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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON NUCLEAR WASTE

5 (ACNW)

6 128TH MEETING

7 + + + + +

8 TUESDAY,

9 JULY 17, 2001

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11 ROCKVILLE, MARYLAND

12 + + + + +

13 The Committee met at the Nuclear Regulatory

14 Commission, Two White Flint North, Room T2B3, 11545

15 Rockville Pike, at 8:30 a.m., George M. Hornberger,

16 Chairman, presiding.

17

18 COMMITTEE MEMBERS PRESENT:

19 GEORGE M. HORNBERGER, Chairman

20 RAYMOND G. WYMER, Member

21 B. JOHN GARRICK, Member

22 MILTON N. LEVENSON, Member

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1 P R O C E E D I N G S

2 8:31 A.M.

3 CHAIRMAN HORNBERGER: The meeting will come
4 to order. This is the first day of the 128th meeting
5 of the Advisory Committee on Nuclear Waste. My name
6 is George Hornberger, Chairman of the ACNW. Other
7 Members of the Committee present are John Garrick,
8 Milton Levenson and Raymond Wymer.

9 During today's meeting, the Committee will
10 discuss the following: planning and procedures,
11 update on igneous activity, issue resolution
12 activities, DOE's supplemental science and performance
13 analysis, research plan for radionuclide transport
14 program, preparation of reports.

15 Howard Larson is the designated federal
16 official for today's initial session.

17 This meeting is being conducted in
18 accordance with the provisions of the Federal Advisory
19 Committee Act. We have received no written comments
20 or requests for time to make oral statements from
21 members of the public regarding today's sessions.
22 Should anyone wish to address the Committee, please
23 make your wishes known to one of the Committee's
24 staff.

25 It is requested that the speakers use one of

1 the microphones, identify themselves and speak with
2 sufficient clarity and volume so that they can be
3 readily heard.
4 Before proceeding with the first agenda
5 item, I would like to cover some brief items of
6 current interest. I have to find them.
7 The first, the President announced that he
8 intends to nominate Nils J. Diaz to be a Member of the
9 Nuclear Regulatory Commission for a term of 5 years
10 expiring June 30, 2006. He has served as Commission
11 on the NRC since 1996. Dr. Andy Campbell, Senior
12 Staff Scientist, ACNW, has been selected for the NRC's
13 leadership potential program. On July 16, 2001, he is
14 assigned as a Technical Assistant to Dr. Carl
15 Paparello, Deputy EDO for materials on a rotational
16 assignment. In November, a return to the ACNW as
17 anticipated.
18 Latif Hamdan, Hydrogeologist, NMSS, BWM,
19 High Level Waste Branch, that's a lot of initials,
20 Latif, was rotated to the ACNW staff on July 9, 2001.
21 The State of Nevada has filed a lawsuit
22 stating that EPA's Yucca Mountain standard, 40 CFR
23 197, is too loose to protect local residents.
24 Specifically, it states that EPA violated the Energy
25 Policy Act of 1992 by setting looser standards than

1 recommended by the National Academy of Sciences. On
2 June 6th, NEI filed a suit charging that 40 CFR 197
3 was overly restrictive, notably in setting a separate
4 radiation limit for groundwater. So we see we're
5 getting convergence.
6 Okay, that's all the announcements. Is
7 there anything else I missed. Howard? No. Okay, our
8 first session then is going to be our usual approach
9 and that is planning and procedures, talk about what
10 we're going to do, what we committed to last time and
11 what we're going to do this meeting. And who's going
12 to lead us on this.
13 MR. LARSON: Jit has got the follow-up items
14 from the 127th meeting which is in your notebook
15 section, page 2.
16 MR. SINGH: I'll just go quickly through
17 this. The last 127th meeting the two accomplishments,
18 there are two letters approved, one was NRC Staff
19 Public Outreach Activities and this conformed to
20 performance based regulation of waste management and
21 decommissioning which was done by 6/30/01.
22 Assignments, we had KTI vertical slice
23 reviews. Lynn Deering was supposed to compare to the
24 vertical slice templates for the commonalities and
25 outline for the lateral report. It's due end of this

1 month, I think, and I'll get feedback from you guys.

2 There was a new policy was established. The

3 ACNW staff the e-mail reports to members prior to

4 meeting. Page numbers and notebooks should be placed

5 in the center of the page.

6 CHAIRMAN HORNBERGER: That sounds really

7 important.

8 MR. SINGH: Very important. We are supposed

9 to solicit for a new Member. We still need some names

10 for the consultants.

11 MEMBER GARRICK: I have some. I will be

12 following them up and getting more information and

13 leaving the information with Howard. And in fact,

14 we've already shared some two or three names as a part

15 of that discussion.

16 MR. SINGH: Howard, the next item is yours.

17 MR. LARSON: Ray and I are meeting with

18 Orlando tomorrow at noon to talk about potential

19 working group and the white paper on decommissioning

20 and decontamination.

21 MR. SINGH: And the next one, take over the

22 TSP activities for Andy while he's gone.

23 Latif has it now.

24 CHAIRMAN HORNBERGER: That was very

25 efficient, Richard.

1 (Laughter.)

2 MR. LARSON: No disagreement. Can I back up

3 to the previous item for just a second. Howard, you

4 mentioned RESRAD and Frames, the white paper on the

5 subject. Is the subject --

6 MR. LARSON: No on decommissioning and

7 decontamination in general. AS part of that we can

8 talk about it, but all yo really heard about Frames

9 anyway was that MOU, at the last meeting.

10 In reading the agenda, while reading the

11 transcript and everything, I see the Committee had

12 quite a few questions on Frames and how it was going

13 to work.

14 VICE CHAIRMAN WYMER: Do you want to hear

15 more about the white paper? I brought a summary of

16 what I want to put in it, but not right now, of

17 course.

18 MR. LARSON: Ray has a 10-page outline.

19 VICE CHAIRMAN WYMER: Not quite.

20 CHAIRMAN HORNBERGER: Ray's outlines are

21 longer than most of our letters.

22 MR. SINGH: Okay, sorry. Next one, I'm

23 going to skip that. Next one is a working group

24 committees. I think we discussed that last time.

25 Unless there's any change.

1 CHAIRMAN HORNBERGER: Right. I think that
2 we'll probably follow up on some of this throughout
3 the meeting.
4 MR. SINGH: Okay. And future activities.
5 Under 2.8 you already discussed what we're going to do
6 today.
7 The next meeting is 129th. And 130th
8 meeting which I was asked by John Larkins to propose
9 the agenda for October meeting in Las Vegas and I have
10 done that already. Here's the proposed agenda. We
11 can discuss this.
12 CHAIRMAN HORNBERGER: So we're just skipping
13 the 129th for the moment.
14 MR. SINGH: Yes, I don't have anything right
15 now.
16 CHAIRMAN HORNBERGER: I'll go through the
17 charts you've got in there and as one of the things
18 I've pointed out to George is that as Chairman, it
19 seems like 80 percent of the assignments have evolved
20 upon him.
21 What Jit is handing out now is an attempt to
22 at least outline the topics that the Committee has
23 indicated an interest in for the meeting in Las Vegas,
24 recognizing that even filling up the days that are
25 here, there are still 3 or 4 topics that the Committee

1 indicated an interest in, but have not -- we haven't
2 even put them in there. So one thing the Committee
3 will have to look at is the priorities and then we can
4 discuss with Carol Hanlon whether they want to do
5 that.
6 Now two of the topics, the IRSR and the
7 Yucca Mountain Review Plan, the staff has indicated
8 their intention to comment and present those to us.
9 The other ones, most of them, and in the
10 public outreach is one that Jit will address that he's
11 been following through on and trying to organize.
12 The only other one that I'd comment on at
13 this time is the microbian induced corrosion one
14 that's listed on Wednesday, No. 8. The reason we put
15 that down there, was as you remember, the last time
16 you briefed the Commission, Commissioner Diaz said
17 what about this. And in talking to DOE they said we
18 do have a program and I thought that as long as we're
19 going to be out there, even though the program I guess
20 is being organized by Livermore, we can still have the
21 DOE people talk about.
22 But the rest of these topics that are in
23 here, that Jit will go through with you, are ones that
24 you've indicated some interest in, but I don't know
25 what your priorities are. It's somewhat a chicken and

