 additional risks from transuranic above and beyond high-level
11 wastes, but nowhere in the documents, at least that
12 the Federal Register has, is that made explicit.

13 It almost seems as though the transuranic
14 addition of the formula that you show up here is almost
15 like an afterthought.

16 Was in fact the addition of transuranics a
17 calculated additive that still is within the kind of risk you
18 indicate in the one extra -- or 1,000 deaths in 10,000 years?

19 MR. EGAN: To give you some inclination of how these
20 ratios occurred, we picked this unit for transuranic
21 wastes, based on the assessment that we felt the retention of
22 long-lived radionuclides that was clearly achievable for
23 high-level waste, should within an order of magnitude be also
24 achievable for the transuranic wastes.

25 Now, we did not make specific calculations in

1 the documents for the risk of transuranic waste only
2 repository.

3 The risks in fact are quite small when compared to
4 the high level waste inventory. Because when we look at the
5 ratio, you are talking perhaps about a few million curies
6 of transuranic waste that they see for a lifetime, for
7 example. So this ratio here might get to be a 3, 4, or 5,
8 whereas, for this ratio, even for one repository, typically
9 talking in 100,000 metric tons, so this ratio is 100 or
10 more. So the risks of transuranics are typically smaller,
11 just by the virtue of the inventories not being very
12 large in a relative sense.

13 What we have not done, because we do not have
14 nearly as good information for the waste forms for transuranic
15 wastes as we did for high-level wastes, we have not
16 done specific repository analysis for the high-level risks
17 of those.

18 MR. MOELLER: Frank.

19 MR. PARKER: That seems to imply that the hazard
20 from the 1,000 metric tons is equivalent to the hazard for
21 1 million curies of waste. How many curies of transuranics
22 are there in 1,000 metric tons?

23 MR. EGAN: It should be reasonably close to this
24 number. I have to go back and check. The intent was that
25 it would be approximately the same, and again, within

j-2-10 1 a factor of 4 and 5. We have decreased this denominator
2 a little bit at one point. It used to be 3 million curies,
3 and we looked at it, and we just rounded it down. We just
4 reduced that relatively fraction of retention, or changing
5 it a little bit.

6 The intent is that they are approximately the
7 same by a factor of 3 or 4.

8 MR. MOELLER: Let me ask if any members of the
9 subcommittee have further comments on these models that
10 will be used to determine compliance. Because I gathered
11 from our earlier meetings that you were concerned about
12 the validation of the models, and I gather from Dr. Egan that
13 he is not that concerned.

14 You know, I don't want to put words in your
15 mouth.

16 MR. EGAN: I would say validation, I think, a fair
17 amount of attention needs to be devoted to the models that
18 have been developed.

19 MR. MOELLER: But you believe that the attention is
20 being devoted to them?

21 MR. EGAN: Well, I think at the level of the
22 people who are developing the models, they are doing a very
23 good job in looking at that. What I personally have not seen --
24 I don't mean to say my vision is all that omnipotent -- is
25 I think we probably need to spend, we being the government, a

j-2-11 1 little more time looking at the Sandia model now that we've
2 got the standards, and assuring ourselves that in fact it is
3 reliable.

4 I think it is. But I have benefit of being the
5 director of that program now for six years.

6 MR. MOELLER: Thank you.

7 MR. PARKER: Maybe I can comment a little bit
8 on that. All the discussions referred to earlier are
9 public meetings. Their models are very simple generic models,
10 and so in some respects, it is very hard to quibble with
11 them, because they are very general and very, very simple.
12 And they don't pertain to any real site whatsoever, and as
13 the subcommittee has said many times, we don't like generic
14 models, and if we don't like generic models, we won't like
15 these models at all either.

16 I think there are some small quibbles about the
17 numbers that are used in those models. We are meeting on
18 those, and hopefully, those will be refined. But the key
19 question is, can we then take these generalized generic
20 models and use those to come up with the very specific
21 numbers that we see in table 1 and table 2.

22 I think, again, this has already been expressed in
23 the Science and Advisory Board, the meetings of the
24 subcommittee, and that is that there needs to be fairly good
25 escape clauses for the individual sites.

j-2-12

1 We are really only talking about one or two sites to
2 the end of the century. There needs to be good escape
3 clauses so that one shows what is actually going to take
4 place, as well as we can predict it; that one may want
5 some variance from these numbers, because the health
6 hazard may not be as severe as indicated.

7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1 MR. MOELLER: Thank you.

2 Carson.

3 MR. EGAN: I was going to make a comment here.
4 Not so much rebuttal, but this is perhaps a clarifying
5 remark of Dr. Parker.

6 He's quite right, our models draw a sharp
7 distinction between the models EPA has developed and the
8 models Sandia has developed for NRC. They are quite
9 different. Certainly for our models, they in fact are
10 very generic, only can be applied generically. I think
11 that is appropriate for what we were doing.

12 Sandia is developing site-specific models.
13 In fact, this can be applied to actual license application
14 sites. However, those models can then calculate numbers
15 that are entirely equivalent in form to those that we have
16 looked at for purposes of comparison. And my confidence
17 that the standards can be implimented is not based on using
18 our models for specific sites, which is not appropriate,
19 but on the Sandia/NRC developed models.

20 MR. MOELLER: That is helpful.

21 Carson.

22 MR. MARK: Two questions. This last point you
23 mentioned, does that mean that if the Sandia model is
24 applied to the site, and the site passes, that that
25 satisfies your requirements? That is, that you bless the

1 model as a way of doing this arithmetic and getting an
2 acceptable answer and things are okay?

3 MR. EGAN: I'll speak for myself as a
4 self-appointed surrogate for the NRC.

5 I think the Sandia models are quite good and
6 shows that the numbers are met and that that is in fact
7 an adequate finding.

8 I would encourage the NRC to look at the Sandia
9 model somewhat generically and somewhat bless it for its
10 use as a model, and then you can go further and talk about
11 what type of data you input to the model for a specific
12 site.

13 MR. MARK: My question is, there is a known way
14 of meeting the conditions, and we apply the Sandia model and
15 you are in.

16 MR. EGAN: As I said, yes.

17 MR. MARK: It is kind of important in these
18 regulations that there be such mechanism identified.

19 I'm unclear about that first term in the top
20 formula.

21 Is there a standard prescription for the
22 high level wastes from 1,000 metric tons of heavy metal
23 independent of the exposure to which the metal is given?

24 MR. EGAN: No. There has not been a rigorously
25 defined equivalent there. In a session I had with

1 with Bob Mordan recently, that may have some headaches.
2 It also crept in the Nuclear Waste Quality Act.

3 For commercial reactors, given a typical
4 variant, that is a pretty tight defined number.

5 MR. MARK: The difference between 20 and 40,000.

6 MR. EGAN: Right. We look at defense wastes
7 which will tend to run factors of two or three or four
8 before that, which would tend to make the standards
9 somewhat less stringent in the equivalent amount of
10 defense curies, say, Strontium or Cesium, we are
11 not uncomfortable with that, within accuracy of all that.

12 I don't get too concerned about factors of four
13 or five in this whole exercise.

14 MR. MARK: Then you have a nominal quantity for
15 that denominator on the left based on 30,000 --

16 MR. EGAN: We have one that we use
17 analytically. It is in the part of our standards.

18 This is an interesting split of responsibilities
19 between us and other particular agencies. We don't have the
20 job, as I see it, to particularly define what that number
21 is; but I think you can fairly straightforwardly define one
22 that will work adequately for any fuel cycle we use now.

23 MR. MARK: That is a bit of homework where the
24 NRC has some options.

25 MR. EGAN: Occasionally we leave exercises for

1 the interested agency to do.

2 MR. MARK: It is really 20,000, but they say they
3 want 100,000 megatons, and then you can pass a lot of
4 stuff.

5 MR. EGAN: The point is well made. Again, we
6 looked at LWR's and defense reactors are run at somewhat
7 less.

8 One of the things that -- it is problematic,
9 let's say, the breeder situation, which has much higher
10 burns, that would tend to make the facility rather more
11 stringent. I'm not at all convinced they are unmeetable.

12 MR. MOELLER: Personally, I appreciate the
13 philosophy that this represented. In other words, you
14 are readily acknowledging that these aren't that precise,
15 and a factor of 2 isn't all that important.

16 Dick.

17 MR. FOSTER: Yes. I'm still having a little
18 difficulty trying to fit these individual models and the
19 individual pieces into a bigger picture. The same question
20 asked a little bit ago.

21 Somewhere along the line you must be aiming
22 toward some acceptable health-risk situation, and to me,
23 if we saw the big picture first and then worked down to
24 this, why, it would make more sense than starting with
25 the small pieces without seeing the big picture.

1 MR. STEINDLER: I assume that the amount of
 2 content of a ton of waste has been calculated in the sense
 3 that you have had to do some kind of estimates in order to
 4 get the table 2. That then represents almost by
 5 definition your reference case?

6 MR. EGAN: For our use, yes.

7 MR. STEINDLER: And one could scale it if
 8 necessary, but I think that would fall inside the error
 9 band, so it probably really isn't a useful exercise.

10 MR. EGAN: This type of accounting system,
 11 which is literally what it is, has occasionally been
 12 criticized by some folks within the department to see
 13 some of the same types of problems that we see here.
 14 My standard challenge to them has been, okay, give me a
 15 better one. So far, that has not been forthcoming.
 16 In fact, Bob Morgan, I encouraged him to do the same.
 17 To me, it was important to build the concept in that the
 18 release limits for a particular repository should be
 19 sensitive to how much is in there.

20 I personally don't see a health and safety
 21 reason to have a repository, ten repositories of size X,
 22 versus one repository of size 10X.

23 MR. MOELLER: Go ahead.

24 MR. EGAN: I am proceeding, hopefully, to
 25 Dr. Foster's bigger picture.

1 A brief word on why we chose 10,000 years, which
2 occasionally gets comment. Obviously it is not an
3 unequivocal scientific definition of why this is the only
4 number that is right. There are two broad considerations
5 we used in developing it.

6 First of all, we found when we did our analyses,
7 we had to go to 10,000 years as opposed to 1,000 years or
8 a shorter period of time, because the analyses would not
9 show much less than 10,000 years the effect of releases
10 through groundwater pathways, or put more directly, we
11 couldn't tell a good site from a bad site when we judged
12 compliance only against limits extending to 1,000 years.

13 On the other hand, if you go much beyond 10,000
14 years, you are getting to a different type of geological
15 period. Your predictive problem gets longer
16 and harder, the longer you go. Obviously, I can't
17 tell you 10,000 is preferable to 9,000 or 11,000. I argue
18 it is clearly preferable to 1,000. It is those two
19 trade-offs that led us to pick that number.

20 Interestingly enough, there are relatively
21 few people who are criticizing the number as being too long.
22 We occasionally get people who criticize it as being too
23 short.

24 This is certainly an issue that we should look
25 at in the public comment period.

1 MR. MOELLER: Well, now, in terms of the DOE
2 Guidelines and the NRC criteria, which are, as I recall,
3 all based on a 1,000-year value --

4 MR. EGAN: Waste package.

5 MR. MOELLER: Don't they say 1,000-year travel time?

6 MR. EGAN: Yes.

7 MR. MOELLER: Then are they in compliance with
8 your standard?

9 MR. EGAN: Both of them say right up front that
10 our standards are the basis for overall compliance out to
11 10,000 years. They are not inconsistent, because I would
12 argue that even if you have only a 1,000-year waste
13 cannister and a 1,000-year groundwater travel time, you
14 still have lots of room for additional protection from the
15 geochemical characteristics of the site which will make
16 the radionuclides move much more slowly.

17 In our opinion, that is one of the most important
18 factors that has to be considered in the site.

19 MR. MOELLER: But in their guidelines, in the
20 DOE Guidelines, somewhere they should talk about 10,000
21 years, should they not?

22 MR. EGAN: And they do, I believe.

23 MR. MOELLER: I missed it.

24 MR. EGAN: In several places they do talk about
25 10,000 years, both in the context of describing our

1 standards, and also in the context of siting as a favorable
2 condition of groundwater travel time that would be greater
3 than 10,000 years, therefore ruling out the whole
4 groundwater pathway.

5 MR. MOELLER: Yes. In terms of acceptable and
6 unacceptable.

7 MR. EGAN: It is not necessary to say that a site
8 would have to have a 10,000-year groundwater travel time to
9 comply, because lots of other things come into the
10 calculation.

11 MR. MOELLER: Right. But the bottom line, in a
12 sense, to comply with your standards, is the 10,000-year
13 figure.

14 MR. EGAN: Right.

15 MR. MOELLER: Okay.

16 MR. PHILBRICK: Do you know how long 10,000 years
17 is? Can you put your hands on it, to realize what you
18 are talking about? That is just a little bit shorter than
19 the time necessary for Niagara Falls to retreat from the
20 cliff at Ontario to its present location. This is just a
21 hell of a long time. I think this is a little ridiculous
22 to talk about 10,000 years.

23 MR. EGAN: Let me perhaps get the benefit of
24 your judgment. We are running a little longer than I
25 anticipated, and the next part of the package we talk about

1 the qualitative assurance requirements. That typically
2 takes me about five or ten minutes to run through. I'll
3 be glad to do that if you like, or if you want me to get on
4 with the question of how we derived the numerical
5 containment requirements, I could do that as well.

6 MR. MOELLER: Why don't you pass over it for the
7 moment, and then if we have time we will come back.

8 MR. EGAN: Okay.

9 Let me enter a period now where we talk about
10 four categories of issues, and I'll touch upon one before
11 I get to the system they used. These are four categories
12 of issues that we specifically have sought comment on in
13 our Federal Register notice. These are things we think are
14 of particular policy importance.

15 The first concerns our definition of high level
16 waste. What we did in that definition is took the
17 relatively standard definition of spent fuel and literally
18 copied it from the NRC regulations, and added an additional
19 condition.

20 What the additional condition is, is that given
21 that, you are dealing with ways for the spent fuel or
22 derivatives thereof, this standard applies to those wastes
23 only if they also exceed the concentrations indicated
24 in table 1 of the standards.

25 Now, the table concentrations are expressed

1 per gram, rather than volume, and are essentially equivalent
2 to the ones listed in 10 CFR Part 61, for the allowable
3 acceptable shallow land burial sites.

4 The Defense Department were concerned that
5 there were waste streams, that in fact had relatively low
6 levels of radioactivity, but if one took a very severe
7 interpretation of what first cycle ramping or its
8 derivatives would comply would have to be disposed of by
9 these regulations.

10 We thought they in fact had quite a fair point.
11 So we are proposing to set this definition which would
12 not make those waste forms subject to these standards,
13 those things that are below these concentrations if they
14 are reprocessing wastes.

15 This does not apply to a couple of things.

16 This table does not mean that any radioactive
17 material above these concentration limits is covered by the
18 standards. It only means that spent fuel, or first cycle
19 derivatives are covered by these standards. There are some
20 categories of waste, radium needles, something we get
21 into all the time. Those clearly have concentrations above
22 these numbers. They have to exceed these tables. That is
23 one of the issues we particularly are receiving public
24 comment on.

25

1 MR. PARKER: Does that mean -- you say the
2 ion exchange resins from Three Mile Island which can
3 be pretty warm, would they be excluded from this?

4 MR. EGAN: In my thinking, those things do not
5 come under our definition of high level wastes as we have
6 not proposed it. Because there are cases like that,
7 I'm concerned whether we should look to see whether we
8 should extend that to include those things. But now they
9 are not in the definition.

10 MR. STEINDLER: First off, the "and" that you
11 referred to in the regulation is buried deep enough
12 so that on two readings -- I missed it.

13 Secondly, it isn't clear to me that the
14 rationale is based on a risk. At least it wasn't obvious
15 that that was the rationale.

16 MR. EGAN: Only implicitly in that we see
17 in Part 61 that it defines wastes in shallow land
18 that is acceptable. Therefore, we are saying things that
19 could be so disposed of would be disposed of some other
20 way than this.

21
22
23
24
25

1-4-1

1 MR. STEINDLER: The label "First Cycle"
2 is not a risk-related, it is a process-related issue.
3 As a consequence, the only issue is concentration
4 fission products. But you exclude wastes with higher than
5 table 1 concentrations by the "and," and thereby include
6 potentially at least waste pots, or streams, or
7 samples that have a significant amount of activity, but are
8 excluded only because they don't match the source from
9 which they come.

10 That is not a risk-related issue, and I'm
11 wondering whether you could justify that.

12 MR. EGAN: I will say we started off largely with
13 a mandate to look at a waste from a process, i.e., high-level
14 waste, and the waste definitions for a long time had
15 been oriented more towards process and concentrations.

16 I think it is true that ultimately we should get to
17 wastes that are risk-related, not process-related. I had
18 enough dragons to slay, as it was, and I decided to keep
19 on the ones I had. That is a particularly tough job.

20 The NRC spent quite a lot of time of charging at
21 that windmill of trying to develop risk-related waste
22 concentrations. So some extent they have, to some extent
23 they haven't. But we did not devote much time to it.

24 MR. THOMPSON: You guys are 90 percent there. This
25 would simply eliminate the definition portion of it that

j-4-2
1 relates to process, to be sure you would catch flack,
2 and I can think of a half a dozen people who would jump all
3 over you. But the issue of getting the rationale put
4 together seems to me is almost done.

5 MR. MOELLER: I guess I need some clarification. I'm
6 listening. I do hear you saying that you are basing your
7 definition upon the source, or a key factor in the definition
8 is the source. But why doesn't this table say in the
9 right-hand column "Concentration greater than this"?

10 MR. EGAN: There is a footnote that says that.

11 MR. MOELLER: Okay. A footnote says that.

12 MR. EGAN: Perhaps I should have been more
13 explicit about it.

14 MR. MOELLER: Say the waste has 7 times 10 to the minus
15 6 of C-14, what is it, what do I call it?

16 MR. EGAN: This table works in the ratio formula
17 as well.

18 MR. MOELLER: All right. There is nothing else. Then
19 what is it called?

20 MR. EGAN: It is not subject to this regulation,
21 is all I say at this point. I haven't presumed to give it a
22 label.

23 MR. MOELLER: Okay.

24 MR. MARK: Could you help me understand that
25 number on that table for plutonium-241? It is a beta emitter

j-4-3
1 of a fairly short half-life, like 14 years.

2 MR. EGAN: Right.

3 MR. MARK: Or something like that.

4 MR. EGAN: Yes, that is correct. 3 times 10 to the
5 minus 6 is the number here.

6 MR. MARK: That is a lower number than for the
7 beta emitter Carbon-14, which is for 5,000 years. There
8 are, of course, alpha-emitting daughters. But when is
9 that to be measured, when the waste is fresh, or buried, or
10 at 10,000 years?

11 MR. EGAN: I would argue that you measure it when
12 you are talking about disposing of the material for compliance
13 with our standard. As to the relative numbers, I'm
14 actually in the position of having to defer to the NRC
15 Staff, because here we literally copied these numbers from
16 part 61. I frankly have not spent a lot of time looking
17 at the relative numbers.

18 MR. MARK: It is appropriate for part 61 for shallow
19 burial, where it has rained --

20 MR. EGAN: These are limits that define things that
21 have to meet our standards. In some extent you read it has
22 to be geologically disposed of, essentially drawing the
23 line between two types of disposal.

24 MR. MARK: I guess that was the question. That
25 seems like a very strange number for high-level wastes, whether

1-4-4 1 it allows it to be classified as that, or free of that, and
2 it should be the same number as for shallow burial. Because
3 you are not talking 10,000 years. You are talking of
4 10 years.

5 MR. EGAN: If these are numbers that are used to say
6 wastes greater than this cannot go in shallow burial,
7 which is my understanding of part 61, then I'm saying, okay,
8 I will make my standard then apply to those wastes. And
9 they should be disposed of.

10 The only rationale I see that would say there
11 is a logical error there is one presumes there is some
12 disposal method intermediate between geologic disposal
13 and shallow land, which some people will have proposed.

14 We have not chosen to assume that will occur at
15 this point.

16 What I'm saying, everything that part 61 says can't
17 go in shallow land, from this particular process, is subject
18 to this regulation. That is how the table is effectively
19 used.

20 MR. THOMPSON: That is not quite true. You've got
21 to put that "and" in there.

22 MR. EGAN: Subject to your condition, that's correct.
23 If you are only looking at this source or process of
24 wastes, that is true.

25 MR. MOELLER: This raises a question in my mind.

j-4-5
1 We talked in the guides and standards and so forth about
2 the site where this material is disposed, and clearly marking
3 it to try to avoid inadvertent human intrusion at a later
4 time.

5 Where are we writing down for posterity all of
6 this thinking so that 10,000 years from now, someone can look
7 up the rationale that we used and say, well is it good
8 today?

9 MR. EGAN: In the Public Document Room.

10 MR. MOELLER: PEC.

11 Martin.

12 MR. STEINDLER: I don't want to belabor this point.

13 As you know, Cesium and Strontium are removed from
14 high-level waste and separately encapsulated. Their
15 source is high-level waste. If I have a pot of Cesium which
16 contains 10 to the minus 2 curies per gram of wastes, whose
17 source is through the operations of that Cesium isolation,
18 would you consider that to be high-level wastes subject to
19 your regulation?

20 MR. EGAN: It is above this number?

21 MR. STEINDLER: Yes.

22 MR. EGAN: I would say it certainly would be.

23 Now, again, the interesting thing about trying to plan any
24 quantitative system is, you immediately find people have
25 ways around it. If you start fractionating waste, you could

-4-6 1 in fact take the wastes from, say, a particular batch of
2 reprocessed waste and fractionate it among particular waste
3 streams. This is relevant if you are serious about
4 beneficial use of these things, which some people are,
5 and you could dilute it, and then the accounting system could
6 become somewhat complicated.

7 I don't have an answer to that. The concern I have
8 is that anytime you set specific numbers like this, there
9 are all kinds of waste to play with the system. To me, any
10 particular item that is above the concentration limit that is
11 from that source to me is clearly included in the definition.

12 I have some concern about other problems with the
13 accounting system.

14 MR. STEINDLER: One of the things this
15 methodology does, unfortunately, it precludes the greater
16 confinement possibility if you once omit the "and" factor
17 that relates to the process. You simply don't allow for
18 greater comments.

19 MR. EGAN: Several of the comments you made, I would
20 encourage you to get into your rule-making. I would certainly
21 encourage you to give us that type of comment in
22 the rule. Certainly something like this, we propose that we
23 are certainly open and in fact are very much seeking
24 suggestion on better ways or things that might have
25 been properly excluded or included by the concept.

j-4-7
1 So I would certainly encourage you to document
2 that if you could. Our prospective was that the greater
3 confinement systems that people have talked about, there
4 hasn't been much progress in implementing those things that
5 I have seen, which is why I personally shied away from
6 placing too much reliance on the concept.

7 MR. STEINDLER: Yes. You can avoid that, what I
8 would call probalematic deficiency, by half a dozen
9 things, including budgets, et cetera, by going back to the
10 fundamentals of your risk analysis.

11 MR. MARK: These numbers identify high-level wastes,
12 and I think you just said they were copied from part 61.

13 MR. EGAN: The units were changed, but they were
14 essentially equivalent.

15 MR. MARK: If someone should discover that part 61
16 had had a typo in it, a mental typo, or physical typo --

17 MR. EGAN: Which we have a few of them ourselves.

18 MR. MARK: -- would that then immediately be carried
19 across to a recipe of this sort?

20 MR. EGAN: Certainly, from the logic of the way we
21 developed it, yes, it should be.

22 MR. MOELLER: Go ahead, Dan.

23 MR. EGAN: All right. My second and much longest, in
24 terms of things I want to talk about, issue, how we define the
25 level of potential on which we base the standards, and I

1 hope to get to Dr. Foster's question.

2 Our decision system considered two conceptual
3 processes relying on neither one exclusively. First, we spent
4 a great deal of time projecting the capabilities of disposal
5 technology to reduce waste over this period of time. As
6 I will describe in several charts later, we looked at a
7 wide variety of combinations of repositories, canisters,
8 waste forms, and the like, albeit with relatively simple
9 models as Dr. Parker described.

10 We tried generally to overestimate the risks
11 given the other parameters we looked at. I would argue that
12 our generic models are also conservative. We are trying to
13 upper-bound things within reasonable scopes.

14

15

16

17

18

19

20

21

22

23

24

25

-5-1

1 Having done that, as an interim process, we also
2 looked at other types of benchmarks for radiation exposure
3 that we might use to try to judge whether a particular
4 level of risk was or was not acceptable. From that process,
5 in allowing for the uncertainties, in talking about
6 this 10,000-year period of analysis, we then picked the
7 number that we picked.

8 We used neither one of these exclusively. Certainly,
9 we did not say that we depict the release limits which
10 will force the best possible technology as we see it.

11 I would argue we are orders of magnitude
12 away from that. Most of the analyses I've seen indicate,
13 because of our conservatism and because of technologies
14 that we didn't assume, that in fact waste disposal limits
15 can do much better than the release limits we specified.

16 Therefore, one could argue on a technological
17 basis, this number could be considerably lower. We did not, on
18 the other hand, try to set the standards strictly on the
19 acceptability of risks to society independent of what was
20 technologically achievable. We did not say that the
21 benefits of nuclear power or defense justify such and
22 such as a risk to future generations, try to set the
23 standards on that consideration only.

24 We did not try to look at it and say the risks
25 from chemical waste disposal always, if there is this waste,

-5-2 1 point 1 should be justifiable from nuclear waste.

2 There are no rules that are always accepted by
3 anybody. It is a controversial area. We did not see
4 the use of trying to chart that course here. What we
5 ultimately did, as you know from looking at the Federal
6 Register, we looked at the risk from many other modes
7 that would generate the risks that are in the repository,
8 that we could easily limit the risks to the factor that it
9 would be not greater than the ore that would have been mined
10 in the first place.

11 We also adjudged that this risk was very small. It
12 is this very iteration that we picked the number we
13 got. But it is not the unique determination of either.
14 Technology says you can do considerably better than we
15 chose. I certainly think in philosophical reasons, you could
16 argue that the risks could be somewhat higher and still
17 be acceptable. I don't think one has to make either of
18 those findings to come up with the policy that is useful
19 for high-level waste disposal.

20 Just to walk you quickly through. This is the
21 process we use, and you've got this in your charts, and I
22 won't dwell on it, other than to point out we select the
23 level of risks to base the standards on that, for
24 repository of 100,000 heavy tons of heavy metal, plus most
25 of the waste generated by current operating plants, over a

-5-3

1 10,000-year period would cause an increase in premature
2 cancer deaths of 1,000, i.e., an average of one-tenth
3 of an extra death per year for disposal of high-level
4 waste generated from that much spent fuel.

5 MR. MOELLER: Dan, in your standards, you stated
6 that your estimates of the number of health effects are the
7 unmined uranium ore would be between 300 and a million?

8 MR. EGAN: Right.

9 MR. MOELLER: Why did you choose 1,000?

10 MR. EGAN: We chose 1,000, A, again from the chart I
11 show, they appeared achievable, and B, it was at the
12 end of that rather wide range.

13 MR. MOELLER: But since it was at the bottom end,
14 it makes it very nonconservative.

15 MR. EGAN: It is conservative in the sense of saying
16 that the risks from the ore body would be at least as
17 great or greater than the risk from high-level wastes.

18 MR. MOELLER: Okay. Yes. In that sense, it is.

19 MR. EGAN: There is a fair amount of concentration
20 in that ore body, because the low end is a theoretical
21 analysis. The high end is based on some data measured
22 around the uranium mines.

23 MR. MOELLER: Okay. And by choosing -- all right.
24 I understand.

25 MR. EGAN: We are essentially saying that within

1 the range of slop of the ore body analysis, it appears we
2 are still below that risk level in terms of a benchmark.

3 MR. STEINDLER: Before you leave that, that calculates
4 out, according to my estimates, two-thousandth percent of
5 background.

6 MR. EGAN: It becomes a question of what you
7 average.

8 MR. STEINDLER: I'm taking your number. Somebody
9 here at the table pointed out you get by living one foot
10 higher than you do now. That strikes some people
11 as being horrendously conservative.

12 MR. EGAN: You have to be a little careful when you
13 start averaging those things. I don't remember that
14 particular number, but people who have done this have come
15 up with a number of average risks to individuals based on the
16 U.S. population, that number of health effects, and spread
17 it over the population, and that gets to be a small number.

18 On the other hand, it obviously gets larger and larger
19 the closer and closer you draw the net as to who you
20 average over. I think it is probably unreasonable to
21 assume that the releases from a high-level waste
22 repository will in fact find their way in the bodies of
23 people from the Pacific to the Atlantic.

24 Certainly, as you draw that risk group tighter,
25 that you choose to play that little game, the number gets

j-5-5
1 considerably higher, to the point that if you look at
2 people in the vicinity of the repository, you might be
3 trying to use the groundwater, say, 4,000 or 5,000, 6,000
4 years in the future, those people get nice doses if
5 they are not careful.

6 So it is a problematic question of how you
7 average that individual exposure. Under average individual
8 exposures, if you pick your average body large enough, you
9 get very small exposure. However, most exposures
10 are based on maximum exposure. Therein lies a much tougher
11 problem, and a much tougher problem in relative
12 comparison as well.

13 MR. STEINDLER: You didn't do that for obvious
14 reasons.

15 MR. EGAN: For a number of reasons. People sometimes
16 argue, why don't you set it at 5 or 10 millirems, and
17 I would argue there are some very difficult and practical
18 problems in doing that just because of the nature of the
19 activity.

20 At the same time, I will not argue that we haven't
21 set quite conservative and stringent standards. I believe
22 we have. That becomes ultimately more of a social and
23 political judgment than technical.

24 Let me give you some background in the analysis
25 before I show you some results.

1 We did an extensive study to look at a whole
 2 variety of things that might go wrong with the repository.

3 We then screened that to look at a smaller subset of
 4 events that in fact captured the most significant
 5 chances of harm from that list.

6 It turned out from our analyses that only two of
 7 those ever contribute significantly to a risk from a
 8 particular repository. One is normal groundwater flow, which
 9 is not present in salt repositories, but certainly exists
 10 for hard rock repositories, and dominant is almost all
 11 cases where you have already picked a good site, is risk
 12 from inadvertent human intrusion by drilling.

13 Faulting shows the next event of some interest.
 14 The relative risks are much, much smaller than the other
 15 two.

16 To give you a feel for those bars, here is what we
 17 call our reference case for bedded salt. The solid bars
 18 are the consequences per event. The cross-hatched bars
 19 are the probabilities times the consequences, or the
 20 frequency, if you will, for that category.

21 These are health effects over 10,000 years on a
 22 logarithmic scale.

23 For salt, we have no groundwater flow paths so we get
 24 no risk. Dominant in this situation is the risk from
 25 human intrusion, not because each event causes so much health

1 effects, in fact, less than one, but because we
2 assume for the purpose of our analysis that after 100 years
3 you reverted to average historical rates of drilling
4 intrusion, which I'm sure would be overconvservative,
5 and you have many intrusions, on the order of 200 over the
6 10,000-year period, each bringing out a little bit of waste
7 to the surface as it goes. So you get a risk of about
8 200 health effects over the 20,000 years.

9 The accidental events have high consequences if they
10 occur, but the frequency is such that on a risk basis, they
11 are trivial as compared to the other.

12 This is the case of granite. You now have a normal
13 groundwater pathway that contributes a few tenths of health
14 effects over the period of 10,000 years.

15 Again, your human intrusion of risk still dominates.
16 The consequences are larger because we assume there is
17 more water in the repository susceptible to being brought
18 to the surface. Therefore, that is why the total risks are
19 larger for this case.

20 Again, the accidental events are trivial.

21 I don't have a chart here for the salt situation
22 that we modeled, which was much wetter than this, but
23 in that case, both the normal groundwater flow and the human
24 intrusion are somewhat higher. The fraction of the total
25 risk that was due to normal groundwater flow was considerably

1 higher for the salt case than for the granite case.

2 MR. MOELLER: Can I total the risk for each of these
3 charts, you know, for each type of repository material,
4 and then pick out the best material?

5 MR. EGAN: On a generic basis, you could. This is
6 where we get back to Dr. Parker's comments about the
7 generic models being useful, certainly not being useful
8 for that. Because specific sites are going to vary so
9 much.

10 There are lots of cases where you could find a salt
11 site that was better than a particular salt site. I
12 would argue these are very rough screening tools that make you
13 ask basic questions. When I look at the salt versus granite
14 versus salt numbers, I asked the basic question, why is
15 there so much difference.

16 I think there is a good reason. In the case of
17 the salt situation, you have the salt flows with intervening
18 aquifers, and you have much more water in that system,
19 which our generic models picked up.

20 The granite system, we assume there is no
21 underlying aquifer. I think that is the question we should
22 ask. Beyond that, I don't think you can fairly go.

23 I would not even conceive of somebody trying to use
24 this type of calculation to discriminate, say, between a
25 paradox basin, and the Nevada test site, for example. That

1 is not the proper use of generic models.

2 I think the Sandia model can be used for that.

3 MR. MOELLER: Mr. Steindler.

4 MR. PHILBRICK: If the gremlin is on the outcrop,
5 which is the only reason for recognizing for the stuff
6 being there, what earthly reason would you have for going
7 into granite?

8 MR. EGAN: Why would somebody intrude into granite,
9 is what you are asking?

10 MR. PHILBRICK: Yes. I've seen a guy some couple of
11 hundred feet in granite on a crosscut, all by himself with
12 a single jack and a capdell.

13 That is the only person I ever saw or ever
14 heard of went into barren granite looking for something.
15 So I think your human intrusion number there is out of line.

16 Let me take the next question. If we are talking
17 about volcanics, the granite is a pluton that was formed
18 at depth at essentially the same time that there was
19 volcanic activity. The odds, then, of finding volcanic
20 activity in association with exposed granite looks to me like
21 they are pretty low. You can talk to George about that, and
22 get a better answer. But it seems to me that your
23 consequences or your risks are overloaded on the human
24 intrusion when you are dealing with granite.

25 As far as the volcanic chances are concerned, they

1 are also overloaded.

2 MR. EGAN: I'm just making some notes of what you are
3 saying.

4 MR. MOELLER: George, to help us on that, is volcanic
5 activity more common in certain formations?

6 MR. THOMPSON: I have to say, I think in deference
7 to Carson's earlier comment, that if one is looking at the
8 long past history, then Shayler is quite right, but in
9 looking at granite, you are looking at an indication of
10 volcanic activity that has happened a long time in the
11 past.

12 On the other hand, if you have an entire new
13 cycle of geologic activity, certainly volcanoes can intrude
14 into granite areas. But I'm deeply troubled by the
15 attempt to assess these risks quantitatively in a
16 generic sense, and I was comforted somewhat by your emphasis
17 on the site-specific character of these things.

18 I think it would be really a great
19 mistake to attach much significance in a general way to the
20 relative risk, between, say, a granite site and a salt
21 site.

22 MR. EGAN: Let me come to a point I think we did
23 attach some significance to, and Dr. Philbrick's comments,
24 I think, are relevant. We did attach a feeling that, if
25 anything with this generic analysis, we have overestimated

j-5-11
1 the risks.

2 There were assumptions about the numbers and the
3 like, and here we figured that we were probably conservative,
4 that the risks we calculated here in fact could be much lower
5 at a reasonable site, and using perhaps more reasonable
6 models. That is consistent with the analysis,
7 which was to assess how achievable a particular level
8 of risk was, i.e., if Dr. Philbrick is in fact right, and
9 I don't particularly dispute it, let's say these risks are
10 an order of magnitude or more overestimated, then the
11 total risk over 10,000 years from this granite repository
12 have been overstated, and in fact, at a reasonable site, you
13 could achieve risks of an order of magnitude lower.

14 That is consistent with our intent in the
15 rule-making which was determined that it was reasonably
16 achievable to meet the risk levels in terms of the curies
17 release level we assessed.

18 If your feeling is that these risks are grossly
19 underestimated, then we have a logical problem with the
20 whole process of our rule-making. So I would encourage your
21 review of these, the comment that I perhaps cavalierly
22 or irresponsibly, the overestimated risk certainly is
23 something to talk about. It does not invalidate the logic of
24 how we picked our numbers.

25 The other side of the coin does. If we grossly

j-5-12

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25

underestimated it, then we have a logical problem.

1 MR. FOSTER: At least your consequences here
2 are associated with a number of people involved.

3 Did you assume the same population density
4 around all these different things?

5 MR. EAGN: These are for all practical
6 purposes the smeared population based on average
7 populations.

8 They are actually fairly close.

9 MR. FOSTER: What did you do about distances
10 for these various kinds of events? Since you are using
11 the smeared population, are you using a much larger area
12 for the consequences of a volcano than you are, say,
13 for breccia pipes?

14 MR. EGAN: Essentially, yes. This is not the
15 easiest thing to explain. You basically use up date passages
16 of various pathways.

17 By doing this, you capture the macro effects of
18 a volcano as opposed to a release to a river. This applies
19 only to a small subset of people.

20 But I would argue that that is all considered
21 in the model. But if you want to get into the details
22 of that, we could get into that later and do the pathway
23 work.

24 I'm not an expert to talk about that.

25 MR. FOSTER: I'm just trying to get a feel at

1 this point for whether these things are in my ball park,
2 or whether they are way out of my ball park.

3 You've got the scale on the left-hand side.
4 What are the units particularly in terms of time?

5 MR. EGAN: These are total health effects over
6 the 10,000-year period that we looked at.

7 MR. FOSTER: 10,000-year period.

8 MR. MOELLER: Frank.

9 MR. PARKER: I think that is a good explanation,
10 but I think the whole thing that comes to my mind and that
11 we have emphasized around the table a number of times
12 are, NCR-43 cautioned against making these kinds of
13 calculations because it may cause us to do things that are
14 more hazardous than we would have done had there been more
15 realistical calculations.

16 Here Dan is quite correct. It would be less
17 if they were drawn in the opposite direction. Is there
18 also a danger of being too conservative, which may force
19 us to take other actions that themselves are more
20 hazardous?

21 I just want to make one other comment on the
22 granite. If my memory serves me correctly, in the more
23 euphoric days of nuclear energy, they talked about burning
24 the granite in New Hampshire for the uranium content,
25 and that is how we were going to get more power.

1 MR. PHILBRICK: I'm talking about -- if you are
2 going to locate this thing in some place in which you
3 don't have any mineral of any present consequence or
4 future consequence. That is not the condition you are
5 talking about.

6 My remarks deal with a situation in which you
7 would put in a repository. There would be nothing on the
8 surface that showed any value.

9 So, then the next man coming along in a few
10 thousand years is going to find the same kind of situation
11 with no value on the surface, and he's not going to waste
12 his time going into it, if he's got any sense.

13 MR. MARK: Shayler, if that granite retreats
14 as far as Niagara Falls, he may not cover the Comstock
15 lode down there.

16 MR. MOELLER: Go ahead, Dan.

17 MR. EGAN: These graphs actually are some of
18 the ones we showed the last time I was here, so they are
19 relatively old slides. But this again is health effects
20 over 10,000 years, and you can look at the effects of
21 various parts of the system.

22 In this case, looking at canister life. This is
23 canister life in years. What this tells us is that for
24 canister life for two of the media for salt and granite,
25 there is not very much effect, certainly in terms of the

1 proposed standard level that we drew.

2 Again, you can see the salt media that we use
3 generically, which is far below the 1,000. The granite,
4 depending on the canister life, can be as far below or
5 approximately equal to. It is only in the salt case we
6 have a relatively wet media, that the canister has, I would
7 argue, a more enhanced effect of the long-term risk.

8 That gives you a feeling of the scale from zero
9 to 4,000 where canisters might be effective in reducing
10 or not reducing repository risk.

11 Let's look at another waste form now. Again
12 from zero to 7,000, now the waste form release rate
13 parts per year, again for the salt situation, because you
14 have very little water in that media, no imperceptible
15 move in the curve over the waste forms.

16 For granite you start to see more of an effect
17 such that there is a waste forming again in this
18 generic model that is needed to meet the standards, and
19 the salt reacts much more than the life curve.

20 We had assumed for the baseline purpose of our
21 calculation a release rate of 10 to the minus 4. One can
22 compare that, of course, to the Part 60 requirement of
23 10 to the minus 5, which says that in these three generic
24 settings any one of the three meets those limits, we
25 want to point out.

1 The point I want to make is that we now talk
2 about changing only obviously two of the media, granite and
3 bedded salt, for health risks, and the geochemical
4 factors of the site. My scale is compressed, again,
5 from zero to 11,000, and now for the bedded salt case, which
6 you recall the engineer controls, if you assume there
7 are no solubility limits in that calculation, you can
8 now get further dramatic increases in the risk up to about
9 9 or 10,000.

10 In the case of granite, which again was
11 relatively stable in these other graphs, you can get up
12 to 35,000 if you assume there is no geochemical
13 retardation in the surrounding aquifers.

14 The very rough point we draw from all this is
15 that the big swings in long-term risks come from the
16 geological and geochemical factors surrounding a site
17 more than the engineer controls, and within the engineering
18 controls, the waste form affects things more than the
19 canister. This is one of the -- for a qualitative sense
20 that is probably as strong a conclusion as you can draw;
21 but this is the basis why we at EPA have always argued that
22 the focus needs to be on good site selection and careful
23 examination of particular factors of the site, perhaps more
24 so than waste form or canister, particularly the canister.
25 And we consistently argue to the Commission that while we

1 support the approach they took in Part 6, where they set
2 separate numerical parts, we felt they should push on the
3 geologic side more than they did to examine that part
4 of the process. And perhaps we are overconservative on
5 the canister lifetime, which is a statement we made last
6 year. That is the kind of qualitative thing that came
7 out of this.