1 the egg. We could try to contact all these people,
2 but if they all said yes, we're still at the same
3 situation because we don't know what priorities you
4 want to do. And since we're not going to tour the
5 site this year, we do have another day of technical
6 presentation.
7 I've talked more than I should have. Go
8 ahead, Jit.
9 VICE CHAIRMAN WYMER: One of the things
10 we've said about this meeting was that we were going
11 to try to bring up topics that were of specific
12 interest to the people out there and that gave the
13 audience insight into the kind of things we do.
14 Glancing through this, I don't know whether
15 we've done that or not.
16 MR. SINGH: Then I need to know what you
17 have in mind. What we discussed, those are the issues
18 we discussed last time. That's the way I did it. But
19 if you have any --
20 VICE CHAIRMAN WYMER: No, I understand that.
21 MR. LARSON: On page 4 of Section 2, Jit's
22 agenda that he was going through, there's a list of
23 items that we've tried to cover most of them. So
24 that's why they're in there and that's why you see at
25 the end we still didn't have room to put them all in

1 and that Jit has added additional topics such as
2 chlorine 36, fluid inclusion, resolution, etcetera.
3 MEMBER GARRICK: Is there any -- on the
4 chlorine 36 issue, has there been any further
5 developments since it sort of came out that two of the
6 laboratories were in disagreement as to the
7 implication of the results?
8 MR. LARSON: Lynn, have you heard anything?
9 I haven't heard anything.
10 MS. DEERING: I haven't heard anything.
11 Nothing definitive. I think an update would be a good
12 idea.
13 MEMBER GARRICK: Yeah. If that thing has
14 progressed. If there's anything that could be done
15 that would clarify the whole issue, that would be
16 certainly something that they'd be interested in, I
17 would think.
18 MS. DEERING: Yes, I agree. That should be
19 on.
20 MEMBER GARRICK: I agree with Ray. We
21 really need to scrub this agenda and make darn sure
22 that this fulfills our desire to offset a public forum
23 meeting with a lively engagement of issues and topics
24 in a manner that the public can observe how the
25 process works.

1 VICE CHAIRMAN WYMER: We may not have worked
2 quite hard enough at the last meeting, Jit, to give
3 you the input that you --
4 MEMBER GARRICK: I think we need to go it
5 through it step by step and I don't know when we do
6 that.
7 MR. LARSON: WE do have the first session on
8 Thursday morning, I believe, for this meeting. We've
9 got an hour. Isn't that right, dedicated -- an hour
10 or two dedicated to the topic. So maybe in the
11 interim you could look at it and sort of help us
12 prioritize. As I said the staff has said they'd come
13 in on the two issues, IRS and Yucca Mountain Review
14 Plan, the NRC staff.
15 We put microbial induced corrosion and Jit
16 still probably may want to say a few words about his
17 public outreach session.
18 MR. SINGH: Yes.
19 MR. LARSON: And the rest of the things are
20 really things that are on this list. Now Carol Hanlon
21 will be here this afternoon and probably have some
22 time, we can ask her an update on fluid inclusion
23 thorine 46 and some of those and maybe give you some
24 sense or maybe we can get some information in the next
25 two days. Jit, do you want to tell them what you're

1 doing?

2 MS. DEERING: Can I make a comment about the

3 transportation?

4 Howard wasn't at the last meeting, so I'm

5 trying to recall to the extent, in his role, and what

6 I had recalled was that transportation is of interest

7 to this Committee. We understand we can't make it as

8 big of a feature as we would maybe like, but to

9 compensate we thought about some options which

10 included having a lessons learned on WIP which is on

11 here as a possibility. Invite someone from Bob Neal

12 or EEG and -- or maybe someone from DOE.

13 The other thing was having someone from the

14 NRC staff talk to us about what types of information

15 on transportation risks have been amassed in this

16 Agency and just in terms of risk assessment of

17 transporting radioactive waste. I know that's

18 available, but we haven't exactly pinpointed the right

19 person, but we can, we will.

20 And I think when Joe Marks and I went down

21 to brief Senator Ried's staff last week, many of the

22 questions we got were on transportation. No big

23 surprise.

24 MEMBER GARRICK: I was briefing three

25 Senators' offices two weeks ago on the same thing.

1 MS. DEERING: Yes. So I think it's
2 important to -- I explained why it had dropped to a
3 first tier from a second tier, partly because it was
4 our Commission's wishes at this time for us not to
5 make it. They didn't want us to have a big session on
6 transportation.
7 But I said it was still important at this
8 Committee, which I know it is and we tried to do what
9 we can on that subject and when we're in Nevada, we
10 wanted to do something. So that's on there for that
11 reason. I don't know if we want to keep it, but I
12 thought it was a good item.
13 MR. LARSON: You see that there's four hours
14 on transportation. Items 13 and 14.
15 MEMBER GARRICK: I like the spin of sort of
16 a heads up of where we are with respect to
17 transportation risk because it would aggregate all the
18 issues.
19 MS. DEERING: That was your idea.
20 MEMBER GARRICK: Maybe that's why I liked
21 it.
22 (Laughter.)
23 Milt likes it.
24 MEMBER LEVENSON: We need some kind of spin
25 like that because probably keep having and the reason

1 I think it's the second tier, is that a major part of
2 the responsibility for the transportation is not NRC.
3 But in our attempt to take a little broader
4 view, I think that these two approaches of what's
5 going on with WIP, NRC's responsibility of WIP is
6 limited to licensing the shipping container. But the
7 experiences of everything else, plus if we ask the NRC
8 staff to come in and talk about licensing for Yucca
9 Mountain, they'll be limited to talking about a very
10 few things.
11 And therefore the approach of asking them to
12 update us on available data and risks of
13 transportation of radioactive material including
14 experience with spent fuel shipments and all of that,
15 I think would meet the needs of both this Committee
16 and the local people. Because the local people aren't
17 concerned with drawing a line in the sand and saying
18 this is NRC's responsibility and this isn't. Congress
19 does that, but I think these two approaches would be
20 very good.
21 CHAIRMAN HORNBERGER: Yeah, I think what we
22 should do is just what Howard suggested and that is
23 that we should look at these topics and look at this
24 draft agenda and come prepared Thursday morning to do
25 the polishing that Ray and John suggested.

1 One of the things that I think we should
2 think about is that, and the thing that sometimes
3 concerns me is when we look at presentations, the kind
4 of presentation that Milt just described, I think
5 would be good because there are real data. There's
6 substance and I said that the wrong way, but we got
7 some presentations that are almost procedural as to
8 how things are being done. And I don't think -- even
9 though we need those presentations that's probably --
10 shouldn't be a priority at Yucca Mountain because they
11 are not necessarily the most engaging for outsiders.
12 I think that, for example, the YMRP should
13 be really good because I think that everyone would be
14 interested. I'm less convinced that the integrated
15 IRSR needs to be the first item, but we can think
16 about this.
17 MR. LARSON: We put them first and second
18 because we had firm commitments.
19 CHAIRMAN HORNBERGER: I understand that.
20 That wasn't a criticism. I was just saying as we
21 think this through we should keep this in mind.
22 MS. DEERING: There's a chance we might also
23 hear the sufficiency review because I think that's
24 still up in the air whether we're going to get it in
25 August. They'd like to do that, but it's -- were'

1 kind of -- because we don't have that September
2 meeting. They're still waiting, which is going to be
3 their better option.
4 MR. LARSON: And as you remember, on the
5 Yucca Mountain review plan at one time the staff
6 wanted a day, so we've only got a couple of hours
7 here, so we have to -- we tried to restrict the hours
8 in some sense to give you an idea of what potential
9 topics were and not even finishing all the topics and
10 to proceed this meeting, I know several of you asked
11 at the last meeting, I have e-mailed and talked twice
12 to the people at EnviroCare about holding the tour,
13 traveling on Sunday, going through the site Monday,
14 going to Las Vegas Monday night so that you can start
15 Tuesday morning.
16 VICE CHAIRMAN WYMER: Is that how it's going
17 to be?
18 MR. LARSON: The lady that I talked to that
19 arranges these things said she didn't see a problem,
20 but she wanted to talk to Charlie. I would assume it
21 would be okay. I mean they agreed doing it on
22 Tuesday, so I don't see why you couldn't do it on
23 Monday. But I don't have that blessing yet. And they
24 will have suggested hotel and other things to make the
25 logistics as easy as possible. And I'll let you all

1 know that.

2 CHAIRMAN HORNBERGER: Jit, public outreach.

3 MR. SINGH: Okay, some of you have suggested
4 at the lat meeting that we should do some mailing to
5 different people. What I have done is I have taken
6 all the State and local officials, I have a whole
7 listing about 200 of them. We've mailed those and
8 after this letter which everybody has seen it and
9 that's what I have done in this letter sent by e-mail
10 and also I have included a local school board, I've
11 done that. I also intend to advertise in the public
12 local television stations and the radio stations in
13 the first week of October. If we do that now, they
14 probably would forget about it. So we'll do that in
15 the first week of October.

16 And there was also one suggestion was made
17 by Leslie and Janet Kota yesterday when I talked to
18 her. We can make a poster like they did and make ANNW
19 and kind of have some ideas and I can talk to you
20 afterwards and show you what I intend to do in a
21 graphics way.

22 You know what the charter is and what we
23 intend. Right now, everybody knows about the ACNW.
24 We have to show it's a totally independent of the NRC
25 staff. We work for the Commission directly and then

1 we have the responsibility OGC and the ASMB.
2 Everybody knows what the ASMB is because they have
3 done this public outreach. That's what I intend to
4 do.
5 Meeting is 5 to 7 on 16th of October, unless
6 you have any choice. You want to do 17th. I plan on
7 16th. Any preference?
8 CHAIRMAN HORNBERGER: No. I don't. Anyone?
9 16th, 17th? 16th is fine.
10 MR. SINGH: John Larkins came in. You
11 suggested he has specific issues he wants to discuss.
12 I need to know that so we can add these things or
13 delete.
14 CHAIRMAN HORNBERGER: To the agenda, right?
15 MR. SINGH: To the agenda.
16 CHAIRMAN HORNBERGER: But we're going to
17 discuss that on Thursday morning, right?
18 MR. SINGH: That's fine, we can do that.
19 CHAIRMAN HORNBERGER: And I think we have
20 time allotted for that on the Thursday morning
21 schedule. Don't we?
22 MR. SINGH: Lastly, we also -- Lynn is going
23 to help me on this. I think it was suggested by John
24 Geig last time. We summarized some letters which we
25 have written in the past six months and we can just do

1 it at the open house meeting.

2 CHAIRMAN HORNBERGER: You have some kind of

3 a mock up of the graphic that you propose?

4 MR. SINGH: I'm going to.

5 CHAIRMAN HORNBERGER: Okay. On Tuesday.

6 MR. SINGH: Excuse me, Thursday.

7 CHAIRMAN HORNBERGER: Okay, fine.

8 MEMBER GARRICK: The idea there was to --

9 was it not, was to communicate that we're listening

10 and that there have actually been some recommendations

11 and actions taken by the Committee that are a direct

12 result of that interaction and so on. Okay.

13 MR. SINGH: That's all I have.

14 MR. LARSON: The next pages following that

15 had to do with meetings related to high level waste.

16 Linda has handed out a new one to you. I

17 don't know, Lynn, if you want to talk about that now.

18 It's labeled 2.8. It's in the notebook twice, but

19 it's a dynamic meeting schedule, so Lynn, you want to

20 --

21 CHAIRMAN HORNBERGER: This is updated even

22 from the e-mail I got yesterday?

23 MS. DEERING: Every time I issue it, Howard

24 like within 10 seconds is over in my office saying you

25 misspelled this. It's always a misspelling.

1 And then Milt, we accidentally dropped Milt
2 off of a meeting and he didn't like that. So I had to
3 re-issue that.
4 MEMBER LEVENSON: You finally convinced me
5 to go to a meeting.
6 (Laughter.)
7 MS. DEERING: Let's see. Some of these are
8 completed at the top of the chart. I guess we --
9 let's start with the NRWTRB panel meeting -- is that
10 this week?
11 CHAIRMAN HORNBERGER: That's this week.
12 MS. DEERING: This was their complementary
13 meeting to the panel on-going on waste package. And
14 we don't have coverage for that. We'll have to try to
15 talk to the staff and see if we can get some
16 information if somebody else attends. That's the best
17 we can do on that.
18 They'll have a transcript. I don't know, I
19 don't think anybody has been designated to follow up
20 on that, so --
21 CHAIRMAN HORNBERGER: That's the NRWTRB
22 meeting that's going on later this week in Las Vegas.
23 MS. DEERING: In terms of a staff person
24 here to at least get the information, we need that.
25 So we'll have to discuss that at some point.

1 CHAIRMAN HORNBERGER: Let's put that on
2 somebody's "to do" list to follow up and either
3 contact Dan Bolan or somebody.
4 MS. DEERING: Right.
5 CHAIRMAN HORNBERGER: Or not, but it's
6 probably somebody from the staff probably, NRWTRB
7 staff and see if we can't get information. But we
8 should do what you said and that is find out somebody
9 from NMSS probably went.
10 MS. DEERING: Yes, and there's the second
11 meeting in the series of the DOE panel that they've
12 convened. And I believe that's happening -- Howard,
13 you showed me the agenda, is that this week? And
14 we're not covering that either, but again, some of the
15 Center people are going. So we're thinking that
16 because on our October agenda, Gene has proposed that
17 we have a member of that panel come and give us a
18 summary update of what they have been doing and it
19 does relate to Ray's chemistry work. Who knows, we
20 may want to write a letter. Something here might
21 trigger --
22 CHAIRMAN HORNBERGER: Yes.
23 MS. DEERING: A follow-up to the letter
24 we've sent on --
25 MR. SINGH: Excuse me, Lynn. The reason for

1 that is because the interim report is supposed to be
2 issued by the peer review panel, by the middle of
3 September.
4 MS. DEERING: Okay.
5 MR. SINGH: That's the reason I thought it
6 would be a good idea if we have some type of a
7 briefing in October.
8 MS. DEERING: Okay, the preclosure, it looks
9 like we've got coverage on that next week. And --
10 CHAIRMAN HORNBERGER: One of those people
11 doesn't want to go to Cleveland, huh?
12 (Laughter.)
13 MS. DEERING: Can you imagine?
14 MR. LARKINS: Lynn, the range of operating
15 repository temperature, Jit was scheduled to go to
16 that meeting.
17 MS. DEERING: Is he?
18 MR. LARKINS: Yes, his name is not on here.
19 MS. DEERING: And that one is still
20 tentative as I understand it. That was a proposed
21 date, but if we verify that, should we put Jit's name
22 by there?
23 MR. LARKINS: Yes.
24 MS. DEERING: And that's in Cleveland.
25 MR. LARKINS: No.

1 (Laughter.)

2 MS. DEERING: Okay, we have got Latif Hamdan
3 going to the Center's Hydrology Workshop at the
4 beginning of August. It's a 3-day planning session
5 for future work in the unsat-sat zone, modeling and so
6 forth, I think.

7 MR. HAMDAN: To see where we stand on issues
8 related to hydrology.

9 CHAIRMAN HORNBERGER: Yeah, that will be
10 important to cover. I'm chairing another meeting here
11 at the Academy that same time. No can do. Can't be
12 in two places at once.

13 MS. DEERING: Excellent reports.

14 CHAIRMAN HORNBERGER: Yes.

15 MS. DEERING: The TSPA&I technical exchange
16 that keeps being postponed looks like it's still
17 scheduled for August 6 through 10 in Las Vegas and
18 Latif is our new TSPA person will be handling that for
19 us.

20 MEMBER GARRICK: My schedule has changed
21 somewhat. I'm planning to attend at least part of
22 that.

23 MS. DEERING: Really, okay. I'm going to
24 have to reissue this I can see.

25 MEMBER GARRICK: There's one day in that

1 week that I have to be absent, but other than that, I
2 can be there.
3 MS. DEERING: Excellent. Then Georgia
4 brought to our attention this Board of Radioactive
5 Waste Management meeting that looks really
6 interesting, August 7th and 8th, involving the public
7 in the decision making process for managing nuclear
8 waste and I certainly plan to go to that. George,
9 were you going?
10 CHAIRMAN HORNBERGER: Probably not. I'm
11 probably not going to be able to make it.
12 MS. DEERING: Well, other staff people might
13 want to go to that too. It's local.
14 CHAIRMAN HORNBERGER: I think that one day
15 they have a bunch of invited speakers, don't they?
16 MS. DEERING: Yes. It looks like a great
17 meeting. Really interesting. The other range of
18 operating repository temperature, it seems that they
19 are splitting this out into two meetings. This is the
20 second proposed meeting and it does overlap with our
21 August meeting, so we probably won't have
22 representation there. But this is a tentative date,
23 so perhaps it will change. Keep you posted.
24 MR. LARKINS: Will we have a consultant go
25 there?