8 MR. MOELLER: Again, Dan, that, as I interpret
9 it, is what was emphasized, these very points were
10 emphasized in the Waste Policy Act.

11 MR. EGAN: Certainly the focus on geology and
12 its importance was clearly emphasized. They also
13 emphasized the multibarrier approach. We again agree with
14 that. We think the approach in Part 60 was right. We
15 just felt it should be pushed more to the geologic side and
16 perhaps had been a bit too demanding on the canister,
17 the particular number that was used for the canister.

18 Now, to kind of top off the chart, the other
19 side of that system: The only point I talk about here is
20 the ore body risks from the ore that would be used to
21 make the waste in this generic model if the repository
22 varied from a range of 300 to over a million excess deaths
23 over 10,000 years. With that thousand health effect
24 limit that we choose, it sits right at the lower end of
25 this range, again justifying the argument the risks to

1 future generations of the repositories would be less, or
2 at worst approximately equal to the high level ore as in
3 the beginning.

4 MR. MARK: This is based on a flat population
5 distribution, and using the same techniques?

6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1 MR. EGAN: Using the same pathway model, so
2 the relative calculation is the same. We did essentially
3 look at ore bodies that are pretty equivalent to the type
4 of ore bodies that are found here which are somewhat
5 different than, say, worldwide uranium ore. Our ore
6 bodies tend to be more in aquifer sandstone.

7 MR. MOELLER: And for the uranium ore you
8 considered external dose rates and ingestion and
9 inhalation?

10 MR. EGAN: Uranium ore, we only looked at
11 ingestion of Uranium-226. There may be other pathways,
12 but that just increases this range and again supports my
13 philosophical conclusion, if you will, that the high level
14 waste, which we looked at a whole variety of pathways, the
15 risks are in fact less than that range.

16 I think Uranium-226 essentially dominates the
17 ore body. But we do not look at a full complement of
18 pathways in the ore body.

19 MR. MOELLER: You did not consider the external
20 whole body dose which is, say, in the Colorado Plateau
21 area?

22 MR. EGAN: No, we did not, for the ore body.

23 MR. MARK: Does this include a guess about
24 the uranium in the Florida phosphate rock?

25 MR. EGAN: I think not, but let me check.

1 MR. MARK: It is really focused on the Colorado
2 Plateau?

3 MR. EGAN: Yes. The gentleman that did the
4 analysis looked at several ore bodies of the type that are
5 currently being mined, and it was primarily in the
6 western states.

7 It is in one of the reports that we have.

8 MR. MOELLER: And for the repository, you just
9 said you considered all pathways.

10 MR. EGAN: For the repository, we considered
11 food pathways, external, internal, and the like. That is
12 again documented to some great extent in one of the reports
13 that I refer to at the end.

14 MR. PHILBRICK: Dave, what does excess mean?
15 Excess over what?

16 MR. EGAN: Excess means --

17 MR. PHILBRICK: That they didn't have the ore
18 body?

19 MR. EGAN: Excess means cancer deaths that would
20 not have been caused at that particular time, premature
21 cancer deaths caused by radionuclides.

22 MR. PHILBRICK: The ore body wasn't there?

23 MR. EGAN: That's correct.

24 MR. PHILBRICK: Now you get down to nuclear power
25 generation. 3,000 excess deaths in the first 100 years.

1 MR. EGAN: This number was picked from some of
2 the back-up documents from our Part 190 rule-making where
3 we had looked at what the premature cancers that might be
4 caused by the various releases from the fuel cycle,
5 particularly Krypton-85, and some from the reprocessing
6 fuel cycling.

7 MR. PHILBRICK: Is that 3,000 excess deaths over
8 the number of deaths that have been caused by mining coal
9 necessary to produce in quantity?

10 MR. EGAN: No. Those are cancer occurrences
11 that our models indicate would be caused by exposure --

12 MR. PHILBRICK: It doesn't make any difference
13 whether it is cancer or anything else. They are dead.
14 Those that get killed underground, in the coal mine, are
15 just as dead as those.

16 MR. EGAN: Let us say you have excess deaths
17 from nuclear power generation. We assumed that was against
18 the baseline of zero. We did not then say, well, you have
19 to generate the power some other way, by, say, coal, or
20 whatever, and bang that against the deaths that might be
21 caused by that. It is not an interpower source, for
22 example, and the like.

23 MR. MARK: You are using the 1972 BEIR report
24 for these numbers?

25 MR. EGAN: That is correct.

1 MR. MARK: You are lucky, because if you used
2 the 1980 one, you wouldn't know what to put down.

3 MR. EGAN: Of course, originally we still
4 think we know because we think we haven't entirely
5 forgotten about the '72 report. That observation has
6 been made before.

7 Let me move on, then -- I will not spend much
8 time on the qualitative assurance requirements. If you
9 have any questions, you can ask about that.

10 The only other point I would make briefly
11 is the comparison to individual exposure standards,
12 and some of the reasons why we argue, or why we looked at
13 or considered individual exposure standards, I put it in
14 the framework that we looked quite hard at how we would do
15 an individual exposure standard. Our program bases were
16 coming in saying that we needed to set release limits that
17 contained long-term risks from long-lived radionuclides.
18 But also it was appropriate to set the individual dose
19 standards to minus the risks that an individual might
20 be exposed to, as well.

21 We started out thinking we would do both, as in
22 fact we did in Part 190 for the fuel cycle.

23 We did not actually develop individual
24 exposure standards because we in fact did not find a
25 practical way to do it, looking at maximum individual

1 exposure, looking at the facts that you are isolating
2 a tremendous amount of radioactivity in one place.

3 We think for the purpose of isolation, those
4 are appropriate.

5 Given that, we also assume that you cannot rely
6 on institutional controls forever to keep people away from
7 these things. People who intrude into the site for whatever
8 reason may in fact get very severe doses.

9 Against that practicality problem we chose to
10 set qualitative requirements, things like don't put the
11 repository where there are resources, don't rely on active
12 controls, therefore, require engineering controls; use
13 markers and so forth to keep people away from the site
14 as best we can. These are the things we try to argue so as
15 to minimize the chance that people will stick their
16 nose in the thing.

17 Against that, many people have argued that we
18 should have -- I have argued perhaps -- have categorized --
19 this is my own reference -- four perhaps reasonable
20 people have argued this. One is the traditional way to do
21 it. We are somewhat departing from that tradition here.
22 Some people have argued that our release limits are in
23 fact too stringent, and I don't accuse anybody of
24 doing that. If you set an individual dose limit, you
25 would not be so conservative. I don't think that logic

1 but it is a concern I have. Again, I don't necessarily
2 blame Dr. Steindler for the logic.

3 Some people have argued that the whole calculation
4 that we use is a sham, and in fact we should only look at
5 the individual exposure limits.

6 I think all three of these are useful in the
7 arguments we want to listen to, but the one I'm most
8 concerned about is the argument made at some point that
9 because we do not set individual limits, we do not provide
10 adequate protection on the standards.

11 I think because of the qualitative standards
12 we've got, we do the best one can in trying to address
13 exposures of individuals. The concern I have for people
14 to say that we should use individual exposure limits to
15 protect something that we are not otherwise protecting
16 is to let us know how you would dispose of the material
17 differently in response to a different type of standard
18 that would in fact offer more protection.

19 Obviously ultimately it is not the standard
20 that offers the protection. It is the disposal system that
21 offers the protection. I conceptually don't see how you
22 would design an exposure system differently from the ones
23 that we are talking about that would comply with our
24 containment requirements.

25 If there are ways to do that, I want to know

1 that. I haven't yet seen that. That is my challenge.

2 Occasionally people have offered that the
3 subpart does not offer adequate protection because it does
4 not look at those exposure limits. That is one of the
5 reasons why we particularly sought comment on this issue,
6 as well, which is one of the alternatives we highlighted.

7 MR. MOELLER: Dick.

8 MR. FOSTER: The new DOE criteria do speak to
9 potential use of your Part 190 fuel cycle standards for
10 individuals.

11 Can you comment on that?

12 MR. EGAN: That, as I read it, was for the
13 operational phase. In other words, before they backfilled
14 and sealed the repository, while they were dealing with
15 operational issues. That is perfectly consistent with what
16 we have done. I don't recall them talking about applying
17 the Part 190 limits to the disposal phase, per se.

18 MR. FOSTER: These are limits for individuals.
19 What is to prevent you from continuing to use that
20 post-closure?

21 MR. EGAN: My concern would be where you would
22 look at it. In other words, one of the concepts that is
23 somewhat associated with maximum individual exposure is
24 a fencepost. In other words, our uranium fuel cycle
25 standards are set 25 millirems to a member of the public.

1 A member of the public can't get inside the facility.

2 One of the concerns of the repository is,
3 I would maintain, that after some period of time, one can
4 argue a hundred years, or a few hundred years or the like,
5 you can't count on the fencepost any more. There is
6 nobody there to maintain the fence. If somebody comes in
7 and explores for water in the area and the like, he is
8 very likely to get a dose in excess of 25 millirems, in
9 excess of an amount considerably higher than that.

10 I don't see a useful way of protecting that
11 case in a quantitative sense. I think you do things to try
12 to discourage in a qualitative sense from trying to
13 do that. I don't see in a quantitative sense in trying
14 to force him away from that.

15 MR. FOSTER: What you are saying is that
16 exceeding that Part 190 standard at some time in the
17 future would be a consequence of a human intrusion; right?

18 MR. EGAN: That is certainly the most likely
19 case. That -- ultimately this is from a human intrusion.
20 There are some cases where a guy intrudes, and I think you
21 can argue, we don't care about him, he's stupid, and
22 he may bring some stuff to the surface, and he may just leave.

23 He's left a source on the surface which can
24 provide some type of exposure on its own. And you get
25 the second person coming along, and farming or walking,

1 and these are things that you can't hypothesize.

2 MR. FOSTER: But these are all what-ifs that
3 apply no matter what standards you use.

4 MR. EGAN: They are. Our concern was
5 we thought an individual exposure limit probablistically
6 would be much harder to do. An individual exposure limit,
7 assuming everything worked right, could certainly be
8 chosen. I don't know that it accomplishes much, because if
9 everything works right in these things, there is probably
10 virtually no release anyway, so virtually no exposure
11 that I'm aware of. As a consequence, we could
12 have picked an individual exposure limit assuming nothing
13 went wrong.

14 MR. MOELLER: Martin.

15 MR. STEINDLER: I think your answer to critics
16 concerning that last bulletin that you are not providing
17 adequate protection is probably valid. I'm surprised that
18 someone hasn't pointed out to you that you cannot devise a
19 system different than geologic disposal if you were to
20 identify individual dose limits, that the conclusion
21 is that geologic disposal is simply not feasible in a
22 safe fashion.

23 MR. EGAN: We have not heard argument yet.
24 There are possible ways of drafting it, which we know as
25 well.

j-8-1 1 You can argue that somebody goes to disposal, or
2 subseabed disposal, or somebody argues a very deep hole
3 could reduce the individual exposure. We have not
4 heard the argument in a forceful way. We may.

5 I think most people, people that I have talked to,
6 the whole range of constituents is, that perhaps with a
7 few exceptions geologic disposal properly done is
8 a very reasonable policy to dispose of these wastes with.

9 I haven't seen the opposite argument being widely
10 accepted.

11 MR. STEINDLER: It strikes me that you have to operate
12 in your own domain, but the argument that I would agree with
13 is, there is simply no mechanism of identifying a compliance
14 with any individual limit that 10 to the fourth year is out.
15 It is bad enough to try and handle the geology and all the
16 other things, but certainly, a numerical value, a specific
17 numerical value attached to an individual 10,000 years out is
18 a ludicrous concept.

19 MR. EGAN: We would be very glad to have you submit
20 that for comment.

21 MR. STEINDLER: I have one other question. In your
22 list of issues regarding CFR 191, you listed four items that
23 you were walking your way through.

24 Do I then gather that the issue of retrievability
25 has not arisen emphatically enough to have you label it

-8-2
1 an issue?

2 MR. EGAN: That is the issue of the recoverability,
3 is one which is called out in the Federal Register
4 for comment. When I put this presentation together,
5 I kind of lumped those three that deal with the
6 qualitative assurance requirements under one here. But
7 if I had gone through that, we would have kicked that around
8 some.

9 MR. STEINDLER: That is one that bothers me.

10 MR. MOELLER: Frank.

11 MR. PARKER: You may have already answered this
12 earlier, but the question comes up possibly, if you
13 separate Cesium and Strontium to reduce the heat loading in
14 the geological repository, and decide then you want to keep
15 them on the surface in some sort of a stonehinged-type
16 configuration, you might claim that you could then have a
17 safe geological repository, and yet if I understand the
18 rule, this would be prohibited.

19 MR. EGAN: That is a fair comment.

20 I haven't heard that variety, or the variation on
21 that. I think it is one I would want to consider. My
22 initial reaction is, I haven't heard an argument that the
23 heat load creates a problem, given a few decades of cooling,
24 which is certainly consistent. But if there were a problem
25 by heat loading the particular repository, that certainly

1 strikes me as a reasonable way to proceed.

2 You are right. The accounting system we have now
3 would rule that out, I think.

4 MR. MOELLER: Shailer.

5 MR. PHILBRICK: Have you made any investigation of
6 the efficiency of the gas storage pools presently in use?

7 MR. EGAN: Gas, like as in natural gas?

8 MR. PHILBRICK: You know, the demand on natural gas
9 is greatest in the wintertime, and it is less in the
10 summertime. So for some years now, gas has been pumped
11 up to formerly operating oil fields and injected down into
12 the reservoir rocks, and then in the wintertime, it is turned
13 loose into the mine.

14 Now, some of those places had oil wells, and
15 those oil wells have been plugged and sealed.

16 Now, do you have any idea how inefficient
17 those seals are? Whether there has been leakage through them
18 or not?

19 Certainly, there has not been enough leakage to make
20 it economically infeasible to operate those systems. But
21 you are not concerned about economically infeasible
22 situations. You are concerned about having radioactive
23 materials come to the surface.

24 Here is the situation, where the seals have been
25 in operation, in one case I know of, more than 30 years, and

1 they are still operating that field. That is a gas storage
2 pool.

3 MR. EGAN: The only answer I have, and I'm not sure
4 I'm answering the right question, is that as part of the
5 Arthur D. Little study they did for us, they did look
6 at the long-term performance of shaft seals and borehold
7 seals, and the like, and did develop models for us that
8 we then used to calculate ingress of water through those
9 seals.

10 That was one of the failure mechanisms that we looked
11 at.

12 MR. PHILBRICK: You know, this stuff is high-pressure
13 storage.

14 MR. EGAN: Your argument is, they perform fairly well?

15 MR. PHILBRICK: Yes. They perform fairly well, so
16 the gas companies are in business.

17 MR. EGAN: Again, the best answer I can give you
18 now -- and I want to look at that -- but when we looked
19 at the seals and how they are performing, leakage through the
20 seals was not a particularly important failure mode relative
21 to other things. The seals did relatively well compared to
22 other ways of getting stuff out.

23 So, from my perspective, the seals are not a
24 problem. I think we are talking about the same thing.
25 For the salt repository, where the seals are really the only

-8-5
1 pathway for water to get in, you've got very, very
2 little water down in the seal before the thing is sealed up.

3 And for the hard rock, we actually got considerably
4 more water flowing out through the bulk rock itself, through
5 the fracture, and relatively low, but not zero porosity
6 through the granite of the salt.

7 So, the seals seemed to be the better part of
8 the system. But that is all documented in a couple of
9 reports we did.

10 Let me touch on the documentation. I expect many of
11 you may be aware of most, if not all of these. But this is
12 the portfolio of the more important reports issued to
13 support the standards. These two are the actual rule-making
14 documents per se. These are various technical support
15 documents that we have issued.

16 The first two and the last of these were issued
17 as draft reports subject to completion of the review of the
18 Science Advisory Board panel, of which Dr. Parker is a member.

19 We will be reissuing these, taking into account
20 public comment as we conclude the rule-making. As I always do,
21 I encourage people to read as much of these as we can, and
22 certainly, give as many comments as you can.

23 We don't begin to presume that we've got all
24 the right answers to these things. Again, we try to be
25 systematically conservative, and the more we understand whether

-8-6 1 we did it right or not, the more useful it is for us.

2 If I have whetted your appetite for digging
3 into this at all, I certainly encourage you to dig further
4 and let us know what you find.

5 That is all I have.

6 MR. MOELLER: Thank you.

7 Carson, and then Don.

8 MR. MARK: A couple of small points.

9 The basic ultimate criterion, I guess, is 1,000
10 excess cancer deaths over 10,000 years per so much waste.

11 MR. EGAN: That is the policy number we chose to
12 base the regulation around.

13 MR. MARK: Right. Nowhere does it say something
14 in terms of the maximum actual exposure of an individual at
15 the boundary of the site shall be less than something or other.

16 MR. EGAN: It does not say that, for the disposal
17 phase.

18 MR. MARK: For the disposal phase?

19 MR. EGAN: It says before you seal the repository,
20 if you've got tractors running around --

21 MR. MARK: I'm talking of the period beyond that.
22 It doesn't use numbers in that sort of statement.

23 MR. EGAN: That's correct.

24 MR. MARK: That, of course, would be something on
25 which you could much more easily arrive at a number. In

1 fact, you've got to arrive at such a number before you
2 could guess whether you've got this 1,000 excess deaths or not.
3 You are now getting to use some BEIR-type in your curve,
4 or semiquadratic, or when it is discovered that there
5 really is a threshold of 250 millirem, then that will
6 completely change the whole base.®

7 MR. EGAN: I have a comment. I'll let you get
8 through your question first.

9 MR. MARK: Then I find in these graphs not excess cancer
10 deaths, but health effects. Are those the same excess
11 cancers, or are they health effects?

12 MR. EGAN: They are premature cancer deaths.

13 MR. MARK: But there are health effects which
14 aren't deaths?

15 MR. EGAN: Yes. There are nonfatal cancers;
16 there are genetic effects that are nonfatal cancers, for
17 example.

18 MR. MARK: There is a factor of 3 or 4 between those.
19 Why do you label your graphs with health effects and your
20 criterion with excess deaths?

21 MR. EGAN: Good question. The best answer may be,
22 we made a mistake. The best logic I can give you is, we
23 did earlier talk about health effects being equated for
24 the purpose of that report to fatal cancer only. We did look
25 at genetic effects and found they are relatively small. It

1 turns out for this particular mix of radionuclides, the
2 nonfatal cancers are also relatively small. I think
3 there was a feeling on some people's part --

4 MR. MARK: These are not the leukemia, so much as
5 bone cancer?

6 MR. EGAN: Mostly alpha.

7 Two comments on your BIER things.

8 The nonuse of BIER-3, if you will, here, is
9 perhaps less a problem because of that dominance of the alpha
10 numbers, the change in the form of those curves was most
11 notable for the low LET radiation, which is a very
12 small fraction of the total risk here.

13 The other comment I make in passing is, the use of
14 the linear hypothesis, and linear is important here, allows
15 you not to calculate individual doses very often.

16 MR. MARK: Whether it is there or not?

17 MR. EGAN: Yes. If anybody changes this linearity
18 assumption, lots of calculations have to go back to the
19 drawing board, because the whole model doesn't make
20 any sense anymore.

21 If you are doing an environmental impact analysis
22 and change from BIER to something else, it requires you to
23 calculate all those individual doses.

24 MR. MARK: I was just looking forward to that.

25 MR. MOELLER: Don.

j-8-9
1 MR. ORTH: I want to address a question on this
2 definition of high-level wastes one more time.

3 Somewhere in the definition, and somewhere in the
4 concentrations, the release limits, should we have a reference
5 of some kind to absolute quantities, even if it is
6 to other EPA regulations?

7 For example, even if it is a radiopharmaceutical,
8 one tiny little bit that is way beyond all of the
9 concentration limits, and meets some other things. How do
10 we exclude something?

11 MR. EGAN: I don't have an immediate answer for that.
12 I think it is a good concept. My initial gut reaction is
13 that for reprocessed wastes, I'm not sure how much of
14 a problem that is.

15 That source is not often subdivided into small
16 quantities. Radio --

17 MR. ORTH: This gets back a little bit to what
18 Marty was talking about, whether it be some high-level ion
19 exchange resins that somebody has used to strain something
20 out of TMI, or whether they have used it to strain something
21 out of reprocessing wastes.

22 It is that some minimum quantity that you ought to
23 refer to from some other regulation, at least.

24 MR. EGAN: I'm just making a note of that.

25 MR. MOELLER: Other questions or comments?

1 Okay. George, and then Martin.

2 MR. THOMPSON: Let me ask a question, and then
3 try to partly answer it myself.

4 Have you tried to estimate the limits of error
5 in these general geologic risk limits?

6 My partial answer to that is, the greatest
7 geologic risks are probably the ones that haven't been
8 anticipated. The pipe in granite, the breccia pipe in granite,
9 which is assigned a zero risk.

10 I don't think that probably you can put limits on the
11 geologic risks, the probabilities of geologic risks,
12 without considering specific sites, and since there are only
13 going to be two or three repositories built in this century,
14 it would seem to me that we need much more emphasis on
15 the specific sites, and less than the risks in general
16 generic sense, the salt and so on. Because I don't think
17 those are very meaningful geologically.

18 MR. EGAN: No, we have not done really any
19 comprehensive uncertainty analysis of the margin error models.
20 I suspect Dave Okrent is going to nag us to do that on our
21 Science Advisory Board panel.

22 I think the comment that uncertainty is
23 important is more important, important in the context of
24 specific site is correct. I think the Sandia model can
25 in fact do very well in treating the effects of uncertainties,

1 as well as they can be estimated.

2 We are, of course, charged with developing a
3 generally applicable standard, and there is no way under the
4 sun that that ever gets to a site-specific standard.

5 I think one can argue that what the program needs
6 is a general standard that sets kind of an umbrella within
7 which specific sites can be judged.

8 So, I think we have done a reasonable job.
9 Obviously, I'm not the most unbiased person to make a
10 statement. I think we have done a reasonable scoping job for
11 our purpose. I don't begin to argue that these analyses
12 are suitable for a particular site or for measuring the
13 standards. I think the models developed by Sandia are
14 much more appropriate.

15 I think the context of your argument may suggest that
16 there is no need for applicable standards. And we might
17 part company there philosophically.

18 MR. THOMPSON: I don't mean to say there is no
19 need for them. I do question whether it is possible in a
20 geologic sense to assign some of the numbers.

21 MR. EGAN: Again, when you say "possible," I always
22 encourage comment, because if we have been unrealistically
23 conservative in our assessment, I'm not unhappy with that.
24 If your concern is that the numbers indicated things we
25 hadn't considered, that it might make these numbers

1 significantly low, that is something we need to get told
2 as soon as we can, because that could affect the rule-making.

3 MR. THOMPSON: My point is more that it is nearly
4 impossible to know whether they are low or high.

5 MR. EGAN: That is another opinion that I don't know
6 the answer to. I've gambled on this, the fact that we can
7 make rough calculations.

8 MR. MOELLER: Martin.

9 MR. STEINDLER: I've got a question and a comment.
10 Are you not constrained in becoming site-specific?

11 MR. EGAN: That's correct.

12 MR. STEINDLER: So, the issue of site-specific
13 analysis would only be useful to you to test whether or
14 not your generic limits are sensible, or can in fact be
15 reasonably measured?

16 MR. EGAN: I think that is reasonable.

17 MR. STEINDLER: My comment is that it seems to me
18 that we are moving very quickly toward a rationale base from
19 which then to depart into the other rule-making areas, and get
20 this show on the road.

21 I recently had an opportunity to review a French
22 document that dealt with problems of disposal, as well
23 as the whole fuel cycle, and it is quite obvious that
24 those folks are floundering, and are back where we were
25 perhaps 15 years ago, because they haven't yet recognized that

1 you've got to start with some kind of an acceptable
2 risk level for which everybody reasonably agrees, and then
3 build on that, which I think is precisely what these guys
4 have done. And I'm fairly encouraged.

5 MR. MOELLER: Dr. McCone has a problem, and then I
6 have a couple, and we will take a break.

7 DR. McCONE: I just want to clarify something.

8 As I understood, you said that in calculating the
9 risk of an ore body, you equated most of the risks with
10 ingestion of Radium-226?

11 MR. EGAN: That is my recollection.

12 DR. McCONE: I've been reviewing this, and I
13 know that UNSCAR and NCRP both equate the major fraction
14 of the risk with Radium-222, from inhalation of Radium-226,
15 the background levels of Uranium.

16 MR. EGAN: We did not look at the radium. We will
17 have to go back and check what the relative magnitude of that
18 problem is. Again, my previous comment would hold, if the
19 uranium ore body risks are underestimated, and should in fact
20 be higher for some other pathway, again, it is important
21 that we have underestimated them, but it is logical for the
22 rule-making, that the high level waste risks are lower
23 than the ore body risk.

24 We will take your comment under advisement.

25 MR. MOELLER: Let me ask just a couple, and then we

1 will take a break.

2 You state that your criteria do not apply to
3 transuranic wastes already disposed of, so that is just to
4 avoid that problem?

5 MR. EGAN: The problem with transuranic wastes already
6 disposed of is, in part, that we did not have the time in
7 the rule-making we are doing now to look at the risks from
8 digging that stuff up, or the costs and benefits applied,
9 and then to redispense of it someplace else.

10 We are currently reviewing the DOE's Defense Waste
11 Management Plan. What it looks like will come out of that is
12 a fairly well-enunciated concept that transuranic waste that
13 was buried before 1970 are already disposed of. The
14 department concedes that wastes disposed of after that have
15 not been taken care of. But it was a question of not having
16 looked at the date.

17 MR. MOELLER: Okay. Another question, or comment.

18 This is a nit. But you use the word "radioactive"
19 in the standard quite frequently, like on page --
20 that is a funny way to refer to it -- but the middle column on
21 page 58, you say these disposal systems will be designed
22 so that very little, if any, radioactivity returns to the
23 environment.

24 To me, and I think officially the word "radioactivity"
25 is appropriate, like morality, and you really mean that little

1 radio -- few radioactive materials will return.

2 There is a lot of discussion in the comments of
3 the accessible environment.

4 Now, how has your definition changed, and what
5 is your justification?

6 MR. EGAN: Let me take it from, I think, probably
7 the point we were at the last time I talked to you. There
8 were several iterations of that definition.

9 Let me say that the basic problem we are trying to
10 resolve with that definition, whether we successfully
11 resolve it is an important matter for comment, is the
12 following. Clearly most, if not all, geologic disposal
13 contents concerns putting waste below the water table.
14 Therefore, unavoidably, you are going to be contaminating
15 some amount of groundwater.

16 Now, there are other laws and regulations, and the
17 like, that look at groundwater protection, other
18 authorities which try to define quantities of groundwater that
19 should or should not be protected in terms of usability or
20 yield, and the like.

21 We looked at that continually to find out
22 whether there was some useful way to distinguish groundwater
23 one should protect from groundwater one need not protect as a
24 basis for defining accessible environment.

25 What we ultimately found, after struggling with

8-16 1 this for years, was nothing that was useful in a definitive
2 sense.

3 Quantities that appear to be important for, say,
4 a single well-user, are quantities you can probably get right
5 from the middle of a hard rock repository. Therefore, there
6 is no useful screening there.

7 Not being able to do that, we fell back on the
8 concept that you are relying on the geology for some
9 protection, and therefore, perhaps you just draw a boundary
10 in the lithosphere, as it were, saying that I'll allow
11 contamination of groundwater within some area around the
12 repository to enhance/encourage the use of that geology for
13 long-term protection, which we have shown in our slides as
14 perhaps the most important function of a site, and then
15 beyond that, I'll just protect groundwater outside of that.

16 Now, the first definition we probably came to you
17 all with was that boundary being one mile away from the
18 original placement of the wastes. Now, that one mile, which
19 was totally arbitrarily picked by me, actually, on the
20 Staff, is certainly relatively short, say, compared to
21 the dimensions of the repository, which are a few miles or
22 kilometers on the side, and we always considered that a
23 relatively tight boundary.

24 People later on in the process suggested that perhaps
25 that was being overly stringent, that we should be making

1-8-17 1 plans to control an area larger than that. And we ultimately
2 said, after going through several iterations of how you
3 define groundwater, we came back to where we were.
4 We wound up with a longer distance, in this case, 10
5 kilometers.

6 It is still much within the same concept. It is --
7 people try to misrepresent it by saying surface water
8 or land surface within the 10-kilometers is not part
9 of the assessment. That is not correct. It is only applying
10 to the groundwater.

11 Again, it was our second stage arbitrary acceptance of
12 the distance of 10 kilometers to be the pathway to allow.
13 Much like the 10,000 year question. There is no scientific
14 way of proving one number is right or wrong. That is
15 the current judgment we have made in the case.

16 It is one that has been commented on in the guise
17 of guidelines, which I'm sure you have read. I think
18 the Sierra Club took us to task for that number.

19 MR. MOELLER: We will probably come back to that
20 several times later today.

21 MR. EGAN: Again, I encourage you, if you have a
22 better concept of what we should use, if you discuss this later
23 on, please feel free to send us this definition. We have
24 struggled with this groundwater thing. I'm personally not all
25 that happy with what we've got, but it appears to be the best

j-8-18 1 we can do so far.

2 MR. MARK: Is it or is it not identical to the
3 draft in 60?

4 MR. MOELLER: It is, but the questions that have
5 been raised is that all three organizations have
6 attempted to converge on one definition.

7 Okay. Let's take a ten-minute break.

8 Thank you so much, Dan, for a very informative
9 presentation.

10 (Recess)

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 MR. MOELLER: The meeting will come back to
2 order.

3 The next item on our agenda is a review of the
4 guidelines themselves, the DOE proposed general guidelines
5 for recommending nuclear waste repository sites, the
6 10 CFR 960, and for that presentation we have with us
7 from DOE Mr. C. George.

8 MR. GEORGE: Thank you, Dr. Moeller.

9 MR. MOELLER: It is a pleasure to have you.

10 MR. GEORGE: I brought along some projections.

11 (Discussion off the record.)

12 MR. GEORGE: Which would be better for you
13 gentlemen?

14 This looks like it is getting a little more
15 magnification.

16 MR. MOELLER: Yes. That is a good one.

17 MR. GEORGE: I'm not going to start with the
18 opening sheet. I'll move right along in my presentation,
19 because I understand you have the guidelines themselves.

20 I intend to just cover a little bit of the
21 background to the guidelines, and then of course I think
22 most productively offer opportunity for questions and
23 answers.

24 MR. MOELLER: Yes. I think you can assume that
25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

not only are the guidelines available, but that we have read them.

MR. GEORGE: Okay. Fine.

The thing to keep in mind is that these are in fact mandated by the law. It is not as though the Department has not had some guidelines, and I'll touch base on the history behind citing criteria, much that I'm sure you will be aware of.

The guidelines mandated by the Act included some of the things which we have had to deal with before, but they also have some very special features, which we had not heretofore dealt with in our efforts, and when we proposed these, we went a little bit beyond the requirements of the Act in terms of the processes we were using to do a formal -- something more like a formal rule-making, and this was under the advice of our general counsel.

The Nuclear Waste Policy Act of 1982, of course, is the source of all of this, and it requires that the Secretary shall issue general guidelines for the recommendation of sites and that we should do so not later than 180 days after enactment of the bill, and that is July 6, 1983.

In the process of that, we are having to consult with, in addition to producing the guidelines themselves,

1 we are having to consult with the agencies you see,
2 CEW, EPA, USGS, and interested governors. The phrase
3 "interested governors" is different than the phraseology
4 which was used elsewhere through the Act in which they used
5 "governors of affected states." We interpreted that as a
6 matter of fact as being the fact that of course the
7 affected states, the ones most near-term involved,
8 interested states might be anybody, since subsequent
9 repositories could crop up in an exploration program that
10 looked at a larger number.

11 And, in fact, we already have 17 states in the
12 very early stages in a look at crystalline rocks.

13 Furthermore, those states other than which might
14 have sites, but through which transportation might be
15 an issue, they would certainly be interested; and then,
16 again, states which have nuclear power plants which are
17 dependent upon a solution to the back end of the fuel
18 cycle, they might be interested.

19 For that reason, the public hearings which are
20 about to come to a close on the guidelines were held
21 regionally as opposed to being site-specific.

22 MR. MOELLER: Excuse me. On this first
23 slide, in terms of the schedule, the schedule is one
24 item which a number of the public interest groups have
25 commented on.

1 What does it mean that you positively have to
2 do by July 6th?

3 MR. GEORGE: We have to issue the guidelines
4 following all of the consultations and following the
5 concurrence of the Nuclear Regulatory Commission.

6 In my briefcase back there I have a copy of the
7 Act.

8 MR. MOELLER: We also each have seen that. So
9 that is the deadline.

10 MR. GEORGE: We interpret that as the job has
11 to be finished by that date, or else we are no longer in
12 compliance with the bill.

13 MR. MOELLER: Thank you.

14 MR. MARK: But just the guidelines?

15 MR. GEORGE: That's correct. Just the guidelines.

16 MR. MOELLER: As I say, as we go along with these
17 various deadlines, I would appreciate a clear
18 specification of what it is you must do by a particular
19 time.

20 MR. GEORGE: Certainly. Actually the only
21 deadline I need to talk about in a presentation on the
22 guidelines, which is what I'm here to discuss, is that
23 date. We have to allow enough time, and I will show you
24 some other dates as to when we have done certain things.

25 MR. MOELLER: Yes, Dick.

1 MR. FOSTER: Did I understand that it is
2 our own legal staff that says go through the procedures
3 of Federal Register, and all of the comment situation
4 that -- that without that guidance that it might have
5 been possible to just issue a piece of paper without talking
6 to people?

7 MR. GEORGE: No, no. I don't mean to say that.

8 The provisions which I had on the prior Vu-Graph
9 here, the consultations indicated here are specified in
10 the Act, but the Act does not require that you hold public
11 hearings. And it does not require that we have to promulgate
12 them as a formal rule-making.

13 But nonetheless, these things are being done.

14 MR. FOSTER: I wanted that clarified. Thank
15 you.

16 MR. PARKER: Wouldn't the Administrative
17 Procedures Act require you to do a lot of these things in
18 any case?

19 MR. GEORGE: There is some question about that,
20 Frank, and I'm not an attorney. I don't know what the
21 trip point is. Our G.C. decided we should do it, and for
22 other legislative history, that we should hold public
23 hearings when we are going through it. So they took a
24 conservative view of putting together all the things that
25 we should do, and that is the way we are going.

a6 1 The requirements of the Act with respect to
2 these guidelines is that, first of all, they should
3 specify detailed geologic considerations that shall be
4 the primary criteria for the selection of sites.

5 In other words, there is recognition in the
6 bill that in spite of all the other things mentioned, that
7 the geologic considerations are those primary criteria.

8 They also ask for factors that qualify or
9 disqualify any site from development as a repository.
10 That is something that is entirely new in terms of any
11 attempt that most people have made at developing these
12 guidelines, either here or abroad.

13 Required consideration of various geologic
14 media, so that's in line with, I think, common policy that
15 has evolved over the last few years, and it is reflected
16 in NRC's 10 CFR Part 60, that there should be at least --
17 I think 10 CFR 60 says at least one rock type other than
18 salt.

19 Then there are specific restrictions on adjacent
20 populations, and I think it is not blowing the whistle
21 on anybody or being overly cynical to being one of those
22 who has realized that if you follow the course of the
23 debate in the Congress, a lot of what went on with
24 respect to adjacent populations was an effort by people
25 to set up some sort of specific conditions that they had

1 in mind.

2 Now, these things, as I said before, did not
3 emerge from a vacuum. There is a considerable history here.

4 Going all the way back to some criteria that
5 were issued by the office of waste isolation, which was
6 of Union Carbide Corporation at Oak Ridge in November
7 of '77; the International Atomic Energy Agency at site
8 selection factors in '77; Natural Research Council, '78;
9 then we had published -- actually, there is a history of
10 these being battle criteria and program criteria even
11 before this final date. These were issued in draft in
12 1980 and went through a public comment period.

13 These criteria are also published, by the way,
14 in the Confidence Rule-Making Document, which was a 1981
15 document. So there is some history to these things.

16 Then we also, in drafting these criteria, tried
17 to use everything we could out of the 10 CFR 60 draft technical
18 criteria, the advanced notice, of course, in the Federal
19 Register in May of '80. But we used a final draft of
20 November of 1982, which is the last one that is available
21 in the reading rooms of the NRC, and then with the EPA,
22 we used the proposed standards issued in the Federal
23 Register on December 29th.

24 Now, obviously the purpose of these guidelines is
25 for the recommendation of sites. In other words, to be

1 appealed to in various decisions and recommendations
2 that are put out in the waste bill, and so it is clear that
3 what we have to do is that we have to have something that
4 can start -- that can serve us through the screening
5 process, starting at very early time periods where we
6 don't know very much, and we may be looking at very large
7 land areas, and going all the way down through the
8 winnowing process which we know a great deal about many
9 sites.

10 Clearly there has to be a divergence on the
11 conditions which comport with the requirements of NRC, or
12 we could be finding a site that wouldn't be licenseable,
13 and that is obviously what we don't want to do and have
14 tried not to do by relying as heavily as possible on the
15 EPA and the NRC standards.

16 This is just a rather obvious thing that
17 we use, I guess, to brief the more initiated as
18 regards the total logic of a program. Clearly in order
19 to define the method of disposal, you set an objective;
20 and the objective is permanent isolation of high level
21 waste to protect health and safety and the environment.

22 And then the explore-alternative method, and the
23 selecting of the preferred method, was made formal in a
24 generic environmental impact statement in a record of
25 decision which was published a couple of years ago.

1 Then as we go along, we define the required
2 characteristics of a repository and its setting, what is it
3 you aim for in a sense to meet this objective, and then
4 we start looking for preferred sites.

5 MR. MOELLER: Excuse me. To help me on that,
6 item 2 was to explore the alternative methods?

7 MR. GEORGE: Yes.

8 MR. MOELLER: But at this point the decision has
9 been made that the geologic media is the best?

10 MR. GEORGE: It is the primary method. The record
11 of the proceeding, I believe, said the geologic disposal
12 is the method that we should undertake. That is going to
13 be the basis of the federal program, however, with some
14 research into alternatives, primarily subseabed disposal.

15 MR. MOELLER: In number 5 here where you look for
16 preferred sites, that was a question I had. Are you to
17 identify the best site in the United States, or having
18 selected five potential sites, to identify the best of the
19 five?

20 MR. GEORGE: I would say that the department has
21 fairly steadfastly stayed away from promising that we
22 would find the best site in the United States, globally,
23 for reasons that this would be -- that it would be very
24 difficult in the first place to make an argument that
25 something is the best site. Secondly, we would, no matter

1 how many sites we found, or how good they may be, it would
2 be very easy for someone to say "but you didn't look a
3 hundred miles over there; how do you know it isn't better,"
4 and we don't know. So the only way to find the best site
5 would be to find all sites and to evaluate them all.

6 And if you sort of figure the cost of boreholes
7 on a one-mile grid across 3.5 million square miles of
8 the United States, or anything even approaching that, that
9 would be a pretty unrealistic approach.

10 Now, in terms of the required characteristics of
11 a repository, I think that what we are trying to do is to,
12 in effect, choose sites, particularly in the case of the
13 natural barriers. We are trying to choose sites that
14 avert these possible release mechanisms so that we gain
15 confidence that we are going to meet the EPA standard.

16 Of course, the release mechanisms, the primary
17 ones would be materials dissolved and carried by groundwater,
18 violent and natural events, for example, volcanoes, or
19 perhaps I suppose glacial erosion, and accidental future
20 mining, the human intrusion scenario that the EPA has
21 studied quite a bit.

22 The required features that result from that is
23 that we want to look for appropriate mechanical and chemical
24 properties of host rock, and this means, of course,
25 designing suitable ways packages and operations within

1 that context; features and surroundings outside of the
2 host rock itself that can be adequately understood, and
3 which gives you some questions about the certainty with which
4 you can model these things; and then compatibility with
5 present or future surface activities which have to do with
6 environmental constraints and so on.

7 Again, it is important to keep in mind, in
8 terms of how these guidelines would be used and what they
9 are for, that they are not selective screening; that is,
10 the choice of the most promising. This effort cannot
11 avoid being a little bit like the look for the search for
12 mineral resources, and just as oil companies come up
13 with dry wells, we are going to come up with some stuff
14 that doesn't look so good, either. And we are --
15 and you start out fairly ignorant, or with at least very
16 sparse information, and you also look over very large
17 regions. For the most part, you start by looking at a
18 rock type that looks promising, because the geologic
19 community has the information to look for rocks.

20 Some of the very important determining data,
21 like deep groundwater flow patterns and so on, can be
22 actually virtually totally unknown and a matter of total
23 surmise at the early stage. But nonetheless you have to
24 take what data you have, compare them against at least
25 some subset of the guidelines and start looking for more

1 promising areas to put in the next level of investment, and
2 typically we start out on a national or regional scale
3 looking only at existing data. And then when we get down
4 to something more or less called areas, sometimes specific
5 rock units, if you are talking about discrete bodies like
6 plutons or salt domes, then we may start field work at that
7 level and pulling out the kind of data that we
8 specifically need.

9 As you go along and get closer to individual
10 sites, you are having detailed information. In other
11 words, you are filling out the data matrix to make your
12 full decisions.

13 Structure of the guidelines is to a certain
14 extent dominated by the requirements of the bill and it is
15 also made analogous to the efforts of the NRC. And I'll
16 return to these throughout to give you a little bit of
17 logic which I think will address concerns that we all have
18 about the kind of public comment we are getting.

19 We have qualification factors. Those
20 qualification factors are meant to be -- where they are
21 there, they are meant to be minimum conditions for site
22 qualification. That is, if that one variable to which
23 this is attached -- it must meet that minimum, that one
24 variable must meet that minimum for site qualification.
25 Disqualifying factors are, when found, immediately

1 disqualify site. In other words, when you try to have a
2 disqualifying factor, no matter how unitary it may be,
3 or on how specific a measured parameter, what we are
4 having to define there is something that for that one
5 reason alone, and with no mitigating circumstance, that
6 would disqualify that site.

7 Now, that is very difficult to come up with, and
8 not unnecessarily and arbitrarily restrict the future
9 siting process. So to do that and do it in a valid fashion
10 is difficult.

11 MR. MOELLER: Excuse me. On the basis of what
12 your slide shows, the first item would be a disqualifying
13 factor, also, if it is a minimum condition for site
14 qualification.

15 What I gathered in reading the material
16 was that a qualification factor is what you would like to
17 have unless it is compensated for by some other factor that
18 has more conservative -- or has sufficient conservatism
19 in it to overcome that.

20 MR. GEORGE: There are some qualification
21 factors which could be related to a disqualifying factor
22 by mirror image, such that you suggest, but I'm not sure
23 that I recall that all of them are like that. Where these
24 two are mirror images of one another, we did not repeat
25 it for that purpose.

1 The favorable conditions intend to be presumptions
2 that evaluations will lead to positive results. Another way
3 of putting it is that these encourage us; we find those
4 kinds of conditions there encouraging, that subsequent
5 full data and analysis will lead to subsequent results.

6 Potentially adverse conditions we see as the
7 reverse of that, if you will, a discouraging finding, one
8 which warns us that the situation must be examined carefully
9 to determine if whether or not that really sacrifices or
10 threatens the overall acceptability of the site to meet
11 again the function of the site which is isolation of the
12 wastes, and the standard against which that isolation is
13 measured is the EPA standard.

14 Now, we have a number of disqualifying factors
15 in the -- that we have put into the guidelines, and
16 I just enumerated them here on a couple of Vu-Graphs;
17 that the site, for example, with state-of-the-art
18 engineered systems and controls, if that is predicted not
19 to meet EPA and NRC release limits, it would be
20 disqualifying. So, therefore, if we have to step beyond
21 state-of-the-art engineering systems and controls in order
22 to make a site work, that is disqualifying.

23 Characteristics too complex to allow
24 reasonable prediction of compliance. That would be
25 disqualifying.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Not possible for all portions of the facility, except, of course, the shaft, to be at least 200 meters from the surface. That was a minimum condition for meeting the isolation criterion.

Groundwater travel time to accessible environment of less than a thousand years. That is consistent with 10 CFR Part 60.

MR. STEINDLER: How did you arrive at the number 200 meters?

1 MR. GEORGE: I think that is also in 10 CFR, part 60,
2 but I'm not positive on the answer to that question. It
3 may have to do with the erosion rates.

4 MR. PHILBRICK: What is the relationship between
5 10 CFR 60 and this 960?

6 MR. GEORGE: There is no formal relation, in the
7 sense that anybody says -- the relationship is that 10 CFR 60
8 has within it the regulatory guidelines by which a
9 site will be judged acceptable when we put it forth for
10 licensing.

11 MR. PHILBRICK: You are looking at this thing from
12 DOE, then, aren't you?

13 MR. GEORGE: That's correct. These are guidelines
14 which have to do with selection of sites to put forward.
15 Therefore, there has to be a convergence between the
16 application -- let me put it this way. The NRC standards, the
17 NRC technical criteria, 10 CFR 60, as they relate to sites,
18 can be specific and detailed enough that they can demand that
19 at the time you come in with licensing with a full matrix of
20 data on the site that you have numbers to plug in for them
21 to examine all of this information and come to an conclusion,
22 and then on the other hand, we have to have guidelines which
23 operate throughout the process, starting at a point
24 where data is sparse, that is, we are relatively ignorant,
25 and ending up at a point where we may have three sites on which

1 we have a considerable amount of data and want to decide
2 which one to put forward for licensing.

3 That means that our guidelines have to be a vehicle
4 by which the data and site selection converge in this
5 10 CFR 960, converge on the requirements of 10 CFR 60.

6 MR. PHILBRICK: Does this indicate that you are tied
7 to that 200 meters from the surface?

8 MR. GEORGE: Yes.

9 MR. PHILBRICK: The presence or absence of mining
10 on the site, the presence or absence of drill holes on the
11 site, the presence or absence of extreme erosion in the
12 site.

13 MR. GEORGE: Yes.

14 MR. PHILBRICK: All of those things are things
15 that tie to you.

16 MR. GEORGE: Yes. All of the features -- you are
17 talking about the potentially adverse conditions now of
18 10 CFR 60, are you not?

19 MR. PHILBRICK: I think so. But the 200 was yours.

20 MR. GEORGE: That is correct. That's right.

21 Now, I'm just telling you that I don't honestly recall
22 carefully enough to give you -- to really want to set my
23 name on the answer exactly where that 200 came from.

24 There was some analysis behind it. I don't know whether we
25 borrowed it from 10 CFR 60 itself, or whether we analyzed it

J-10-3 1 concluding from 10 CFR 60.

2 MR. PHILBRICK: My concern is, how did you ever
3 get so shallow?

4 MR. MOELLER: I thought 10 CFR 60 had a 300 meter in
5 it.

6 MR. PHILBRICK: Even so, how did you ever get so
7 shallow, in either case?

8 MR. GEORGE: We aren't in fact looking at
9 anything that is at 100 meters.

10 MR. PHILBRICK: This was one of the things that was
11 picked up in one of your hearings.

12 MR. GEORGE: I don't know the answer to that, sir.
13 I don't.

14 MR. PHILBRICK: There are certain things that
15 seem to me to be without any real basis and common sense.
16 I don't know when we discuss that stuff. I don't want to get
17 into it now, if we should do it later.

18 MR. MOELLER: Let's ask, is this matter of the 200
19 meters, does it come up later in your presentation?

20 MR. GEORGE: No, it doesn't.

21 MR. MOELLER: Then let's discuss it.

22 MR. PHILBRICK: It is shallower -- that is 600 feet,
23 isn't it?

24 MR. GEORGE: 660, yes. It is far shallower than
25 anything we are looking at, I can tell you that.

j-10-4
1 MR. PHILBRICK: Why isn't it struck? Why isn't
2 it a situation where you are talking about a couple of
3 thousand feet or something like that? There is a certain
4 amount of rationality to that number.

5 MR. GEORGE: Excuse me?

6 MR. PHILBRICK: I say, there is some rationality
7 into that number.

8 MR. GEORGE: Which number?

9 MR. PHILBRICK: 2,000 feet, or 3,000 feet. But
10 there isn't any reason in the world for trying to do business
11 at a depth of 600 feet.

12 MR. GEORGE: In order to answer your question, and
13 I would be happy to get back to you with some comments
14 here, or some reply to your comment, but I just don't know
15 specifically what computation was made to defend that
16 200 meters. I'm sorry. I just don't know it.

17 I'm sure that someone looked at erosion rates
18 or glacial scour or something like that, and came up with
19 such a number. But whether it was a proper -- how proper a
20 computation, I'm not going to say, because I didn't do it
21 myself.

22 MR. MOELLER: George.

23 MR. THOMPSON: I would like to comment on that,
24 because unless there is a compelling reason to specify a
25 large depth, one tends to have some pretty big effects in

-10-5 1 doing that. And that is, one, if you go to larger
2 depths, you exclude all the possibilities of storing above
3 the groundwater table, and that may be a very favorable
4 factor in some areas.

5 There are other site-specific things that are
6 connected with rock properties, with temperatures, for
7 example; if you go deep, you get into higher temperatures,
8 and then you limit the heat loading that you can put into the
9 repository.

10 So I think that is a problem that needs to be
11 considered very carefully rather than specifying a larger
12 depth just to get it away from easy access.

13 MR. MOELLER: It was stipulated as a minimum depth.

14 MR. THOMPSON: I think Shailer is suggesting that
15 maybe a larger minimum should be specified.

16 MR. MOELLER: Now, NRC, 10 CFR part 60, does say
17 300 meters.

18 Are the NRC people here?

19 VOICE: I'm from the NRC.

20 MR. MOELLER: Could you identify yourself and get a
21 microphone, if you could respond.

22 VOICE: My name is Regis Boyle from the
23 Division of Waste Management.

24 My understanding is that it is 300 meters in
25 10 CFR 60. But I'm not aware of the rationale that was

1 behind it. Mike Bell will be here this afternoon, and I'm
2 sure that he could provide some explanation as to how
3 NRC arrived at their number.

4 MR. GEORGE: Is the 300 meters under a favorable
5 condition? And so a favorable condition could be, for
6 example, deeper than a minimum condition?

7 I understand your question quite thoroughly. I
8 just don't understand as thoroughly what the answer ought
9 to be. I'm sorry. It is a trade-off up to a certain
10 limit.

11 If you were to go one dimensionally toward a
12 greater depth, you could exclude the unsaturated zone which
13 many people have suggested as an alternative that should
14 certainly be considered, and, in fact, we are
15 considering it in the Nevada test site.

16 MR. PARK: If you go too deep, the salt will be
17 pretty well prohibited because of plastic flow at these high
18 temperatures and pressures.

19 On the previous slide, when you talked about
20 characteristics too complex to allow reasonable prediction,
21 how would you feel about the OSA mines, which
22 certainly has complex conditions?

23 MR. GEORGE: To tell you the truth, I would
24 prefer not to comment on the acceptability of any foreign
25 project site, and on the specific point of OSA, I'm afraid

1 I don't know the details about that site nearly as
2 well as you do.

3 MR. PARK: Another question along the same line.
4 As you may recall, John Breneough, in an article in SCIENCE,
5 suggested that in highly fractured media, which
6 would be very complex and very difficult to predict, but if
7 it is drained into a well-characterized porous media would
8 be easier to predict, and he advocated strongly that
9 we look for those kinds of sites.

10 Would your relations here preclude that because
11 you could not predict the initial movement, even though you
12 knew eventually where it would wind up, and could predict
13 what would happen once it got into the porous media?

14 MR. GEORGE: I don't think so. What we have to predict,
15 it will depend on how things shake out with the definition
16 of accessible environment, and given the fact that the
17 total standard is keyed to perform and measure against
18 the EPA standard.

19 MR. PARK: This dealt with the complexity rather
20 than the accessibility environment?

21 MR. GEORGE: I realize that. You were asking whether
22 it would preclude it because you don't know in the close-near
23 field exactly what is happening, but you would know in sum
24 something about how long it took to get a great distance, and,
25 therefore, that distance and the release points are defined

1 around the accessible environment, so that is
2 the connection I was trying to make.

3 MR. MOELLER: Dick.

4 MR. FOSTER: Relative to that same point, what
5 organization or individual is going to make the determination
6 of a too complex situation? Will it be DOE or somebody
7 else? And do you visualize that as being subject
8 to adjudication in the licensing process?

9 MR. GEORGE: Well, I would say absolutely the
10 question will re-enter in the licensing process. We have
11 to consider it because we know the Commission will consider
12 it, and so we will use that as a screening.

13 It is a thing that, we are just not going
14 to pour money into a site alternative which we believe is
15 too complex.

16 MR. FOSTER: I'm trying to get a feeling for who
17 makes that decision and where along the line.

18 MR. GEORGE: We will make it in the site screening
19 process. The Department of Energy will make it when we
20 come up with a final site or sites to propose for licensing.
21 The NRC will then decide whether we have done a good job
22 of that or not, because presumably, our residual sites will
23 have met our feeling that they were not too complex, and that
24 they did permit modeling.

25 Now, if the NRC, in its review of the data and

1 analysis that we have, believe that that is not the
2 case, then we are out of luck.

3 MR. FOSTER: Thank you.

4 I can see this coming up in a lot of licensing
5 cases.

6 MR. MOELLER: Martin.

7 MR. STEINDLER: I think what Dick brings up
8 is actually crucial to moving the ball forward here.
9 There is a tremendous difference -- in the way of a
10 commentary -- there is a tremendous difference
11 between a statement in 10 CFR 960 that says we will
12 disqualify sites that are too complex, and a corresponding
13 analysis that comes up during the licensing process which
14 happens to show that this is in fact a complex issue,
15 because one is subject to some kind of numerical or
16 quantitative analysis.

17 The other one is a judgment. And if you want to
18 litigate that judgment, you will be in hearings forever.

19 There is a tremendous hazard in the wording --
20 administratively, procedurally, there is a tremendous
21 hazard in the wording that you folks have issued in 960,
22 the way the thing is summarized in the previous slide.

23 My recommendation is that you think through the
24 licensing process, and the kind of hearings you are going
25 to have to go through, and sympathize, if you will, with the

1 Atomic Safety and Licensing Board people that are going
2 to have to litigate some issue as to what is complex
3 and what isn't. Not the question of whether quantitatively
4 you have met the standards.

5 That comes out numerically in a sense. But you
6 are saying here if it is too complex, without specifying
7 what that is, if it is too complex, you will automatically
8 disqualify them, a very positive statement.

9 You have indicated in your preamble to the
10 notion of disqualification that they have to be very
11 carefully constructed.

12 My contention is, and I think that is what
13 Dick is driving at, is that you have not carefully constructed
14 it, not from the technical standpoint, but from the
15 administrative standpoint, and the process that you will have
16 to go through in licensing.

17 I would strongly urge you to have another
18 hard look.

19 MR. PHILBRICK: The complexity you are talking about
20 is a geological complexity?

21 MR. GEORGE: Yes.

22 MR. PHILBRICK: Why don't you say so?

23 MR. GEORGE: Why don't we?

24 Again, the effort that was undertaken in drafting
25 these guidelines was to try, given the difficulties of what

1 we are doing here, trying to establish general guidelines
2 which can be used for siting, where we may be considering
3 greatly diverse host rocks and geologic environments,
4 nonetheless, trying our best to meet the
5 guidance of the act to put in disqualifying factors,
6 and so that is the spirit under which these things were
7 developed.

8 A few more of them are on this particular Vu-Graph
9 here. We would disqualify where we had active dissolution
10 fronts predicted to interact within the facility within
11 10,000 years, which is the time horizon presently in the EPA
12 standard. If certain operational safety requirements
13 could not be met. Failure to meet the EPA standards
14 during operations. Surface facility would need to be
15 adjacent to an area one mile by one mile with
16 population not less than 1,000. That is mandated in the
17 act.

18 MR. MOELLER: Why does it say with a population not
19 less than 1,000? Why doesn't it say with a population
20 greater?

21 MR. GEORGE: This language is taken directly from the
22 act.

23 MR. MOELLER: I see.

24 MR. GEORGE: There were several things mandated that
25 we had to have.

1 If the repository would result in unsatisfactory
2 adverse environmental impact. Again, the key to the
3 legislation and NEPA compliance in those issues location
4 within a significant naturally protected natural resource,
5 which was a first order response, at least, to the
6 requirement that we consider the proximity to a whole host of
7 these things.

8 The guidelines themselves are categorized or
9 broken into three broad categories. The systems
10 guidelines, which have to do with the overall system
11 performance, to provide its function, that is isolation during
12 operating and after closure, and during operation is tied
13 to 10 CFR 20, I think it is, 40 CFR 190, the usual
14 things that have to do with releases from fuel cycle
15 facilities.

16 The post-closure is tied to the EPA 40 CFR 191, and,
17 of course, to the extent that 191 or 10 CFR 60 would change,
18 we would change the guidelines, and the act does require that
19 the guidelines be mutable, if some cause like that were to
20 arise.

21 The program guidelines have to do with additional
22 policies, administrative and Congressional, which are in
23 effect, in the discretionary area as opposed to technical
24 area.

25 Then, the technical guidelines are a little more

1 specific breakout of the geotechnical environmental factors,
2 which in fact contribute to meeting the system guidelines.

3 The system guidelines again, basic objective,
4 protection of public health and safety and the environment.
5 I think I said these things a moment ago.

6 The preclosure, the same standards as fuel
7 cycle facilities, maximum annual dose to individuals, post-
8 closure is release to the environment, 10,000 year time.

9 Program guidelines are those things that have
10 emerged over 25 years, I think, of thought in
11 the Government agencies and the public.

12 I think principally, things that have emerged
13 in the last four or five years.. The conduct of site
14 investigations, we include the commitment to investigate
15 multiple sites to increase the probability of success.

16 There have actually been people who have suggested
17 we should go out and look at one site at the time until we
18 fail, and then run off and do another one. That has been
19 popular in some Congressional offices that want to minimize
20 the impact on districts, I suppose.

21 Consultation with states and tribes. Again, that has
22 been a part of the program for some time, and it is -- certain
23 features of that are mandated in provisions of the act.

24 Environmental impact considerations. We have a
25 statement that we will adhere to the requirements of NEPA, as

1 interpreted by the Waste Act itself.

2 Regional distribution, that again is in the Act.
3 Certainly starting with the second repository and subsequent
4 ones, there would be an attempt to build towards a
5 regional distribution to the extent technically feasible.

6 That even traces all the way back through the
7 Interagency Review Group, which operated during the Carter
8 administration.

9 MR. MARK: In fact, there is not to be more
10 than one per state?

11 MR. GEORGE: That certainly would be the case.
12 But we are looking even regionally more than that. For
13 example, if the first one ends up in the West, we would tend
14 to emphasize the Eastern United States.

15 MR. MOELLER: That, you are saying, is mandated
16 by the fact?

17 MR. GEORGE: Yes.

18 MR. MOELLER: It doesn't offhand seem to me to be
19 compatible totally with the selection of the best sites
20 and with the idea of placing -- I really didn't understand
21 this.

22 It said that the site, from the transportation
23 point of view, should be near the source of the wastes. So
24 I presume that means near the nuclear power plants existing.

25

1 MR. GEORGE: Yes, Dr. Moeller. It says
2 consider all of these things. It does not give any guidance
3 at all as to what should have priority over the other,
4 except that the statement I made early that observed that
5 it says that the fundamental geological criteria that
6 are most important. It does give some primary reading
7 to that. And that is in line with what has been said before,
8 to the extent technically achievable, and I think that
9 most people would agree who have dug deeply into the
10 literature of this problem, that if one has done a
11 pretty reasonable expectable job in selection of the
12 site, the actual health effects that will occur from a
13 repository, or from repository operations, these effects
14 will be miniscule compared to the likely, perhaps
15 even loss of life from the mining operations themselves;
16 and certainly the loss of life from transportation, and
17 nonradiological, from just the mechanical accidents of
18 these hundred-ton casks on railroads, and 25-ton casks
19 on trucks.

20 So there is some reason certainly to consider
21 these things. It all gets bound up into ecclesiastical
22 arguments, because the people that get run over by
23 the trucks are today's people. Maybe that is better
24 than in a margin of risk that would be bequeathed to the
25 future in order to save the earlier -- the other earlier

1a2
1 problem.

2 MR. STEINDLER: Can I continue on that regional
3 distribution problem.

4 You indicate the word "equitable distribution"
5 there. I must say I didn't find any such word in the Act.

6 MR. GEORGE: No.

7 MR. STEINDLER: There is an enormous difference
8 between equitable, undefineable, and perhaps even in
9 conflict with the -- since there is no hierarchal ranking
10 of guidelines, perhaps even in conflict with those that deal
11 with geology and other factors, and the statement that
12 I think is in the Act that says advantages. "The
13 Secretary shall consider advantages of regional distribution."

14 Is the term "equitable" -- I don't wish to pick
15 nits, but if that is the direction you are moving in, you
16 are going to end up in the same licnesing board problem that
17 you are in ohter areas. Is the word "equitable" something
18 that you folks generate?

19 MR. GEORGE: No. The idea of equity as well as
20 tarnsportation risks is something that has grown out of
21 the literature of regional distribtuions. It was certainly
22 observed in the interagency review group reports which
23 urged regional distribution of repositories, and that has
24 been urged upon us repeatedly by specific states and
25 regional state groups.

1 I don't recall the exact wording, and we are not
2 striving for some exact equity. We are just saying
3 this is one of the considerations which has led to the idea
4 of regional distribution. It is not that we are committing
5 ourselves to achieve some specific degree of equity.

6 MR. FOSTER: In this case, let me support
7 Dr. Steindler relative to the particular word. That word
8 "equitable" got written into Indian treaties in the
9 Pacific Northwest many years ago and now has come back to
10 cause tremendous and continuing agony in the management of
11 the salmon resources of the Pacific Northwest, and the
12 interpretation of an equitable distribution of the
13 harvest for those fish of the Indian tribes. Exactly
14 what you are you talking about?

15 MR. GEORGE: So it is another issue such as the
16 earlier one that you are drawing attention to the
17 administrative problems.

18 MR. MOELLER: Are we clear, though, that the
19 word "equitable" was put in by DOE; that it is not in
20 the Act?

21 MR. THOMPSON: I am.

22 MR. GEORGE: Yes. I think that is correct.
23 And then the schedule, certain schedule considerations and
24 certain impact sitings are among the siting guidelines.

25 The technical guidelines, following the

11a4 1 problematical guidelines, have to do with the attributes
2 relevant to overall site performance, and these are the
3 ones that follow the literature of the program very closely
4 in that they all have to do with things that need to be
5 studied and defined through the process of getting to sites.

6 I guess in the limit, if we had a mathematical
7 analogy, we have broken out ten of those which are an attempt
8 to reach to some extent the orthogonal coordinates of the
9 system's performance, so that we could discuss things in
10 terms of measurements along the line of each of these
11 contributions.

12 MR. MOELLER: Well, now, several of the
13 groups that have criticized your proposed guidelines have
14 said that you have not emphasized sufficiently the
15 geohydrology, the geochemistry, and the geology of
16 the site's top priority items.

17 Is that a justified criticism?

18 MR. GEORGE: I don't really think so, in the sense
19 that the system guideline has to do with releases which
20 are going to be -- I mean, it is true that we have taken the
21 inheritance of the position of the government for some time
22 to use a systems approach, which includes consideration
23 of not only geology, the natural barriers of the system,
24 but the engineered barriers as well, and that somehow these
25 be consistently contributing factors at whatever site.

1 Again, the system performance in waste isolation
2 is the final measure of the site, and that is releases
3 to the environment.

4 Out of these ten that are mentioned here in the
5 two sheets, 7 -- well, even -- well, six of them certainly,
6 have to do with nature as you find it. The rest of them
7 have to do with, if you will, speculative things or
8 softer judgments that have to do with the socioeconomic
9 impacts, are the more strictly traditional NEPA issues.

10 MR. MOELLER: I hear what you are saying, but
11 I also hear what the public commenters have said. I
12 agree totally that it is the system that is going to give
13 you the performance, and you are interested in the releases
14 that come out through the system. But, as I read the
15 Nuclear Waste Act of the Congress, they would agree with
16 your statement, but they said we want to have the natural
17 barriers be given priority over any barriers.

18 Now, I can't quote the paragraph. But it must
19 be clearly in there.

20 MR. GEORGE: It is virtually up on the first
21 couple of --

22 MR. MOELLER: Then why don't you say that in your
23 guidelines?

24 MR. GEORGE: Well, I thought that we had, at least
25 by implication, if not specifically. If it needs a more

1 specific statement, then that certainly would reflect the
2 way we are doing business.

3 MR. MOELLER: Thank you.

4 Don.

5 MR. ORTH: Related to that, and related to some
6 of the other comments from the public, had to do with the
7 qualifying and disqualifying factors on these things here,
8 and you had mentioned earlier that you did not put in where
9 you had mirror images, where a favorable condition was
10 at least such and such, you didn't turn around and say that
11 a disqualifying condition was some minimum below that.

12 Since you have been critiqued for not putting in
13 more disqualifying factors, you either ought to then add
14 another statement similar, saying that you do have all those
15 mirror images, or just head through and make them.

16 MR. GEORGE: The image might be improved in that
17 regard, I agree. Many of the states' comments -- all of
18 this comes, I think, from the basic skepticism that
19 people have toward institutional functions these days.
20 They don't trust the Department of Energy; they don't trust
21 the Nuclear Regulatory Commission. So they would like to
22 see an a priori table of ranges, of acceptable ranges of
23 values for every measured parameter that one could go
24 after at a site. They would like to see us admit that we
25 will measure a certain set of X sub E, and put in a certain

1 range, and if that is not satisfactory, that one value alone
2 will eliminate the site.

3 We have had difficulty trying to convince people
4 that it is in the best interest of the country and that it
5 is not some plot to consider this thing as a system
6 performance which is a complex function. A lot of the
7 people that are criticizing us are attorneys and others
8 with whom I cannot speak in terms of, for example, a sum
9 total quality function that is a multivariant nonlinear
10 function of a number of variables, but in fact that
11 is what we are trying to do. And the favorable and
12 potentially adverse conditions we are talking about here
13 many cases are like, we find ourselves stepping into the
14 field of this multivariant function and seeing where
15 are we going uphill. These are like the partial derivatives
16 of that function, and it is how you take partial sparse
17 data, jump in, use the partial derivatives to look for the
18 upward slopes and look for better sites.

19 MR. MARK: Just as long as you are not getting
20 near some national forest?

21 MR. GEORGE: Or national parks or whatever, yes.

22 MR. MOELLER: Following-up on Don Orth's
23 comment, I noticed, for example, where you were talking
24 about the physical properties of the site, and you
25 listed then favorable conditions, and you didn't list any

1 at all.

2 It seems rather odd that you don't know any
3 favorable conditions with respect to the physical properties
4 of the site. You know, I hear what you are saying, but
5 I really think you need to put them in.

6 Back on this population thing: You say that
7 population density is important, particularly during
8 the time in which you are placing the waste in the
9 repository, and then you immediately say the establishment
10 of the repository will produce a considerable influx of
11 people. That left me hanging. I mean, how considerable
12 an influx? Is it enough to make more than a thousand
13 people per square mile?

14 MR. GEORGE: It depends on how they are
15 distributed.

16 MR. MOELLER: Are you going to locate, spread out
17 a little bit?

18 MR. GEORGE: No.

19 MR. MOELLER: I'm referring to page 5675 of your
20 guides, and I don't know what section and so forth, but
21 these two statements are made one after the other, and I
22 just found them sort of intriguing.

23 MR. GEORGE: Well, you know, we expected
24 considerable comment on these guidelines, and it was
25 important for us to -- in order to meet the schedule

1 mandated by the bill, and to go through the process they
2 had, we had to put something out that ended up being the
3 basis for this public comment; and you are calling
4 attention to a number of things here which have to do with
5 places where it is not great literature.

6 MR. MOELLER: But then you do intend, or you
7 anticipate significant revisions?

8 MR. GEORGE: I would be surprised if we do not,
9 given the comments that I have heard, yes.

10 MR. MOELLER: Well, I think that is a very
11 important statement to hear, because so frequently these
12 things come out in draft, and the changes between the draft
13 and the final, even though there is lots of comment, the
14 changes are minimal.

15 If you indeed do make some significant changes
16 in rewording in this, I think it would be very beneficial,
17 not only for better guidelines, but in terms of your
18 recommendations with the public.

19 MR. GEORGE: We are going to do our best. I
20 certainly understand that problem fully and am one of the
21 stronger advocates of that approach within the program.

22 MR. MOELLER: Very good.

23 Martin.

24 MR. STEINDLER: A couple of comments. One on the
25 population thing.

1 I gather from the Congressional Record portion
2 of the Act that the whole issue of population density is not
3 one that really focuses on the temporary workers that
4 arrive on the scene as they are digging out of the shaft,
5 but it is a more permanent population. However, the folks
6 at DOE are constrained by the way the Act is written. I
7 think that causes the kinds of problems that seem to arise.

8 On the other hand, though, I'm persuaded that these
9 guidelines should be designed to be reasonably useful but
10 not very useful. They should, however, absolutely
11 not be a source of mischief, and so I don't see any real
12 need to, for example, rank in order of importance, or
13 amplify those things which some people view as being critical
14 in these guidelines.

15 I think the whole issue of what becomes
16 important and what isn't will come out when the system
17 people and the modeling people finally put together the
18 specific site data, and then assign some levels of
19 importance to various attributes of the site as they
20 assume the overall risk. That, it seems to me, doesn't and
21 shouldn't come out in these generic general guidelines that
22 happen to be required by the Act.

23 Under ordinary conditions, it seems to me,
24 in the basence of the particular provision in the Act, the
25 NWTs documents that we have seen and heard about, and

1 internal guidelines that already exist within the
2 department, would have been perfectly adequate, in fact
3 are more quantitative, and in fact if you look at them, are
4 ranked in order of importance very often, importance to
5 the whole risk, would have been perfectly adequate as
6 a body of information to set a set of guidelines by which
7 DOE can operate.

8 It happens that the climate which generated this
9 Act called for a set of guidelines. I would be a little
10 bit suprised if there was an enormous amount of
11 enthusiasm on the part of DOE saying, yes, these
12 guidelines are absolutely important for us to proceed.
13 I think they could proceed very well without them.
14 Having been forced into this action, however, it seems
15 to me they have done a reasonable job of putting together
16 generic guidelines, and the only criteria that I'm applying
17 at the moment is do they conflict with EPA and NRC, and,
18 two, can you get into some kind of mischief if these
19 guidelines stay the way they are.

20 My comment on the administrative part would cause
21 mischief and delay, which is totally unnecessary, and
22 doesn't add to the protection of the health and safety of
23 the public.

24 I'm not looking for a ranking, particularly,
25 or a tightening of these generic guidelines in specific

1 geochemical areas. I think that will come out naturally
2 in the course of the analyses that the Staff is going to
3 require when the licensing application comes floating
4 through.

5 MR. MOELLER: I hear what you are saying, and
6 yet when Dan Egan presented the EPA generic risk evaluation,
7 he showed that the natural barriers, the geology and
8 the hydrology and so forth, the hydrogeology of the site
9 were key factors, and were in fact more important, at least
10 the way I saw what he did, than the man-made variables, and
11 the Congressional law which has been passed says that we
12 shall -- or says that we shall -- that the geological
13 features, the natural barriers shall be the primary
14 criteria. "Such guidelines shall specify detailed
15 geologic considerations that shall be primary criteria
16 for the selection of the sites and various geologic
17 media."

18 So I'm simply thinking that Congress was
19 pretty wise here, and that indeed therefore the DOE
20 guidelines should emphasize the importance of the natural
21 barriers.

22 MR. STEINDLER: My view of the wisdom of
23 Congress is limited by the political end of the spectrum.
24 Technically it is obviously no more sensible for Congress
25 to declare the geology shall be controlling than it is for

1 Congress to set the value.

2 MR. MOELLER: I presume that in the hearings that
3 went into the development of the Nuclear Waste
4 Policy Act of 1982, that perhaps even EPA testified
5 and showed them this, and therefore they incorporated it.

6 MR. STEINDLER: And I'm perfectly willing to
7 accede to the notion that the geology will ultimately
8 determine to a much more positive extent the level of
9 positive risk. All I'm saying here is that these guidelines
10 are not necessarily going to be the numerical criteria
11 against which these folks are going to operate, unless
12 you want to combine these guidelines with all the EPA
13 and NRC regulations and combine them into a single
14 statement. There, however, exists pretty good reasons
15 for keeping those separate.

16 It seems to me that the NRC, backed-up by the
17 EPA fundamental ground rules, are going to be the
18 folks who are going to determine how well that geology
19 performs, and how important it is. We may all agree today
20 that it will be important and we may all agree that the
21 statement in the Act will ultimately turn out to be
22 correct, as a correct guide; these guidelines, however,
23 it seems to me, have no compelling reason to rank and
24 provide additional numerical quantification. They need
25 to be generic, and in that sense I think they have to

1 be loose. But to keep them out of mischief, I think,
2 is the important issue.

3 MR. MOELLER: This does raise a question
4 which I made -- or relates to a statement that I made in my
5 opening remarks this morning, and this might be a good time
6 to address it. That is, what does DOE specifically want
7 from the ACRS? That is, do you want us to comment on
8 your guidelines in terms of meeting the requirements of
9 the Nuclear Waste Policy Act, or do you want us to comment
10 on them in relation to the NRC criteria and the EPA
11 standards, or their usefulness in selecting a site, or what?
12 What would you like for us to do? What should be our main
13 thrust?

14 MR. GEORGE: I wish I could split up those
15 alternatives.

16 MR. MOELLER: Well, a combination is fine.

17 MR. GEORGE: Well, a combination is fine.

18 MR. GEORGE: Basically we see that what we want
19 to do is, since NRC must concur in the guidelines,
20 the Commissioners must concur in the guidelines; they are
21 the last agency to put their stamp on the guidelines, and
22 if they cannot put their stamp on the guidelines, we are
23 in trouble at the end of our tether before the Congressional
24 mandate is upon us.

25 Now, we wouldn't be the first agency by far, I

1 suppose, to miss a mandated date, and we will have given
2 it the old college try. But we would like to try to preempt
3 some problems of interpretation or other issues before the
4 commissioners come to review them so that we can have a
5 high confidence that, first of all, the NRC Staff and --
6 well, let's not put them in order -- but that both the
7 NRC Staff and the ACRS in advising the commission will
8 encourage the commission to concur and that the commission
9 will find that they can concur.

10 So, clearly we are interested in comments
11 which would aid your advising the commission that these
12 guidelines will recommend sites which are consistent
13 with the kind of regulatory decisions that the commission
14 must make. These will -- because of the role of the
15 guidelines mandated in the Act against which decisions on
16 site recommendations are made, these guidelines must be
17 consistent with recommending sites which will meet the
18 NRC licensing judgment.

19 MR. MOELLER: That is helpful.

20 In the law it states that you must have, I
21 guess the concurrence of NRC or something like that.

22 MR. GEORGE: Yes.

23 MR. MOELLER: What does that really mean?
24 Does that mean for the commissioners to vote 3 to 2 or
25 something?

1 MR. GEORGE: That is certainly what we were
2 assuming.

3 MR. MOELLER: I just wasn't sure what
4 concurrence meant.

5 MR. MARK: There are some things very specific
6 in the law which override the fact that geology is
7 important; namely, you won't go into a highly populated
8 area. There is probably no terribly sound technical
9 reason for that, but it sounds right. It doesn't say what
10 a highly populated area is.

11 MR. GEORGE: Yes.

12 MR. MARK: No?

13 MR. GEORGE: Yes, you are correct.

14 MR. MARK: Okay.

15 Then it says you mustn't be adjacent to a
16 magic mile, which is a thousand people.

17 MR. GEORGE: Yes.

18 MR. MARK: Do you have an understanding what they
19 meant by adjacent to? Do you have to be ten miles away,
20 or only ten feet?

21 MR. GEORGE: We don't have a magic insight
22 into that. If you read the history of the Act, you will
23 find that the population density debates that several
24 states try to propose population density standards which
25 would omit specific sites that were under consideration

1 in their state, and that is exactly what was happening.
2 There was even a last-minute debate over the specific
3 wording of this provision and a complaint that it didn't
4 eliminate a specific site.

5 MR. MARK: Was it a site or a state they
6 wanted to eliminate?

7 MR. GEORGE: Since they were Congressmen
8 discussing it, may have been to eliminate a district,
9 for all I know. I mean, it is not being facetious to
10 realize that this is an intensely difficult political problem
11 for all the people who have to deal with it, and even with
12 the greatest respect, you have to admire the times when
13 statesmanship can hang in there even a few more moments,
14 sometimes when you see the level of public debate over
15 these issues.

16 So, yes, these people were very concerned over
17 that, and I was driven to some extent. They were under
18 advice of their states.

19 Out of the numbers of attempts at population
20 density criteria, there was one which OTA quickly jumped
21 in and said, if you do that you will eliminate all but,
22 I think it was an odd dozen or so counties in the whole
23 United States, and six of those are in Georgia, which
24 certainly caused a remake of things.

25

1-12-1
1 MR. MARK: Getting the geology up front is
2 overriding. As Marty said, you don't really want to
3 put yourself in that spot, because I judge you've got to keep
4 out of national forests, wilderness areas, and so on?

5 MR. GEORGE: There are some interesting arguments that
6 have been made about issues like this.

7 I had discussions with people who have suggested
8 that -- for example, the EPA analysis shows the predominance
9 of the risk comes not from the normal predominance of the
10 site, but through inadvertent human intrusion.

11 MR. MARK: You've got to keep out of the forests
12 anyway, whether there is a risk or not. Maybe the best
13 geological site in the country is right in the middle of
14 some forests.

15 MR. GEORGE: Actually, we don't have to stay out
16 of national forests necessarily. National parks, you do.

17 MR. MARK: National forest lands? What does that mean?

18 MR. GEORGE: National forests are administered by the
19 Park Service. People are allowed to graze on them.

20 They are a resource for controlled land use. Parks,
21 on the other hand, have a much more narrower requirement.

22 MR. MOELLER: He's reading the law.

23 MR. PARK: The law says, park systems, wildlife
24 refuges, wild and scenic rivers, you can't get near the
25 Colorado, national wilderness preservation, national forest

1 lines.

2 MR. GEORGE: It only says that you should consider
3 proximity to these things.

4 MR. MARK: You are awfully proximate, if you are
5 in them.

6 MR. GEORGE: And it says that you should consider
7 that, I believe.

8 MR. MARK: It also says you must absolutely stay away
9 from population, or this magic mile, and you can only
10 have one per state under serious consideration at one time.

11 MR. GEORGE: I don't recall those words being in
12 exactly that form.

13 MR. MARK: That is how I finally got to
14 understand them after I read them six times.

15 MR. MOELLER: Dick.

16 MR. FOSTER: I wonder if you could elaborate a little
17 bit on the various DOE sites, like Hanford, Savannah River,
18 what not, relative to this. Those things seem to enter
19 in, and in several different places -- I must confess, I
20 haven't read this enough times to be able to sort all of those
21 out.

22 A little more specifically, one of the things
23 which pops into mind is the need during the operational
24 phase to comply with EPA regulation 190. In other words,
25 not exceed the 25-milirem, which does in fact apply to

1 the fuel cycle.

2 MR. GEORGE: Yes.

3 MR. FOSTER: But would an operation like Hanford,
4 with its separations plants for military purpose, would
5 effluence from them impact on an operational site here?

6 In other words, does the 25 milirem score in
7 relationship to the operation of the DOE nonfuel-cycle site?

8 MR. GEORGE: You are pushing me to the edge, I think,
9 of acting like a lawyer, because I'm not actually sure
10 what defense facilities must and must not comply with anymore.
11 But I'm assuming that they do, and that, therefore, the
12 25 millirem has to apply at the boundary of the Hanford
13 site for any releases due to all operations there.

14 MR. PHILBRICK: Now, is that the limit fo the
15 underground excavation; is that the limit of the site?

16 MR. GEORGE: It would have to be -- I would assume
17 that it would be at the fence line.

18 MR. PHILBRICK: At the what line?

19 MR. GEORGE: Fence line.

20 MR. PHILBRICK: I still didn't hear you.

21 MR. GEORGE: At the fence line.

22 MR. PHILBRICK: Where is the accessible environment?
23 On the other side of the fence?

24 MR. GEORGE: The accessible environment is intended
25 to -- the accessible environment is not related to the

1 operating phase criterion. The accessible environment is
2 a definition that only applies to the post-closure phase, and
3 the long-term releases of activity, and the accessible
4 environment definition -- it would be better if Dan
5 hadn't left so you could ask EPA about this. But the
6 accessible environment definition is meant to include, or
7 to say that not only can you not release to the biosphere, the
8 plants and animals and air and surface waters, but you must
9 not release to some portion of even the potentially potable
10 groundwaters. And so they include a -- but they don't
11 believe -- they don't surmise that it would be reasonable
12 to assume that in 10,000 years there may nothing get out,
13 and even move no distance at all into particularly slow-moving
14 aquifers.

15 And so they allow that there would be
16 some contamination out to a point, even at subterranean
17 levels, at which begins the accessible environment.

18 MR. PHILBRICK: All right. That is out there
19 somewhere.

20 MR. GEORGE: All right. Yes. 10 kilometers.

21 MR. PHILBRICK: That gives you 10 kilometers in this
22 direction, and 10 in that direction, unless you figure out
23 which way the water is flowing.

24 Tell me this: What sort of control do you have
25 over this area between the fence and the accessible

-12-5 1 environment?

2 MR. GEORGE: Well, I suppose it could depend on local
3 laws that have to do with separate purchase of minimal
4 rights. And this does become an issue.

5 At a minimum, it would mean that perhaps even
6 beyond the surface intercontrol zone, which the department
7 would own both surface and subsurface zones, proceeding through
8 the distance at least which we would need to assure the
9 10,000-year time element, we would have to own the mineral
10 rights so that we could preclude drilling.

11 MR. PHILBRICK: Then you are assuming that somewhere
12 out there the water comes to the surface?

13 MR. GEORGE: Well, somewhere out there, if it is
14 moving, it does come to the surface. If the
15 radiation is not going to get anywhere near that within
16 10,000 years, we have met the criterion of the EPA, that
17 the releases will be less than a certain amount within
18 10,000 years.