1 MS. DEERING: That's a good idea. We have
2 one. We have a consultant.
3 But that consultant wants to come to our
4 August meeting, by the way.
5 CHAIRMAN HORNBERGER: Really? We probably
6 want him. He wrote a nice -- he wrote a very nice
7 trip report, I thought on the IA.
8 MS. DEERING: He did.
9 CHAIRMAN HORNBERGER: Meeting.
10 MS. DEERING: He's well trained.
11 CHAIRMAN HORNBERGER: Yeah. He knows what
12 we need.
13 MS. DEERING: Then some of these others are
14 getting a little further out here. They're quarterly
15 management meeting. If they're here, we typically try
16 to go if the room is big enough, but this one is in
17 Las Vegas. But if its videocom, we'll try to attend
18 that. There's the NWWTRB fall meeting in September
19 and Sher Bahadur is going to go to that. Then we've
20 got our October meeting and that's as far out as we
21 go.
22 CHAIRMAN HORNBERGER: Where are we, Howard?
23 MR. LARSON: Page 8, Section 2 where we talk
24 about letters and assignments for this meeting. WE
25 talked about preparations for the October meeting in

1 Nevada and you've got a cursory draft, first draft
2 agenda for the meeting and we're going to look at it
3 and we're going to meet and talk about this as per the
4 schedule. I think it's item 13 on Thursday morning.
5 This afternoon, DOE is coming in, a
6 representative is going to talk about greater than
7 Class E disposal options. It's going to be two parts
8 to that talk, the fellow giving the presentation is
9 going to talk about what they do with their sources
10 and they actually have a program that they're doing
11 something. The other one, the other part of his
12 presentation is going to be a discussion of DOE's
13 development of plans on how to handle greater than
14 Class C. That's being done out of Germantown and the
15 man that was going to -- that would have given the
16 paper is at the ANS meeting discussing it. So the
17 fellow talking today, will be talking about the vu-
18 graphs that this other fellow has prepared. But he's
19 aware of the situation.
20 VICE CHAIRMAN WYMER: Do you know, Howard,
21 whether this guy will be telling us whether or not DOE
22 has published anything with respect to their
23 regulations for handling Class C or whether they
24 actually have something written?
25 MR. LARSON: Disposal, well, you're probably

1 going to hear more about storage than you are about
2 disposal because --
3 VICE CHAIRMAN WYMER: Sure, because that's
4 what they're doing with it.
5 MR. LARSON: Yes. They'll tell you their
6 plans was the most I could get.
7 VICE CHAIRMAN WYMER: Not whether or not
8 they have any specific regulations written down how
9 they're handling it.
10 MR. LARSON: It wasn't his field so he's
11 going to tell me what he's got.
12 Vertical slice reports, we've got commenced
13 draft preparation. I know from talking to George this
14 morning he wants to spend as much time as is necessary
15 on this topic over the next three days to come out of
16 this meeting with a pretty good draft.
17 Research for radionuclide transport, we're
18 going to have a discussion on that tomorrow after
19 lunch. You've got a program in your book on that.
20 And this is part of the overall research thing which
21 is really your last item there is the scoping document
22 for working group on NRC research and Dick Savio has
23 got the lead on that and there's an outline in the
24 book and Dick also has time on the agenda to talk
25 about that and I know the Committee wants to spend

1 some time on that.

2 MR. SAVIO: At this point, George and I

3 thought, we need a Committee decision.

4 At this point we need a Committee decision

5 on the scope and resource commitment to the review

6 when we have that, we can develop a time and place and

7 list of activities.

8 MR. LARSON: And then we have the topic that

9 continues to remain on our -- igneous activity, hot

10 topic. I don't know if you want to say anything at

11 this tim on it, or let it speak for itself.

12 CHAIRMAN HORNBERGER: It is clearly

13 something that we have to get an update on and so

14 that's -- we're going to do that this time and then we

15 have something else, a fuller discussion in August.

16 Is that our idea?

17 MS. DEERING: We let ourselves the option of

18 if we want to pursue some of these concerns in the

19 area of consequences in more depth, we can do that in

20 October we were thinking.

21 CHAIRMAN HORNBERGER: October.

22 MS. DEERING: That was what we were

23 thinking. We can be flexible on that.

24 CHAIRMAN HORNBERGER: I recall that. I got

25 confused because you said that Bill Heinz wanted to

1 come to our meeting and it's clear that Bill --

2 MS. DEERING: He couldn't come to this one.

3 CHAIRMAN HORNBERGER: Gotcha.

4 MS. DEERING: It's possible we could get him

5 to come to the October one instead.

6 CHAIRMAN HORNBERGER: Okay.

7 MR. LARSON: Okay. And letters, talking

8 about the same thing, the draft on the vertical slice.

9 Finish the chemistry letter. You may or may not,

10 depending on what you hear on the radionuclide

11 transport and activity, have a letter as well as --

12 greater than Class C. I can envision the letter from

13 the Committee unless you hear something that DOE is

14 doing that you think maybe the NRC should do or

15 consider follow-up.

16 CHAIRMAN HORNBERGER: We could clarify our

17 last letter.

18 MR. LARKINS: Before you leave that, isn't

19 there a void left from the letter that was done on the

20 entombment where you said you were going to address

21 the issue in terms of from a risk-informed perspective

22 what made sense? This is on the activation products

23 and things. And we never sort of got back to it?

24 I see a puzzled look.

25 CHAIRMAN HORNBERGER: Yeah, can you amplify

1 a little? I don't recall that.

2 MR. LARKINS: The Committee was talking

3 about entombment. The issue came up, what do we do if

4 the greater than Class C material --

5 CHAIRMAN HORNBERGER: Yes.

6 MR. LARKINS: What made sense. It seemed to

7 make sense to leave the stuff there to go through

8 several half lives to decay as opposed to trying to go

9 in and remove the material and at some point this

10 issue was left open. There was some thought about

11 going back trying to address this issue.

12 CHAIRMAN HORNBERGER: I think my

13 recollection is that what we did is we separated it

14 and we did the entombment without that issue and then

15 wrote the letter that was more generic, having to do

16 with the risk-informed regulations rather than --

17 MR. LARKINS: Yeah,but you never really

18 addressed the issue specifically.

19 MEMBER GARRICK: Early drafts of the RIPB

20 letter had the word greater than Class C waste in it

21 and we chose, deliberately, to generalize it.

22 MR. LARKINS: I remember that. I was

23 raising the issue as to whether or not you plan on

24 going back trying to make it specific to that issue.

25 MEMBER LEVENSON: We could, John.

1 MR. LARKINS: It just appears to me this is
2 sort of an open item and I know some of the
3 Commissioners have had this on the back of their mind
4 when we talk about decommissioning some of these sites
5 and how do we handle these different materials and
6 different levels of activity.
7 MR. LARSON: And what you've got and your
8 reconciliation thing there which we haven't gotten to,
9 but there is the entombment letter. It was in the
10 little pink thing there in front of you. EDO response
11 to it. And the EDO -- your recommendation was it
12 should not be the subject of a separate regulation,
13 should be included in the larger context of other
14 reactor decommissioning and license termination issues
15 which I though John and George were saying, you
16 thought you handled.
17 The staff's response from EDO said they've
18 gone out and asked for comments and that based upon
19 input from the various stakeholders and from the ACNW,
20 the NRC staff will then provide a recommendation from
21 the Commission on how to proceed. The staff plans to
22 continue to keep the Advisory Committee on Nuclear
23 Waste informed of developments concerning this issue.
24 And according to what, as John Larkins is saying, one
25 of the issues in the entombment thing was how to

1 handle the greater than Class C waste.

2 MR. LARKINS: And also, the staff is doing

3 some of these things by exceptions. You know, there

4 have been some plant specific requests that have come

5 in an hey seem to be handling things on a case by

6 case basis as opposed to doing a broad based --

7 MEMBER GARRICK: I think there's a -- we use

8 the word "phasing" in our letter, but I think there's

9 an evolution here taking place that our RIPB letter

10 kind of eludes to if you take a risk-informed approach

11 the greater than Class C issue goes away, rules and

12 regulations notwithstanding. That's the underlying

13 movement is that if you indeed adopt a risk

14 prospective, then you don't have these thresholds, you

15 have a standard and you risk-base that standard and

16 that's generally the target.

17 VICE CHAIRMAN WYMER: In fact, what industry

18 is doing is putting the greater than Class C into dry

19 cask storage along with the spent fuel and if they

20 leave it there for 50 or 75 years it may well decay

21 down to where the dose is acceptable for low level

22 waste storage.

23 MR. LARKINS: So what you're saying is that

24 by practice then we're handling this issue as opposed

25 to doing it by regulation. Is that acceptable?

1 MR. LARSON: And the Commission in several
2 instances as Dr. Larkins has pointed out has in
3 response to a request from a utility has said can I
4 store the greater than Class C waste with my other
5 stuff, either in the spent fuel or at a IFSI and the
6 Commission has come back and said yes.
7 And as you know from the regulations, Part
8 61, which is about the only place it really talks
9 about it is that the Commission, it has to go to a
10 high level waste repository. It has to be designated
11 as high level waste for DOE to accept it, but the
12 Commission can decide based on other information and
13 from a health, a public health and safety perspective
14 whether it's permissible to have low levels of grater
15 than class C waste stored at a reactor site stored,
16 not disposed of.
17 So getting back to the basic question of do
18 we pursue the greater than Class C issue.
19 VICE CHAIRMAN WYMER: There's not enough
20 substance there really to write a letter, yet all we
21 can do is describe current practice pretty much.
22 MEMBER GARRICK: I would suggest maybe that
23 in our one on one discussions we bring this up and get
24 some feedback and see if there's --
25 MR. LARKINS: Today, I think you're having

1 discussion on what types of regulations may benefit
2 from being risk informed. Certainly, part 40, this
3 falls into that regime and the transportation
4 regulations and so on and so forth, yes.
5 MEMBER LEVENSON: Isn't part of our
6 floundering around a little bit with this greater than
7 Class C, our feelings that currently it really doesn't
8 represent a risk because of current practices and
9 therefore it's hard to get excited about something
10 which doesn't have a risk?
11 CHAIRMAN HORNBERGER: That can be true for
12 several things. I think, my recollection is that we
13 did grapple with this and Raymond tried to get us to
14 be very specific about greater than Class C and we
15 warmed down.
16 (Laughter.)
17 MR. LARKINS: Yeah, I thought you deferred
18 or commonly used term punted for a while with the idea
19 that it was going to get addressed later on.
20 CHAIRMAN HORNBERGER: The real question is
21 whether we have enough information to come back and
22 say make some kind of sensible recommendation to the
23 Commission on what the Commission should do about
24 GTCC, given Ray's observation that it's basically a
25 DOE regulation problem to begin with, that unless --

1 the recommendation would almost be for NRC to work
2 with DOE to try to come to an agreed upon resolution
3 of the issue.
4 I think the bottom line is that we did all
5 agree that in terms of decommissioning, we didn't
6 think that it should be made a special item for
7 decommissioning.
8 MR. LARSON: Your plan is to address, or
9 Ray's plan is to address it as part of the white
10 paper.
11 VICE CHAIRMAN WYMER: Yes.
12 MR. LARSON: That is one of your topics.
13 VICE CHAIRMAN WYMER: Yes, it's one of my
14 multiple page outline items.
15 MR. LARSON: You went from controlled BRC
16 type to --
17 CHAIRMAN HORNBERGER: Let's listen to the
18 GTCC presentation today and keep this in the back of
19 our mind, whether or not we need to revisit this.
20 MR. HAMDAN: For information purposes, there
21 is a rule making in the final stages on storage of
22 greater than Class C waste that's being developed
23 right now. The licensees, under special license to
24 store, yes. It should be coming out soon. And
25 there's a guidance also that has been completed, but

1 it's going to come out after the rule making is sent
2 to the Commission as approved.
3 MR. LARSON: Yeah, and reactor sites. Rich?
4 MR. MAJOR: This is a scheduling issue. I'm
5 getting a little confused. I'm hearing "today",
6 "today" for GTCC, but I'm seeing tomorrow on the
7 agenda.
8 CHAIRMAN HORNBERGER: I'm sorry. This
9 meeting.
10 MR. MAJOR: I just want to make sure.
11 That's tomorrow.
12 MR. LARKINS: This is different. This is a
13 general discussion of the subject.
14 You're worried we had moved something up on
15 you, huh?
16 MR. LARSON: Okay, so that's some of the
17 issues for this meeting. The August meeting is on
18 page 9. We have to finalize the data visit, the
19 EnviroCare site visit. We've asked Margaret a long
20 time ago to come in as the new Deputy Director at NMSS
21 and present us with her perspective gain from both
22 being an NMSS research and back at NMSS and she had
23 told us when we had asked her that she wanted to spend
24 a few more months at NMSS to be sure that she could
25 present a balanced approach.

1 We got the DOE sufficiency review. I don't
2 know, Lynn, is there anything you want to say on that,
3 other than the uncertainty of the schedule?
4 MS. DEERING: What do you mean? I'm
5 confused.
6 MR. LARSON: Submit our comments.
7 MS. DEERING: NRC sufficiency review?
8 MR. LARSON: Yes. NRC review.
9 MS. DEERING: For August?
10 MR. LARSON: Yes.
11 MS. DEERING: That's still tentative.
12 MR. LARSON: Tentative. Research working
13 group. This is as Dr. Savio said as we firm up the
14 topic so that we want to look at and what that group
15 is going to look at. I've got a summary of the TSPA,
16 Technical Exchange Personnel, that will be Latif.
17 Pre-closure, tech exchange. Okay. DOE
18 supplemental science performance analysis report.
19 We're going to hear something today. Next month we
20 should hear a more detailed technical presentation.
21 One thing you can look at here that I
22 commented on earlier was there's seven items, five of
23 which Dr. Hornberger is the cognizant member.
24 CHAIRMAN HORNBERGER: In fairness, I guess
25 most of them are like briefing by Margaret Federline.

1 (Laughter.)

2 MEMBER GARRICK: Also, a couple of them are

3 just the deposition of one topic, namely research. So

4 --

5 CHAIRMAN HORNBERGER: But having said that,

6 we will remain alert to --

7 MEMBER GARRICK: There are some that were

8 signed that I don't know how they got assigned. Did

9 we do this? Did we make all these assignments

10 ourselves or did staff do this?

11 MR. LARSON: Like which ones?

12 MEMBER GARRICK: I was thinking of the long

13 list that I saw somewhere else that had the lead ACNW

14 member and for example, the supplemental science

15 report. I noticed poor George was assigned that too.

16 MS. DEERING: You know how that happened?

17 I can explain that. I can explain.

18 (Laughter.)

19 CHAIRMAN HORNBERGER: In other words, Lynn

20 did.

21 MS. DEERING: Please, let me explain.

22 Originally, if you recall last summer we were pretty

23 descriptive about who was going to do what topical

24 areas. George and I had the overall site

25 recommendation and NRC sufficiency review. Now

1 there's a whole lot of things tucked under that
2 including the supplemental science performance
3 analysis and all these tech exchanges. You can lump
4 a lot of things under there. Well, I have been
5 getting help from my co-workers supporting me on these
6 different topics as appropriate, whereas George isn't
7 doing that or we're not helping him get that to
8 happen.
9 CHAIRMAN HORNBERGER: But the TSPA is one
10 that should have carried John's initials.
11 MEMBER GARRICK: Or Milt's.
12 CHAIRMAN HORNBERGER: Because it's
13 performance analysis, that's true, Milt could do it as
14 well. But you've been doing the TSPA. I read this as
15 a supplemental to the TSPA. That's why I said John.
16 MS. DEERING: That's good.
17 MR. LARSON: And we've talked about the
18 October meeting. The only thing different on page 10
19 is since this was prepared and we got the information
20 back from the DOE after this went to press, the Yucca
21 Mountain Review Plan is also scheduled for October.
22 Now there was one other thing that came up
23 that I mentioned to George this morning that's been on
24 the Commission tracking system for the last couple of
25 months and that is that the ACNW provided semi-annual

1 briefing on recent ACNW activities on October 27, 2001
2 which is when the Committee will be in Las Vegas. So
3 --
4 CHAIRMAN HORNBERGER: We could invite the
5 Commission out there.
6 MR. LARSON: You could do that. Whether --
7 in November, you're going to be in San Antonio, so
8 whether you want to think of a date.
9 MR. LARKINS: I thought we had suggested to
10 SECY that that be in December.
11 MR. LARSON: I don't know if we've suggested
12 it yet, but I don't know whether the Committee has
13 found a date.
14 MEMBER LEVENSON: One day meeting in
15 December, John, is that what you're saying?
16 MR. LARKINS: If you're going to go to Vegas
17 and then San Antonio, it's kind of difficult to have
18 a Commission meeting. Plus, by that time you may have
19 some different things you want to discuss.
20 MR. LARSON: Handwritten page 18 in your
21 notebook is the December calendar.
22 CHAIRMAN HORNBERGER: Is there going to be
23 a time for us to pick that December day or suggest
24 possible dates?
25 MR. LARKINS: I think we would suggest

1 possible dates.