19 MR. PHILBRICK: The accessible environment then
20 included the groundwater?

21 MR. GEORGE: Yes.

22 MR. PHILBRICK: It doesn't say so in the paper.

23 MR. GEORGE: I believe it says the lithosphere, which
24 I think includes the groundwaters. It was intended
25 that it do.

J-12-6

1 MR. MOELLER: Frank.

2 MR. PHILBRICK: Groundwater is a fugitive constituent.

3 MR. MOELLER: Frank. Go ahead.

4 MR. PARKER: On the rock characteristics, you talked
5 about operational safety. I wonder if you also can talk about
6 ease of operation, for example, if you get up to 200
7 degrees or 150 degrees Fahrenheit, it might not be safety
8 problem so much as it is ease of operation, and the same
9 thing could possibly be true with horizontal stresses in the
10 rock. It may not be a safety problem so much as
11 difficulty of working down there.

12 I wonder if there should be something on ease of
13 operations, as well as safety.

14 MR. GEORGE: Well, we tend to realize and try to stay
15 consistent with the public's demand that safety be the first
16 and foremost criterion, and, therefore, things like
17 operational convenience, or perhaps cost, are not given
18 high play.

19 MR. PARKER: You wouldn't want to be in the position to
20 say some of the South African gold mines, the amount of
21 time that you can spend in them is severely limited?

22 MR. GEORGE: No, that is true.

23 MR. PARKER: Let me ask another question, on the
24 geohydrology we were talking about modeling and ease of
25 modeling in noncomplex situations.

1 Could you construe that to include salt domes,
2 because around the domes themselves, you might say
3 that the groundwater conditions are extremely complex?

4 MR. GEORGE: It would depend. The United States
5 Geological Survey has certainly advised us, and I guess
6 it is fairly common sense, that there is a degree of complexity
7 that arises from the fact that these are piercement
8 structures in the first place, so certainly it has to
9 be considered. But it may be that, for example, sheer
10 size of the dome and buffer regions and overall gross measures
11 of dissolution rates, and things like that may
12 compensate for that.

13 So it is certainly a consideration, but it may be
14 compensated for by other things which increase the
15 certainty that you have that the waste is never going to get
16 to the groundwater in the first place.

17 MR. PARKER: Final question. In the discussion
18 you talk about operational and monitoring periods. I don't
19 recall any place else where you define monitoring period.

20 MR. GEORGE: I don't recall why the monitoring period
21 per se was put in there, except that it is considered that
22 there would be a period of monitoring before one could get
23 the license for decommissioning from the NRC, and it would
24 a period which we have discussed in terms of performance
25 confirmation tests, and they may extend somewhat beyond the

-12-8 1 period of actual operation, loading the waste into a
2 repository.

3 MR. PARKER: The reading that I have of the
4 phrase would seem to be that this would be after the
5 operational period. I was just curious as to what
6 sort of monitoring, if any, and how you can justify --

7 MR. GEORGE: It hasn't been fully determined how
8 long a period monitoring would extend beyond, for example, the
9 placement of the last waste canister. There is an unrealistic
10 expectation on the part of some members of the public
11 that the thing would be monitored somehow forever and ever,
12 and that 25, 50, 100, 1,000 years afterwards, there would
13 be something clicking away, or a meter there that
14 would tell people whether everything was all right.

15 On the other hand, there is a more subtle
16 definition of performance confirmation, which is in the
17 department's literature, and I think has been under
18 discussion with the Commission, that has to do with the
19 decision on decommissioning, and there you would have
20 measured the process which may influence degradation
21 and come to a conclusion that, for a sufficient length
22 of time, that you conclude that the heat levels are turning
23 around, or whatever, the the processes from there forward
24 are not going to yield anything unexpected.

25 MR. PARKER: Is there even any instrumentation

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

available today that might not provide a greater threat
to the facility than the information that it would provide?

1 MR. GEORGE: Clearly after decommissioning,
2 you are right that the conduits from the instrumentation
3 to surface readout would be a potential threat.
4 Of course, it could depend a lot upon hydrology, on the
5 hydrology of the site. In some places the pressure
6 gradients are such that groundwater flow is downward so that
7 if there is a conduit, the water is going to move to deeper
8 aquifers which have even further and more distant and more
9 time distant discharge points.

10 MR. MOELLER: Shayler.

11 MR. PHILBRICK: I saw a drawing in some of the
12 stuff that we received a while ago which showed that the
13 waste packages were inserted in a horizontal hole on
14 the side of the work.

15 Is that a proposed scheme?

16 MR. GEORGE: I believe that one of the projects
17 has proposed that. I think Hanford has proposed a
18 horizontal emplacement.

19 MR. PHILBRICK: Has anybody said how they were
20 going to compact and backfill?

21 MR. GEORGE: Obviously the question is how
22 compact.

23 MR. GEORGE: The department has organized the
24 program under three separate projects, Hanford being one
25

1 of them, and I haven't had anything to do with Hanford for
2 over two years, or a year and a half. So I really
3 can't answer that question.

4 MR. PHILBRICK: Well, compacting dry stuff is
5 pretty hard.

6 MR. GEORGE: Yes.

7 MR. PHILBRICK: We've tried to do it. I can
8 see you compacting it -- placing the backfill in the
9 workings, but to backfill around the package
10 and horizontal pouring is going to be an awfully difficult
11 thing, and nearly impossible.

12 MR. GEORGE: I don't know the answer to that.
13 They may be planning to grout in there or something. I
14 just don't know.

15 MR. MOELLER: Martin.

16 MR. STEINDLER: I've got a couple of questions.
17 In your specific wording -- and I sound like a nit-picker,
18 and I guess I'm really concerned about this issue in terms
19 of mischief -- but in your specific wording, you indicate
20 that the guidelines were developed in accordance with the
21 requirement of the Act for use by the Secretary of Energy
22 in evaluating the suitability of sites for radioactive
23 waste repositories and so on.

24 The Act says, the Secretary shall use guidelines
25 established in the subsection in considering candidate

1 sites.

2 Now, is there a difference between evaluating
3 and considering?

4 MR. GEORGE: One could say so, except that you
5 look at the requirements in the Act for environment
6 assessments, which accompany site nominations, and other
7 documents and other requirements in there, you will see
8 that there are statements having to do with evaluation of
9 the sites pursuant to the guidelines.

10 MR. STEINDLER: One other question. In the
11 case of what your section called present and future
12 hydrologic conditions, you indicate that a site is
13 disqualified if the average prewaste and placement
14 groundwater travel time along the paths and so on is
15 less than a thousand curies.

16 A couple of items down under favorable
17 conditions, you say the fastest path likely to be
18 traveled by nuclides is greater than a thousand years.

19 Now, I assume you took the average groundwater
20 travel time as a disqualifier deliberately.

21 Why didn't you take the fastest test in this
22 case?

23 MR. GEORGE: I believe those words are borrowed
24 from the language of 10 CFR 60. I'm almost positive that
25 those specific words were borrowed from 10 CFR 60 technical

1 guidelines on average groundwater travel time, including
2 travel time, and the favorable condition.

3 MR. PARKER: I do have one minor comment that I
4 think you want to get out of there, or at least I would like
5 to see you get out of there.

6 On natural resources, it says the presence of
7 natural materials, whether identified or undiscovered.

8 If they are undiscovered, it is going to be hard
9 to get them out of there. So you really ought to take
10 the undiscovered out.

11 MR. MOELLER: On that same thing: I didn't
12 know why they had to be naturally occurring. What if you
13 discovered gold there, or something that someone had
14 buried? Why must it be naturally occurring?

15 MR. PHILBRICK: What was his name, Kid?

16 MR. MOELLER: Couldn't there be something there
17 that was unnatural?

18 MR. GEORGE: I doubt that it would be of large
19 enough extent that it couldn't be removed.

20 MR. STEINDLER: There is a serious problem that
21 people keep raising, that if you bury enough waste down
22 there, you've got enough palladium and other things that --

23 MR. GEORGE: There is no attempt, I believe, in
24 the EPA standard or ourselves, to try to preclude the fact
25 that people may intentionally go down in there to go after

1 the waste, if they have some use for it. As long as they
2 know what we are doing. Are we going to protect people
3 from their conscious decisions, or are we going to protect
4 people from some unconscious blundering, from some mess
5 we have left behind? So I think it is the latter symptom
6 that we are trying to avoid.

7 MR. ORTH: As long as we are starting to
8 quibble about words and things here and there, one thing
9 that disturbed me in great many of the sections was the use
10 of the word "potential," a synonym for which is possibility
11 of. So when we say something is unfavorable if there is
12 a potential for something that would adversely do something.
13 What we are really saying in many places, section after
14 section, is that if there is any possibility that somebody
15 could do something, what we mean is a high possibility or
16 a low possibility, or something of that nature. You may
17 want to look very closely at every place you have used
18 "potential" and see if there is a qualifier of some kind
19 that you put in the sections. Otherwise, you can get hung
20 up forever.

21 Certainly there is a possibility that somebody
22 could do something. What you really meant was a high
23 possibility, or high potential, or something of that
24 nature.

25 MR. MOELLER: To pick up on one item which we

1 had discussed earlier, your slide showed the equitable
2 regional distribution. The Nuclear Waste Policy Act --
3 neither the Nuclear Waste Policy Act nor the draft
4 10 CFR 960 have the word "equitable" in them.

5 MR. GEORGE: That was raised earlier, yes. And
6 we didn't really say that it would be an equitable
7 distribution; only that equitability and transportation were
8 some of the driving, I suppose -- some of the underlying
9 forces which would recommend in some way regionality.

10 There is no reason -- the only reason for
11 regionality that is a physical measurable reason would be
12 transportation, the things having to do with transportation.

13 MR. MOELLER: Well, the point I was making was
14 the one that Dr. Steindler made. That is, that you have
15 added the word, that it is not in any of the written
16 material.

17 MR. GEORGE: Yes. I believe that is correct,
18 that it is not in the material directly impinging on
19 the guidelines. It is in the history of the program, and
20 the drafters of this particular item no doubt were intending
21 to appeal to sensibilities expressed by critics outside
22 the program.

23 MR. MOELLER: While we are picking up various
24 items, and then I'm sure we better get back and let you
25 finish, but for hydrologic conditions, which is on page 5679,

1 where you were trying to name adverse hydrologic conditions,
2 you couldn't name any, and that just seemed baffling to me.

3 Are there no adverse --

4 MR. GEORGE: Well, there is a disqualifying
5 factor on that, and I suppose that we assume that with the
6 disqualifying factor that there was no need for further
7 adverse conditions. As I recall, disqualifying
8 factor had to do with a groundwater travel time of
9 a thousand years or less.

10 MR. MOELLER: All I can read is in the third
11 column on 5679 under 960.5-2-1b, potentially adverse
12 conditions. None specified.

13 MR. PHILBRICK: Come down a little farther
14 and you get them, the next B.

15 MR. MOELLER: Well, now, in hydrgeologic modeling
16 you say that potentially adverse conditions, military
17 activities. What are those?

18 MR. GEORGE: That shouldn't be under hydrology.

19 MR. MOELLER: It's under 960.5-2-2, hydrologic
20 modeling, item B, potential adverse conditions, and it
21 lists a lot of things, including "military activities."

22 Is Hanford a military activity?

23 MR. GEORGE: Well, no. Rigidly speaking it is
24 not. To tell you the truth, I don't have all this committed
25 to memory. The only way that makes sense to me, to

1 interpret that, proximity to military activity, under
2 hydrology, it would have to do with something at the Nevada
3 test site where the weapons have done something to fracture
4 rocks or whatever.

5 MR. MOELLER: Carson.

6 MR. MARK: In the public law, the word comes
7 over and over, monitored retrievable storage.

8 MR. GEORGE: Yes.

9 MR. MARK: I don't find in the law any attempt
10 to define "retrievable." Maybe it is in the background
11 of the Act?

12 MR. GEORGE: Monitored retrievable storage is a
13 completely separate facility notion from geologic disposal.
14 It has no relation to these guidelines; it has no relation
15 to permanent disposal. It is a proposal of those who
16 believe that one will never reach sufficient degree of
17 concensus among geologists and geoscientsts that the
18 information is adequate to assure that you will meet
19 the EPA standard and/or those people who believe that
20 there may be breakthroughs in that capability, and/or
21 people who believe that we should allow the wastes to
22 cool for literally 100 or more years, that are suggesting
23 that we should have a separate facility entirely which
24 would be near surface or surface for semipermanent
25 storage, monitored storage of this material. And the

1 forefront advocate of that is Senator Bennett Johnson.

2 MR. MARK: You are dealing, however, with
3 geologic disposal and the notion of retrievability applies
4 during the loading of the site perhaps, or perhaps a little
5 while after that?

6 MR. GEORGE: Retrievability will ultimately
7 be determined by what NRC's standard is on retrievability.
8 They will judge whether we have sufficient retrievability.

9 MR. MARK: Fine.

10 MR. MOELLER: Dick, and then let's let Mr. George
11 finish up.

12 Go ahead, Dick.

13 MR. FOSTER: These would certainly fall into the
14 category of editorial nit-picking, but items which may
15 come back to haunt you, if you leave them the way they
16 are. Under section 960.5-8-1 there is a subparagraph,
17 potentially adverse conditions which reads, "A population
18 density and distribution such that the projected releases
19 could result in the exposure of many people."

20 You really need some sort of an adjective
21 associated with "exposure." Otherwise, no matter what
22 you do, people will be exposed.

23 The second one is in section 960.5-9,
24 under environmental potential, there is a sentence which
25 reads, "A site shall be disqualified if a repository would

1 result in an unsatisfactory adverse environmental impact
2 that threatens the health and welfare of the public or the
3 quality of the environment and cannot be mitigated."

4 I guess there re the words in that sentence
5 that say unsatisfactorily adverse, but I would recommend
6 some additional qualifying adjectives in there relative to
7 the significance of the degree of adverseness, or degree of
8 uncertainty.

9 MR. GEORGE: There must be some legal history
10 behind those words, because I happen to recall that that
11 specific phraseology was entered into by a NOPA lawyer.
12 Not that that may be very helpful.

13 MR. FOSTER: Usually you find such things as
14 unacceptable, or significant.

15 MR. MOELLER: I promised we would let him speak.
16 However, in 960.5-7-4, in terms of off-site
17 hazards, you refer to atomic energy defense activities.

18 Is it now atomic energy instead of nuclear
19 energy?

20 MR. GEORGE: It is the same thing. Atomic
21 energy defense activities are a legal name for what it is
22 the department does in production of nuclear materials
23 special nuclear materials.

24 MR. MOELLER: So it is a legal term.

25 Why don't you continue.

1 MR. GEORGE: I think nothing much more needs to
2 be said about it than this: In the application of the
3 guidelines, it is a sequential screening by steps. It is
4 an exploration process, where each step is to focus
5 subsequent exploration on diminishing land areas. It is
6 progressively more detailed as we accumulate information
7 over these land areas, and it recognizes possible later
8 disqualification. The site search is not a zero risk
9 effort.

10 At very late in the process we can mine into
11 something that invalidates the site. But we work the system
12 with the variables, the data that we can acquire in a way
13 which is reasonable use of public money, in order to come
14 up with the sites.

15 We try to create -- obviously we are trying to
16 create a basis for numerical evaluations during site
17 calculations when we start creating a lot of information,
18 and finally disqualification can occur anywhere along the
19 line.

20 I have some information here that just might be
21 useful to you on some of the things which the department has
22 done to solicit comments on the siting guidelines. We
23 have had a series of Federal Register notices. We
24 have had mailing lists, both the program mailing list
25 which out of Columbus, Ohio, sent notices of these things

1 to something like 2,000 or 3,000 respondents, public
2 interest groups list that are maintained either in the field
3 or headquarters, consumer groups, trade associations;
4 plus, we had press releases both by the field offices and
5 by headquarters, and there was an Indian Affairs organization,
6 and Indian tribes were also informed.

7 In trying to solicit comments on the draft
8 siting guidelines, we notified the states, both the
9 governors, the state legislative leaderships, territorial
10 officials, public interest groups in affected states,
11 state offices in Washington, D.C.; a number of states
12 keep offices there; local affairs, public interest
13 groups, Congressional delegations and so on.

14 That is all fairly obvious, I imagine.

15 In the review by federal agencies, the copies
16 of the guidelines were sent to the agencies on these dates.
17 That tells you when they have been transmitted.

18 MR. MARK: Who do you think of when you refer to
19 consumers? Meaning, I guess, your product?

20 MR. GEORGE: No. Consumer groups are an
21 assortment of people, as you understand, that rally around
22 the banner of consumerism. It being a good way to attract
23 a large constituency, I suppose.

24 MR. MARK: Different from public interest groups?

25 MR. GEORGE: Many times overlapping.

1 MR. MOELLER: Okay.

2 Other questions?

3 I have a couple.

4 You gave us, of course, in your opening remarks,
5 a schedule for the guidelines.

6 Now, you also, though, have that schedule --
7 by the end of the summer you wanted to have a site picked
8 out?

9 MR. GEORGE: Not a site picked out.

10 MR. MOELLER: Three sites. For the President to
11 look at and make a decision.

12 MR. GEORGE: As to whether they are ones in which
13 we make that final assessment of site clarification.

14 MR. MOELLER: Can you tell us in a couple
15 of sentences how far you have to go in choosing those three
16 sites? Are these guidelines what you will use in choosing
17 those three sites?

18

19

20

21

22

23

24

25

j-14-1

1 MR. GEORGE: Well, yes and no.

2 They have to be weighed against these guidelines,
3 but the bill itself, for example, called upon us to
4 identify potentially acceptable sites within 90 days of
5 passage of the Act.

6 Clearly, we could not have done that, that
7 identification of potentially acceptable sites based upon the
8 guidelines which weren't going to be ready until 180 days.
9 We take that to mean the will of the Congress that the sites
10 that we have been studying are the pooled alternatives
11 for the repository decision.

12 The next step is the nomination of sites out
13 of that pool of acceptable sites. Those nominations must
14 be accompanied by a statutory environmental assessment which
15 includes mandatory sections, which evaluate those sites
16 against the guidelines.

17 MR. MARK: Those are due January 1, 1987?

18 MR. GEORGE: The bill says not later than January 1,
19 1985. The nomination has to be done, and not later
20 than March of 1987, the recommendation of a single repository
21 site must be made by the President and the Congress.

22 MR. MARK: The President has to tell you to go
23 ahead with those sites that you have mentioned?

24 MR. GEORGE: That's right.

25 MR. MARK: How long a process is the characterization?

1 it could easily be more than two years?

2 MR. GEORGE: Oh, my goodness, yes. It depends on
3 the rock medium and what you already know about it,
4 and how hard it is to get down there, and what kind of
5 tests might be required.

6 In fact, these test programs are still under
7 development with some review by the Nuclear Regulatory
8 Commission, the USGS, and so on.

9 In a sense, then, we are still figuring out the
10 full slate of tests that would be required at departments.
11 But everyone is talking about long periods of time, to drill
12 and equip the shaft -- in fact, at Nevada, we are going to
13 mine it, because drilling would screw up the measurements of
14 porosity that you need in order to evaluate the
15 storage in the unsaturated zone.

16 MR. PHILBRICK: Try that again. The drilling will
17 wreck the porosity --

18 MR. GEORGE: That's correct. Drilling will make more
19 difficulties in measurements of rock profiles and
20 particularly, I think, hydraulic conductivity.

21 MR. PHILBRICK: What do you constitute drilling --
22 what do you talk about when you are talking about drilling?

23 MR. GEORGE: We are talking about wet drilling, not
24 drill and blast.

25 MR. PHILBRICK: That screws up not the porosity, nor

1-14-3 1 the permeability, but the water content.

2 MR. GEORGE: Actually, I see some drilling experts in
3 the back of the room from USGS, who know something
4 about that. I believe that the drilling mud, fines, and
5 materials like that get forced back into the rock and create
6 difficulties in both mineral -- for example, early
7 measurements I propose, as I understand it, of
8 conductivity, mineralogical and other matters.

9 Perhaps I could have some help from Pete Stevens.

10 MR. PHILBRICK: What are you talking about when
11 you are drilling? Are you talking about the whole shaft,
12 or are you talking about some holes?

13 MR. GEORGE: No. The shaft.

14 MR. PHILBRICK: You are talking about the shaft?

15 MR. GEORGE: Yes. At Hanford, and in the salt
16 sites, we would be drilling those shafts. In the case of
17 Nevada, where we are considering a site that is above the
18 water table in the unsaturated zone, we would be mining that.

19 MR. MARK: How deep is the water table there? In
20 some spots it's only a few hundred feet?

21 MR. GEORGE: I think it's 1200 feet where we are
22 talking about.

23 MR. ROSEBOOM: 1700 or 1800.

24 I think it is 1700 feet.

25 MR. MARK: There were so many public comments to the

1 effect that you were dashing off very fast, and I was trying
2 to find out how long is your characterization? You can't
3 work between 85 and 87 to complete a characterization.

4 MR. GEORGE: That is correct.

5 MR. MARK: So you've got to be turned loose
6 really as soon as you can manage?

7 MR. GEORGE: The people who have backed up the schedule
8 from March 31, 1987, looking at the test sequence that
9 needs to be done, and the time required to drill an outfit,
10 the shaft, and mine, some working space at the bottom, to carry
11 out those tests, have concluded that we must start that at
12 least in early '84 in Nevada, and Hanford -- sorry -- at
13 Nevada and at the salt sites, and therefore, if you back
14 through the permitting processes and other things that
15 have to be done, you must have the Presidential
16 representation in the late summer of 1983.

17 And if we don't make that, if there are delays to
18 that, then we will not make --

19 MR. MARK: That's what I was fishing for, which, I
20 suppose, is the case. That you are rushing, even though
21 you have until '85 is irrelevant, because if you've got an
22 '87 date, you've got to start the end of this year.

23 MR. GEORGE: '87 date is the controlling date,
24 yes. That is the most restrictive date, if you add up
25 everything that has to be done by the time you get there.

-14-5
1 MR. MOELLER: Okay. That is helpful.

2 MR. GEORGE: Now, some of the public's
3 suggestions, by the way, are quite conscious of the problem
4 here. Some are not. Some are quite conscious of the problem,
5 and, nonetheless, advise that the department would be
6 better off to sort of -- I won't say necessarily ignore --
7 but take with less emergency the '87 date, and slow things
8 down without respect to how badly you might fail that, in
9 order to have the cleanest and publicly most acceptable
10 process, so that people don't have the -- the image is not
11 being given of these people being stampeded.

12 MR. MOELLER: In some of the public comments, or at
13 least one of the commenters said that you were
14 grandfathering Hanford and the Nevada test site.

15 What did they mean by that?

16 MR. GEORGE: The bill itself grandfathers the
17 Hanford and the Nevada site. It forgives the Hanford site
18 from fulfilling things in a rigid order.

19 MR. MOELLER: From fulfilling what?

20 MR. GEORGE: Some of the requirements of the
21 guidelines, EA, and so on -- again, not being on the
22 Hanford site, I haven't taken it upon myself to really try to
23 understand the exact provisions there, but in the bill,
24 the Hanford site is not noted by name. It merely says if the
25 principal borehole has been drilled by a certain date,

1 then -- for a given site, then that site may go ahead and
2 be forgiven awaiting certain things.

3 MR. MOELLER: Then they can go ahead with their
4 site characterization; is that what you mean?

5 MR. GEORGE: Yes.

6 MR. MOELLER: Which in essence, then, says it is one
7 of the three sites that will have to be chosen this
8 summer?

9 MR. GEORGE: Yes. It would be commendable, given the
10 fave that we need to go to NRC with three sites, one of
11 which is not salt, at the stage of nomination, and perhaps
12 even recommendation, it would be perhaps a good idea to
13 have more than one site that is not in salt. That is, to
14 assure ourselves of having one that is not in salt in the
15 end.

16 MR. MOELLER: Will you be here this afternoon?

17 MR. GEORGE: No, actually, I was not. I planned
18 to be back at my office.

19 MR. MOELLER: Why I ask, as you know, according to the
20 schedule, we will be hearing from the NRC Staff and the
21 USGS Staff, and I'm sure some questions will come up. Perhaps
22 we can call you.

23 Do any of you have other immediate questions for
24 Mr. George?

25 MR. THOMPSON: Would the exception apply to the Nevada

-14-7
1 test site as well as Hanford?

2 MR. GEORGE: No. Only Hanford met that exception.
3 I think it is in 121-F, but I'm not positive about that.

4 MR. THOMPSON: Yet you are going ahead with the
5 shaft at the Nevada test site?

6 MR. GEORGE: No. The shaft is not ready. The
7 department intends to fulfill the letter of the law,
8 and we think we will be fulfilling the spirit of the law,
9 but that is where there is some debate. But we are not
10 violating the letter of the law.

11 MR. MOELLER: When the public commenter,
12 as I recall, said both Hanford and Nevada, that is wrong?

13 MR. GEORGE: That is correct. That is wrong.

14 MR. MOELLER: Any other questions?

15 MR. PARKER: You may not be familiar with all the
16 details of the Hanford site, but had they actually picked the
17 location of the principal borehole by that August 1st
18 deadline?

19 MR. GEORGE: Yes. You see, that got in there because
20 all of the Congressmen deliberating on the Act, the one who was
21 supportive of the site in his district, was the Congressman
22 from that district of Washington, and he worked to have that
23 language put in such a way that the grandfathering would be
24 there.

25 MR. PHILBRICK: I said, I don't want this

1 grandfathering idea to be thought of as a low-life idea,
2 because being a grandfather is something of great
3 interest.

4 MR. GEORGE: They were also quite ready. There is
5 sufficient controversy over the exact interpretation of
6 the grandfather here, that the department, Bob Morgan, who has
7 been called in to run this show for a while, has actually
8 moved out in time somewhat the intended date for starting
9 that drilling, and we are at some cost, I might add.
10 Something like \$6,000 a day for a rig that is sitting on the
11 site. But in order to some -- not in the pejorative
12 sense, but in the highest sense of the word, to resolve some
13 of the political problems.

14 MR. PHILBRICK: What do you mean by the principal
15 borehole?

16 MR. GEORGE: There is a borehole that is drilled of
17 a certain size, and cored, and hydrology tests done, and
18 so on, within certain proximity of the exploratory shaft to
19 yield detailed engineering data that is required in
20 order to have the construction of the shaft be at a
21 firm price.

22 In other words, we cannot guess -- you can't get a
23 driller to come in and give you a firm price on that project
24 unless you have that kind of information close by. If
25 you don't, it is an open-ended cost thing. You couldn't

j-14-9 1 compete it, other than cost-plus fee.

2 So, it is a specific hole to yield data proximal
3 enough to a shaft to allow data and design that people will
4 stand behind.

5 MR. PHILBRICK: The previous holes that you had
6 at Hanford do not qualify?

7 MR. GEORGE: No one would bank themselves on
8 something that they wouldn't run into something that was
9 predicted. They've got to analyze the cost of liners,
10 and grouting, and all the rest of it, and so the truth of the
11 matter is, I guess so.

12 MR. PHILBRICK: An exploration hole for contract
13 purpose. That is what it is?

14 MR. GEORGE: Certainly. A lot of the holes are to
15 establish the geological system. A lot of the data that
16 you get out of the holes will give you some idea of what you
17 are going to be engineering against, and this one is strictly
18 engineering, although I won't say that if they came up with
19 something -- if they drilled a principal borehole and the thing
20 artesianed, suddenly it changed the interpretation of the
21 groundwater hydrology in the whole system.

22 MR. MOELLER: Thank you very much, Mr. George.
23 It has, I know, been a long session for you, but you have
24 been very helpful in reviewing the DOE guidelines, and
25 we will listen to your other experts this afternoon, and then

1 try to formulate some recommendations or suggestions.

2 MR. GEORGE: Please let me just say that I lay no
3 claim to a photographic or magnetic tape memory, and many
4 of the things raised here, I hope I will get in writing,
5 I appreciate the thought that you are putting into this, and
6 apologize very much for the places where I was not
7 able to to give you as sharp an answer as you would
8 have desired.

9 MR. MOELLER: Thank you. We will take one hour for
10 lunch.

11 (Whereupon, the Subcommittee adjourned, to
12 reconvene at 1:50 p.m., this same date.)

AFTERNOON SESSION

(1:50 p.m.)

MR. MOELLER: The meeting will come to order and we will resume with our schedule.

The initial item that we can take up this afternoon while we are waiting for our speaker to appear is simply to ask the subcommittee members and our consultants if you have any comments on what we have heard thus far.

I wonder how far we should pursue this thing of the definition of the accessible environment. I presume we want to discuss that the last thing this afternoon.

Let me go ahead and introduce the topic and then as soon as they are ready we will proceed. The next item on the agenda is the NPC staff comments on the DOE proposed 10 CFR Part 960. Of course we will look forward to hearing what the NRC staff has to say about what we heard in the way of the DOE presentation this morning.

The leader of that discussion will be Michael Bell of the High Level Waste Licensing Branch.

Mr. Bell.

MR. BELL: Well, you will have to excuse this brief delay while my staff gets the handouts. First, let me try to give you some background of how we see the DOE guidelines fitting into the overall repository licensing process.

1 As you all know from many previous meetings with
2 the staff the NRC's 10 CFR Part 60 procedural rule covers
3 the licensing procedures for selecting and eventually approving
4 a geologic repository for disposal of high-level waste.

5 The Nuclear Waste Policy Act adopts many of the
6 concepts that were already in Part 60, the idea of the
7 need for multiple site characterization, the need for under-
8 ground testing at depth prior to licensing, the need for
9 submission of a site characterization report and the informal
10 period of interaction between DOE and the NRC staff before
11 submission of the license application.

12 The Act retains all of these concepts. There
13 is one area however, that affects the guidelines where
14 it is different. In the Procural Rule the content of the
15 site characterization report simply leaves it up to DOE
16 to select the sites that it is going to characterize, deter-
17 mine what the criteria will be for site selection, and then
18 come in and present its case to NRC and also inform NRC
19 what actions it has taken to get the public and the states
20 and Indian tribes and other interested parties involved and
21 our licensing procedures are not specific on how to do those
22 things.

23 The Nuclear Waste Policy Act, on the other hand,
24 formalizes a process that requires DOE to have these guide-
25 lines, go out and conduct public meetings, nominate sites,

1 prepare environmental assessments and recommend sites to
2 President. In other words, all those things that were left
3 vague on Part 60 are now spelled out under the Act, and one
4 of the things that is spelled out is that DOE must issue with
5 NRC concurrence this set of guidelines that they are going
6 to use to select the sites that they will characterize.

7 So now we are in the very beginning of this process
8 that has been laid out under the Act leading up to the eventual
9 recommendation on NRC concurrence on the guidelines.

10 I have with me today two members of my staff,
11 Regis Boyle, who is the Section Leader of my Project Section,
12 and Chris Pflum, an Environmental Project Manager in that
13 section. Mr. Boyle will be going through the review that
14 we have done and and tell you generally where we stand on
15 making recommendations to the Commission, and then what is
16 the process that we will be going through for the next several
17 months to eventually make a recommendation to the Commission
18 on concurrence or nonconcurrence with the guidelines.

19 Regis.

20 MR. BOYLE: I would first like to point out that
21 we haven't completed our review. We are still in the midst
22 of developing comments and in fact obtaining comments from
23 other members of the staff in different branches, divisions
24 and offices.

25 What we have here today is where it stands as of

1 this morning pretty much, but this is not complete and what
2 we have done is put together comments as of today to present
3 to you people on our initial or preliminary thoughts.

4 MR. MOELLER: Excuse me, Mr. Boyle, on this what
5 have you been looking for particularly in your review? In
6 other words, what are the key items you are seeking to find
7 or comments to make?

8 MR. BOYLE: Well, I think what we have been driven
9 by is that these guidelines would eventually lead to a site
10 that is licensable under 10 CFR Part 60.

11 MR. MOELLER: So it is a comparison to 10 CFR Part
12 60.

13 MR. BOYLE: It is a comparison with Part 60 and
14 also just the feasibility of applying these guidelines for
15 site selection.

16 MR. MOELLER: Has I&E been involved or will they
17 be involved? Why I ask that is presumably they may inspect
18 the site during construction and operation.

19 MR. BOYLE: I&E has not been involved in the review
20 of these guidelines.

21 MR. BELL: Dr. Moeller, you understand these
22 guidelines will be applied before sinking an exploratory
23 shaft or before any construction goes on. The actual con-
24 struction and inspections during that time would be done under
25 Part 60 procedures and not under these guidelines.

1 MR. MARK: You mentioned other branches and
2 divisions and so forth. You didn't mention regions I was
3 happy to hear.

4 MR. BOYLE: Well, we primarily have all the branches
5 within the Division of Waste Management. We have solicited
6 comments from our Office of Research.

7 MR. MARK: So it is mainly Waste Management and
8 Research and how about the legal staff?

9 MR. BOYLE: Oh, excuse me, also the legal staff.
10 We have had discussions with the legal staff.

11 MR. MOELLER: So you have a pretty well integrated
12 review underway?

13 MR. BOYLE: Yes, but as I said, these comments
14 are still coming in.

15 MR. MOELLER: Sure. We realize it is a report
16 as of today.

17 Go ahead.

18 MR. BOYLE: I think we can just walk through these
19 handouts that I have here, and I believe the first several
20 were covered by Chris this morning. In putting this together
21 we weren't sure exactly what Chris would present this morning.

22 On the first one, the Nuclear Waste Policy Act,
23 it indicates why the guidelines are being developed, and I
24 think that was pretty well covered this morning. The important
25

1 part as far as we are concerned, is that the NRC, and that
2 is the Commission eventually has to concur in these guidelines.

3 The content of the guidelines, again it was similar
4 to Mr. George this morning. It was to specify detailed
5 geologic considerations that should be primary criteria for
6 those selection of sites, and also factors that qualify or
7 disqualify any site. We felt that those were the two most
8 operative statements in the Act as far as how these guidelines
9 should be developed.

10 The qualifying or disqualifying factors as identified
11 in the Act were the ones that are shown on this next chart.
12 Many of these are covered in 10 CFR Part 60. Some are not.
13 Again, I think Mr. George went over these with you this
14 morning.

15 Then, finally, the additional considerations in
16 the guidelines were three more items that the Act specified
17 should be incorporated in the guidelines.

18 The chart on program for selection in the first
19 repository I think gets into where we start to go away from
20 the Act somewhat. DOE is to nominate five sites, and when
21 they nominate those five sites they are to prepare an environ-
22 mental assessment. At that time the guidelines are to be
23 applied. From the five sites there are to recommend three
24 of those sites to the President. At that time we are not
25 at all sure that the guidelines will be applied again. It

1 is not clear to us either in the Act or in the guidelines
2 themselves whether they would apply at that point.

3 Then, finally, from those three sites they would
4 recommend on to the President for the first repository site.
5 It appears that the guidelines will again be applied at that
6 point.

7 So as far as their site selection program is
8 concerned, there are these two points where the guidelines
9 would be applied.

10 MR. MOELLER: On this particular item, the middle
11 one there is where they recommend three sites by January the
12 1st of '85. Now that then is the legal deadline.

13 MR. BOYLE: That is correct.

14 MR. MOELLER: However, this morning, if I am correct,
15 then that is what Mr. George told us he wants to have done
16 by the end of the summer of '83.

17 MR. BOYLE: That is correct.

18 MR. MOELLER: What is your comment on that? The
19 public interest groups have said that they are rushing things.
20 Do you concur that if they waited until this date they could
21 never get the site characterization done?

22 MR. BOYLE: Well, I think the comment we were
23 going to make back, or at least a preliminary comment, and
24 it is going to be covered later on.

25 MR. MOELLER: All right, I will wait.

1 MR. BOYLE: Now if you look at the next chart,
2 application of guidelines, again, we tried to determine
3 again when the guidelines would be applied from the Act and
4 we came up with four distinct points.

5 One is when they prepare their environmental assess-
6 ment which matches when they nominate a site.

7 The second point is when they prepare a site
8 characterization plan. That has no match-up on the previous
9 page though in their site selection process.

10 The third is when they recommend to the President
11 a particular site for a repository, and that does match up
12 on the previous page to item No. 3.

13 Then the fourth item is what is called a preliminary
14 determination in the Act that the three alternative sites
15 that are considered are suitable.

16 Now I guess what I am saying here is there are
17 a lot of questions that we don't have answers to as to when
18 and how these guidelines are applied and the guidelines them-
19 selves don't make it any more clear. I think in reviewing
20 the Act it wasn't clear to us and having reviewed the guide-
21 lines it still isn't very clear. So we intend to ask DOE
22 to be more specific in how these guidelines will be applied
23 later in the site selection process.

24 The next viewgraph on proposed guidelines covers
25 some of the things that Mr. George covered this morning.

1 They were issued on February 7th of this year. Public
2 hearings have been held and are continuing to be held.
3 There will be one on Monday in Seattle.

4 DOE has requested written comments from the public
5 and States by April 7th, and they plan to issue the final
6 guidelines by July 6th of 1983.

7 The next chart, the NRC review of the proposed
8 guidelines, as I mentioned previously, it is currently going
9 on right now. It isn't complete. We have attended or had
10 in attendance a member of our staff at each of the public
11 hearings that have been held so far.

12 I gather you people are aware of some of the types
13 of comments that are going on at those hearings. I think
14 in general the public is particularly concerned about the
15 time frame that you mentioned, that DOE will have nominated
16 five sites and selected three by the end of this summer, even
17 though the guidelines will be finalized this summer, and in
18 doing nomination and selection process they are suppose to
19 apply the guidelines.

20 Another comment that was given particularly by
21 members of the state was the lack of specificity in the guide-
22 lines. In many instances I believe at the various hearings
23 they wanted the guidelines to be more specific to their
24 particular site that was being considered. In other words,
25 if their site was near a national park they felt more

1 emphasis should be placed in the guidelines on national parks,
2 depending on the area of the country.

3 Then I think the third primary area was jus
4 local interests. A lot of participants at these hearings
5 give their views on whether DOE should or should not go ahead
6 with a particular repository site in their locality.

7 The method that we intend to use in reviewing
8 these guidelines and eventually obtaining Commission con-
9 currence is to develop specific detailed comments and send
10 these comments to DOE without any recommendation or statement
11 on whether we concur or not concur. But prior to sending
12 that we would send this to the Commission for a negative
13 consent.

14 In other words, we would let the Commission have
15 our comments for a couple of weeks, and unless they have
16 serious problems with it, we would send it to DOE as staff
17 comments on the guidelines.

18 MR. MOELLER: I understand roughly, but I didn't
19 under the phrase where you said you would send your comments
20 to the DOE without saying whether you favored them or didn't.

21 MR. BOYLE: The staff would not take a position
22 on whether we concur or don't concur.

23 MR. MOELLER: In the total guidelines.

24 MR. BOYLE: In the total guidelines.

25 MR. MOELLER: But you will send them your comments.

1 MR. BOYLE: We will send them our comments and
2 our views.

3 MR. MOELLER: Then presumably though if you have
4 some key problem with the guidelines and they didn't alter
5 it, then that might very well develop a negative vote.

6 MR. BOYLE: That is possible, but it is our under-
7 standing at this point that it is the Commission that would
8 vote and decide whether or not they concur.

9 MR. MOELLER: Right, and you will tell the
10 Commission your point of view on it.

11 MR. BOYLE: Yes. What we intend to do is send
12 these comments and see how DOE reacts to them and modifies
13 their guidelines.

14 MR. MOELLER: Will DOE staff have an opportunity
15 to appear before the Commission to present their point of
16 view?

17 MR. BOYLE: I would presume so if they desired
18 that.

19 MR. MOELLER: All right.

20 MR. BOYLE: We intend to have our comments sent
21 to DOE by April 7th, which is when the public is supposed
22 to comment on. We may be hardpressed to meet that date.

23 Then, finally, there is the NRC concurrence on
24 July 6th. We suspect that there will be a lot of interaction
25

1 between DOE and the NRC staff between the time that we
2 submit our comments on April 7th and the concurrence on July
3 6th.

4 Now the next chart shows our preliminary overall
5 impressions of the proposed guidelines. The first one
6 indicates to us that it would appear that the guidelines cover
7 all the significant points that should be considered in a
8 site selection process for any type of nuclear facility.

9 Furthermore, it appears to comply with the intent
10 of the Act. That is not to say that everything in there is
11 perfectly fine, but there weren't any major omissions in the
12 development of these guidelines.

13 The second point is that we have not found
14 inconsistencies between the guidelines and Part 60, or I
15 should say major inconsistencies. We feel that if these
16 guidelines were implemented properly, DOE should end up with
17 a site that could be licensable under 10 CFR Part 60.

18 MR. MOELLER: Martin.

19 MR. STEINDLER: If you word this in the classic
20 bureaucratic caution fashion ---

21 (Laughter.)

22 MR. STEINDLER: --- guidelines are not inconsistent
23 with. Do you want to expand on why that interesting language
24 was used?

25 MR. BOYLE: We have gone through these and compared

1 them with Part 60, and they aren't verbatim. They have made
2 changes in some of their guidelines. Where they are talking
3 in their guidelines and they reference Part 60, in many
4 instances the words are not identical. In some instances
5 they have actually changed terminology.

6 At this point it doesn't appear that those changes
7 are significant. But in the period between April 7th and
8 July 6th we intend to sit down with DOE and discuss each
9 of these and get their understanding of why there was a
10 change. They may have a very good reason for the change
11 because these guidelines are going to be applied much earlier
12 on than Part 60 was ever intended to be applied.

13 So that bureaucratic language was by design.
14 What we intended there was it doesn't appear that they are
15 inconsistent at this point. That is not to say that when
16 they reference Part 60 that they have truly referenced it
17 verbatim.

18 MR. STEINDLER: Well, it shouldn't be too surprising
19 that they haven't referenced it verbatim since you guys in
20 theory at least have not formally nailed it down. Is that
21 not correct? They can't very well reference a moving target,
22 or at least they ought not to be asked to.

23 MR. BELL: The final rule hasn't been issued,
24 that is true, but they reference the particular dated draft
25 of the rule. I think the point is that the language they

1 are using in some cases is different from the particular
2 reference draft of the rule.

3 MR. STEINDLER: I didn't realize they referenced
4 the dated draft. I tried to see whether I could correlate
5 their references to the copies I had and I couldn't find it
6 in any of their drafts.

7 MR. BOYLE: I think Mr. George this morning in
8 one of his viewgraphs indicated precisely what draft it was
9 that they referenced.

10 MR. STEINDLER: Well, the only two sections I
11 tried to look up didn't match that draft that I thought I
12 had. All I guess I am saying is that this thing seems a
13 little peculiar, if not inconsistent, and I was wondering
14 what was in behind it.

15 MR. BOYLE: The final point on our overall impres-
16 sion is that it is not at all clear how these guidelines will
17 eventually be applied by DOE.

18 MR. MOELLER: That is a question we had. When
19 would they be applied and when will the guidelines be effective?
20 When do they become official? Is it July the 6th or whatever
21 that date was that they are hoping to achieve?

22 MR. BOYLE: Well, it is our understanding that
23 they will become official on July the 6th. I guess from
24 my standpoint after that I am not sure how they are implemented.
25 It is clear in the Act that DOE will apply the guidelines

1 when they prepare the first environmental assessment, but
2 who determines compliance and what method they go through
3 and so on is not specified in the Act and it is not at all
4 specified in the guidelines themselves. They may very well
5 have some method, but it is not the type of thing that we
6 would be accustomed to here at the NRC where we know that
7 there would be a Licensing Board and there would be hearings
8 and so on.

9 MR. MOELLER: Well, that is a very fundamental
10 question of who determines compliance with the DOE's guide-
11 lines. Then if the EPA standards become effective 12 months
12 after they are promulgated, and have they been promulgated?
13 They are still in draft, aren't they?

14 MS. TANG: That is right.

15 MR. MOELLER: In fact, they are out for public
16 comment. So we are down the road a bit there. In your
17 10 CFR 60, it will become official or whatever it is whenever
18 it is published, which could be in a month or two.

19 MR. BELL: We were told at the Commission meeting
20 this morning that it is scheduled for affirmation next week.

21 MR. MOELLER: So it could be within a few weeks.
22 All right. But then you have the standards a year or so
23 off, the criteria immediately and the guidelines July the
24 6th, but no one knowing who determines compliance with the
25 guidelines.

1 At what point then do you begin to determine compli-
2 ance with your criteria? When do you do that?

3 MR. BELL: Well Part 60 criteria are applied in
4 the review of the construction authorization application.

5 MR. MOELLER: Which will be after site
6 characterization.

7 MR. BELL: At the completion of site characteriza-
8 tion and the recommendation of one site for the first
9 repository to the President. That is an important point
10 because that means when we apply our criteria in the licensing
11 review we will have all the information from site characteriza-
12 tion and we will have the data that comes out of the construc-
13 tion and exploratory shaft and the tests that are run in the
14 underground facility to be able to perform the evaluations
15 that are required by Part 60.

16 DOE will be attempting to apply Part 60 type
17 considerations at very early stages in the site screening
18 and selection process where you won't have all the data you
19 will need to make those kinds of evaluations.

20 MR. FOSTER: If I understand what you are saying
21 then, any disqualification of a site under DOE guides would
22 come from DOE itself that NRC would not blow the whistle
23 and say this particular site is disqualified because it does
24 not meet DOE standards.

25 MR. BELL: There is nothing built into the Act

1 for NRC to do that. The way we would see the process working
2 is DOE would initially in applying the guidelines decide
3 that certain sites might be disqualified and present us with
4 an application for one particular site that they thought met
5 all the guidelines and we would determine during the licensing
6 review that it wasn't qualified under Part 60 where on a
7 very similar issue covered by the guidelines DOE has previously
8 considered that it was qualified.

9 MR. MARK: But if they misapply their guidelines,
10 that is neither here nor there to you. Your concern will
11 be does it meet 60 or not.

12 MR. BELL: That is our concern and we think that
13 the fact that they are incorporating Part 60 in the guide-
14 lines is they are on the right track into minimizing the
15 chances that they will in fact come up with a site that
16 doesn't meet Part 60. If they do, it is because they have
17 misapplied Part 60 requirements rather than they are looking
18 at the wrong kinds of questions.

19 MR. MARK: If they disqualify the site which in
20 your own private feeling would have been your favorite site,
21 there is nothing you can do.

22 MR. BELL: It is a somewhat hypothetical situation,
23 but DOE when they submit their license application will submit
24 an environmental impact statement. The environmental impact
25 statement has to compare the site that they eventually

1 recommend for licensing with the two other alternatives that
2 they characterized but didn't pick.

3 It is a theoretical possibility that when the
4 environmental impact statement of DOE gets reviewed that the
5 conclusion might be that one or the other alternatives was
6 the preferred site. It is really only speculation to say
7 whether a situation like that would ever occur.

8 MR. MOELLER: Back on your earlier statement,
9 Mr. Boyle, I notice in the DOE proposed guidelines they say
10 that the NRC's prior criterion have been made compatible,
11 or that they have been made compatible with the proposed
12 criteria and standards recently issued by the NRC and the
13 EPA. But I see your point, too, if they use a slightly
14 different wording, then you have to meet with them and get
15 them to interpret to you what they mean.

16 MR. BOYLE: We are trying to determine what it
17 means to be compatible.

18 MR. MOELLER: Sure. That is reasonable.

19 Frank.

20 MR. PARKER: It almost seems to me as though DOE
21 is setting itself up to have a preliminary construction
22 license application hearing of its own to conform with 10
23 CFR 60. They will go through that diagram and then they
24 will come back to NRC and see if it really works for them
25 as well.

1
2 MR. MOELLER: They Congress has set it up for DOE
3 to do this. I don't see that they are doing anything beyond
4 what the Act requires.

5 Martin.

6 MR. STEINDLER: Well, I am not aware that there
7 is anything in the administrative guidelines under which
8 DOE operates which requires them or even authorizes them to
9 hold hearings of the same kind that are normally held in the
10 NRC process.

11 The second point is that even though the Commission
12 may well approve 10 CFR 60 in the next few weeks, that doesn't
13 mean there won't be a challenge to the rule in a rulemaking
14 hearing which can be a fairly prolonged process as we have
15 had in some instances. So the final application of that
16 10 CFR 60 may in fact drag out significantly beyond the
17 implementation of 9/60 by DOE or, if all else fails, even
18 40 CFR 191.

19 MR. MOELLER: Correct, and of course I am sure
20 this is germane to our discussion, but I presume NRC could
21 approve the guidelines without 10 CFR 60 being final, just
22 saying they are compatible and so forth.

23 MR. STEINDLER: I think so. All I am saying is
24 that the schedule as we currently envision it is a no-screw-
25 up schedule. That is unlikely it seems to me just as a

1 matter of history.

2 MR. MOELLER: It is just odd that this whole
3 sequence could hardly be more reversed than it is.

4 Yes, Dick.

5 MR. FOSTER: Impact assessments and statements,
6 I would presume from what I have heard this morning that the
7 assessments which are made for the nomination of the sites
8 would be done just by DOE itself, but I am unclear as to
9 the full-blown impact statement that accompanies the
10 recommended site to the President as to whether NRC is
11 involved in that or not. Can you tell me how that is going
12 to go?

13 MR. BOYLE: Well, what the Act specifies is that
14 DOE will prepare the environmental impact statement and NRC
15 will, to the extent practicable, adopt it. I think that
16 allows some latitude in what the NRC does. If you look at
17 CEQ guidelines, in order to adopt an environmental impact
18 statement you simply have to agree that it complies with the
19 CEQ regulations.

20 On the other hand, there are other methods within
21 the CEQ guidelines that would allow us to be a cooperating
22 agency, I would suspect, if we would desire to do that kind
23 of thing.

24 Or as an alternative we could start to get involved
25 in environmental matters now on sort of an informal basis

1 with DOE to see to it that when their environmental impact
2 statement is prepared that it would reflect the types of
3 considerations that we would like to see considered in that
4 environmental impact statement.

5 MR. FOSTER: Do you then anticipate that you may
6 be involved in the impact appraisals?

7 MR. BOYLE: The environmental assessments?

8 MR. FOSTER: Or assessments, I should say.

9 MR. BOYLE: The term "environmental assessment" was
10 a poor choice of words for what they are doing. It is not
11 an environmental assessment as we understand it in the normal
12 NEPA process. In other words, an environmental assessment
13 is generally to decide whether or not you prepare an
14 environmental impact statement.

15 MR. FOSTER: Correct.

16 MR. BOYLE: It is clear in the law that no
17 environmental impact statement will be prepared. It already
18 states that. That decision has been made for DOE. So this
19 environmental assessment as it is called should probably have
20 been called something else.

21 MR. FOSTER: As I recall the language, the assess-
22 ments were made strictly against the DOE criteria and they
23 really didn't address environmental impacts as we traditionally
24 know them.

25 MR. BOYLE: That is correct. In fact, these

1 guidelines are a very important part of that environmental
2 assessment. The application of these guidelines is probably
3 the most important part of an environmental assessment as
4 it is defined in the Act.

5 MR. BELL: I don't think Regis has answered your
6 question, but I think he has laid all the ground work for
7 it now. So let me answer it.

8 The question you asked is will we get involved,
9 and we plan to comment on all the draft environmental
10 assessments that DOE will prepare when they nominate sites,
11 and we would be commenting on factors like are they applying
12 the guidelines correctly in a way that would lead up to
13 licensable sites. I mean what you want to try to accomplish
14 is to get a process for site selection that would eventually
15 come up with a license application that NRC would be able
16 to review and make a decision on. So we would be planning
17 to get involved in commenting on the environmental assessments
18 involved with this environmental process very early.

19 MR. FOSTER: You are not a coauthor or a co-
20 participant in preparing the environmental assessments for
21 site nomination, but as a commenter that does get your foot
22 in the door as far as an official review of those nominated
23 sites.

24 MR. BELL: Right.

25 MR. FOSTER: So you have that official step in

1 the process prior to actually looking at the construction
2 permit.

3 MR. BELL: That is right.

4 MR. MOELLER: Frank.

5 MR. PARKER: Since the environmental assessment
6 for the Hanford site is already out in a hearing, and I
7 believe it is a week from today, have you already looked at
8 that and made some preliminary views?

9 MR. BELL: We are in the process of reviewing
10 it right now. It is our understanding that this environmental
11 assessment is not really out officially for comment, and
12 that come May or June there will be another environmental
13 assessment for BWHIP published that will reflect the input
14 from this meeting on Friday that will be the official
15 environmental assessment that is required by the Act.

16 MR. MOELLER: Go ahead.

17 MR. BOYLE: If you remember this morning, and I
18 gather all of you have reviewed these guidelines, they are
19 broken down into three parts, the supplementary information
20 and then three portions of guidelines, system guidelines,
21 program guidelines and technical guidelines.

22 What I have with the rest of these charts is
23 preliminary comments on each of those specific areas.

24 First, as far as the supplementary information
25 is concerned, we have three principal points at this time.

1 The first one, Dr. Moeller, to answer your
2 question about the timing of these, they are going to have
3 nominated five sites and selected three by the end of the
4 summer of 1983 and the guidelines will come out at the same
5 time.

6 At least preliminarily we are thinking of suggesting
7 that for the first repository these guidelines should be
8 used as a standard which these sites should be judged rather
9 than to imply that it is a search technique to select a
10 site.

11 I think if you read those guidelines without
12 understanding where the program actually stands, it does
13 leave you with the impression that it is a technique to find
14 sites.

15 Secondly, we believe that DOE should make clear
16 that these guidelines when they apply them only assure that
17 the site is suitable to move to the next step. In other
18 words, when they nominate five sites, it is going to be based
19 on very preliminary information and data. It should be clear
20 in the guidelines that that doesn't mean that the site is
21 acceptable. It simply means that those five sites could be
22 considered in recommending three for site characterization,
23 and then when the three are considered for site characteriza-
24 tion and they apply the guidelines again, if they make a
25 positive determination, it should only be that they can go

1 to the next step.

2 The determination of the ultimate acceptability
3 of the site of course would be when they can file a 10 CFR
4 Part 60.

5 MR. MOELLER: Well, then I would think, too, that
6 you would have a major impact on DOE if you simply point out
7 to them that if their guidelines are not compatible with
8 10 CFR 60 they could go through their whole sequence gloriously
9 and come up against you and just be brought to a screeching
10 halt. So they had better make sure that their screening
11 process does lead to a site which meets your criteria.

12 Martin.

13 MR. STEINDLER: A couple points. What is it
14 that you are concerned about in the area of prejudgment of
15 the site acceptability or not? Are you worried that they
16 are going to take those guidelines and come to you folks and
17 say since we think this meets our guidelines you don't need
18 to go through the licensing process?

19 MR. BOYLE: No, I don't believe that is the case
20 at all. It is simply in reading these it has the implication
21 that when they pass through these siting guidelines the site
22 is therefore acceptable. At least in our reading of it, it
23 doesn't come out that the site is only acceptable to go on
24 to the next step.

25 We believe that they should make it clear that

1 there is another regulation involved, and that is 10 CFR
2 Part 60 when the site will actually be judged and all the
3 requirements of 10 CFR Part 60 would be applied.

4 MR. STEINDLER: You are then assuming that people
5 do not understand in general the fact that it goes from
6 10 CFR 9/60 and the next step passes to 10 CFR 60 as the
7 determining document. Do you think that is too vague? Is
8 that the point you are making?

9 MR. BOYLE: Yes.

10 MR. STEINDLER: The second question I have here
11 deal with this last point that you have on that same chart.
12 DOE has not, as far as I can tell, and my contention is they
13 should not, rank the various criteria that they have in 9/60.
14 Yet that item 3 in a sense implies that they are going to
15 have to rank them in order to tell you which ones are going
16 to be used if they don't have enough data for the rest of
17 them. Do you see this to be a problem in a set of generic
18 guidelines? Are you forcing them into a site specific format
19 for those guidelines when they apparently are supposed to
20 be generic?

21 MR. BOYLE: No. I think what we are trying to
22 get a feel for is which of these guidelines would be applied
23 when they go through the process of nominating five sites
24 and which would be applied well after site characterization.
25 We did have a preliminary look at the BWHIP environmental

1 assessment, and based on that draft it indicated that only
2 the last five guidelines can be applied at this stage of the
3 BWHIP project. The last five guidelines I believe were human
4 intrusion, environmental consideration, socio-economics,
5 population and another one.

6 So I think they should try to indicate in the guide-
7 lines which ones they feel they can apply before site character-
8 ization, for example, and which ones they can apply afterwards.

9 MR. STEINDLER: Would you be satisfied if DOE
10 came out and said I have ten guidelines and out of the first
11 five I can't give you any positive indications, but I can
12 tell you that none of them disqualify the site. The second
13 five I have got more data on and I can give you some more
14 information and therefore identify why these things are
15 perfectly favorable. Would you be happy with that? That
16 is maybe a bad question to ask you. I am trying to figure
17 out what it is that you expect out of these folks when in
18 fact they don't have enough information without forcing them
19 to rank these in some kind of an order that moves away from
20 the generic nature of it and then becomes site specific.

21 MR. BOYLE: They could probably give some indication
22 in the guidelines which ones are going to be applied early
23 and which ones aren't.

24 MR. STEINDLER: In a generic way?

25 MR. BOYLE: I would suspect in a generic way.

1 MR. STEINDLER: Well, I think that is where the
2 problem may arise. I am not so sure that is possible. You
3 are in a forcing position in the sense that your concurrence,
4 or at least the Commission's concurrence is required.
5

6 If you force them into that mode, then these
7 guidelines of DOE's will become non-generic, or they certainly
8 will begin to look like they are non-generic. Then poor old
9 DOE is going to be accused of in fact either grandfathering
10 a set of sites named or unnamed, having named one. That is
11 my concern.

12 MR. MOELLER: Let me ask this. In 10 CFR 60,
13 help me recall, does it emphasize or give priority or primary
14 attention to the natural barriers meaning geology, geo-hydrology
15 and so forth? I ask that because the waste law does.

16 MR. BELL: Well, 10 CFR Part 60 is concerned almost
17 entirely with geology and hydrology. We don't have these
18 factors like proximity to national parks.

19 MR. MOELLER: Correct. So in essence it does
20 give priority.

21 MR. BELL: That is right.

22 MR. MOELLER: Martin and I have been having sort
23 of a discussion on this, and I agree with what he has just
24 said. If, indeed, you made the natural barriers the primary
25 ones in judging the acceptability of the site, then those

1 are the very things you know the least about when you are
2 beginning to review. That is what he is saying and I think
3 that is a good point. Then you know the most about the least
4 important facts.

5 MR. STEINDLER: It seems to me if you have
6 disqualifiers, all you really want to know is that there
7 are not obvious disqualifiers on that site. That may be the
8 least amount of data that you have, but that is a minimum
9 requirement. Beyond that, I think those guys are going to
10 have to start digging holes in order to get you the kind of
11 decent data that would then allow them to comment on guidelines
12 1 through 5 or whatever they are.

13 MR. MOELLER: Frank.

14 MR. PARKER: Have you tried to use the BWHIP site
15 as an analogy? I know it is not required for high level and
16 all that, but they are going through essentially the same
17 sort of process so you can see what is available before you
18 go underground, you can see what you get once you go under-
19 ground and how you can start to meet the various guidelines.
20 It seems to me that might be a very good informal trial run
21 to see exactly what can be done to some degree before you
22 actually open with everything to a full scale.

23 MR. BELL: We haven't tried anything like that
24 yet, but it does sound like it might be a useful kind
25 of exercise to go through and that we could do in the next

1 couple of months and perhaps find a better way to frame
2 this issue.

3 As Regis pointed out when we started, we are still
4 in a fairly preliminary stage of putting our comments together.
5 This particular language here may not be exactly the right
6 way to express our idea. What we are concerned about is we
7 don't want the guidelines to be applied in say arbitrary and
8 different ways at different sites. That can work either way.
9 I mean in Utah there are going to be certain parties pushing
10 you to give a lot of consideration to nearness to state parks.

11 At DOE reservations there is going to be a big
12 controversy over how much weight should be given the federal
13 lands. If DOE finds itself in the position where for each
14 different site it applies a different set of factors, the
15 perception is going to be that they sort of gerrymandered
16 the site selection.

17 What we want to have is some sort of process sort
18 of laid out that is reasonable that they would go through
19 at each site so that you could come to the conclusion that
20 given the data that you had at the time that the guidelines
21 were applied in a fair and consistent way and nobody could
22 say we got stuck with the repository because we happen
23 to have a federal reservation here.

24 MR. BOYLE: The next set of comments address the
25 system guidelines. If you recall, the system guidelines were

1 those that would protect the overall health and safety.

2 Our principal concern there was that the guidelines
3 as written didn't appear to recognize the relationship between
4 the EPA standard and 10 CFR Part 60.

5 MR. MOELLER: Can you elaborate?

6 MR. BOYLE: 10 CFR Part 60 requires DOE when they
7 apply for a license to show compliance with 40 CFR 191. So
8 40 CFR 191 is incorporated into 10 CFR Part 60 and the NRC
9 implements it and the write-up in the guidelines doesn't
10 appear to recognize that. In fact, there are very few places
11 in there that they mention 10 CFR Part 60 at all as far as
12 system performance guidelines.

13 Their overall objective here should be to comply
14 with 10 CFR Part 60, and as part of that they would comply
15 with 10 CFR Part 20, which they mentioned, and also 40 CFR
16 191. It is not a major issue, but it is ---

17 MR. MOELLER: But legally it should be in there?

18 MR. BOYLE: Yes.

19 MR. MARK: Are there statements in 191 which are
20 not embedded in 60?

21 MR. MOELLER: What he is saying is 60 clearly
22 says that the site must comply with 40 CFR 191. So the
23 reverse is true.

24 MR. MARK: All right. So even if there is a
25 thing in there which would require a technical activity that

1 is not in 60, it is hereby adjoined to 60.

2 MR. MOELLER: Correct.

3 MR. BOYLE: So 60 is sort of the umbrella.

4 MR. MOELLER: Okay, we understand. Go ahead.

5 MR. BOYLE: The second point is one in which
6 there is sort of a discrepancy in the guidelines. The system
7 guidelines list as a favorable condition the absence of any
8 facility that would provide contributing nuclear releases,
9 while if you look in the technical guidelines under the off-
10 site, and I believe it was off-site hazards, they list as
11 a favorable condition locating the site at an existing nuclear
12 reservation.

13 MR. MOELLER: There are several public interest
14 groups that raise this same point. That is a good one.

15 MR. BOYLE: Our comments on the program guidelines
16 are listed ---

17 MR. MOELLER: Martin. Excuse us a second, Regis.

18 MR. STEINDLER: 10 CFR 60 isn't the umbrella. In
19 fact, I thought Mike just make that comment. There is an
20 awful lot of material that represents guidelines which are
21 simply not included in 10 CFR 60. For example, all the
22 things that the BWHIP people right now know, what distance
23 they are from a national park, et cetera.

24 So when you say 10 CFR 60 is the umbrella, it is
25 the umbrella only in a very restricted sort of way, and that

1 is within the charter of the NRC.

2 MR. MOELLER: But in the regulatory sense it is
3 the regulation.

4 MR. STEINDLER: If you want to exclude those aspects
5 of the Act that forced the guidelines to include certain
6 items, that is true. But the Act forces the guidelines put
7 out by DOE to include items which are not in 10 CFR 60 and
8 probably will never show up in 10 CFR 60.

9 MR. MOELLER: Correct.

10 MR. STEINDLER: It is in that sense that the
11 umbrella notion I think is somewhat limited.

12 MR. BELL: I think Regis meant umbrella sense.

13 MR. STEINDLER: Health and safety items.

14 MR. BELL: As far as health and safety is concerned,
15 Part 60 is the umbrella and it incorporates by reference the
16 EPA overall standard.

17 MR. BOYLE: If you recall, the program guidelines
18 that DOE talked about were the ones where they talk about
19 implementation of the program.

20 The first comment here is similar to our comment
21 on the overall impression of the guidelines, and that was
22 we just aren't sure how these guidelines are going to be
23 applied or when they are going to be applied and how DOE
24 will show compliance with them.

25 Secondly, we felt that the guidelines should

1 elaborate more on how DOE intends to implement the Act as
2 well as quoting applicable portions of the Act.

3 If you look at the program guidelines, to a large
4 extent they have simply adopted the wording directly from
5 the Act. So that the guidelines don't actually provide any
6 assistance in how they are going to implement this. You could
7 read the Act and understand they would apply the guidelines
8 just as well as if you read the guidelines themselves.

9 Then, finally, one of the guidelines under program
10 guidelines was regional distribution, which was discussed
11 this morning. We only note that DOE has qualified how much
12 they would look at regional distribution with the words
13 to the extent that technical policy and budgetary considerations
14 permit.

15 There is no place in the Act that those qualifiers
16 are listed nor could we find it in previous DOE guidelines.
17 So we are going to ask for clarification on why DOE wants
18 to limit the consideration of regional distribution from
19 those three aspects.

20 MR. MARK: You don't understand that they might
21 think they had a budgetary constraint and that that meant
22 something?

23 MR. BOYLE: Well, they could probably put those
24 words to every one of their guidelines.

25 (Laughter.)

1 MR. MOELLER: How do you interpret the need for
2 regional distribution? Mr. George said if the first site
3 were on the list or in the Western U. S., then the second
4 one would have to be in the South, North or East or somewhere.

5 MR. BOYLE: Well, until I attended the Salt Lake
6 City public meeting, until that meeting I interpreted it as
7 putting the repository where the waste is generated to a
8 certain extent.

9 MR. MOELLER: That means near where the reactors
10 are, does it not?

11 MR. BOYLE: To a certain extent. However, at that
12 meeting Mr. George's point came out by participants in the
13 Board themselves. They felt that you can't even consider
14 regional distribution until after the first repository is
15 located and that the first one could be located any place.
16 Then after that you start to distribute them regionally based
17 on where the first one was located.

18 MR. MOELLER: And for the first one I presume then
19 we do not have to locate it near the waste generating
20 facilities. Of course in all of it they say these factors
21 must be taken into consideration or should be taken into
22 consideration. So they are not go/no-go guides.

23 MR. BOYLE: That is correct.

24 Furthermore, I believe in the Act itself there
25 is one section of the Act that says after the first

1 repository regionalization should be considered. It doesn't
2 say it, however, in the section on the siting guidelines.

3 MR. MOELLER: Well, regionalization is pretty far
4 down the pike at the moment, meaning years.

5 MR. PARKER: The guidelines for the first one
6 does say they shall take into account precaution in the
7 act of transporting to the proposed first site and that
8 certainly affects where you locate it. It doesn't say it
9 is the sole determinant. Do you have to take it into account.

10 MR. MOELLER: Yes. Now of the first three sites
11 that are nominated, one of them will be selected; is that
12 correct?

13 MR. BELL: Right.

14 MR. MOELLER: But that does not mean the other
15 two are permanently rejected. I mean, they have just got
16 the first one selected.

17 MR. BOYLE: Correct me if I am wrong, but I think
18 they nominate five sites and choose three for site
19 characterization. The two that drop out that don't make
20 it from nomination to site characterization are permanently
21 eliminated.

22 MR. MOELLER: They are permanently eliminated
23 perhaps. Well, that would make sense.

24 MR. FOSTER: It says that. It spells that out.

25 MR. MOELLER: Then of the three that survive, all

1 three are site characterized. Then one of those three is
2 selected?

3 MR. PARKER: But the other two can be used again
4 for the next round.

5 MR. MOELLER: That is what I thought. Now that
6 is not clear to apparently.

7 Read it to us, Frank, if you have it.

8 MR. PARKER: By no later than July 1, 1989, the
9 Secretary shall nominate five sites, which shall include
10 at least three additional sites not nominated in subparagraph
11 (a) and recommend by such date to the President from five
12 such nominated sites three candidate sites that the Secretary
13 deems suitable for chacterization. The Secretary may not
14 nominate any site that has been previously nominated under
15 subparagraph (a) that was not recommended as a candidate
16 site under subparagraph (b).

17 MR. MOELLER: That is those first two of the five
18 that are kicked out totally, but we never got to Martin's
19 point.

20 MR. STEINDLER: The question is of the two out
21 of the three that got as far as nomination but in fact were
22 not picked, those you can or cannot?

23 MR. PARKER: Can.

24 MR. STEINDLER: Well, I see various opinions as
25 to whether or not they can or cannot.

1 MR. PARKER: The last sentence says the Secretary
2 may not nominate any site previously nominated under sub-
3 paragraph (a) that was not recommended as a candidate site
4 under subparagraph (b).

5 MR. STEINDLER: Okay, that is one of the five. I
6 am talking about the three. There are going to be three
7 run up to the President presumably. He is going to pick one
8 and say okay, guys, dig a hole. That leaves two sites for
9 which you have a fair amount of data ready for the second
10 round to get around to the second site.

11 The question is whether those two can become
12 viable candidates in that second round process.

13 MR. PARKER: In Section 112(b), 1(a) it says
14 following the guidelines, et cetera, the Secretary shall
15 nominate at least five sites that he determines suitable for
16 site characterization for selection of the first repository
17 site. Subsequent to such nomination the Secretary shall
18 recommend to the President three of the nominated sites not
19 later than January 1, 1985. That is section (b).

20 Then (c) is the one I read earlier about nominating
21 five sites which will include at least three additional sites
22 not nominated. The three additional tells you that you can
23 nominate those two that you have already rejected as part
24 of the last three which is more confusing than I intended it
25

1 to be.

2 MR. FOSTER: Well, you did reject them. You
3 just didn't select them.

4 MR. PARKER: Didn't select them, right. You picked
5 five, then you throw out two and recommend three to the
6 President. Then you pick one. The two remaining can still
7 be part of the next five. That makes it very explicit that
8 you can do that.

9 MR. FOSTER: But not the two that were originally
10 rejected, which means from a different point of view if you
11 are in an area where you have one of those five sites and
12 it is not nominated to begin with, you are not subject to
13 double jeopardy. If you are eliminated in round one, they
14 cannot come back and get at you in round two.

15 (Laughter.)

16 MR. BELL: Dr. Moeller, the next time you have
17 a vacancy in the consultants you may want to consider a
18 lawyer.

19 (Laughter.)

20 MR. MOELLER: Let's move on.

21 MR. BOYLE: The next page shows the technical
22 guidelines, the ten that were listed to give you some idea.
23 I think Chris George went over each of these this morning
24 again.

25 The final page shows our preliminary comments on

1 the technical guidelines. Again, I think this gets back to
2 a point that was raised earlier. We felt that DOE should
3 indicate which of the technical guidelines can be applied
4 without the benefit of site characterization.

5 We felt that the way they are going to apply these
6 at various stages that it is going to be difficult to make
7 any types of tradeoffs in their site selection process without
8 indicating some type of priorities to the various guidelines.

9 Third, it hasn't been shown which guidelines would
10 be applied at various stages of repository development.

11 Then, finally, the last one is one we covered
12 previously, and that is that there are differences between
13 the wording of the technical guidelines and 10 CFR Part 60
14 and we are going to request clarification.

15 That completes our overall comments. We do have
16 about 40 pages of specific comments much less significant.

17 MR. MOELLER: We are mainly interested in the broad
18 impressions which you have. This is very helpful. Some of
19 them of course we had heard or read from others or had
20 developed on our own, but some of them are new. Of course,
21 some of them are specifically related to carrying out your
22 own duties and the problems you would have in doing those.

23 Questions.

24 Martin.

25 MR. STEINDLER: I hate to belabor this point. In

1 your preliminary comments on technical guidelines, you are
2 going to ask DOE to indicate which of any of the technical
3 guidelines could be applied without the benefit of site
4 characterization.

5 Now aside from the obvious ones like concurrent
6 population density and all the things you can see by standing
7 on the ground and looking on the square mile out, aren't the
8 rest of those likely to be site specific?

9 MR. BELL: Not entirely. There are kinds of
10 information that you can at least get a good fix on from surface
11 studies, information about just the absence of any evidence
12 of faults or anomalies in the geology that you don't need
13 to go down and do underground testing.

14 MR. STEINDLER: But the problem is can you make
15 a judgment as to whether or not the details of the information
16 you collect for a particular site by standing on the ground
17 and looking at the fault system is going to be adequate for
18 that site? The fact that you don't see anything in some areas
19 may in fact not tell you thing one, whereas in some other
20 areas I could envision where you can get a fair amount of
21 information, but it depends on the area. It is in that context
22 that I keep driving back to the notion that if you in fact
23 asked DOE to identify for you what can be applied, they
24 are going to have to focus in on the site and say okay, BWHIP
25 here are the things we can do without having to go through

1 site characterization. In Nevada here are the things we can
2 do and they may be different.

3 Now that may not be bad. I am not saying that
4 is necessarily bad, except that I got the impression that
5 the DOE guidelines were supposed to be generic. If they are
6 generic, then driving them into site specific ranking is going
7 to be difficult for them I would guess.

8 MR. MOELLER: Dick.

9 MR. PARKER: I think we have got a misconception
10 about what the terms really mean. When it says site characterization,
11 the NRC has defined that as having sunk an exploratory shaft.

12 MR. MOELLER: Correct.

13 MR. PARKER: That doesn't mean that there isn't a
14 hell of a lot of other work that has been done from the surface
15 to determine in a broad outline what the groundwater flows
16 are, what the geochemistry is, et cetera. In fact, if you
17 don't have a hydrologic model, by the time you of course sink
18 the shaft you may have no right to sink the shaft and it
19 seems to me that you ought to have a pretty good indication
20 of what is going to take place there. This is really more
21 confirmatory to see if there are things that you have missed
22 because you have had such a broad brush look at it. So it
23 isn't as though you haven't looked at all underground, but
24 you have looked at it from the surface rather than from
25 underground itself. I think we have gotten that impression

1 and I don't think it is true at all.

2 For example, if you look at the Hanford site or
3 if you look at the WHIP site, we know a lot about those sites
4 even though we have not yet sunk shafts or we have just sunk
5 shafts down to the repository depth.

6 MR. MOELLER: I think that is helpful.

7 Martin, on your comments, maybe I have a different
8 idea, or maybe I am not hearing you correctly. But to me
9 a generic requirement does not mean that you don't have to
10 examine a specific site to see if it meets the generic
11 requirements. I mean a generic requirement just means these
12 are commonalities, common factors that all sites must comply
13 with. But you still have dig into the site and see if it
14 complies with the generic requirements.

15 MR. STEINDLER: That is correct. The thing that
16 I am concerned about is that it looks to me as though the
17 staff is looking to have DOE rank the ten technical criteria
18 in order of importance. If that is what they are going to
19 do, my contention is that that ranking will be different from
20 site to site.

21 MR. MOELLER: Well, certainly.

22 MR. STEINDLER: In order to avoid forcing them
23 into a site specific set of guidelines, my comment is don't
24 ask them to rank. There are other ways of getting at that
25 information I think. Have I misinterpreted that?

1 MR. MOELLER: Well, let's ask.

2 Mike.

3 MR. BELL: My previous statement applies here as
4 well. I tried to give the flavor of what our concern was.
5 At site "A" they could order the priorities all one way and
6 at site "B" they order them a completely different way and
7 at site "C" a different way in each case so they could give
8 highest priority to the things that were favorable at that
9 site and it is just not going to lead to a credible site
10 selection process.

11 We think DOE should commit themselves to the extent
12 that would avoid those sorts of things happening.

13 MR. STEINDLER: Would you be satisfied if in each
14 of these ten criteria that are listed there was a fairly
15 clear statement of a disqualifying factor which DOE then can
16 apply uniformly across the board and say my sites A, B, C
17 and D show no disqualifying factors in any of these ten
18 criteria and, furthermore, we now know enough about the sites
19 so that in technical guidelines 1, 6, 7 and 8 we can give
20 you even more information?

21 MR. BELL: That may be a more difficult thing
22 to do than to come up with some prioritization.

23 MR. MOELLER: Well, you get the impression though
24 from DOE's guidelines that they were unable to give you
25

1 a disqualifying level for each of the criteria.

2 MR. STEINDLER: They have thus far been unable
3 to.

4 MR. MOELLER: Right. It is only three or four things
5 that they even give a disqualifying ---

6 MR. STEINDLER: My contention is that if proded
7 a little they may very well be able to find some disqualifiers.

8 MR. MOELLER: Oh, certainly, I agree.

9 MR. ORTH: Dave, that is why I made the remark
10 about mirror images, because in my first reading I noticed
11 that there weren't any, but you could invent a whole bunch
12 just by taking the favorable things and saying if they want
13 that, and the other one is the unfavorable. - -

14 MR. MOELLER: Of course, okay, I agree. That is
15 a good point.

16 MR. BOYLE: I think another point that we would
17 like to make on this is that these guidelines are supposed
18 to the selction of a site, but they still rely on their
19 national siting plan that they had prepared about a year or
20 so ago.

21 In that national siting plan they talked about
22 different approaches to siting. One was a host rock approach
23 and one was a land use approach. Now that would appear to
24 me that they have assigned priorities in their site selection
25 process. When they use land use, the No. 1 priority is land

1 use and then they use host rock, the No. 1 priority is host
2 rock.

3 I think they have the opportunity now to maybe
4 set up guidelines that clarify that in their site selection
5 process. These guidelines I don't believe necessarily clarify
6 how you incorporate the host rock and land use siting concepts
7 into these guidelines.

8 MR. STEINDLER: I think that is exactly correct.
9 The problem I had with those guidelines is they tended to
10 focus in on BWHIP. At least that is the way I read them,
11 and they didn't seem to me to be generic. I guess I keep
12 going back to this document that I think needs to be generic.

13 I agree with you, if they can make that thing
14 generic, then my problems rapidly disappear.

15 MR. MOELLER: Frank.

16 MR. PARKER: I disagree with the last statement.
17 I think part of the problem is that we are focusing now
18 exclusively on the technical guidelines, but that is not the
19 only thing that is going to determine where a repository
20 is going to be located. Even the Act itself just says primary
21 consideration will be given to the geological and environmental.
22 We have to look at where the wastes are located, what the
23 social situation is and what the political situation is, all
24 of which is incorporated in the Act. Otherwise, we wouldn't
25 have to have that veto power by the Congress.

1 MR. MOELLER: Martin isn't saying only the technical
2 criteria.

3 MR. PARKER: That is the only thing we are ranking
4 here.

5 MR. MOELLER: Right. They have already ranked
6 most of these non-technical things, or I mean they have given
7 disqualifying factors for several of the non-technical items.

8 MR. PARKER: Well, the distance to transport the
9 waste is a very important part that is mentioned in the Act.
10 Yet, it doesn't show up on this at all, on these technical
11 guidelines.

12 MR. MOELLER: Oh, you would like then for there
13 to be a list of technical and a list of non-technical items.

14 MR. PARKER: What I am saying is I don't think
15 we can say that they are dancing around because they are trying
16 to pick a site where the wastes are located. If that is site
17 suitable, then it ought to be considered. If it is not
18 suitable, no matter how much waste is there, and you can have
19 all the waste in the world there and it shouldn't be considered.
20 So I don't see anything pejorative about that.

21 MR. MOELLER: I think we agree with that.

22 Let's see, Mike, was Chris going to speak now.

23 MR. BELL: He is just here to answer questions.
24 He did most of the work.

25 (Laughter.)

1 MR. MOELLER: I thought maybe he had a presentation.

2 MR. PHILBRICK: Mike, what is the relationship
3 between these potentially adverse conditions in 60 and the
4 stuff we have been talking about so far?

5 MR. BELL: Well, in their technical guidelines
6 DOE has adopted many of the potentially adverse conditions
7 from Part 60. Basically we think that is a consistent approach
8 and good way to look for sites that avoid those kinds of
9 conditions that are going to give you trouble in the licensing
10 process.

11 MR. PHILBRICK: Then 60 is going to be something
12 that you are going to be using when you review.

13 MR. BELL: Later on, right. After they go through
14 all this process with the guidelines and pick the one site
15 for the repository application, then it is going to have to
16 meet Part 60 criterion.

17 MR. PHILBRICK: That is an interesting thing
18 because you tie up the originality that you can apply to
19 these guidelines here. What you have done in one case is
20 throw out practically the whole of the Eastern United States.
21 In 19, evidence of drilling for any purpose within the site.
22 We have been drilling for oil and gas since 1859.

23 MR. BELL: A potentially adverse condition doesn't
24 throw out any of the sites. If there is evidence of drilling
25

1 for oil and gas, what Part 60 requires you to do is thoroughly
2 evaluate what has happened and how it might affect transport
3 and determine whether in light of having that drilling you
4 could still reach a conclusion that the site will isolate
5 wastes. If you can make that conclusion, then even though
6 there was drilling, the site would still be licensable.

7 MR. PHILBRICK: All right. Now let me ask you
8 the next one. Prior to that this No. 18, evidence of sub-
9 surface mining for resources within the site. This throws
10 out all the coal fields. The coal is not at the depth that
11 you probably ought to be working with.

12 MR. BELL: Well, DOE would have the ability to
13 come in and argue that having overlying coal fields that had
14 been previously mined wouldn't really affect anything at
15 greater depths and the site would still isolate wastes.

16 All that we are doing is saying that if you have
17 that kind of condition at a site that is being considered,
18 are going to look at that a lot harder than if you didn't
19 have that. So it sort of tends to drive you away from those
20 kinds of conditions, but it doesn't reject them entirely.

21 MR. PHILBRICK: Good. Now let me point up one
22 thing which I pointed out this morning, and maybe you were
23 here and maybe you weren't, which has to do with the fact
24 that they have been sealing gas wells for years, and success-
25 fully so so that they can store gas underground in abandoned

1 oil reservoirs and not have it leak.

2 So I think this problem of sealing bore holes is
3 probably horribly overemphasized. When you review this business
4 of drilling for any purpose in the site, I think you ought
5 to keep that in your mind. The testing on this thing has
6 been done in terms of decades with pressures way beyond any
7 pressures you fellows will ever have.

8 That is all I have.

9 MR. MOELLER: Does that complete your presentation?

10 MR. BOYLE: Yes, it does.

11 MR. MOELLER: Carson.

12 MR. MARK: I have a trivial question which really
13 falls far aside from what we have been looking at. I read
14 the definition of geologic setting in their list of definitions,
15 and it says it means the geochemical, et cetera, systems of
16 a region in which the site is to be located. Is the region
17 a well defined term?

18 MR. BELL: Now you are quoting from the guidelines?

19 MR. MARK: I am quoting from the guidelines in
20 their definition list, and I came on this.

21 MR. MOELLER: Well, that is a question for us to
22 ask DOE. Mike, is a region defined?

23 MR. BELL: I don't think it is a defined term.

24 MR. MARK: It is not defined here. I am concerned
25 about it. If it isn't well defined then it is a time bomb

1 for argument. This is in the region. Now the region is
2 presumably a geologic unit of some kind, but it has to reach
3 ten kilometers even if you get into a new geology, but it
4 doesn't mean what we are used to with power plants where the
5 region includes the nearest earthquake even if it is 125
6 miles away.