2 CHAIRMAN HORNBERGER: From the Commission

3 and then we'd react to it. Okay. Then I will just

4 plant in your mind that the week of December 10th is

5 AGU week.

6 MS. DEERING: That first week in December,

7 I recall, we did a poll, possibly thinking of moving

8 our November meeting and everybody was free that I

9 heard from, I think, that first week in December,

10 except there's an ACRS meeting.

11 MEMBER GARRICK: But that's the back end.

12 We can do the front end.

13 MS. DEERING: Yes. Good.

14 CHAIRMAN HORNBERGER: We weren't going to

15 suggest dates, John, but --

16 MR. LARKINS: So either the front end or

17 right around the middle.

18 MS. DEERING: We don't have a December

19 meeting and we're not home for two months to brief the

20 Commission.

21 CHAIRMAN HORNBERGER: The week of the 10th

22 is going to be impossible for me because it's AGU.

23 MR. LARKINS: So either like the 3rd and 4th

24 or 17th, 18th, maybe?

25 CHAIRMAN HORNBERGER: Yes.

1 MEMBER GARRICK: Of course, the problem with
2 having it the 3rd, 4th and 5th is that we just had met
3 the week before, right?
4 MS. DEERING: But, of course, this is sort
5 of a special one day to come in and brief the
6 Commission only.
7 MEMBER GARRICK: That might work out well.
8 They'd be prepped.
9 MS. DEERING: Yes, right.
10 CHAIRMAN HORNBERGER: The only thing is we
11 can't report on what we did in Las Vegas because we
12 wont' have that time to get the information up to the
13 Commission.
14 MR. LARSON: Las Vegas you will, but not San
15 Antonio.
16 CHAIRMAN HORNBERGER: That's right. We will
17 have had time from our Las Vegas meeting. So that's
18 fine.
19 MS. DEERING: And you probably have ideas to
20 share in progress, works in progress.
21 CHAIRMAN HORNBERGER: Exactly.
22 VICE CHAIRMAN WYMER: What are we saying?
23 CHAIRMAN HORNBERGER: We're not. John has
24 to check with the Commission and see what the
25 possibilities are.

1 MR. LARKINS: I am looking at four possible
2 dates, the first two days in December and the 17th and
3 18th of December.
4 CHAIRMAN HORNBERGER: Okay. I gave you a
5 pink sheet on EDO responses, the Committee reports.
6 We talked about 25A and 25B. Does everybody have it
7 set? Okay.
8 We talked about B. The action plan I
9 summarized what Rich had already done on his tracking
10 thing. He filled out the three or four pages
11 associated with that and I just summarized it. The
12 EDO agrees that the priorities are timely and
13 appropriate. Go ahead, Rich, you did all the work.
14 The priorities are consistent with the NRC
15 staff priorities. EDO believes the ACNW efforts will
16 contribute substantially to the Agency's strategies
17 and goals. So I didn't think there was any action
18 required by the Committee and that you ought to accept
19 the letter.
20 MEMBER LEVENSON: Yeah, I think basically
21 the staff says we're in line with what they're doing.
22 Our action plan parallels the staff course of action
23 for the next year. I guess they said we're consistent
24 with operating plans for NMSS, so --
25 MR. LARSON: Now that document hasn't been

1 put in its neat little booklet like you've had in the
2 past. But Ethel does have it and she knows she's
3 going to do it.
4 The other items on there, the EDO's list,
5 future meeting topics which is consistent with what
6 the Committee has. The calendar is just the calendar
7 for the rest of the year. Maybe the August or October
8 meeting we'd have to resolve the agenda for next year,
9 the dates.
10 CHAIRMAN HORNBERGER: The sooner, the
11 better.
12 MR. LARSON: No comment on the Bechtel
13 meeting status and planned attendance at outside
14 meetings. You've been through that.
15 CHAIRMAN HORNBERGER: My goodness. Forty-
16 five minutes ahead of time?
17 MR. LARSON: Yeah.
18 MR. LARKINS: A couple of other things when
19 you get a -- I don't know, Lynn, did you mention about
20 a possible meeting on Wednesday?
21 MS. DEERING: I sent out an e-mail, but I
22 didn't speak to anybody about it this morning. I
23 think Howard may have it.
24 MR. LARKINS: You already talked about it?
25 What does that mean, it's no longer?

1 MS. DEERING: No, it is.

2 CHAIRMAN HORNBERGER: Oh, I'm sorry, it's
3 later in the day, probably 5:30.

4 MR. LARKINS: Tomorrow?

5 CHAIRMAN HORNBERGER: Yes.

6 MR. LARSON: The other thing is we've sent
7 up a solicitation to the Commission. I'll get you a
8 copy for an additional Member to the ACNW. This is in
9 the area of Health Physics Consequence Modeling,
10 hopefully with some type of background in the nuclear
11 arena. Went up last week so I expect, hope to get
12 some feedback from the Commission in the next two
13 weeks or so.

14 MEMBER GARRICK: You weren't here, John. I
15 don't think when we were discussing it, but I did a
16 little research on candidates and have three names to
17 throw into the pool. And intend, if it's appropriate
18 to follow-up on them and talk to each of them and see
19 --

20 MR. LARKINS: I think that helps. I think
21 that's how we get the better candidates, just through
22 actual going out, contacting people as opposed to --
23 from these formal solicitations that we do.

24 MEMBER GARRICK: One of the things that I
25 think is very important and I've talked to a number of

1 health physicists in the last two weeks is to see if
2 we can't find people who have a -- to be sure, a
3 health physics perspective, but also an engineering
4 perspective and a modeling that can tie back to the
5 real issues that in the end end up driving the
6 results. And that's a little different breed of cat.
7 And there are people like that around, but there also,
8 it turns out, in many cases, the busiest and maybe
9 even the most complicated from the standpoint of
10 serving on -- serving the Committee, either as a
11 consultant or as a member. But I do think we want to
12 -- the Committee wants to look at that very carefully
13 because a lot of the health physics candidates are
14 very narrow in their activity. They're very good, but
15 what you'd really like to have is what we used to call
16 a T-shaped analyst, a T-shaped scientist or a T-shaped
17 engineer, somebody that was specialized and quite
18 renown in an area, a very specific area, but then
19 branched out and embraced other components of the
20 problem. And that's a guideline that I tried to use
21 in talking to people.
22 MR. LARKINS: Okay, well, we'll see what the
23 Commission comes back with in the next couple of
24 weeks, but I looked at the charter and going back and
25 looked a little bit at the history when the Committee

1 was first organized and I don't see anything in there
2 that precludes us from having an additional Member,
3 but I'm sure the issue will come up and we'll have to
4 talk through it with the Advisory Committee Managing
5 Officer and also with Office of General Counsel.
6 Another thing, we have issued our operating
7 ACNW's operating plan. It's about 136 pages, but we
8 do plan on keeping it up to date as a way of keeping
9 track of potential milestones, deliverables and other
10 things. So it will supplement the action plan and
11 actually in there we'll use that to track how
12 successful we were in providing advice on different
13 issues and so when we do our self-assessment, in the
14 future, instead of writing this long SECY paper, with
15 all these letters attached, a lot of that will be
16 covered in the operating plan which will also have the
17 letter matrix included in it. We're changing our
18 process slightly.
19 Lastly, I might mention on the budget, it
20 seems like -- well, 2002 is pretty much set and it
21 looks pretty good. I think we're getting some
22 accommodation for the Commission on 2003, so I'm
23 reasonably optimistic that we'll get -- we'll have
24 some success there also.
25 CHAIRMAN HORNBERGER: Good.

1 MR. LARKINS: I can't get into specifics
2 because it's pre-decisional.
3 CHAIRMAN HORNBERGER: That potentially bodes
4 well for a feedback you might get on adding a fifth
5 Member. Good. Excellent.
6 Other items that we haven't covered? May I
7 suggest that we come back to Las Vegas? Sorry, Rich?
8 MR. MAJOR: Myself, like Andy Campbell I've
9 been accepted into the leadership development program,
10 so you'll see a transition here as well from NMSS
11 perspective on sort of manning this table and bringing
12 agenda items and interacting with Isabel. I think
13 you've all met Matt Blevins before. He's an
14 environmental scientist with Division of Waste
15 Management, environmental engineer? And he'll be
16 filling in for me and I'll slowly be bringing him up
17 to speed and I just want to let you know of that
18 transition.
19 I'm going to try to do a little bit of both.
20 We'll see. But for the time being it's fill in or
21 back up.
22 MEMBER GARRICK: He's not a geologist.
23 MR. MAJOR: He is not a geologist. But he's
24 willing to learn.
25 (Laughter.)