7 MR. BELL: No, it doesn't.

8 MR. MARK: It doesn't tell me here anything to
9 pin that down. I wondered if that is a thing you would
10 regard as a worry or not. It needn't be.

11 MR. BELL: I don't think it is a worry. It is
12 not a worry to me as far as Part 60 is concerned because the
13 way we have handled the final Part 60, the isolation require-
14 ments are no longer placed on the entire geologic setting.

15 We define the site as being an area within the
16 geologic setting that provides the isolation for the waste.

17 MR. MARK: Right. Since they won't have hearings
18 on this nor their nominations, except perhaps for political
19 purposes and you will do the assessing on the basis of 60,
20 you won't have an argument on this point because it is in
21 the guidelines.

22 MR. BELL: Well, I think that is the case, but
23 since you have caught that let us give it some thought and
24 maybe it is worth our making a comment.

25 MR. MARK: It would not be very hard to say what

1 meant by this, and in particular one means something rather
2 limited I think.

3 MR. BELL: That is right. It is used in a different
4 sense from reactor sites.

5 MR. MOELLER: Martin, and then we will take a break.

6 MR. STEINDLER: You probably are aware of the flap
7 or discussion on the issue of accessible environment definition.
8 Do any of the comments that have been raised in relation to
9 the 960, which obviously reflect back on 60 as well, since
10 they seem to be I think identical, trouble you to the point
11 where you are rethinking your definition of accessible
12 environment?

13 MR. BELL: Well, we aren't rethinking it for
14 Part 60. The way I see this issue getting resolved is it
15 will have to resolved as part of the final EPA standard.
16 That is really a term EPA coined for their standard. The
17 Waste Policy Act directs NRC after the final EPA standard
18 comes out to go back and revise its regulations is necessary
19 to make them compatible.

20 So it may be a rather extended process with
21 getting to a final EPA standard on the basis of Part 60 and
22 perhaps working its way back into these guidelines and how
23 they are applied to the second repository.

24 All three agencies have consistent definitions
25 now that we think are workable. It is just that EPA is still

1 going through the process of getting comments on their
2 standard and it could change down the road.

3 MR. MOELLER: I plan, too, to ask the USGS people
4 for comments on the definition of an accessible environment.
5 Particularly with respect to groundwater and so forth they
6 should be able to help us.

7 MR. PHILBRICK: We get back into these 21 things
8 and the problem of extreme erosion during the Quaternary
9 period. Now that can be taken as being really something
10 serious or it could be just why sure, it could be hell
11 in this valley over here but it wants it at the top of the
12 ridge. The depth of the erosion in the finger lakes was as
13 much as seven or eight hundred feet in Quaternary time, and
14 how much is taken off the ridge, very little. So these are
15 not absolutes.

16 Now you get to the part here dealing with
17 structure ---

18 MR. BELL: Dr. Philbrick, are you looking at
19 the guidelines or Part 60?

20 MR. PHILBRICK: I am looking at 60, because 60
21 looks to me like a thing that is going to control. When you
22 get down to reviewing it, you are not going to be messing
23 with these things here, but you are going to be basing on
24 this thing.

25 These are the points that ought to be reviewed.

1 They have a problem here with uplift. If you are concerned
2 about uplift as an absolute, you realize that the Great
3 Lakes survey changes its base elevation about every 25 years
4 because the Upper Lakes are still rising, but that has nothing
5 to do with stability. You could bury the waste down there
6 at a reasonable depth and it wouldn't make any difference.

7 MR. BELL: Well, I think we agree with you entirely.
8 Again, none of the Part 60 criteria are disqualifying factors.
9 I mean the Act requires DOE to have factors of disqualified
10 sites. Part 60, all of those potentially adverse conditions
11 are just conditions to be evaluated. After you do the
12 evaluation. if you can show that that situation is not
13 significant, that it is compensated for by other factors or
14 that some things you could even remedy design, then you
15 still could get a license.

16 MR. PHILBRICK: These are not absolutes.

17 MR. BELL: In Part 60 they are not absolutes.
18 One of the things that I guess some people would like DOE
19 to do with their guidelines is make things that are not
20 absolutes in Part 60 absolutes in the guidelines. That
21 certainly is not what we are suggesting.

22 MR. PHILBRICK: All right. Just as long as you
23 don't get tied down to absolutes on these adverse conditions.
24 That is all I am concerned about.

25 MR. MOELLER: One last quick item. The DOE talks

1 about a minimum depth of 200 meters and I think you had
2 300. Am I correct?

3 MR. BELL: Again that is another example of taking
4 something from Part 60 that was a favorable condition, a
5 depth of 300 meters and making an absolutely requirement out
6 of that if they can't place the waste at 200 meters they
7 are going to disqualify the site. That is an example of
8 where they have been more restrictive than Part 60 is.

9 MR. MARK: You wouldn't see yourself as saying
10 the site wasn't acceptable, other things being fine, just
11 because it was 200 meters?

12 MR. BELL: No, we woldn't.

13 MR. MOELLER: Okay. I think we had better
14 take a break.

15 Thank you gentlemen for being with us.

16 We will take 10 minutes and we will resume almost
17 on schedule except an hour late.

18 (Whereupon, a short recess was taken.)

19 MR. MOELLER: The meeting will come to order.

20 The next item on our agenda is the presentation
21 by the USGS staff to provide us with their preliminary
22 comments on the DOE proposed 10 CFR Part 960. We have with
23 us P. Stevens and E. Roseboom.

24 Mr. Stevens, you are going to lead the lead the
25 discussion?

1
2 MR. STEVENS: No, I think Eugene will start off
3 with the presentation.

4 MR. MOELLER: Mr. Roseboom, go ahead.

5 MR. ROSEBOOM: There are two of us here because
6 this activity extends into two divisions of the Geological
7 Survey, both the Geologic Division and the Water Resources
8 Division. So I am here as a geologist and Pete is a
9 hydrologist.

10 For those of you that are not familiar with the
11 USGS, that is the non-geologists, our activities are primarily
12 scientific research and investigations. We have no regulatory
13 functions.

14 We are involved in this program by virtue of our
15 earth science expertise and I hope our objectivity. Our
16 role is not always understood. Basically we have three roles
17 in the program. We advise DOE, NRC, EPA and anyone else
18 who requests our advice on matters of waste disposal.

19 We also assist DOE on specific projects and parts
20 of the program. Perhaps our largest involvement is at the
21 Nevada test site where we have been responsible for the site
22 exporation program because of our previous work out there
23 relating to bomb testing.

24 In addition, we have our own research program on
25 the subject of waste disposal and how to characterize sites

1 and so forth.

2 We have been involved therefore in site identifi-
3 cation activities or screening for probably about seven or
4 eight years directly and indirectly. So that I think we have
5 some accumulated experience in this area.

6 So we are looking at these regulations from the
7 point of view of perhaps those who are trying to identify
8 sites and screen to sites.

9 In addition, some of us were invited by DOE to
10 serve on the four-person panels that oversaw the five public
11 hearings on these regulations. I happened to go to the one
12 in Chicago, which was the first one, and the one here in
13 Washington where I was the USGS technical representative.

14 So we have also been exposed to some of those
15 viewpoints which I think you have received material on. It
16 was very interesting. It is the first time I have ever been
17 compared with a Nazi war criminal.

18 (Laughter.)

19 MR. ROSEBOOM: But I guess you have to expect a
20 little of everything.

21 Under the Nuclear Waste Policy Act of 1982 the
22 only mention of the USGS is that in preparing these regulations
23 the DOE is to consult with us on these regulations.

24 We have not yet completed our review of the
25 regulations. However, the views of about half a dozen of

1 our staff scientists that have been involved have been
2 assembled and we have started a draft.

3 We found basically in the regulations that in our
4 opinion there were no real surprises and of course many rather
5 familiar appearing regulations because of course these come
6 from the NRC regulations and the EPA regulations and the
7 33 series, all of which we have commented on from time to
8 time in the past as they have been developing.

9 MR. MARK: Were your comments accepted by and
10 large?

11 MR. ROSEBOOM: Yes, I think so.

12 MR. MARK: I will have to find out how they do
13 that.

14 (Laughter.)

15 MR. ROSEBOOM: We feel that the guidelines, this
16 initial review, we feel that they are generally acceptable
17 from our point of view. I say this, we are not reluctant to
18 criticize DOE's products, and I think it is too bad that
19 Chris George isn't here to hear us say something nice, and
20 he might be surprised.

21 We have of course heard comments at the public
22 meetings that some of these criteria or guidelines are too
23 vague and too general and not specific enough, and I think
24 some of us have tried to reword these but have found that
25 we ran into difficulties when we tried to do this. So it

1 is not that easy to do.

2 Since the overall systems approach is going to
3 be involved in the nominations, recommendations and selection,
4 one is reluctant to put in guidelines that will be too strict
5 on individual factors in those systems because one may be
6 eliminating sites which in regard to other factors are actually
7 very good.

8 The difficulty of course is that we are looking
9 at, and potentially in the future looking at a far assortment
10 of geologic environments. There is of course salt, both
11 embedded and salt dome. There is dome salt, there is basalt,
12 there is tuff, both above and below the water table, there
13 is crystalline rock of various kinds and, as was mentioned
14 earlier, there is possibly crystalline rock under sedimentary
15 rock, as was proposed by Bredehoft and Mayning in the Science
16 article in 1981.

17 We are interested ourselves in that concept and
18 are exploring the possibilities of whether that is a feasible
19 area and whether there are regions that using that approach
20 would turn out to be worth exploring or screening further.

21 MR. MARK: Do we in the Continental U. S. have
22 any soil which is closely similar to that at OKLO in which
23 fission fragments are known not to move? It is an
24 argillaceous something or other.

25 MR. ROSEBOOM: Oh, shale. Well, let's see, OKLO

1 is probably a little above shale. I have forgotten the
2 details of it. Whether it is still shale or not, do you
3 know, Pete?

4 MR. STEVENS: No, I am not familiar with the
5 details.

6 MR. ROSEBOOM: OKLO is unique because it is a
7 natural reactor which so far as I think we are aware is
8 the only one of its type that has been found.

9 MR. MARK: The only one found.

10 MR. ROSEBOOM: Right. Shale is another potential
11 host rock which at the moment is not currently under serious
12 consideration, but it is possible that with more work it
13 may hold ---

14 MR. MARK: It keeps crossing my mind that that
15 thing was originally absolutely full of water. Water was
16 breezing through it and the fission fragments are within
17 a hundred years of where they were formed, and that is two
18 time ten to the ninth years. It is the only time base that
19 is getting out there.

20 MR. ROSEBOOM: Yes, it certainly is. Of course,
21 it is a little bit hard to go back to the exact conditions
22 that existed at the time that it started to make sure that
23 all of the waste is accounted for there. There are the
24 shorter lived products and such. OKLO is a very interesting
25 analogy, but ---

1 MR. MARK: I was just curious if we have sites
2 which would be absorption-wise or geologically similar to
3 that because you mentioned a number of different kinds of
4 things in your list.

5 MR. ROSEBOOM: At the moment there is nothing
6 exactly equivalent to that.

7 With regard to specific comments, we have a number
8 that are more of an editorial nature, but perhaps there are
9 two which we would endorse, both of which have already come
10 up before.

11 One is the fact that under the subject of hydrology
12 no potentially adverse conditions were indicated, and that
13 is on page 5679 in the third column about two inches down
14 from the top where it states potentially adverse conditions
15 nonspecified.

16 However, if one moves down below that about four
17 inches to the item labeled 3, one runs into several items
18 which if moved up under there could actually serve to
19 constitute potentially adverse conditions. In this case
20 they are listed under hydrologic modeling, but in our feeling
21 they really belong under the actual hydrology rather than
22 simply the modeling.

23 A second item which was mentioned earlier, too,
24 was the question brought up by NRC, the absence of releases
25

1 from other nuclear facilities would direct DOE away from
2 DOE reservations. Whereas the technical guidelines toward
3 the end would regard DOE reservations as favorable. So that
4 you have a potential conflict there. That was taken up just
5 a few moments ago.

6 You warned us you were going to ask on the defini-
7 tion of the accessible environment. I think we would be
8 inclined to dodge that one as not really being an earth
9 science term or a geologic term. It is one which has
10 been invented for the purposes of regulating nuclear waste
11 disposal. So we will punt on that one.

12 MR. MOELLER: I did want to ask them to comment
13 on what it said about aquifers.

14 Frank, would you help me with that.

15 MR. PARKER: I would like to raise that same
16 question, the definition of aquifer. I think you leave
17 something to be desired on 677. You could almost have that
18 as unsaturated by that definition.

19 MR. STEVENS: This is true. It is not a particularly
20 good definition of an aquifer. There are abundant definitions
21 of an aquifer that would be more suitable.

22 MR. PARKER: I agree with that.

23 MR. ROSEBOOM: Also, we had some problem with
24 the definition of capillary fringe, too, where are going
25 to recommend some rewording.

1 MR. STEVENS: We suggested a redefinition that
2 we will give to DOE.

3 MR. MOELLER: Frank, I don't remember where it
4 is in there, but it talked about in terms of the accessible
5 environment it said an aquifer could be contaminated or
6 something, and that it doesn't count.

7 MR. PARKER: Within the first ten kilometers.

8 MR. MOELLER: Right. Well, how were you going
9 to keep the material from moving through the water in the
10 lithosphere? I mean if it is in the water, won't it move
11 as rapidly as the water moves?

12 MR. ROSEBOOM: No.

13 MR. MOELLER: It won't?

14 MR. ORTH: The retardation and ion exchange ---

15 MR. MOELLER: Oh, even with that you take account
16 for moving on to particles and off and back and forth.

17 MR. STEINDLER: I think the issue though is that
18 you have got a 10 kilometer radius of potentially uncontrolled
19 contamination of whatever the aquifers are.

20 MR. MOELLER: Right.

21 MR. STEINDLER: Then the question arises supposing
22 we have a 20 kilometer diameter aquifer whose contamination
23 is significant. To what extent does allowing that contamination
24 to become uncontrolled can produce an unacceptable condition
25

1 downstream of that aquifer, and to what extent if you were
2 to control that aquifer down to a smaller distance around
3 the repository that you would have a better control of the
4 situation downstream. I think that is the hangup that seems
5 to be this whole argument.

6 MR. STEVENS: I think this is true and this hasn't
7 been resolved. I think part of the logic, as I understand
8 it, that went into the definition of the controlled zone ---

9 MR. STEINDLER: The accessible environment.

10 MR. STEVENS: Right. --- was because you are limited
11 by the thousand year canister and also the thousand year
12 travel time. It would be very difficult to determine move-
13 ment of nuclides within the 10 kilometers within that time
14 frame. But it leaves open the question if you have relatively
15 rapid movement of nuclides from the repository within that
16 zone of what are the consequences.

17 MR. STEINDLER: I think another issue that I am
18 sure somebody has got to raise is supposing that 10 kilometers
19 were two kilometers, would it make any difference in the
20 long analysis of where this material is going to go with
21 whatever the retardation factors are that the geology downstream
22 of that aquifer brings to us. Would that really make any
23 significant difference?

24 The advantage presumably of a 10 kilometer distance
25 is that analytically you are much more easily able to get

1 some reasonable set of numbers.

2 MR. STEVENS: That is correct.

3 MR. STEINDLER: Now, however, if the risk is too
4 high and you drive it back to two kilometers, an arbitrary
5 number, the difficulty in getting numbers goes up enormously.
6 The question is do you get a corresponding benefit and
7 lower the risk.

8 I think the implication is that DOE, NRC, and
9 obviously EPA would say no, you are not really making a whole
10 lot of money, but you are sure making life tough for yourself.
11 The question for you is is that a reasonable interpretation.

12 MR. STEVENS: This is their interpretation.

13 MR. ROSEBOOM: But is it reasonable in your eyes?

14 MR. STEVENS: Assuming you don't have any rapid
15 or likely vertical communication and you are able to control
16 to some extent possible groundwater withdrawals within the
17 designated two kilometers, or whatever, it probably is.

18 MR. STEINDLER: Those are important caveats that
19 I hope will show up in the transcript that somebody else
20 reads.

21 MR. MOELLER: Could you either state a summary
22 or jot down a summary of that for me, Martin.

23 MR. STEINDLER: I can give it a try. But I think
24 the transcript will carry that fairly well.

25 MR. MOELLER: I have heard you, but I am not

1 sure because I would be hard pressed to really write it
2 down. Is it possible to write it down in three or four
3 lines?

4 MR. STEINDLER: It has got to be.

5 MR. MOELLER: Okay, if you would do that it would
6 be very helpful for me because I do want to cover it and
7 I am not sure of the right way to say it.

8 MR. FOSTER: This brings up a point that I have
9 been unsure of, and that is that even if you have this 20
10 kilometer control zone, this is a temporary thing, so that
11 let's say a thousand miles down the road you no longer have
12 that as far as surface is concerned. Then what about this
13 groundwater and groundwater use where there is a potential
14 for vertical transmission from below? In other words, you
15 have created a definition of an accessible environment which
16 may be 10 kilometers in a lateral direction, but it sure isn't
17 10 kilometers in a vertical direction.

18 MR. STEINDLER: A comment was made that you had
19 no vertical connection. The other assumption I think is
20 that somebody is not going to drill a well slant to intercept
21 an aquifer significantly but directly below a repository.
22 I think that is not an unreasonable assumption.

23 MR. FOSTER: But there is nothing in these
24 definitions or the criteria that we have read that talks
25 about not vertical connections.

1 MR. STEINDLER: That is right. All I am saying
2 is that the statement was made with two caveats. One is
3 you don't pump water out of that two kilometer zone and,
4 two, that you don't have a vertical connection.

5 MR. PHILBRICK: Well, then somebody has to put
6 a dimension on the site. If they include this zone we
7 are talking about, then the site becomes impossibly big
8 for the eastern part of the United States because you are
9 talking about 10 kilometers. That is 6 miles.

10 MR. MARK: Radius.

11 MR. PHILBRICK: Well, no, because upstream they
12 are not going to buy if you know which way upstream is. This
13 is the thing that bothers me about this business is nobody
14 puts any numbers on the size of the site. One of the first
15 things you have to know about a site is its dimension. I
16 think this is a basic concern in this things we are talking
17 about here, this 877, there is no site dimension.

18 Now I thought the site was going to be a mile
19 square or two miles square or something like that, and then
20 from then you were going to have outlying and going away
21 from the site at 45 degrees the boundary barrier which was
22 going to be in fee simple, and the width of the thing depended
23 upon the depth of the storage, and this gives something
24 you could hand out to them and now you don't have it.
25

1 MR. STEINDLER: That was going to be temporary
2 at best. The fence, as somebody already said in the last
3 day or so, the fence is going to go away. So that is no
4 longer a serious issue. It is a question of whether or not
5 your model takes into account a 10 kilometer radius or
6 some other distance that lasts for a long time.

7 MR. PHILBRICK: Somebody has to go out and buy
8 the land and throw a bunch of voters off the land.

9 MR. MOELLER: Don wants to speak and then Frank.

10 MR. ORTH: I have had another problem with the
11 hydrology bit that I hope maybe one of you gentlemen might
12 help a little bit in clarifying.

13 There are two concepts, one of them which is in
14 the various guidelines and proposals for groundwater travel
15 time for some distance. We haven't defined the distance
16 but you could relate it back to so many kilometers per
17 thousand years or whatever that unit is. But there is the
18 other concept and that is what of the quantity of water.
19 Now this gets back to the business of also driving wells in.

20 Now the quantity, and I will use an example, is
21 underneath a good deal of the Southeast. There is a thing
22 called the Tuscaloosa, a tremendous aquifer, and analysis
23 could show that you could dump a rather large quantity of
24 waste in it and it gets diluted. It is just about like
25

1 putting it in the river. So even if the thing were only
2 a kilometer away you have gotten enough dilution so that you
3 are probably all right drinking the water.

4 So that the travel time by itself is not sufficient
5 to characterize what is good or bad. Now none of this has
6 been addressed so far in any of the kind of criteria and I
7 don't know how to address it. I don't know if USGS has
8 considered trying to address it. But it also comes down to
9 not only the velocity but in a sense the yield you can get
10 out of it. If you have got enough water, that is an independent
11 variable.

12 Now the other part goes that there are some fractured
13 rocks down there in which there is only a little bit of water
14 and it travels quite slow. You could drill a well into it
15 and you wouldn't get very much water out of it. Nobody does,
16 but by the same token, what would be there would be quite
17 concentrated if there were any there and if anybody tried
18 to pump it out, simply because there was so little water.

19 This is missing so far from what I have seen
20 anywhere.

21 MR. MOELLER: Martin.

22 MR. STEINDLER: Let me just add that if there is
23 in fact so little water moving, then you may build up a
24 very high concentration around your waste, but you ain't
25 going to move very much of it downstream.

1 MR. ORTH: But it still could move fairly fast.
2 There may not be very much there. The quantity you are going
3 to get out of that well is not necessarily directly related
4 to the velocity through the little slot that it is going down.

5 MR. STEVENS: Concerning the Tuscaloosa, during
6 past investigations of the feasibility of disposing of
7 nuclear waste at the Savannah River plant site, this was the
8 very reason that that site was essentially rejected as a
9 potential site because of the directly overlying Tuscaloosa
10 aquifer and the lack of any assured confinement of the effluent
11 from the waste reaching the aquifer.

12 There is a zone that to varying degrees may be
13 continuous or discontinuous and becomes a virtually impossible
14 job to demonstrate that you have a continual barrier of
15 material overlying the crystalline rocks and intervening
16 between that and the Tuscaloosa aquifer.

17 MR. ORTH: That is why I asked the question. You
18 could also demonstrate in terms of complying with regulations
19 the rate of movement. There is a large quantity of water
20 there and its rate of movement is relatively slow.

21 MR. STEVENS: In the Tuscaloosa.

22 MR. ORTH: Yes. So we could do two things. We
23 could contaminate the Tuscaloosa, but it wouldn't go outside
24 there because of its rate, nor would it be necessarily bad
25

1 if anybody drilled into it, but it is still a forbidden to
2 contaminate it, and I am just not sure how we hang all of
3 these things anywhere in the regulations.

4 What I am really asking for is is there a way you
5 can see to address that business of the independence of the
6 quantity of water that is there and its rate of movement?

7 MR. STEVENS: Well, I think what you are concerned
8 with is ultimately the dose effects to the so-called accessible
9 environment. My understanding is that the NRC rule applies
10 to this and defines the limits.

11 MR. ROSEBOOM: There is another place where this
12 problem of the quantity of water enters in and that is in
13 the unsaturated zone where we are just really beginning to
14 appreciate perhaps how that zone has to be treated.

15 Now this is a very thick zone above the water
16 table and arid regions where there is water but it is held
17 through capillary forces and there is a very low flux of
18 actual movement on an average. But where there are fractures
19 there may be a small amount of water which does move down
20 rapidly. This has been measured on Ranier mesa in a matter
21 of a few years, but the amount of water would be extremely
22 small and yet it could have a fairly rapid travel time down
23 to the water table and then be greatly diluted in the ground
24 water table and then move there as water comes in from other
25 source areas.

1 So that this question of travel times and quantity
2 becomes rather complex in that situation.

3 MR. PHILBRICK: Is there a real serious interest
4 in putting one of these things above the water table?

5 MR. STEVENS: Yes. That is the direction in which
6 the effort is being focused.

7 MR. MOELLER: Let's see, George wants to comment
8 and Frank, too.

9 MR. THOMPSON: This is just a question. The
10 term "average interstitial velocity" is used in the document
11 here. Is that useful term and what does it mean?

12 MR. STEVENS: It simply means that your velocities
13 as determined by your groundwater equations and so forth are
14 average velocities.

15 MR. THOMPSON: I think in the illustration that
16 you just used that might not be a very useful measure.

17 MR. STEVENS: This is part of the problem. In
18 fractured rocks you are not dealing with porous media and
19 you have a different type of thing to define and the theory
20 isn't well developed. You can apply your cubic law to the
21 parallel plate analogy and come up with some meaningful
22 estimates in the lab at least, but in an analysis of any
23 reasonable fractured field unit it becomes a much more
24 difficult problem.

25 MR. THOMPSON: I tend to think of almost all rocks

1 as fractured.

2 MR. STEVENS: You are absolutely correct, but in
3 the case of the rocks that are dominated such as crystalline
4 rocks, which are really not a porous media, and the rates
5 of movement are controlled say between the mineral grains
6 by essentially diffusion rates. If you are dealing with
7 velocities of that nature you don't really have to worry
8 about it, but the movement in the fractures is many orders
9 of magnitude more rapid and they become dominant in any
10 crystalline rock mass.

11 MR. PHILBRICK: You are in a funny thing out there
12 above the watertable. If you get a climatic change with
13 increase in moisture you are going to have a wet hole.

14 MR. STEVENS: That is being very carefully looked
15 at and we are in the process of doing a number of paleo-
16 environmental studies out there to determine what conditions
17 were say 10 or more thousands of years ago.

18 Surprisingly, although it was wetter, the water
19 table from our studies so far suggests its rise was quite
20 limited and was on the order of like I guess less than
21 a hundred feet.

22 MR. ROSEBOOM: I think about that order, yes.

23 MR. STEVENS: When we are dealing with an
24 unsaturated zone 1,800 thick this really doesn't become
25 significant.

1 MR. PHILBRICK: If you are above it, but the water
2 has to get down to that zone. So it is moving through the
3 fractures.
4

5 MR. STEVENS: This is correct.

6 MR. PHILBRICK: And it is going to drip.

7 MR. STEVENS: This is correct.

8 MR. PHILBRICK: So you do have more water ---

9 MR. STEVENS: But it is a relatively simple matter
10 to isolate say any waste package from the water moving down
11 through the fractures.

12 MR. ROSEBOOM: The estimates of current rainfall
13 at Yucca Mountain is on the order of five to six inches
14 average precipitation per year, and the estimates over the
15 pleistocene have indicated an increase of about 50 percent
16 over that. So you are still talking a relatively small
17 number of inches of rainfall. When you consider that only
18 a few percent of that actually soak in under present
19 conditions, you are talking at the present time of a downward
20 flux on the order of three/tenths of an inch of precipitation
21 per year, and that is the only source of water since you don't
22 have it moving in laterally from recharge areas.

23 So even if you saved that up for quite a few years
24 and dumped it into the repository all at once, you might
25 get your feel wet, but it would tend to drain out rather

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

rapidly.

MR. PHILBRICK: A repository located out there would be located up in the area in which you have got bedrock.

MR. ROSEBOOM: Yes, it would be in bedrock.

MR. PHILBRICK: And it would not be down in the bottom.

MR. ROSEBOOM: I think the estimate at the present time is the current target arising is about 1,200 feet below the surface. This is on the surface of a small mountain out there and I think that would actually put you below the level of the adjoining valley, too.

MR. PHILBRICK: But the surface waters would not be overflowing in.

MR. ROSEBOOM: That is correct.

MR. MOELLER: Let's see, Frank, you have a question and then we almost should wrap this up.

MR. PARKER: I think some of the questions that Don was raising really should be handled in the hydrologic modeling, that is the question of whether you are going to have solubility limits and leach limits and also whether you are going to deal with gossan velocities or not. That all ought to be handled in the models.

MR. STEVENS: That is exactly right.

MR. PARKER: The models that EPA has used doesn't

1 deal with this at all because they are too simple. Whereas
2 the Sandia models which they recognize will be able to handle
3 a site specific basis and I think that should work out okay.

4 MR. STEINDLER: Are you then suggesting that the
5 EPA folk are going to change their lease units that are
6 currently based on a absolute number of curies per thousand
7 metric tons?

8 MR. PARKER: I hope they are going to change it.
9 At least I hope the scientific data is going to convince
10 them to try to change it.

11 MR. MOELLER: Okay, Dick.

12 MR. ORTH: I just had a question of curiosity
13 about the Act. We are talking about the water movement and
14 velocities here, the Act itself I noticed pretty well
15 prohibited the use of radioactive materials for research
16 or exploratory purposes and specifically nonretrievable
17 materials which I interpret as tridium. I just wondered
18 if anybody knows the legislative history as to why they
19 want to eliminate a very valuable tool for getting this
20 information in the first place?

21 MR. STEVENS: I wasn't aware that that was the
22 case. As a matter of fact, tracer studies using various
23 radionuclides are fairly standard procedures for
24 measuring groundwater velocities.

25 MR. ORTH: This is why I was surprised to see

1 the language in the Act.

2 MR. MOELLER: Where is that, Dick?

3 MR. ORTH: I will have to look back and see if
4 I can locate it.

5 MR. MOELLER: Do you have any other comments,
6 Mr. Stevens or Mr. Roseboom?

7 MR. ROSEBOOM: No, sir.

8 MR. STEVENS: No.

9 MR. MOELLER: Well, let me thank you for coming
10 and particularly sticking it out with us. Your comments
11 have been most helpful to us.

12 MR. MARK: You are going to make a formal
13 presentation of these to DOE when you get them pulled
14 together?

15 MR. ROSEBOOM: Yes. We are required to.

16 MR. MOELLER: Well, thank you again.

17 The last formal presentation on our schedule today
18 is the consideration of the transportation impacts related
19 to the guidelines of DOE as well as to the selection of a
20 site for a repository. For that presentation we have with
21 us Fred Millar, Director of Nuclear and Hazardous Materials
22 Transportation Project within the Environmental Policy
23 Institute.

24 Mr. Millar, we did distribute to all of the sub-
25 comittee members and consultants the written material which

1 I believe you had submitted to us or which you had submitted
2 previously at other meetings. So the floor is yours.

3 MR. MILLAR: Maybe I should begin by saying that
4 the written materials that you have are basically the kind
5 of package that I supply to people who are sort of beginning
6 in the controversies about the transportation of nuclear
7 materials. I apologize if you are already well familiar
8 with the various controversies and also with some of the
9 technical data, for example, how many curies there are in
10 a rail cast as opposed to a highway cast and what is the
11 estimated annual number of shipments, et cetera.

12 I guess I am not particularly prepared today to
13 do a very heavy duty safety analysis of the question about
14 radioactive transport, but I understood that the main focus
15 today is to focus on NRC's role in overseeing the guidelines
16 that DOE has come out with.

17 In that area I have a rather brief message,
18 although I can elaborate to some extent. The basic situation
19 is that the Act, the Nuclear Waste Policy Act of 1982 clearly
20 shows a good deal of concern by Congress about the transpor-
21 tation impacts associated with a repository system.

22 On the other hand, the guidelines that have come
23 out of DOE and also the environmental assessment that has
24 been done for the Hanford facility clearly shows that DOE
25 is not taking any of that seriously at all.

1 Now, you may think that is fairly reasonable that
2 DOE might not take seriously any of the safety problems with
3 transportation, but I would just like to point out that if
4 that continues what we are likely to have is a lot more political
5 confrontations about the transportation problem.

6 Since what we are talking about here is not only
7 the technical ability of DOE to put some waste in the ground,
8 but also its political credibility with the public, and it
9 has to do it in such a way that people think they are doing
10 it safely.

11 If DOE is perceived as No. 1 really rushing ahead
12 with the program of site selection in a way that is seen
13 as soliciting possible comments from state and local officials
14 and citizens groups and so forth, and if, secondly, they are
15 seen as paying no attention of any substantial sort to the
16 problems associated with transportation, for one, and if
17 they are seen as having chosen Hanford and the Nevada test
18 site largely for political purposes rather than letting
19 geology be the determining force, well then I think we are
20 going to have a real serious credibility problem similar to
21 what we have had in the previous waste disposal efforts and
22 as very eloquently described in the previous IRG report in
23 1978 and '79.

24 So that is basically what I have to say is that
25 I think we are talking here about the ability of DOE to

1 credibly present a program, and from what I can tell, they
2 are putting themselves in a box in terms of not seriously
3 considering some of the transportation impacts.

4 Part of the materials that I supplied were some
5 maps. If you can find those, and I think they are about
6 pages 10 and following in your packet. I just might point
7 out that visually the impact on western states of a repository
8 operating in either Nevada or Hanford, Washington can be
9 seen from these maps.

10 The first one that has a 4 at the top and says
11 "Projected Annual Spent Fuel Shipments To A Western Storage
12 Site," which is basically a map showing impacts to a Nevada
13 site, is produced by the National Academy of Sciences in a
14 draft report that they did in 1981, which is still not
15 released but which was about the socio-economics impacts
16 of radioactive waste management.

17 I mean what the National Academy concluded from
18 their study, what the National Academy panel concluded
19 was that the current regulatory scheme that the Federal
20 Government has for waste transportation is "primitive"
21 and that unless things get better there is going to be some
22 serious impasses between state and local officials, on the
23 one hand, and federal officials, on the other hand.

24 Lastly, they took a lot of trouble to point out
25 the regional inequities involved in a waste system that

1 looks like that where most of the nuclear reactors are in
2 the Midwest, the East and the South and the waste site is
3 going to be in Nevada.

4 I was out there recently in that area and also
5 in Las Vegas and also in Texas and, as you may know, one of
6 the precedents that they see for this is that when they were
7 doing bomb testing at the Nevada test site they used to wait
8 until the wind was blowing in a particular direction, namely,
9 towards St. George, Utah, before they blew off the bombs.
10 The reason is that DOE's position was or the AEC or whoever
11 that was at the time was that was a "virtually uninhabited
12 area."

13 Well, some inhabitants got up in these meetings
14 and were really raising cain and saying look, you know, this
15 is ridiculous. You not only have exposed us in terms of
16 the bomb testing and you want to put the MX here, but now
17 you are talking about taking a bunch of nuclear waste from
18 the East and putting it in the West.

19 That is the kind of perspective that I think we
20 can expect to see and, frankly, if you look at these waste
21 maps, what they call the nuclear waste funnels, what the
22 National Academy of Sciences calls the nuclear waste funnels
23 as they converge on the Nevada test site, you see that several
24 states that are crossed by heavy concentrations or shipments
25 don't even have any nuclear power plants or very few. So

1 that again the regional inequities are sort of glaring.

2 Now what I did was take these same maps and then
3 extrapolate them to what would the situation look like if
4 they used either Hanford, Washington or Moab, Utah. Now
5 these are unofficial extrapolations of what the Oak Ridge
6 National Laboratories people turned out earlier. These are
7 actually the first two maps in your series.

8 What you will see if that if my guess are right
9 about what routes would be chosen, there are some very heavy
10 concentrations along some of the major interstates that
11 involve going through Denver, going through Albuquerque,
12 going through Cheyenne, Wyoming and so forth.

13 So again your impact on western states is rather
14 striking. Let me just say that I have studied carefully
15 the guidelines and also the environmental impact analysis
16 and the Act and when you look at the guidelines they have
17 some extraordinary things in them.

18 For example, there is no transportation impact
19 that is considered disqualifying. I mean none, no trans-
20 portation impact that is considered disqualifying by DOE.
21 In fact, DOE says that even "site locations requiring the
22 concentration of transportation routes through highly populated
23 areas," in other words, what you would consider possibly the
24 worst scenario, even site locations requiring the concentration
25 of transportation routes through the highly populated areas

1 is only a "potentially adverse condition."

2 I mean basically DOE is maintaining the same story,
3 which is that we have got these casts that are virtually
4 invulnerable and therefore we don't need to consider environ-
5 mental impacts very seriously.

6 In fact, in the guidelines and in the draft
7 environmental assessment they don't even have the routes
8 designated to the Hanford site in the Hanford environmental
9 assessment.

10 Now if I was DOE I wouldn't do that either,
11 frankly. I mean if I was DOE I would wait as late as
12 possible to show people in the western states which routes
13 they are thinking about using to the Hanford site for
14 political purposes. But, on the other hand, if they don't
15 consider those things serious I think they are going to be
16 in some trouble in terms of political acceptance of that
17 transportation pattern.

18 Again, the Congress in its Act clearly said that
19 the guidelines should consider transportation impacts, and
20 the Congress had all kinds of other evidence about their
21 recognition of how serious the population views that problem.

22 When DOE does that federal AFR program they are
23 supposed to minimize the transportastion of spent fuel to
24 any kind of a temporary storage site.

25 In the environmental assessment that DOE has to

1 do in terms of the repository, they are supposed to consider
2 the regional and local impacts of a repository selection.
3 Presumably that includes transportation. And they are also
4 supposed to compare that with other sites. The regional and
5 local impacts are supposed to be compared with those if they
6 chose another site.

7 The Hanford environmental assessment says that
8 since the distances are greatest to Hanford, obviously the
9 impacts from other sites would be less. I mean the fact is
10 that the Hanford site is the worst case. As far as transpor-
11 tation is concerned, DOE has picked the worst case to put
12 out first. I mean it is hard to imagine a worse situation
13 in terms of transportation impacts.

14 So obviously what I think DOE is no doubt aiming
15 to do is get that accepted and then the rest of the time it
16 won't have to worry about those kinds of things.

17 Let me point out that DOE says that there are going
18 to be minimal impacts about the routing of all of this, but
19 they don't say what kind of assumptions they have about
20 the routing. I mean right now you know who chooses the
21 routes are the truckers and the railroad people. I mean
22 the routes are chosen by the carriers with some guidance
23 from DOT in terms of avoiding heavily populated areas if
24 there is a beltway that goes around the city, for example.
25 I mean the fact is the routes are chosen by trucking companies

1 and by railroads.

2 The National Academy points out that if you have
3 a very decentralized railroad system that nuclear spent fuel
4 casks could be sitting in railroad switching yards for hours
5 or days or weeks at a time and have de facto delay for storage
6 sites in the Chicago shipping yard, for example, or something
7 like that.

8 The railroads, by the way, are not very eager
9 to carry nuclear waste. So for the Hanford environmental
10 assessment to say that they think 90 percent of the waste
11 is going to go by rail is rather optimistic. I mean the
12 railroads right now have been the prime critique of the
13 government's safety assurances about the casts. The railroads
14 say they they don't think the casts have been adequately
15 tested for actual railroad crash conditions. They have been
16 before the Interstate Commerce Commission and all the way
17 up to the Supreme Court arguing that special safety precautions
18 have to be used if we are going to carry spent fuel by rail.

19 In the Act, one other example of the Act's concern
20 about transport is that offsite concerns are to be negotiated
21 between the states and DOE which include very clearly some
22 explicit transportation concerns.

23 You may be aware that DOE is not outrageously
24 out of line with the current posture of the U. S. Department
25 of Transportation and the Nuclear Regulatory Commission in

1 this sense. The U. S. Department of Transportation is
2 completely reluctant to allow New York City to ban nuclear
3 spent fuel shipments through the city. New York City in
4 1976 passed a ban on spent fuel shipments through the city.
5 DOT took a look at that and said well, we don't have any rules
6 right now that can take care of that problem, but we will
7 develop some. So they developed a preemptive national rule
8 called H.M.-164 that would wipe out New York City's ban, and
9 New York City took DOT to court and won at the Federal District
10 Court level. Now DOT has appealed that case to the Appeals
11 Court in New York.

12 I mean the postures of the federal agencies are
13 this. DOE is sort of virtually not considering transportation
14 impacts and all this stuff. The DOT is also in effect saying
15 we don't even need to worry about nuclear spent fuel casks
16 by the hundreds per year moving through New York City.

17 And, No. 3, the NRC's position is rather mixed.
18 On the one hand, they have turned out the best studies about
19 the potential impacts of a serious accident or a sabotage
20 incident. In fact, NRC has done a rule in 1979 that said
21 that spent fuel shipments should not go through cities
22 over 100,000. They later modified that rule in 1980 to say
23 that you can go through cities over 100,000, but only if
24 you carry armed escorts and use the interstate highways, and
25 the reason is for sabotage. I mean the NRC is only concerned

1 about sabotage. Officially they are not concerned about the
2 safety questions because they think that they have certified
3 the casks. Chuck McDonald's shop thinks that they have
4 certified the casks so that we have got virtually invulnerable
5 casks.

6 Now again I am not prepared to do a thorough
7 safety analysis at this point. A lot of problems have been
8 revealed with the nuclear casks. I mean just one little
9 example is that a General Electric IF-300 is a \$5 million
10 cask. It is the major rail cask in the country. I mean
11 here is DOE saying we are going to ship 90 percent of our
12 spent fuel to Hanford Washington by rail. The main rail cask
13 in the country is a General Electric IF-300. It costs
14 \$5 million. It has never been tested physically. You just
15 don't ram a cask that costs \$5 million into a brick wall.

16 Secondly, it has got \$25,000 valves on it that
17 don't work. You know they are pressure release valves. They
18 are supposed to open to release potentially radioactive
19 steam in case of an overpressurization in an accident and
20 then they are supposed to close again and reseal and they
21 don't do that. They open up fine, but they don't close.

22 So you have got basically \$25,000 valves made
23 by GE that don't work. I mean generically they don't work.
24 It is not just one or two. So the cask has been withdrawn
25 from service with water coolant.

1 Now luckily the industry is saying look we won't
2 need to ship any spent fuel with water coolants because it
3 is all going to be cooled off for so many years that we won't
4 need to worry about fairly high thermal temperatures and we
5 ship all the spent fuel dry, which is maybe true, although
6 when you consider how many shipments they are talking about
7 making, something like 469 per year to a site, and that includes
8 commercial spent fuel and commercial high level waste, that
9 is more than one or two a day.

10 I mean if their main cask can be held up to
11 ridicule as having been withdrawn from service by the NRC,
12 by the way, and if the federal posture seems to be one of
13 trying to bully state and local officials, I just don't think
14 that is a credible way for DOE to be going into this whole
15 thing.

16 NRC's role in this presumably could be to try
17 to point that out to DOE that the transportation concerns
18 are real and valid and at least need to be considered.

19 MR. MOELLER: Carson.

20 MR. MARK: I don't know that I have any cogent
21 point to make. It is true that the contents of a cask
22 whether it is truck or rail if released, and particularly
23 if released in a badly chosen spot, could have large
24 consequences, and whether the Sandia study is correct on
25 their estimates I am not so sure, but even I would feel that

1 there is the potential for very undesirable or very unhappy
2 events.

3 However, if one believes that the casks met the
4 criteria which I think are probably within reach, and whether
5 they have been reached is a separate matter, then one says
6 fine, that stuff if released would be very damaging, and
7 therefore we put it in these casks and chance that it is
8 released is reduced to an extremely small chance.

9 I am leaving aside sabotage because that of course
10 is a completely separate kind of going on, and the casks'
11 valves do work and the cask does meet and go through all the
12 things that you require is irrelevant to what you might have
13 to say if you were trying now to include sabotage.

14 Would it seem to you that if the casks were done
15 right that the concern about transportation ought to be
16 allayed?

17 MR. MILLAR: I think that there are three or
18 four major concerns that emerge whenever state officials
19 and local officials and citizens groups start raising
20 concerns.

21 One is the casks, that they ought to be tested.

22 MR. MARK: What do you mean they ought to be
23 tested? Each one ought to be dropped 30 feet?

24 MR. MILLAR: Well, let's just say that at least
25 one of the current casts. We only have 17 in the whole

1 country, and one of them ought to be tested.

2 MR. MARK: Each prototype or each design should
3 have a prototype test.

4 MR. MILLAR: Yes. Contrary to the propaganda
5 with the Sandia film and all that stuff, those are only
6 obsolete casks that have been tested and the industry studies
7 of that film itself showed that the casks are different enough
8 so that the ability of those casks to actually reflect the
9 current ---

10 MR. MARK: I am accepting the notion that cask
11 1A-7 should have been subjected to tests before any others
12 of that model are put on the road.

13 MR. MILLAR: You should know that the general
14 direction that I understand from talking with DOE people is
15 that cask manufacturers and utility operators are talking
16 about building a new generation of casks that are cheaper
17 rather than safer, in other words, that are designed to take
18 care of fuel that has cooled longer which is through no fault
19 of the nuclear utilities because they don't have a
20 reprocessing system and because we don't have a repository
21 system operating. They in fact have a lot of old fuel and
22 just by dumb luck they are going to be able to ship a lot
23 of old fuel at least in the beginning.

24 So what I have been hearing is that there is
25 no effort to build a cask that is particularly safer like

1 the casks they have in Germany which doesn't have any welding
2 in it that could be bad and which is an enormous cast iron
3 cask and which has survived a one-ton missile shot into it
4 with a rocket and what-not. I mean they have a much more
5 severe set of tests there than we do here.

6 In the United States it is my understanding that
7 there is no movement in that direction. The movement in
8 fact is to make a cheaper, lighter cask that can in fact
9 meet NRC regulations for containing fuel that is older and
10 less hot.

11 The other major concern is routing. To think that
12 people are going to accept a routing system that goes through
13 the major cities of the West is I just think is a little
14 optimistic. There are no regional political decisions about
15 routing now, much less national. There is not even a regional
16 grouping of officials that decides what is a reasonable route.
17 Nor on the mode of shipment. I mean there is no public
18 official that makes a decision about what is the safest
19 mode of shipment and what is the safest route.

20 Now I just think that that political gap there
21 is going to have to be filled by somebody.

22 MR. MARK: I am very much aware of that point
23 that you make, that there is a political gap, there is the
24 reference to the fact that this stuff is dangerous and it
25 is our course in our experience much more dangerous. I mean

1 the gasoline that we ship is causing more trouble than the
2 nuclear wastes have up to this point, and the chlorine the
3 same thing and it must go through those same funnels except
4 it doesn't head for that same one spot that the nuclear waste
5 does but it goes through every city.

6 MR. MILLAR: We have also a very small data base
7 for nuclear spent fuel shipments. I mean there has only
8 been 300 a year over the last 10 years and only 96 a year
9 in the last year.

10 MR. MARK: But, look, they are no different from
11 general experience in trucking so far as accidents per mile
12 are concerned. They are different in the sense that the casks
13 haven't had sufficient, or anything like sufficient testing
14 or thought.

15 MR. MILLAR: I have looked into some of the
16 statistics that DOT has about accidents per vehicle mile
17 and so forth and it is fairly well known that DOT's data
18 system, and in fact the General Accounting Office says that
19 DOT's data system is just very, very poor. It relies on
20 the voluntary reporting of accidents.

21 So I think when you look at DOT's system and
22 compare it with various state studies, the underreporting
23 is by a factor of two to five. Anywhere from 50 to 80 percent
24 of accidents don't even get reported, even with big gasoline
25 vehicles and so forth.

1 I am afraid you are right. In community forums all
2 the time we get asked isn't it true that there is a lot of
3 other dangers on the road and why aren't you just as worried
4 about that. The fact is, I mean I started looking into that
5 and it is pretty scarey. The main gasoline tanker in the
6 United States, the MC-306 leaks. The industry just found out
7 that it doesn't meet specifications. You just tilt it a little
8 bit and it spills out gasoline through the valves and all.

9 I guess the main conclusion I come to is that none
10 of this stuff is being regulated very well, and not the reverse,
11 that there is all this terrific regulation of the nuclear casks.
12 We just simply haven't had very much history with nuclear
13 shipments.

14 MR. MARK: There is a little history with regulation
15 of nuclear because at least one cask marble has broke and it
16 was taken off the streets.

17 MR. MILLAR: Well, I am not saying that the NRC
18 doesn't do some of that. I am just saying that the overall
19 posture is still a little weak to allow DOE to be sort of
20 cavalier about how they treat the whole thing.

21 MR. MOELLER: Let's see, Dick and Don.

22 MR. FOSTER: In a generic sense the Nuclear Regulatory
23 folks have defined the risk and the environmental impacts
24 associated with shipments. In summary table S-4 and 10 CFR 50,
25 and I don't know whether you are familiar with that or not, that

1 is generally used in the licensing process.

2 I wondered since the environmental costs associated
3 there as balanced against the environmental benefits of the
4 power which has been produced whether or not it was your position
5 that that particular Commission regulation and the documentation
6 which led up to it was something which needed to be redone?

7 MR. MILLAR: Well, the Commission's position is that
8 the casks are safe enough and that the risks are acceptably
9 low. That is a political decision, but it doesn't include
10 such matters should there be additional routing restrictions
11 so that shipments should not go through cities.

12 The Commission's position is that we don't need
13 to make a rule that restricts shipments from going through
14 cities except from the security angle to prevent diversion
15 or sabotage. We require armed escorts if it goes through
16 cities.

17 I just think that that position is not shared by
18 a lot of people. The idea that the risk as acceptably low
19 is just simply not shared by a lot of people. I think to the
20 extent that NRC might revise its regulations on that it would
21 and it would try to make some kind of a decision about routing
22 regulations that that reassure people that they don't have to
23 accept the most dangerous shipments through the most heavily
24 populated cities.

25 MR. MOELLER: Just a couple more questions and then

1 we have to wrap it up. Don and then Martin.

2 MR. ORTH: Just a specific question. Since we
3 started talking about the DOE guidelines and what they are
4 doing with respect to the waste management law, do you have
5 any recommendations for the DOE as to things that might go
6 in the guidelines since that is the subject we are primarily
7 concerned with?

8 MR. MILLAR: Yes. I think DOE ought to include
9 some disqualifying characteristics, for example, that deal
10 with transportation, factors that would disqualify a site.
11 Frankly, I can't imagine that they could do that without
12 disqualifying the Hanford site.

13 MR. ORTH: The question is not whether they should,
14 but would you make the proposal that you would disqualify
15 any site that has to go through population centers or that
16 goes down interstate highways? I am trying to formulate
17 what that disqualification would be.

18 MR. MILLAR: Well, using DOE's own words, I think
19 it should not be just simply potentially disqualified on a
20 potentially adverse condition if the site that is selected
21 requires a concentration of routes through heavily populated
22 cities. I mean it seems to me that should be a flat out
23 disqualifying factor as opposed to a potentially disqualifying
24 factor.

25 I don't have any simple answers as to site selection

1 kinds of things that is going to get DOE off the hook on this.

2 However, the National Academy of Sciences did point
3 out that some kind of a genuinely regional selection of sites
4 could in fact really mitigate the transportation impacts quite
5 a lot.

6 I think DOE is going about it in such a way that
7 what they are saying is we are going to pick the worst site
8 we can imagine and we are going to tell you that the impacts
9 are acceptable, and so there. They are trying to shove it
10 down the Congress' throat. They are trying to say to the
11 Congress, okay, you wrote in all this stuff about transportation
12 impacts and we are going to pick the worst site we can find
13 and tell you it is acceptable and what are you going to do
14 about it? I mean that is not a very credible program. It is
15 rather similar to the question of picking Hanford and Nevada
16 on political grounds as opposed to picking them on geology.

17 If you look at the environmental assessment for the
18 Hanford site, what they did is they picked this big geological
19 region which included the Hanford site and then they dis-
20 qualified other areas around the Hanford reservation if they
21 were not clearly superior to the geology in the Hanford
22 reservation. Well, I think geologists are going to eat them
23 alive on that. I mean that is not a very credible procedure.

24 If anybody would like to see the overall federal
25 posture be one that is going to win acceptance, they are going

1 to have to figure out ways of kind of inching DOE into a more
2 credible stance.

3 MR. MILLAR: Martin, and then I think we have to
4 terminate it because we have got to have an executive session.

5 MR. STEINDLER: Is your concern about transportation
6 through populated areas because the valves you mentioned are
7 going to fail, or do you think that the casks themselves are
8 going to fail, or what is it that you are concerned about,
9 that the fuel is going to come rolling out like the gasoline
10 does from the exercise you indicated? What is the hang-up
11 about populated areas?

12 MR. MILLAR: Well, I think what people are concerned
13 about is the scenario that involves some kind of a fire that
14 would breach the and the seals on the casks. To have
15 a valve that doesn't receipt as it is supposed to is a serious
16 question.

17 MR. STEINDLER: You are envisioning in the canyons
18 of New York that this cask that is sitting on the truck is
19 going to engage itself in a fire that sits there for three
20 hours at 1800 Fahrenheit and at the same time some valve
21 doesn't fail, and that is the primary concern that you have?

22 MR. MILLAR: Yes. We have only had two sort of
23 serious radioactive accidents in the country with radioactive
24 shipments, and one was a Colorado yellow cake accident where
25 yellow cake blew all over the road. The other was an accident

1 with uranium hexafluoride in Rockingham, North Carolina. I
2 mean here is the only one that has great big casks involved,
3 not spent fuel casks, but big casks holding uranium hexafluoride,
4 and, guess what, there was a fire that lasted several hours.
5 There was a train derailment and a fire.

6 The chances of that happening are remote, but ---

7 MR. STEINDLER: How much uranium got out in that
8 fire, do you remember?

9 MR. MILLAR: It turns out that none of those casks ---

10 MR. STEINDLER: Thank you very much. That is exactly
11 my point.

12 What I guess I am saying is that the scenarios that
13 you worry about seem to be non-scenarios, and the cavalier
14 attitude that you attribute to the Department of Energy I think
15 turns out to be exactly the same set of words that are in the
16 Act.

17 I don't know why that represents a cavalier attitude
18 on the part DOE when they put 960 together where they simply
19 are using almost entirely the same words that seem to be found
20 in the Act at least as I see them.

21 Then my review of what it is that you are concerned
22 about regarding transportation turns out to worry about a
23 fire that in fact, aside from the fact that you are comparing
24 apples and oranges because a UF-6 container is hardly to be
25 compared in any sense of the word, fire resistance or anything

1 with a spent fuel cask.

2 It turns out that the thing you are concerned about
3 is an almost non-event. It is hard for me at least to take
4 you very seriously when you say that there is this horrendous
5 problem that exists out in the land in actual fact. It may
6 be a perceptual problem. I have no difficulty understanding
7 that because I can read the press the same way you do. But
8 in terms of the real technical issues, I guess I don't find
9 that to be a serious problem, and I don't really think that
10 you have made a technical point that is worth making.

11 MR. MILLAR: Well, let me just say that I didn't come
12 prepared to make the technical points about what is wrong with
13 the casks. I mean there are technical points to be made.
14 There is a new book about it that got a lot of good play
15 yesterday in the press by the Council on Economic priorities
16 and I can recommend that to you.

17 The fact is I am here to make a perceptual point,
18 which is that we are talking about the DOE's guidelines and
19 the DOE's guidelines I think display a completely cavalier
20 attitude towards the concerns that the Congress showed about the
21 impacts of transportation.

22 MR. STEINDLER: What I am saying is you haven't made
23 your case.

24 MR. MOELLER: Well, thank you, Mr. Millar.

25 In terms of the subcommittee we appreciate your

1 remarks and as the Chairman I would say that we have seen
2 what the Congress said in the Act and we have read what the
3 DOE has said. Certainly I see the points that you have made
4 and I understand what you are driving at.

5 So we will take it under consideration and we do
6 appreciate your coming.

7 I think that completes, as far as I know, the formal
8 portion of the subcommittee's meeting.

9 With that I will announce that we are going to go
10 into executive session to try to formulate our recommendations
11 that the subcommittee will pass on to the full committee.
12 The executive session will be open, but it will not be
13 recorded because it is just general discussion.

14 So with that then I will declare this meeting
15 adjourned.

16 (Whereupon, at 4:45 p.m., the subcommittee
17 adjourned.)

18 * * *

19
20
21
22
23
24
25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings
before the ADVISORY COMMITTEE ON REACTOR SAFEGUARDS,
SUBCOMMITTEE ON WASTE MANAGEMENT,

Date of Proceeding: March 18, 1983

Docket Number:

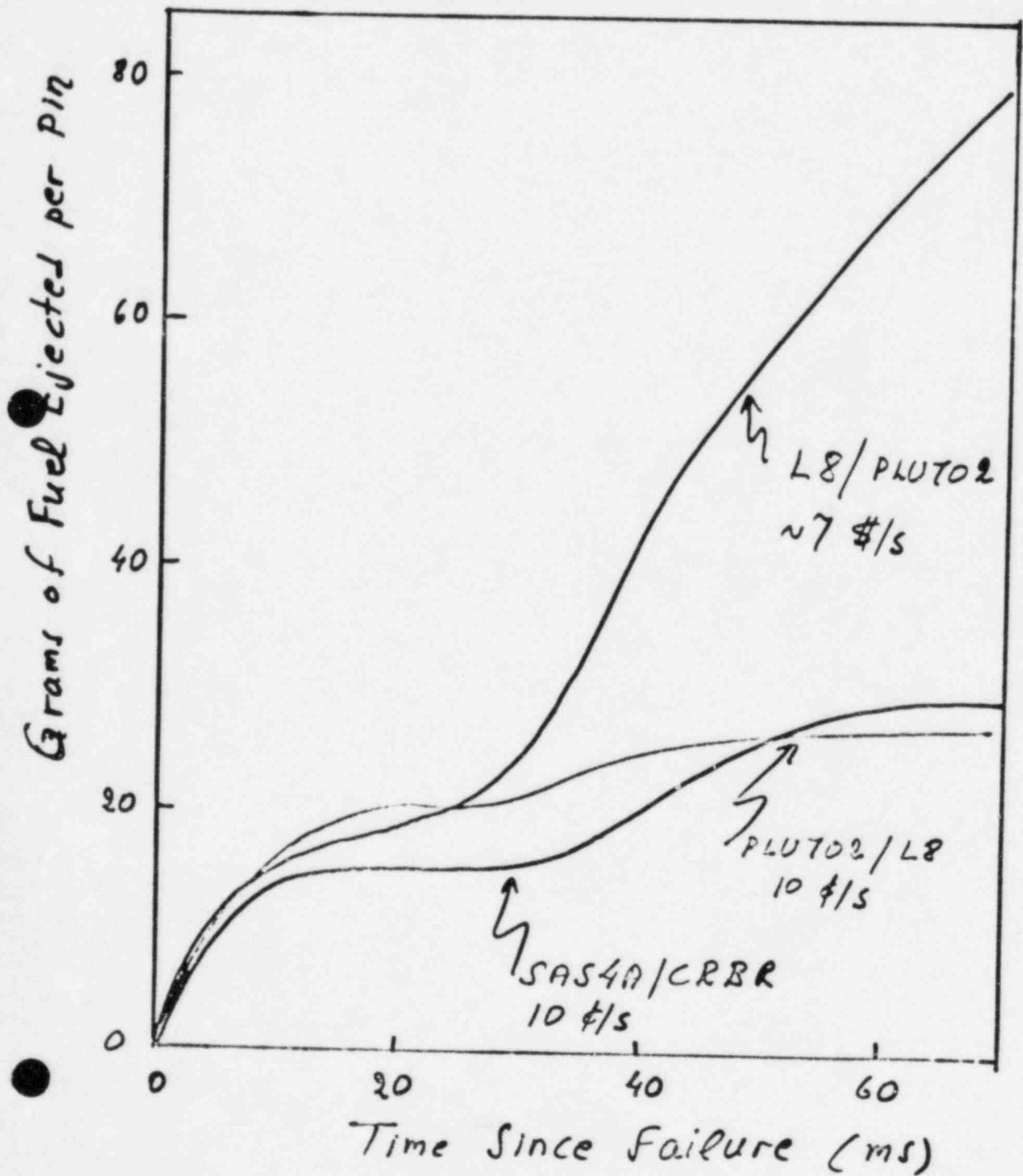
Place of Proceeding: Washington, D.C.

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

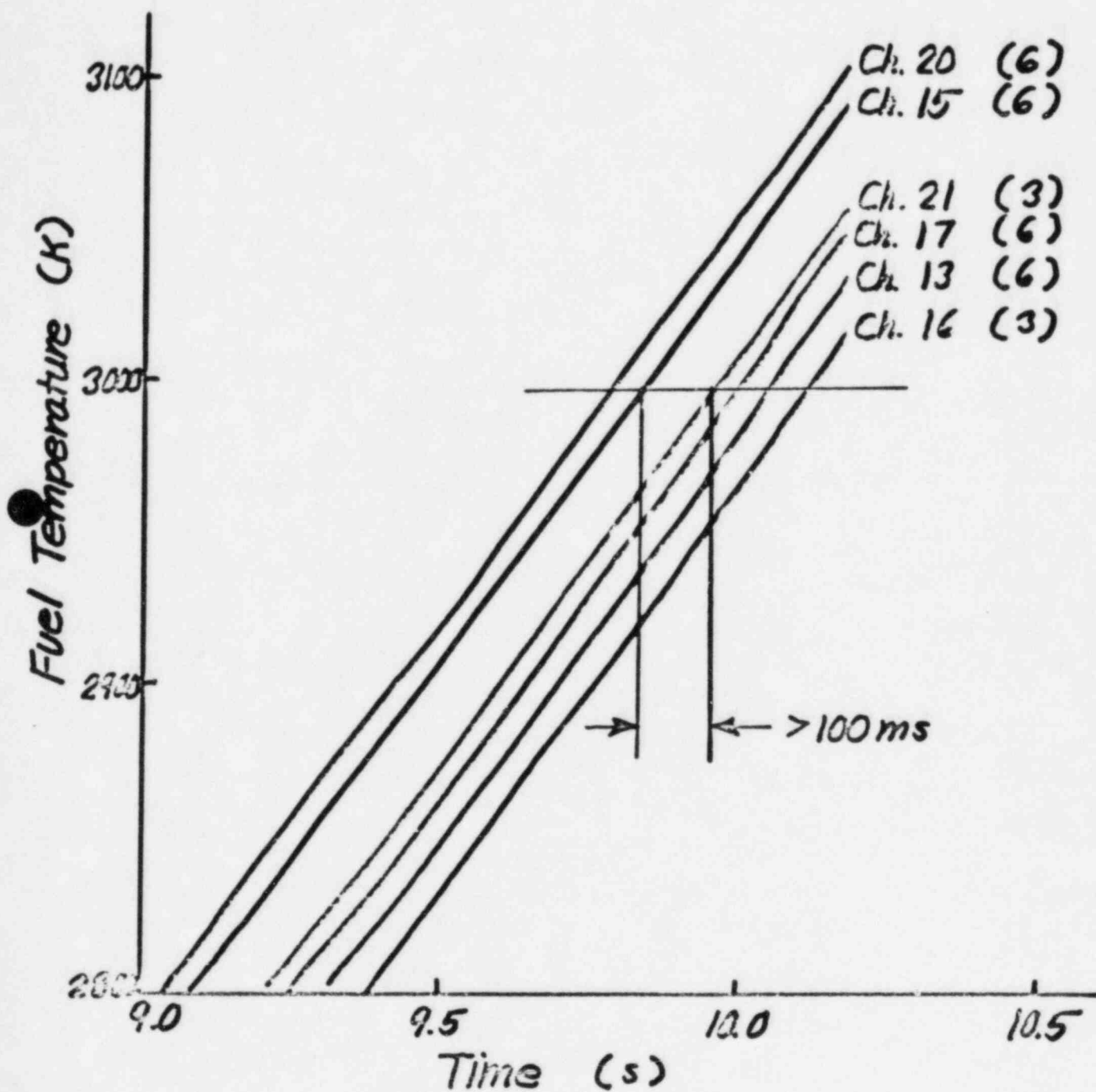
Mary Simons
Official Reporter - Typed

Mary C Simons
Official Reporter - Signature

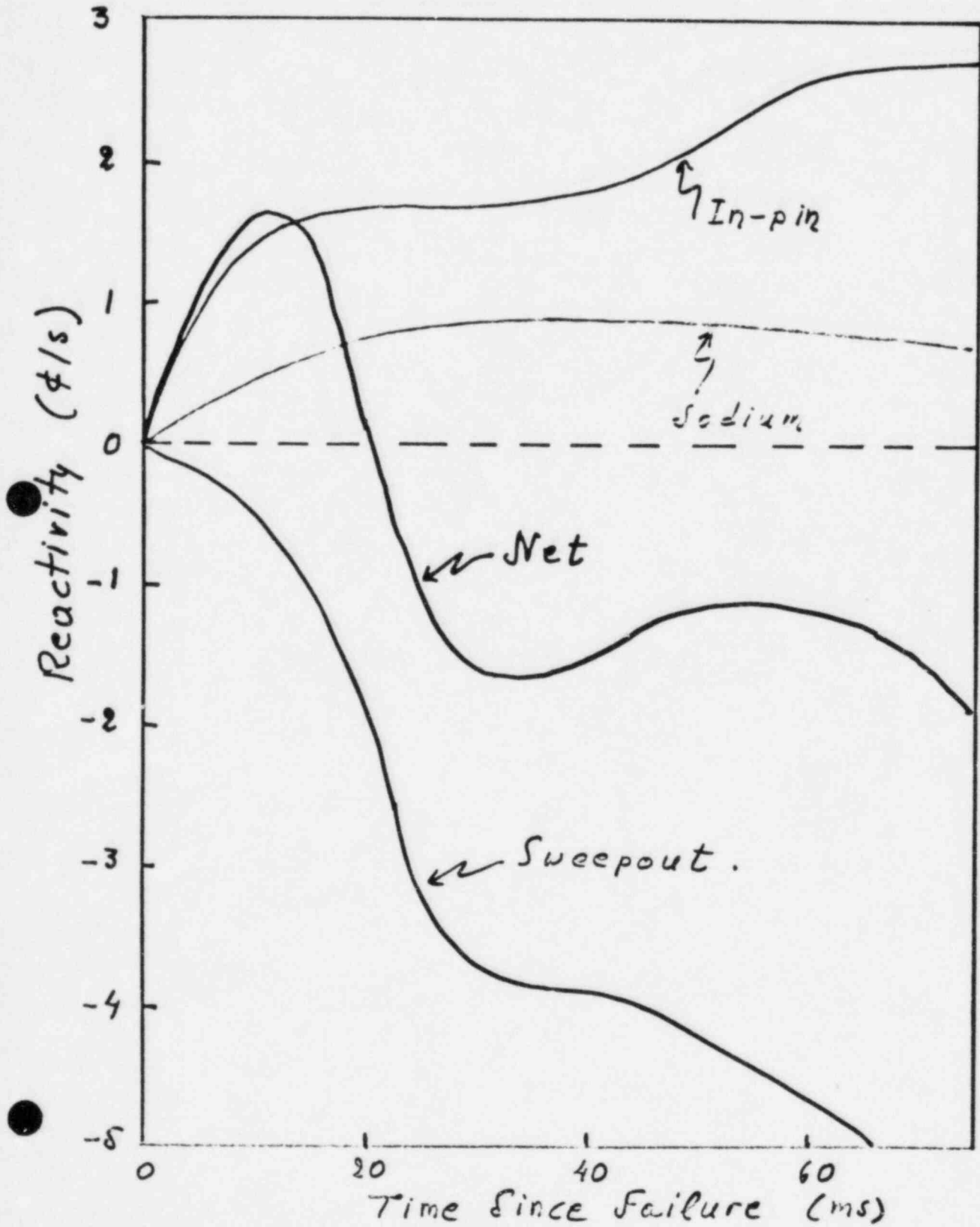
VARIATION OF FUEL MASS EJECTION WITH RAMP RATE.



I.4 FAILURE INCOHERENCE



I.S TOTAL FEEDBACK.



TOP SUMMARY

For $\dot{\rho} < 10-12 \text{ \$/s}$, Negligible autocatalysis



Nonenergetic

For $\dot{\rho} > 15 \text{ \$/s}$, Negligible probability
of occurrence

10

10

1

1

1

1

10^2

10^{-3}

10^{-1}

10^{-1}

10^{-1}

$10^{-1} 10^{-3} 10^{-3} 10^{-3}$

$$10^4 + 10^4 + 10^4 + 10^6 \ll 10^{-3}$$

i.e. PHYSICALLY
UNREASONABLE.

LOHS SUMMARY

- Long recovery times 10 - 100 hrs
- Non - energetic
- High tolerance for energetics

I.1 TOP MECHANISMS

$\dot{p} + \text{Full Flow}$



Overpower



Fuel Melting
with strong cladding



• In-pin fuel motion to failure point $\Rightarrow \dot{p} \uparrow \downarrow$

• Sweepout $\dot{p} \downarrow$

• Sodium voiding $\dot{p} \uparrow$



CONCERNS

• Self-acceleration ?

• And FCI ?

I.2 MAIN EFFECTS

COHERENCE: $\left\{ \begin{array}{l} \dot{\rho} \uparrow \\ \text{Flat Radial Power EOC3} \end{array} \right.$ Upper Limit 10-12 $\frac{\text{¢}}{\text{s}}$

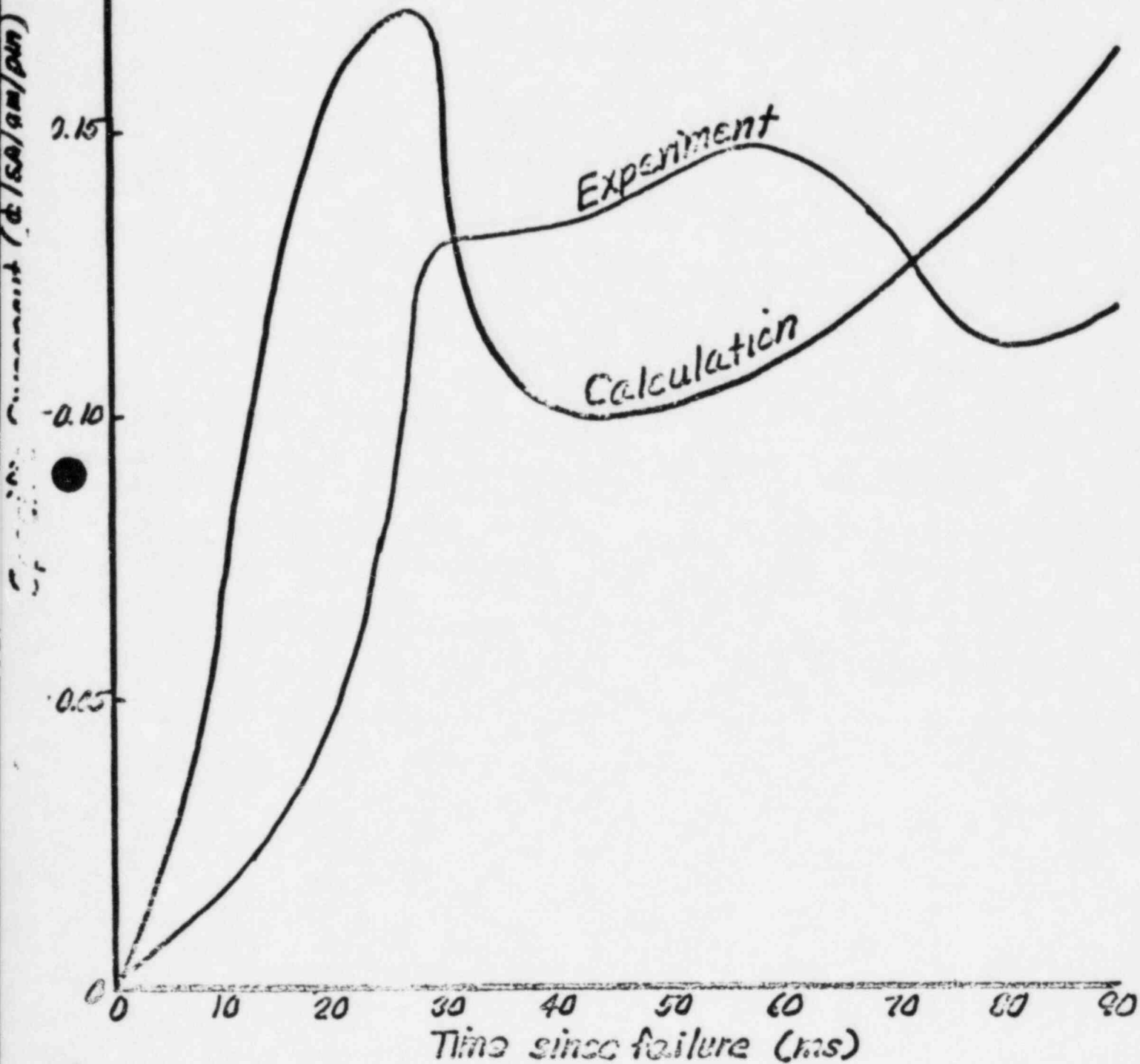
FAILURE LOCATION: $\left\{ \begin{array}{l} \dot{\rho} \\ \text{Burnup ?} \end{array} \right. \Rightarrow \text{Midplane}$

SWEEPOUT: $\left\{ \begin{array}{l} \text{Fission gas pressure} \\ \text{FCI pressure} \\ \text{Hydraulic pressure} \end{array} \right.$ In-plate experiments

QUANTITY OF FUEL INVOLVED
AT 10 $\frac{\text{¢}}{\text{s}}$ IS ~ 10% of PIN

NOT MASSIVE MELTING

I.3 SWEEPOUT



NRC REVIEW OF PROPOSED GENERAL
GUIDELINES FOR RECOMMENDATION OF
SITES FOR NUCLEAR WASTE REPOSITORIES

MICHAEL BELL
REGIS BOYLE
CHRIS PFLUM

PRESENTED TO:

ACRS

MARCH 18, 1983

NUCLEAR WASTE POLICY ACT

SEC. 112(A) GUIDELINES - NOT LATER THAN 180 DAYS (JULY 6, 1983) AFTER THE DATE OF THE ENACTMENT OF THIS ACT, DOE, FOLLOWING CONSULTATION WITH CEQ, EPA, USGS, AND INTERESTED GOVERNORS, AND THE CONCURRENCE OF NRC, SHALL ISSUE GENERAL GUIDELINES FOR THE RECOMMENDATION OF SITES FOR REPOSITORIES.

CONTENT OF GUIDELINES

SEC. 112(A) OF THE ACT STATES THAT THE GUIDELINES SHALL SPECIFY:

- DETAILED GEOLOGIC CONSIDERATIONS THAT SHALL BE PRIMARY CRITERIA FOR THE SELECTION OF SITES IN VARIOUS GEOLOGIC MEDIA .
- FACTORS THAT QUALIFY OR DISQUALIFY ANY SITE FROM DEVELOPMENT AS A REPOSITORY

QUALIFYING OR DISQUALIFYING FACTORS

FACTORS THAT WOULD QUALIFY OR DISQUALIFY ANY SITE FROM
DEVELOPMENT AS A REPOSITORY INCLUDE:

- NATURAL RESOURCES
- HYDROLOGY
- GEOPHYSICS
- SEISMIC ACTIVITY
- ATOMIC ENERGY DEFENSE ACTIVITIES
- PROXIMITY TO WATER SUPPLIES
- PROXIMITY TO POPULATIONS
- EFFECT ON WATER RIGHTS
- PROXIMITY TO NATIONAL LAND AND WATER RESOURCES

ADDITIONAL CONSIDERATIONS IN THE GUIDELINES

- TRANSPORTATION COSTS AND IMPACTS
- REGIONAL DISTRIBUTION OF REPOSITORIES
- VARIOUS GEOLOGIC MEDIA

PROGRAM FOR SELECTION OF FIRST REPOSITORY

AFTER ISSUANCE OF THE GUIDELINES, DOE SHALL:

- NOMINATE 5 SITES THAT ARE DETERMINED SUITABLE FOR SITE CHARACTERIZATION
- RECOMMEND 3 OF THE NOMINATED SITES FOR SITE CHARACTERIZATION TO THE PRESIDENT BY JANUARY 1, 1985
- RECOMMEND A SITE FOR THE FIRST REPOSITORY TO THE PRESIDENT BY MARCH, 1987

APPLICATION OF GUIDELINES

- AN ENVIRONMENTAL ASSESSMENT FOR EACH NOMINATED SITE (SEC. 112(B)(1)(E))
- A SITE CHARACTERIZATION PLAN FOR EACH CANDIDATE SITE BEFORE SINKING SHAFTS (SEC. 113(B))
- A RECOMMENDATION THAT THE PRESIDENT APPROVE A SITE FOR DEVELOPMENT OF A REPOSITORY (SEC. 114(A))
- A PRELIMINARY DETERMINATION THAT THE 3 ALTERNATIVE SITES THAT WILL BE CONSIDERED IN THE EIS ARE SUITABLE FOR DEVELOPMENT AS REPOSITORIES (SEC. 114(F))

PROPOSED GUIDELINES

- ISSUED FOR PUBLIC COMMENT ON FEBRUARY 7, 1983

- PUBLIC HEARINGS:
 - CHICAGO - MARCH 4
 - NEW ORLEANS - MARCH 7
 - WASHINGTON - MARCH 10
 - SALT LAKE CITY - MARCH 14
 - SEATTLE - MARCH 21

- WRITTEN COMMENTS REQUESTED BY APRIL 7, 1983

- ISSUE FINAL GUIDELINES BY JULY 6, 1983

NRC REVIEW OF
THE PROPOSED GUIDELINES

- CURRENTLY DEVELOPING STAFF COMMENTS
- ATTENDANCE AT PUBLIC HEARINGS
- COMMISSION REVIEW OF STAFF COMMENTS PRIOR
TO TRANSMITTAL TO DOE
- STAFF COMMENTS TO DOE BY APRIL 7, 1983
- NRC CONCURRENCE REQUESTED BY JULY 6, 1983

PRELIMINARY OVERALL IMPRESSIONS OF PROPOSED GUIDELINES

- GUIDELINES ARE BROAD ENOUGH TO ENCOMPASS PRINCIPAL CRITERIA NEEDED TO DETERMINE THAT A SITE IS SUITABLE FOR DEVELOPMENT AS A REPOSITORY.
- GUIDELINES ARE NOT INCONSISTENT WITH 10 CFR PART 60. PROPER APPLICATION OF THE GUIDELINES SHOULD ENSURE ADEQUATE DATA AND THE SELECTION OF A SITE THAT COULD MEET THE REQUIREMENTS OF 10 CFR PART 60.
- GUIDELINES DO NOT DISCUSS HOW AND WHEN THEY WILL BE APPLIED AT VARIOUS DECISION POINTS SPECIFIED IN THE ACT.