1 So thank you.

2 CHAIRMAN HORNBERGER: Good. I thought you

3 were going to introduce Andy Campbell to us.

4 (Laughter.)

5 Good, congratulations to you too, Rich.

6 MR. MAJOR: Thank you.

7 CHAIRMAN HORNBERGER: On other things, we do

8 have time left on this part of our agenda. I think

9 that it would be useful to go back and talk some more

10 about Las Vegas, at least brain storm. We don't have

11 to put finishing touches on, but we -- people had

12 brought up the fact that we want to make this as

13 exciting a meeting as we can.

14 MR. LARKINS: Lynn, did you fill everybody

15 in on the meeting with congressional staff?

16 MS. DEERING: I mentioned it. I just sort

17 of made mention of it.

18 CHAIRMAN HORNBERGER: Where is the list of

19 topics? It was somewhere in Tab 2?

20 MEMBER LEVENSON: One of the things, George,

21 is I think the scheduling of the evening session and

22 the scheduling of the agenda not be independent.

23 CHAIRMAN HORNBERGER: I agree.

24 MEMBER LEVENSON: Evening session really

25 needs to come after some of the topics we think the

1 local people are the most interested in.

2 CHAIRMAN HORNBERGER: On that basis, Jit had

3 suggested that we could do it the 17th rather than the

4 16th. Maybe there's a good reason to do it the 17th

5 rather than the 16th.

6 MEMBER LEVENSON: I would suggest we develop

7 these two at the same time.

8 CHAIRMAN HORNBERGER: Yes. My point being

9 that it gives us a little more flexibility on schedule

10 if we do it on the 17th rather than the 16th, so maybe

11 we should do that, Jit.

12 MR. SINGH: 17th, 5 to 7?

13 CHAIRMAN HORNBERGER: Yeah.

14 MEMBER LEVENSON: We're now scheduled to

15 adjourn at 7:30 on the 18th.

16 CHAIRMAN HORNBERGER: Yeah, we'll all

17 probably be running for a red eye, so let's do it on

18 Wednesday.

19 MEMBER GARRICK: Let's look at this list

20 that you're looking at, called our attention to,

21 George, and just ask ourselves in putting ourselves in

22 their position. What are some of the items that would

23 be of greatest interest?

24 How much interest is there in the integrated

25 or the international peer review of the TSPA in a RIM

1 report. Has anybody gotten feedback or been to Las
2 Vegas lately to sense the level of interest there?
3 MS. DEERING: Jit?
4 MR. SINGH: I only put this together because
5 you guys wanted that in there.
6 MS. DEERING: I will say, John, again, when
7 John and I briefed Senator Ried's staff we gave them
8 a series of options that they could hear more detail
9 on and what we did was we walked through our similar
10 to what we did for the Commission, our overall
11 strategy, we highlighted our vertical slice, this
12 on-going effort, but then we said -- we gave them the
13 option of issue resolution, chemical -- I'm sorry,
14 waste package, chemistry/waste package, Alloy 22,
15 public outreach, transportation and one other, it
16 doesn't come to mind, but they wanted to hear, out of
17 all those, badly, waste package, Alloy 22. That was
18 of most interest. And then transportation and
19 outreach. But if that -- that's the only thing I can
20 comment on. Lately, I've heard someone --
21 MEMBER GARRICK: So you'd say the waste
22 package peer review and the transportation, at least
23 on the basis of that data point would be the most
24 important.
25 MS. DEERING: That's most on our agenda.

1 MR. HAMDAN: I would add the fluid inclusion
2 and igneous activity.
3 MR. LARKINS: From a public perspective,
4 probably the igneous activity, I'm not sure about
5 fluid inclusion.
6 MR. HAMDAN: John, it has been in the paper
7 many times and it keeps come backing, this fluid
8 inclusion because they always present it in the press
9 that it would be flooded with water and so on and so
10 forth so they see it from that perspective.
11 CHAIRMAN HORNBERGER: It is a loose tie in
12 back to igneous activity again. It's not igneous, but
13 it's geothermal.
14 MEMBER GARRICK: So I have four things, the
15 waste package, igneous activity, the fluid inclusion.
16 CHAIRMAN HORNBERGER: Chlorine 36, we had
17 said earlier.
18 MEMBER GARRICK: Chlorine 36.
19 MEMBER LEVENSON: And I think the microbial
20 corrosion is part of the waste package issue.
21 MEMBER GARRICK: Now are we going to get
22 into the high/low temperature debate or do we leave
23 that to the TRB?
24 MR. LARKINS: Leave it to the TRB.
25 MEMBER GARRICK: It may come up is all and

1 George, what do you think of that one?

2 CHAIRMAN HORNBERGER: As a specific topic --

3 MEMBER GARRICK: It's not on the list.

4 CHAIRMAN HORNBERGER: It's not on the list.

5 MR. HAMDAN: I would leave it to the review

6 board myself because they seem to know so much more

7 about it and we could --

8 MEMBER GARRICK: Well said.

9 CHAIRMAN HORNBERGER: And the transcript

10 won't even record that you said it with a chuckle.

11 (Laughter.)

12 MEMBER GARRICK: On the other hand, we have

13 to -- we're supposed to be an independent Advisory

14 Committee and we're supposed to have opinions on these

15 issues.

16 CHAIRMAN HORNBERGER: Right, and one of the

17 things that we will -- whether we like it or not, we

18 will to a certain extent get drawn into this because

19 of the -- I forget the initials, the supplementary,

20 SPA or something like that because basically, that's

21 what it is, John.

22 MEMBER GARRICK: Yeah.

23 CHAIRMAN HORNBERGER: And so to that extent

24 in reviewing that we have to be drawn into the issues

25 that are faced in comparing the low temperature and

1 high temperature.

2 MEMBER LEVENSON: I think, George, the key

3 to the last two words you used, until there's some

4 technical information and somebody has compared it, I

5 would recommend we not get involved in a hand waving

6 hard discussion which is the status at the moment.

7 There really isn't any data and facts.

8 CHAIRMAN HORNBERGER: Of course, we should

9 -- data and facts are perhaps hard to come by in this

10 whole program, but there has been because of this SSPA

11 that is not yet released, but is due to be released

12 imminently.

13 Volume 1 has been released, right.

14 Volume 2 maybe this week and so there has been quite

15 a bit of analysis done and I assume that if we're

16 scheduled to hear something about this at this meeting

17 or next meeting? Today. So we will actually hear

18 something about that, so if we wanted to put it on the

19 agenda for Yucca Mountain, there actually would be

20 something, there would be material for us to deal

21 with. I'm not arguing that we should. I'm just

22 trying to respond to John.

23 MEMBER GARRICK: You see, the Supplemental

24 Science Report or the SSPA has results in it that are

25 dramatically different than the TSPA-SR. When you

1 start talking about peak doses being a factor of 30
2 less.
3 CHAIRMAN HORNBERGER: Of course, that's not
4 primarily due to the change in temperature. That's
5 the problem.
6 MEMBER GARRICK: I know. I know, but
7 there's another problem that may come up and that is
8 that in our vertical slice we have been pretty direct
9 in our criticism of the assumption set that was
10 employed and the attempt to back off from that in the
11 supplemental report and then they get results that are
12 dramatically different and of course that's exactly
13 what you'd expect as you adopt a more realistic and
14 reasonable set of conditions. And now they're having
15 to kind of back peddle and defend the credibility of
16 the TSPA-SR and be challenged on that and I don't
17 know, I can imagine that we could get drawn into that
18 discussion because there's some very critical
19 parameters that -- whose values have changed quite
20 dramatically, not so much those that impact the
21 compliance period, but certainly the downstream dose
22 curves have been dramatically impacted.
23 So I don't know.
24 CHAIRMAN HORNBERGER: Of course, if I were
25 DOE I would argue that TSP-SR was conservative and we

1 just --

2 MEMBER GARRICK: That's right, that's right.

3 CHAIRMAN HORNBERGER: I'm' not saying I

4 believe that. I'm just saying that if I were speaking

5 for DOE, that's what certainly --

6 MEMBER GARRICK: The reason I'm pushing this

7 a little bit, I'm just trying to make darn sure that

8 we have an agenda that is going to achieve what we set

9 out as the kind of a guideline at the last meeting,

10 namely one that is responsive to the issues that are

11 considered by the local people as most important.