PRELIMINARY COMMENTS ON THE SUPPLEMENTARY INFORMATION

DOE SHOULD CLARIFY THE FOLLOWING:

- FOR THE FIRST REPOSITORY, THE GUIDELINES WILL BE USED AS A STANDARD AGAINST WHICH SITES CAN BE JUDGED RATHER THAN A SEARCH TECHNIQUE TO FIND SITES

- THE GUIDELINES CAN ONLY BE USED TO ASSURE THAT A SITE IS SUITABLE TO PROCEED TO THE NEXT STEP IN THE SELECTION PROCESS RATHER THAN TO DETERMINE A SITE'S ULTIMATE ACCEPTABILITY

- WHICH GUIDELINES WILL BE USED TO NOMINATE AND RECOMMEND SITES FOR CHARACTERIZATION IF MANY OF THE GUIDELINES CANNOT BE APPLIED EARLY IN THE SELECTION PROCESS BECAUSE OF THE LACK OF DATA

PRELIMINARY COMMENTS ON THE SYSTEM GUIDELINES

- THE GUIDELINES DO NOT APPEAR TO RECOGNIZE THE RELATIONSHIP BETWEEN THE EPA STANDARD (40 CFR 191) AND 10 CFR PART 60
- THE SYSTEM GUIDELINES WOULD DIRECT DOE AWAY FROM SITES HAVING CONTRIBUTING RADIOACTIVE RELEASES WHILE THE TECHNICAL GUIDELINES ENCOURAGE USE OF LAND ALREADY DEDICATED TO NUCLEAR USE

PRELIMINARY COMMENTS ON PROGRAM GUIDELINES

- THE PROGRAM GUIDELINES DO NOT DISCUSS HOW AND WHEN THE GUIDELINES WILL BE APPLIED AT THE VARIOUS DECISION POINTS SPECIFIED IN THE ACT
- THE PROGRAM GUIDELINES SHOULD ELABORATE ON HOW DOE INTENDS TO IMPLEMENT THE ACT AS WELL AS QUOTING APPLICABLE PORTIONS OF THE ACT
- THE PROGRAM GUIDELINES ON REGIONAL DISTRIBUTION OF REPOSITORY SITES LIMITS THE APPLICATION OF THE GUIDELINES "TO THE EXTENT THAT TECHNICAL, POLICY, AND BUDGETARY CONSIDERATIONS PERMIT," THE ACT DOES NOT CONTAIN SUCH A LIMITATION

TECHNICAL GUIDELINES

- SITE GEOMETRY
- GEOHYDROLOGY
- GEOCHEMISTRY
- ROCK CHARACTERISTICS
- TECTONIC ENVIRONMENT
- HUMAN INTRUSION
- SURFACE CHARACTERISTICS
- POPULATION DENSITY AND DISTRIBUTION
- ENVIRONMENTAL PROTECTION
- SOCIOECONOMIC IMPACTS

PRELIMINARY COMMENTS ON TECHNICAL GUIDELINES

- SOME NUMERICAL CRITERIA SUCH AS GROUNDWATER TRAVEL TIME CANNOT BE APPLIED IN A MEANINGFUL WAY PRIOR TO SITE CHARACTERIZATION AT DEPTH. DOE SHOULD INDICATE WHICH, IF ANY, OF THE TECHNICAL GUIDELINES COULD BE APPLIED WITHOUT THE BENEFIT OF SITE CHARACTERIZATION

- PRIORITIES (RELATIVE IMPORTANCE) HAVE NOT BEEN PLACED ON VARIOUS TECHNICAL GUIDELINES SO THAT TRADE-OFFS CAN BE MADE

- IT HAS NOT BEEN SHOWN WHICH TECHNICAL GUIDELINES WILL BE APPLIED AT THE VARIOUS DECISION POINTS IN REPOSITORY DEVELOPMENT

- IN SOME INSTANCES WHERE THE GUIDELINES REFER TO 10 CFR PART 60, THE WORDING OF THE TECHNICAL GUIDELINES DIFFER FROM 10 CFR PART 60 IN WAYS THAT MAY BE SIGNIFICANT AND SHOULD BE EXPLAINED

PROPOSED GENERAL GUIDELINES

FOR

RECOMMENDATION OF SITES

FOR

NUCLEAR WASTE REPOSITORIES

SUMMARY BRIEFING

MARCH 1983

NUCLEAR WASTE POLICY ACT OF 1982

- **THE SECRETARY . . . SHALL ISSUE GENERAL GUIDELINES FOR THE RECOMMENDATION OF SITES FOR REPOSITORIES**
- **CONSULT WITH: — COUNCIL ON ENVIRONMENTAL QUALITY**
 - **ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY**
 - **DIRECTOR OF THE GEOLOGICAL SURVEY**
 - **INTERESTED GOVERNORS**
- **CONCURRENCE OF: NUCLEAR REGULATORY COMMISSION**
- **SCHEDULE: NOT LATER THAN 180 DAYS AFTER ENACTMENT
(JULY 6, 1983)**

REQUIREMENTS OF THE WASTE POLICY ACT

- **DETAILED GEOLOGIC CONSIDERATIONS THAT SHALL BE PRIMARY CRITERIA FOR SELECTION OF SITES**
- **FACTORS THAT QUALIFY OR DISQUALIFY ANY SITE FROM DEVELOPMENT AS A REPOSITORY**
- **REQUIRED CONSIDERATION OF VARIOUS GEOLOGIC MEDIA**
- **SPECIFIC RESTRICTIONS ON ADJACENT POPULATIONS**

PRECURSORS TO CURRENTLY- PROPOSED GUIDELINES

- OWI/TM-47, "GEOLOGIC CRITERIA . . . ," NOVEMBER 1977
- IAEA "SITE SELECTION FACTORS . . . ," OCTOBER 1977
- NATIONAL RESEARCH COUNCIL "GEOLOGIC CRITERIA . . . ," 1978
- NWTS-33(1) "PROGRAM OBJECTIVES, FUNCTIONAL REQUIREMENTS . . . ," 1982
- NWTS-33(2) "SITE PERFORMANCE CRITERIA," 1982
- USNRC TECHNICAL CRITERIA, 10 CFR 60(E) ADVANCE NOTICE, MAY 1980; FINAL DRAFT, NOVEMBER 18, 1982
- USEPA, "ENVIRONMENTAL STANDARDS . . . ," 40 CFR 191, (PROPOSED), DECEMBER 29, 1982

DEFINING THE METHOD FOR DISPOSAL

- 1. SET OBJECTIVE — PERMANENT ISOLATION OF HIGHLY RADIOACTIVE WASTES TO PROTECT PUBLIC HEALTH AND SAFETY AND THE ENVIRONMENT**
- 2. EXPLORE ALTERNATIVE METHODS — (UNDERGROUND, UNDER-SEA, SPACE, PERPETUAL CARE)**
- 3. SELECT PREFERRED METHOD — MINED GEOLOGIC REPOSITORIES**
- 4. DEFINE REQUIRED CHARACTERISTICS OF REPOSITORY AND ITS SETTING**
- 5. LOOK FOR PREFERRED SITES**

REQUIRED CHARACTERISTICS OF A REPOSITORY

NO COMBINATION OF FEATURES OR PROCESSES WHICH MIGHT PROMOTE RELEASE OF RADIOACTIVE MATERIALS

- **POSSIBLE RELEASE MECHANISMS**
 - **MATERIALS DISSOLVED AND CARRIED BY GROUNDWATER**
 - **VIOLENT NATURAL EVENTS — VOLCANOES**
 - **ACCIDENTAL FUTURE MINING**

- **REQUIRED FEATURES**
 - **MECHANICAL AND CHEMICAL PROPERTIES OF HOST ROCK**
 - **FEATURES AND SURROUNDINGS THAT CAN BE ADEQUATELY UNDERSTOOD**
 - **COMPATIBILITY WITH PRESENT OR FUTURE SURFACE ACTIVITIES**

STEPS IN THE SITING PROCESS

SELECTIVE SCREENING — CHOICE OF MOST PROMISING

SIZE OF LAND UNIT

LARGE REGIONS



INDIVIDUAL SITES

INFORMATION AVAILABLE

LIMITED



DETAILED

STRUCTURE OF THE GUIDELINES

QUALIFICATION FACTORS MINIMUM CONDITIONS FOR SITE
QUALIFICATION

DISQUALIFYING FACTORS WHEN FOUND IMMEDIATELY
DISQUALIFY SITE

FAVORABLE CONDITIONS PRESUMPTION THAT EVALUATIONS
WILL LEAD TO POSITIVE
RESULTS

POTENTIALLY ADVERSE
CONDITIONS SITUATION MUST BE EXAMINED
CAREFULLY TO DETERMINE OVERALL
ACCEPTABILITY OF SITE

DISQUALIFYING FACTORS—GENERAL CONDITIONS

- **SITE, WITH STATE-OF-THE-ART ENGINEERED SYSTEMS AND CONTROLS, PREDICTED NOT TO MEET EPA AND NRC RELEASE LIMITS**
- **CHARACTERISTICS TOO COMPLEX TO ALLOW REASONABLE PREDICTION OF COMPLIANCE**
- **NOT POSSIBLE FOR ALL PORTIONS OF FACILITY (EXCEPT SHAFTS) TO BE AT LEAST 200 METERS FROM SURFACE**
- **GROUNDWATER TRAVEL TIME TO ACCESSIBLE ENVIRONMENT LESS THAN 1000 YEARS**

DISQUALIFYING FACTORS—GENERAL CONDITIONS

- **ACTIVE DISSOLUTION FRONTS PREDICTED TO INTERACT WITH FACILITY WITHIN 10,000 YEARS**
- **OPERATIONAL SAFETY REQUIREMENTS COULD NOT BE MET**
- **FAILURE TO MEET EPA STANDARDS DURING OPERATIONS**
- **SURFACE FACILITY WOULD NEED TO BE ADJACENT TO AREA ONE MILE BY ONE MILE WITH POPULATION NOT LESS THAN 1000**
- **REPOSITORY WOULD RESULT IN UNSATISFACTORY ADVERSE ENVIRONMENTAL IMPACT**
- **LOCATION WITHIN A SIGNIFICANT NATIONALLY-PROTECTED NATURAL RESOURCE**

GUIDELINE CATEGORIES

SYSTEM GUIDELINES

**OVERALL PERFORMANCE DURING
OPERATION AND AFTER CLOSURE**

PROGRAM GUIDELINES

**NATIONAL POLICIES, ADMINISTRATIVE
AND CONGRESSIONAL**

TECHNICAL GUIDELINES

**GEOTECHNICAL AND ENVIRONMENTAL
FACTORS**

SYSTEM GUIDELINES

- **BASIC OBJECTIVE:** PROTECTION OF PUBLIC HEALTH AND SAFETY AND THE ENVIRONMENT
- **PRECLOSURE:** EPA 40 CFR 191(A)
 - SAME AS EXISTING STANDARDS FOR FACILITIES
 - MAXIMUM ANNUAL DOSE TO INDIVIDUALS
- **POST-CLOSURE:** EPA 40 CFR 191(B)
 - LIMITS ON RELEASES TO ACCESSIBLE ENVIRONMENT
 - 10,000 YEAR TIME SPAN

REQUIREMENT ON *TOTAL* SYSTEM

PROGRAM GUIDELINES

- **NATIONAL POLICIES — 25 YEARS PARTICIPATION BY GOVERNMENT AGENCIES AND PUBLIC**

- 1. **CONDUCT OF SITE INVESTIGATIONS** — **INVESTIGATE MULTIPLE SITES TO INCREASE PROBABILITY OF SUCCESS**

- 2. **CONSULTATION WITH STATES AND TRIBES** — **CLOSE COOPERATION REQUIRED FOR SUCCESS IN SITING**

- 3. **ENVIRONMENTAL IMPACT CONSIDERATIONS** — **RIGOROUS ADHERENCE TO REQUIREMENTS**

- 4. **REGIONAL DISTRIBUTION** — **EQUITABLE DISTRIBUTION AMONG BENEFICIARIES, TRANSPORTATION ISSUES**

- 5. **SCHEDULE** — **BASIC SCIENTIFIC KNOWLEDGE AVAILABLE**
— **SPECIFIC TIMETABLE FOR DETAILED INVESTIGATIONS AND IMPACT CONSIDERATIONS**

TECHNICAL GUIDELINES

- ATTRIBUTES RELEVANT TO OVERALL SITE PERFORMANCE

- 1. SITE GEOMETRY
 - DEPTH, THICKNESS, LATERAL EXTENT

- 2. GEOHYDROLOGY
 - GROUNDWATER TRAVEL
 - MODELING FOR PROJECTIONS
 - SHAFT CONSTRUCTIBILITY
 - DISSOLUTION FEATURES

- 3. GEOCHEMISTRY
 - TRANSPORT AND RETARDATION
 - PACKAGE CORROSION

- 4. ROCK CHARACTERISTICS
 - POST CLOSURE STRESSES
 - OPERATIONAL SAFETY

- 5. TECTONIC ENVIRONMENT
 - FAULTING, SEISMICITY
 - IGNEOUS ACTIVITY
 - UPLIFT, SUBSIDENCE, FOLDING

TECHNICAL GUIDELINES (CONTINUED)

- | | |
|--|--|
| 6. HUMAN INTRUSION | — NATURAL RESOURCES |
| | — SITE OWNERSHIP AND CONTROL |
| 7. SURFACE CHARACTERISTICS | — SURFACE WATER |
| | — TERRAIN |
| | — METEOROLOGY |
| | — OFFSITE HAZARDS |
| 8. POPULATION DENSITY AND DISTRIBUTION | — LIMIT POTENTIAL RISK |
| | — POPULATION NEAR THE SITE |
| | — TRANSPORTATION IMPACTS |
| 9. ENVIRONMENTAL PROTECTION | — REDUCE LIKELIHOOD AND CONSEQUENCE OF IMPACTS |
| 10. SOCIOECONOMIC IMPACTS | — REASONABLE MITIGATION OR COMPENSATION |

APPLICATION OF GUIDELINES

- **SEQUENTIAL SCREENING BY STEPS**
- **EACH STEP:**
 - **FOCUSES SUBSEQUENT EXPLORATION**
 - **IS PROGRESSIVELY MORE DETAILED**
 - **RECOGNIZES POSSIBLE LATER DISQUALIFICATION**
- **BASIS FOR NUMERICAL EVALUATIONS DURING SITE CHARACTERIZATION**
- **DISQUALIFICATION CAN OCCUR AT ANY STEP**

METHODS USED TO SOLICIT COMMENTS ON DRAFT SITING GUIDELINES

A. FEDERAL REGISTER NOTICES

- 1. FEBRUARY 7 — GUIDELINES**
- 2. FEBRUARY 14 — HEARING SCHEDULE**
- 3. FEBRUARY 28 — SCHEDULE REVISION**

B. MAILING LISTS

- 1. NUCLEAR WASTE MANAGEMENT PROGRAM MAILING LIST**
- 2. PUBLIC INTEREST GROUPS LIST**
- 3. CONSUMER GROUPS**
- 4. TRADE ASSOCIATION**

C. DOE PRESS RELEASES — HEADQUARTERS FIELD

D. INDIAN AFFAIRS ORGANIZATION AND INDIAN TRIBES

METHODS USED TO SOLICIT COMMENTS ON DRAFT SITING GUIDELINES

NOTIFICATION TO STATES:

- A. ALL STATE GOVERNORS**
- B. LEADERSHIP OF AFFECTED STATE LEGISLATURES**
- C. TERRITORIAL OFFICIALS**
- D. PUBLIC INTEREST GROUPS IN AFFECTED STATES**
- E. STATE OFFICES IN WASHINGTON, D.C.**
- F. LOCAL AFFAIRS PUBLIC INTEREST GROUPS**
- G. CONGRESSIONAL DELEGATIONS OF AFFECTED STATES**

METHODS USED TO SOLICIT COMMENTS ON DRAFT SITING GUIDELINES

REVIEW BY FEDERAL AGENCIES:

A. COPIES OF GUIDELINES SENT TO:

EPA — 2/8/83
CEQ — 2/23/83
USGS — 2/8/83
NRC — 2/7/83

B. AGENCIES CALLED 3/2/83

C. FOLLOW-UP FORMAL LETTER SENT — 3/2/83

ENVIRONMENTAL STANDARDS FOR
THE MANAGEMENT AND DISPOSAL OF
SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES
(40 CFR PART 191)

SUBPART A -- STANDARDS FOR MANAGEMENT AND STORAGE

SUBPART B -- STANDARDS FOR DISPOSAL

SECTION 191.13 -- CONTAINMENT REQUIREMENTS

SECTION 191.14 -- ASSURANCE REQUIREMENTS

SECTION 191.15 -- PROCEDURAL REQUIREMENTS

CONTAINMENT REQUIREMENTS (SECTION 191.13)

°° "REASONABLY FORSEEABLE RELEASES":

(MORE THAN ONE CHANCE IN 100 OVER 10,000 YEARS)

-- LESS THAN THE LIMITS IN TABLE 2 OF THE STANDARDS

°° "VERY UNLIKELY RELEASES":

(BETWEEN 1/100 AND 1/10,000 OVER 10,000 YEARS)

-- LESS THAN TEN TIMES THE LIMITS IN TABLE 2

TABLE 2 - RELEASE LIMITS FOR CONTAINMENT REQUIREMENTS
 (Cumulative Releases to the Accessible Environment
 for 10,000 Years After Disposal)

Radionuclide	Release Limit (curies per 1000 MTHM)
Americium-241 - - - - -	10
Americium-243 - - - - -	4
Carbon-14 - - - - -	200
Cesium-135 - - - - -	2000
Cesium-137 - - - - -	500
Neptunium-237 - - - - -	20

APPLYING RELEASE LIMITS FOR PARTICULAR DISPOSAL SYSTEMS

°° DETERMINE RELEASE LIMIT MULTIPLIER:

$$\frac{\left[\begin{array}{c} \text{EQUIVALENT MTHM OF} \\ \text{HIGH-LEVEL WASTE} \end{array} \right]}{\left[\text{HLW FROM 1000 MTHM} \right]} + \frac{\left[\begin{array}{c} \text{CURIES OF TRU WASTE} \end{array} \right]}{\left[\text{1,000,000 Ci OF TRU} \right]} = \left[\text{MULTIPLIER} \right]$$

°° DETERMINE RELEASE LIMITS [RL's] :
 $= \left[\text{MULTIPLIER} \right] \times \left[\begin{array}{c} \text{LIMIT FROM} \\ \text{TABLE 2} \end{array} \right]$

°° COMPARE PROJECTED RELEASES [Q's] WITH RELEASE LIMITS [RL's] :

$$\frac{Q_A}{RL_A} + \frac{Q_B}{RL_B} + \frac{Q_C}{RL_C} + \dots \leq 1$$

10,000 YEARS CHOSEN BECAUSE:

- (1) LONG ENOUGH TO REQUIRE ASSESSMENT
OF GROUNDWATER PATHWAYS

- (2) SHORT RELATIVE TO GEOLOGIC TIME FRAMES

ENVIRONMENTAL STANDARDS FOR
THE MANAGEMENT AND DISPOSAL OF
SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES
(40 CFR PART 191)

SUBPART A -- STANDARDS FOR MANAGEMENT AND STORAGE

SUBPART B -- STANDARDS FOR DISPOSAL

SECTION 191.13 -- CONTAINMENT REQUIREMENTS

SECTION 191.14 -- ASSURANCE REQUIREMENTS

SECTION 191.15 -- PROCEDURAL REQUIREMENTS

ASSURANCE REQUIREMENTS (SECTION 191.14)

- CRITERION 1: "DISPOSE OF WASTES PROMPTLY . . . "
- CRITERION 2: "KEEP RELEASES AS SMALL AS REASONABLY ACHIEVABLE . . . "
- CRITERION 3: "USE SEVERAL DIFFERENT, EFFECTIVE BARRIERS . . . "
- CRITERION 4: "DO NOT RELY ON ACTIVE INSTITUTIONAL CONTROLS FOR MORE THAN A REASONABLE PERIOD (E.G., A FEW HUNDRED YEARS) "
- CRITERION 5: "IDENTIFY SITES BY PERMANENT MARKERS AND RECORDS . . . "
- CRITERION 6: "AVOID SITES WITH RESOURCES OR POTENTIAL RESOURCES . . . "
- CRITERION 7: "DESIGN TO ALLOW FUTURE RECOVERY OF WASTES . . . "

ENVIRONMENTAL STANDARDS FOR
THE MANAGEMENT AND DISPOSAL OF
SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES
(40 CFR PART 191)

SUBPART A -- STANDARDS FOR MANAGEMENT AND STORAGE

SUBPART B -- STANDARDS FOR DISPOSAL

SECTION 191.13 -- CONTAINMENT REQUIREMENTS

SECTION 191.14 -- ASSURANCE REQUIREMENTS

SECTION 191.15 -- PROCEDURAL REQUIREMENTS

PROCEDURAL REQUIREMENTS (SECTION 191.15)

IN PERFORMANCE ASSESSMENTS TO DETERMINE COMPLIANCE WITH 191.13:

- CONSIDER REALISTIC PROJECTIONS OF PROTECTION FROM ALL BARRIERS;
- DO NOT TAKE CREDIT FOR ACTIVE INSTITUTIONAL CONTROLS FOR MORE THAN A REASONABLE PERIOD -- BUT PASSIVE CONTROLS SHOULD DETER SYSTEMATIC EXPLOITATION OF A SITE, AND SHOULD KEEP THE CHANCE OF INADVERTANT HUMAN INTRUSION VERY SMALL;
- USE INFORMATION REGARDING THE LIKELIHOOD OF EVENTS CAUSING RELEASES THAT IS SPECIFIC TO EACH DISPOSAL SITE.

ISSUES REGARDING 40 CFR 191

- °° DEFINITION OF HIGH-LEVEL WASTE
- °° THE LEVEL OF PROTECTION
- °° NEED FOR QUALITATIVE ASSURANCE REQUIREMENTS
- °° INDIVIDUAL EXPOSURE STANDARD FOR DISPOSAL

TABLE 1 - CONCENTRATIONS IDENTIFYING HIGH-LEVEL RADIOACTIVE WASTES

Radionuclide	Concentration (curies per gram of waste)
Carbon-14	8×10^{-6}
Cesium-135	8×10^{-4}
Cesium-137	5×10^{-3}
Plutonium-241	3×10^{-6}
Strontium-90	7×10^{-3}
Technetium-99	3×10^{-6}

ISSUES REGARDING 40 CFR 191

- °° DEFINITION OF HIGH-LEVEL WASTE
- °° THE LEVEL OF PROTECTION
- °° NEED FOR QUALITATIVE ASSURANCE REQUIREMENTS
- °° INDIVIDUAL EXPOSURE STANDARD FOR DISPOSAL

DECISION SYSTEM

DETERMINE CAPABILITY OF TECHNOLOGY



JUDGE ACCEPTABILITY OF RISK

ALLOW FOR UNCERTAINTIES

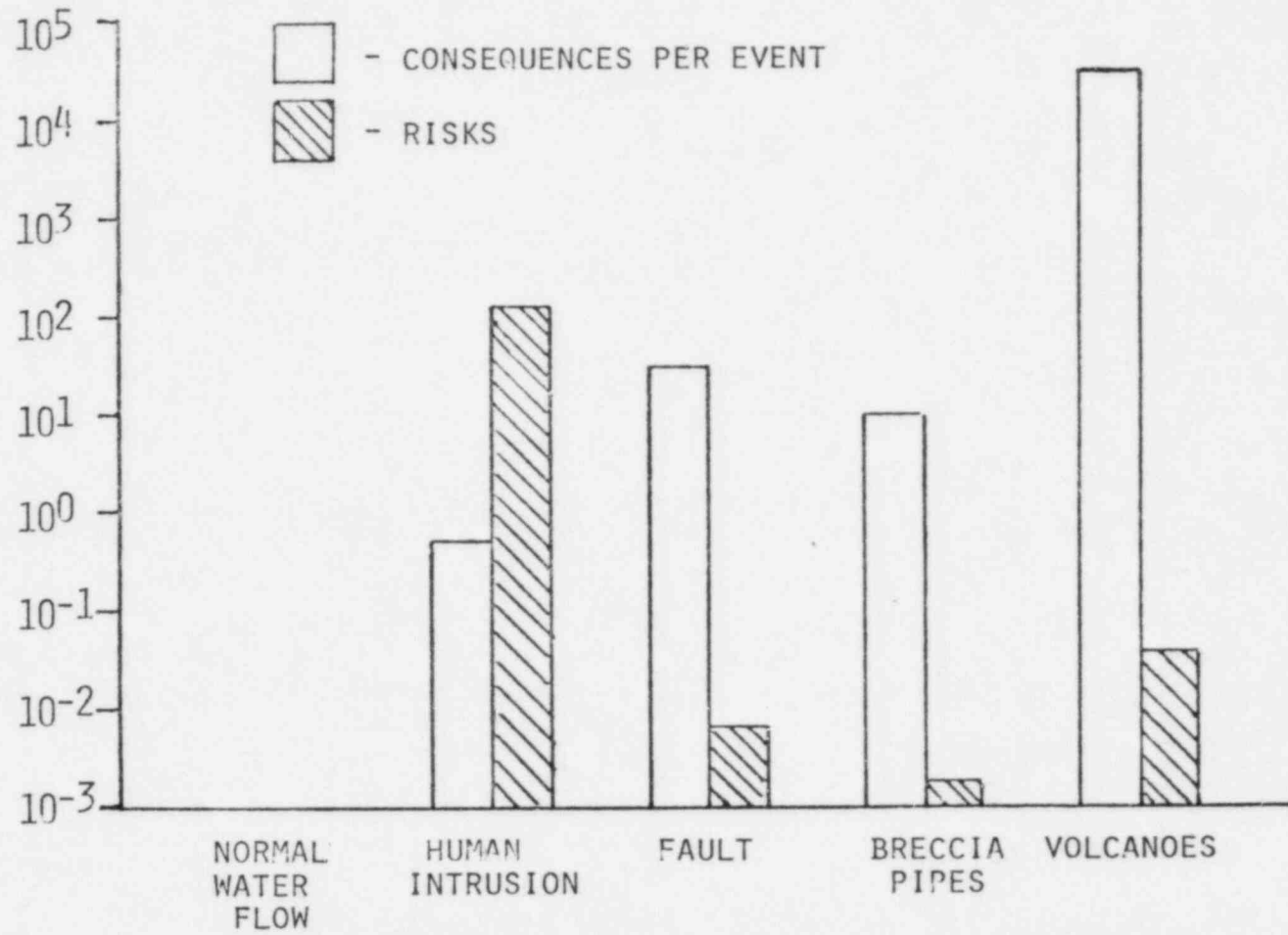
SELECTION OF PROPOSED PERFORMANCE REQUIREMENTS

- °° ASSESS RISKS FROM MINED GEOLOGIC REPOSITORIES
(BEST-KNOWN, NEAREST-TERM DISPOSAL METHOD)
- °° EXPRESS RISKS AS PREMATURE CANCER DEATHS
- °° EXAMINE RISKS ASSOCIATED WITH "REASONABLY ACHIEVABLE" PERFORMANCE
OF DIFFERENT PARTS OF DISPOSAL SYSTEM
- °° COMPARE RISKS FROM OTHER RADIATION SOURCES TO HELP JUDGE ACCEPTABILITY
- °° ALLOW FOR UNCERTAINTIES IN PERFORMANCE ASSESSMENTS
- °° SELECT LEVEL OF RISK TO BASE STANDARDS ON:
(1000 PREMATURE DEATHS OVER 10,000 YEARS FOR 100,000 MTHM)

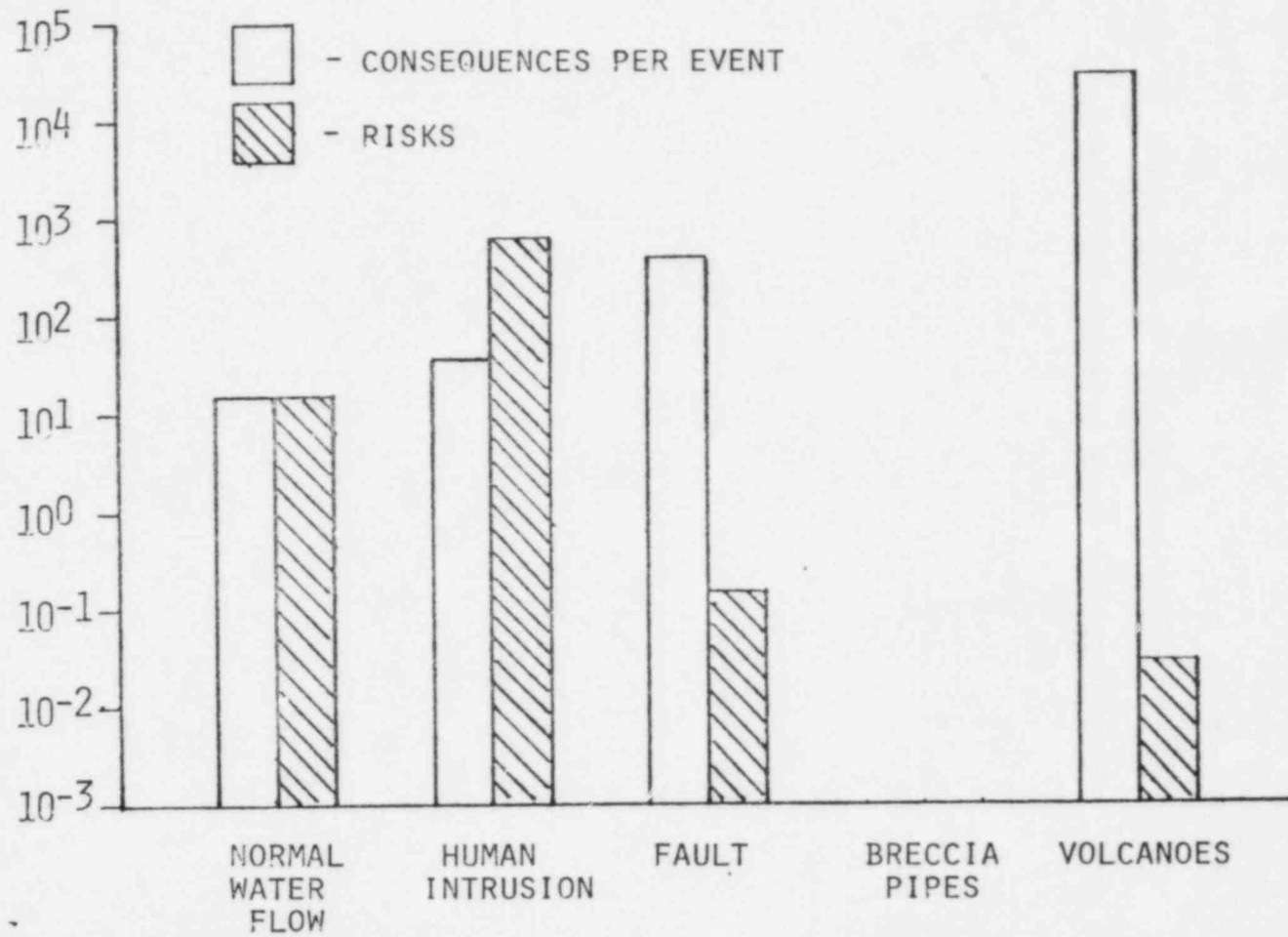
RELEASE MECHANISMS CONSIDERED:

<u>ADL</u>	<u>EPA</u>	<u>SIGNIFICANT</u>
THERMAL STRESS		
SHAFT SEAL FAILURE		
BOREHOLE SEAL FAILURE	NORMAL FLOW	NORMAL FLOW
UNDETECTED BOREHOLES		
DRILLING	DRILLING	DRILLING
OTHER HUMAN INSTRUSIONS		
FAULTING	FAULTING	(FAULTING)
BRECCIA PIPES	BRECCIA PIPES	
IGNEOUS INSTRUSIVES		
METEORITES	METEORITES	
VOLCANOES	VOLCANOES	

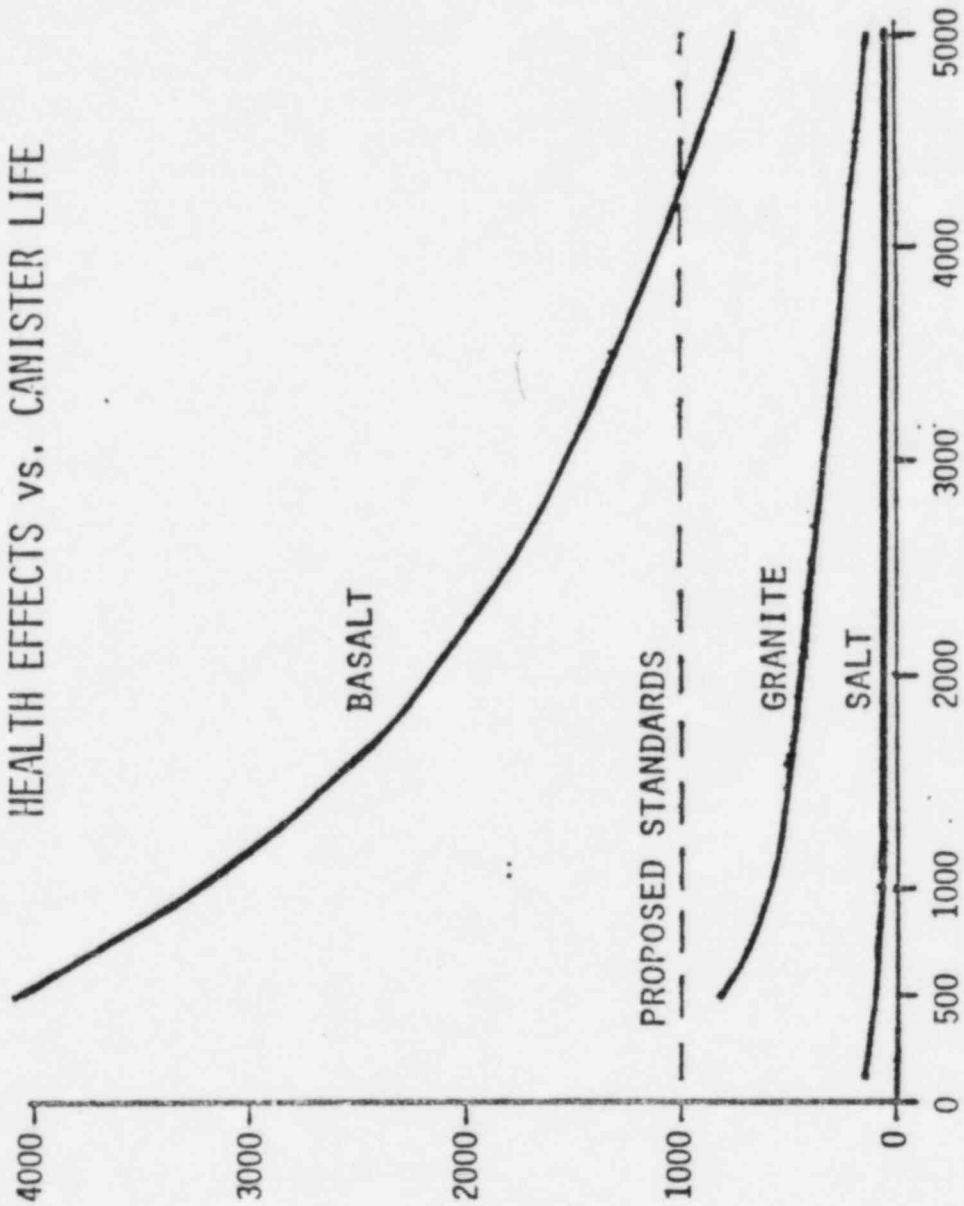
CONSEQUENCES AND RISKS BY EVENT (BEDDED SALT)



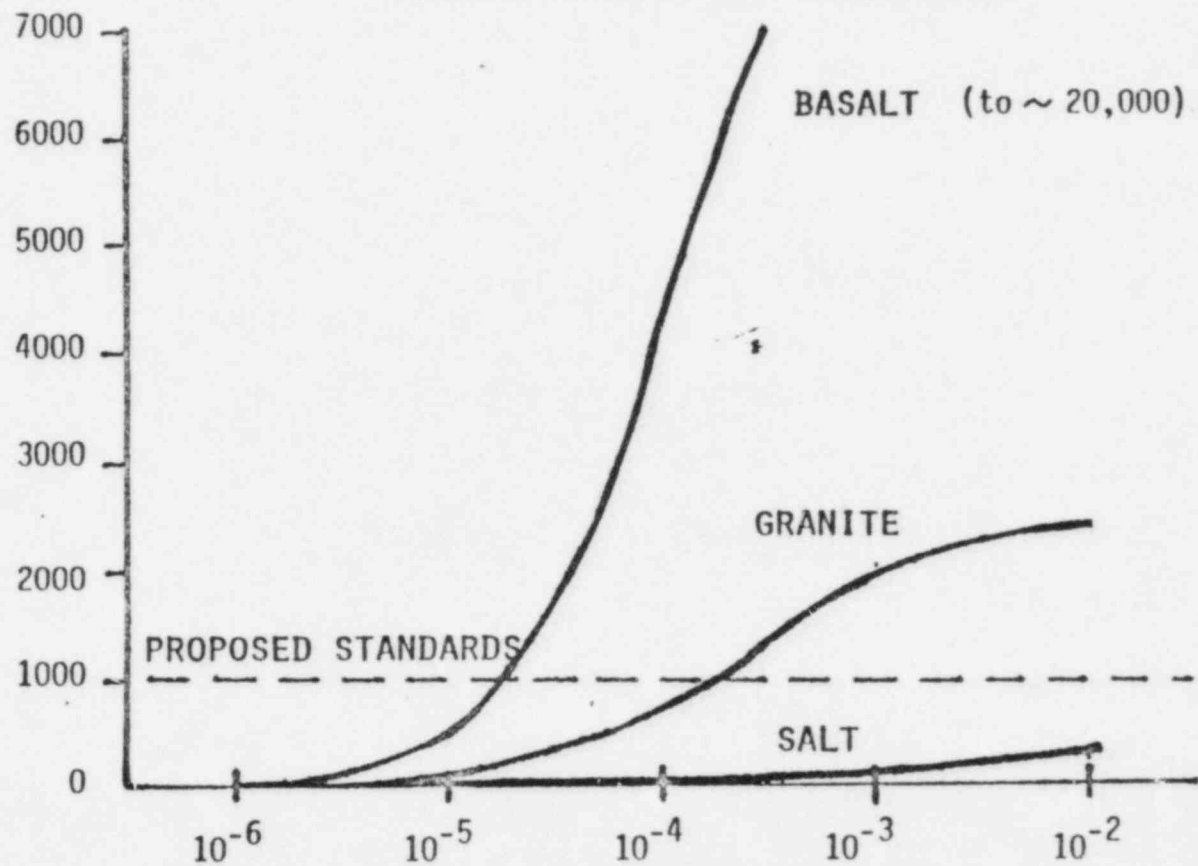
CONSEQUENCES AND RISKS BY EVENT (GPAMITE)

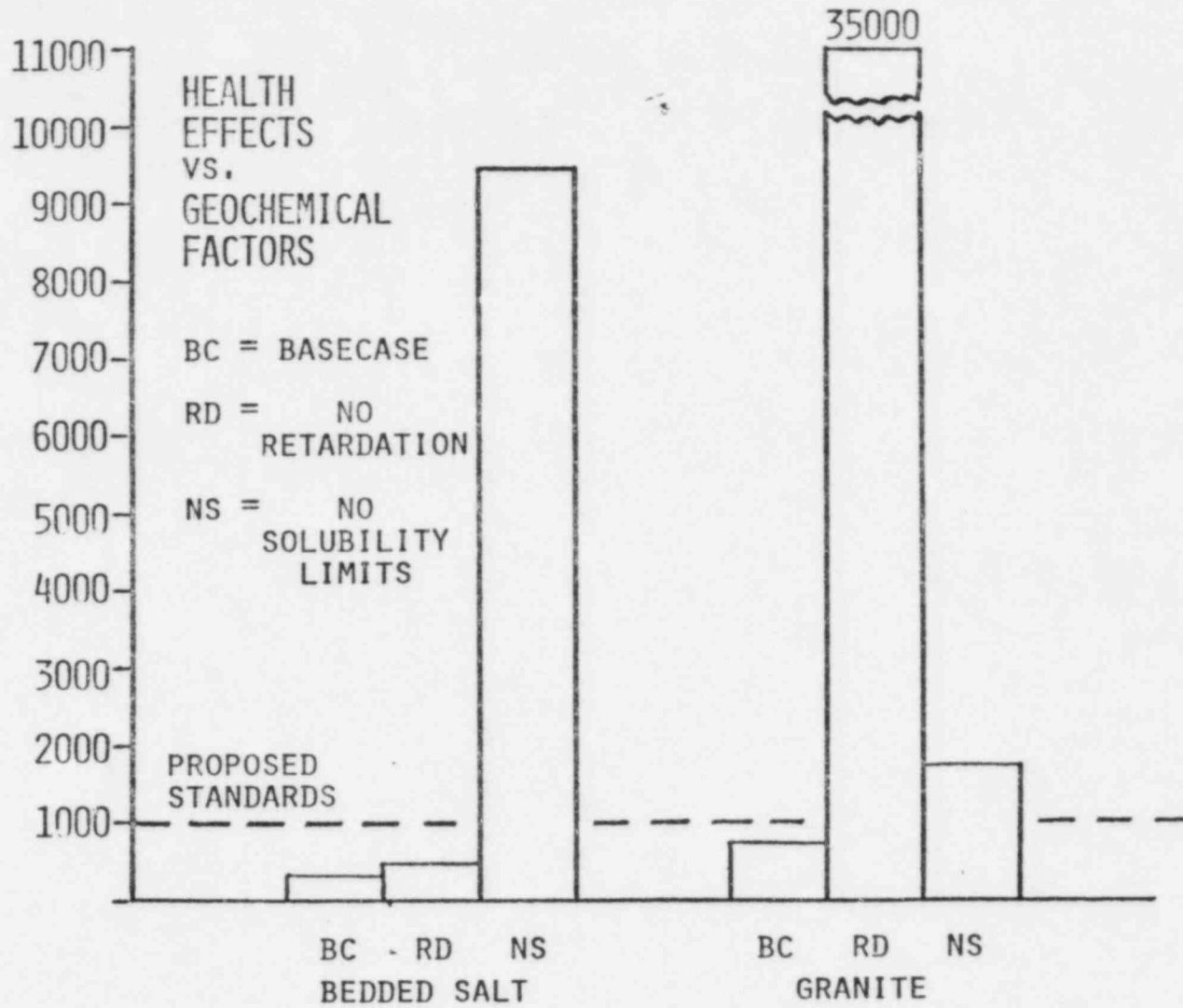


HEALTH EFFECTS vs. CANISTER LIFE



HEALTH EFFECTS vs. LEACH RATE





OTHER SOURCES OF RADIATION EXPOSURE:

URANIUM ORE BODIES: 300 TO 1,000,000 EXCESS DEATHS OVER 10,000 YEARS

VARIATIONS IN NATURAL BACKGROUND:

400,000 EXCESS DEATHS OVER 10,000 YEARS
FROM INCREASE IN BACKGROUND OF ONE MILLIREM/YEAR

NUCLEAR POWER GENERATION:

3,000 EXCESS DEATHS IN FIRST 100 YEARS
FROM URANIUM FUEL CYCLE FACILITIES
ASSOCIATED WITH 100 REACTORS

ISSUES REGARDING 40 CFR 191

- °° DEFINITION OF HIGH-LEVEL WASTE
- °° THE LEVEL OF PROTECTION
- °° NEED FOR QUALITATIVE ASSURANCE REQUIREMENTS
- °° INDIVIDUAL EXPOSURE STANDARD FOR DISPOSAL

TWO MAJOR CONCEPTS OF ASSURANCE REQUIREMENTS

°° DON'T RELY ON FUTURE GENERATIONS FOR LONG-TERM ENVIRONMENTAL PROTECTION

CRITERION 1: "DISPOSE OF WASTES PROMPTLY . . ."

CRITERION 4: "DO NOT RELY ON ACTIVE INSTITUTIONAL CONTROLS . . ."

CRITERION 6: "AVOID RESOURCES OR POTENTIAL RESOURCES . . ."

°° ALLOW FOR THE CHANCE THAT OUR INFORMATION MAY BE INCOMPLETE OR WRONG

CRITERION 2: "KEEP RELEASES AS SMALL AS REASONABLE . . ."

CRITERION 3: "USE SEVERAL DIFFERENT, EFFECTIVE BARRIERS . . ."

CRITERION 7: "DESIGN TO ALLOW FUTURE RECOVERY . . ."

ISSUES REGARDING 40 CFR 191

- °° DEFINITION OF HIGH-LEVEL WASTE
- °° THE LEVEL OF PROTECTION
- °° NEED FOR QUALITATIVE ASSURANCE REQUIREMENTS
- °° INDIVIDUAL EXPOSURE STANDARD FOR DISPOSAL

AN INDIVIDUAL EXPOSURE LIMIT FOR DISPOSAL?

- °° TRADITIONAL
- °° PROPOSED RELEASE LIMITS TOO STRINGENT
- °° AVOID BEIR-TYPE CALCULATIONS OF HEALTH RISK
- °° SUBPART B DOES NOT PROVIDE ADEQUATE PROTECTION

KEY REPORTS:

- ENVIRONMENTAL IMPACT STATEMENT
- REGULATORY IMPACT ANALYSIS

- POPULATION RISKS FROM . . .
- ENVIRONMENTAL PATHWAY MODELS . . .
- RISKS FROM URANIUM ORE BODIES . . .
- A.D. LITTLE TECHNICAL REPORTS
- POTENTIAL INDIVIDUAL DOSES . . .

ENVIRONMENTAL STANDARDS FOR
THE MANAGEMENT AND DISPOSAL OF
SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES
(40 CFR PART 191)

SUBPART A -- STANDARDS FOR MANAGEMENT AND STORAGE

SUBPART B -- STANDARDS FOR DISPOSAL

SECTION 191.13 -- CONTAINMENT REQUIREMENTS

SECTION 191.14 -- ASSURANCE REQUIREMENTS

SECTION 191.15 -- PROCEDURAL REQUIREMENTS