12 VICE CHAIRMAN WYMER: I think if we get into

13 a discussion of the differences in the two temperature

14 --

15 MEMBER GARRICK: That isn't the main thing

16 I'm talking about here.

17 VICE CHAIRMAN WYMER: I know it isn't. I'm

18 not changing the subject on you, John.

19 MEMBER GARRICK: Yeah, Yeah.

20 VICE CHAIRMAN WYMER: I thought you were

21 done with that topic.

22 MEMBER GARRICK: No, I'm talking mainly

23 about just the changes in the assumption set that are

24 employed in the analyses, in the performance analyses.

25 VICE CHAIRMAN WYMER: And I was going back

1 to whether or not we ought to have something about the
2 two temperatures. The principal thing, the kind of
3 thing we could say with respect to the two
4 temperatures is that there are a dozen items that we
5 could list that are changed depending on whether
6 you're running at 85 or at 120 degrees Centigrade.
7 That's about what we could do. We could enumerate all
8 the differences in chemistry and breathing of the
9 mountain and what happens to the water, how fast it
10 evaporates and whether or not you get films. There's
11 a whole host of things that we could raise as things
12 that are different, depending on whether you run the
13 thing hot or cold. I don't know whether that's
14 helpful or not because it raises issues. It would
15 certainly be a welcome thing as far as the people in
16 Nevada were concerned because they would say geez, you
17 don't know what you're doing and there's too many
18 issues here that everything is still up in the air and
19 everything is still in doubt and we haven't analyzed
20 the two situations.
21 So I'm not sure whether that's a good thing
22 or a bad thing to enumerate all these different issues
23 that certainly are true and certainly do come up,
24 depending on whether or not you're running cool or
25 hot.

1 MR. HAMDAN: Can I say something. I think
2 we should anticipate questions concerning the SSPA and
3 considering the issues that have been put on the table
4 and we should be prepared with some answers.
5 MR. BAHADUR: I think one thing that we have
6 to consider about the uniqueness of this meeting that
7 you're going to have in Las Vegas, they're going to
8 increase the public understanding of what ACNW is, how
9 is it independent from the NRC staff and how we have
10 shaped the Commission's thinking in the past by
11 showing certain letters, examples and maybe the time
12 has come for us to look as to where this Committee has
13 strong opinions in certain areas and somehow project
14 that in a tight agenda, rather than picking up one or
15 two items and second guessing what the local people
16 are going to ask us because you are going there as an
17 independent Committee who shapes the thinking of the
18 Commission and if the public should get a clear
19 picture of what your thinking is on various issues, if
20 you choose and pick three or four issues and not issue
21 five and six, you might project a feeling like that
22 issue is not important. So maybe from that point of
23 view, I mean this as we talked this morning, a problem
24 with listers. The moment you say these are the six
25 items I'm going to discuss, that means item number

1 seven, eight and nine are not important to you, but
2 that's not our view.
3 So let's just take a step back and see what
4 are the four or five or six burning issues for which
5 the Committee is going to advise the Commission and
6 maybe we should discuss those issues as just a
7 suggestion.
8 MR. HAMDAN: I agree with that, and that's
9 fine and we can project the image in one meeting with
10 certain things and discuss other things at other
11 meetings, but we need a strategy as to how you plan to
12 answer tough questions maybe and what's on the minds
13 of the local people. You need to have a study.
14 MR. BAHADUR: That is a good point, Latif.
15 The only thing I'm trying to say is this Committee is
16 not DOE and this Committee is not EDO staff. The
17 tough questions are for people to answer who is
18 working on the problem. We are here to advise the
19 Commission because they have raised a certain issue
20 and we have seen what are the pros and cons and then
21 why we believe in the way we believe in. And I think
22 that's the strategy we should be developing.
23 I think your point is well taken. We need
24 to have a strategy to respond to those questions.
25 CHAIRMAN HORNBERGER: Yeah, there are sort

1 of two things that we're talking about and they are
2 linked as Milt pointed out, one being our agenda for
3 the meeting proper and the other anticipating what the
4 people might want to hear at this 5 to 7 session on
5 the Wednesday. And to a certain extent we, I think
6 you're right, we can do some anticipation of what the
7 topical issues are because the NWTRB meets out there
8 all the time and these people who attend public
9 meetings get to hear an awful lot of these issues.
10 In terms of -- let's think a minute about
11 Sher's charge here. Should we think about four or
12 five things that we want to think about advising the
13 Commission on. Now if we think that way we're going
14 to come up with a different list because
15 transportation isn't going to be on that list.
16 MR. BAHADUR: Unless you take it as an
17 anticipated issue for which the Commission needs to
18 focus because they may need to brief the Congressman
19 or Senator and that was one of the burning issues.
20 CHAIRMAN HORNBERGER: Absolutely.
21 MR. BAHADUR: In NMSS' mind spent fuel, the
22 storage, transportation is not the burning issue. So
23 maybe that's something that perhaps this Committee
24 wants to bring to the focus of the Commission. I
25 don't know that's an anticipatory issue.

1 MR. SINGH: Even though it's on our second
2 tier for transportation, when I have been to these
3 meetings up in Las Vegas, everybody talks about that,
4 so it's a very, very important issue. We have been
5 kind of on the back, taking a backseat on that issue.
6 CHAIRMAN HORNBERGER: We need to do
7 transportation. That wasn't my point. I was just
8 pointing out that the lists would be -- might be
9 something different.
10 MS. DEERING: Let me ask you this, and based
11 on what Sher said I would think one way to look at
12 that might be say well, NRC's products have to rise to
13 the top before we go looking at background information
14 that DOE has done on fluid inclusions or whatever.
15 YMRP and integrated IRSR, but we also then have to
16 look at those subjects and say are we, what is the
17 possibility that we are going to have any influence
18 whatsoever on these? Are they done deals? Do I have
19 an answer to that?
20 The YMRP is -- what stage will that be in?
21 We actually have an integrated schedule we can have a
22 look at. I'm sort of having the feeling that in
23 reality we're late, very late coming in on the
24 integrated IRSR, for all I know is going to be a
25 finished product true to form by the time we even get

1 a briefing on it, right?

2 CHAIRMAN HORNBERGER: Yes.

3 MS. DEERING: And I'm not saying it's not

4 important, but advising the Commission on it -- I

5 don't know.

6 CHAIRMAN HORNBERGER: Of course, what we've

7 said all along as this has been progressing is that to

8 a certain extent our comments on something like the

9 integrated issue resolution may come in, as you say,

10 after the fact, but the Commission when we talked to

11 the Members individually say well, that may be how it

12 has to be. They wouldn't dismiss that and if, for

13 example, we saw something that we wanted to be

14 critical of, in the integrated issue resolution, we

15 would certainly have to say that.

16 MS. DEERING: Whether it was too late or

17 not.

18 CHAIRMAN HORNBERGER: Whether it was too

19 late or not.

20 MS. DEERING: That's right, and then it goes

21 on the record. That's true. That being said, I think

22 those two make as we have them as very high

23 priorities.

24 CHAIRMAN HORNBERGER: Yes. I think that

25 they are high priorities. As I indicated, my only

1 concern is that when we were talking we wanted, we
2 said what we wanted to do was have a lively
3 interactive meeting and sometimes because of the
4 nature of this Committee being a technical committee,
5 we have more lively interchanges when there are
6 technical issues rather than procedural issues.
7 MS. DEERING: What about the TSPA peer
8 review? Based on some of the other things you were
9 saying about hot versus cold and this new supplemental
10 science, to some extent our comments on this SSPA
11 should be factored into our vertical slice, but it's
12 always an on-going effort as we all know towards LA
13 should we get that far and to the extent we would like
14 to -- if we wanted to have that as an item, this peer
15 review, because from what I understand this is going
16 to be an important piece to building on the TSPA
17 towards LA. You know, whatever this peer review has
18 to say. It was during the VA when they comment on
19 that. So assuming that's true, we could build a
20 provocative discussion around that, not just have them
21 come and brief us and say thanks a lot. Maybe we
22 could build in some of our own thoughts and thinking
23 about hot versus cold, to the extent the analysis has
24 changed radically to the extent the peer review is
25 picking up on the same concerns we're bringing to the

1 table. You know, sort of integrate. That would be
2 provocative to keep it performance oriented.
3 CHAIRMAN HORNBERGER: So to try to do it,
4 use the TSPA again as a structuring mechanism and then
5 use that to bring in, for example, waste package
6 issues.
7 MS. DEERING: And any other concerns we may
8 have raised in vertical slice and performance
9 assessment in general. Uncertainty, this issue on
10 conservatism, to what extent it might be masking or
11 misleading or whatever key issues come out of our
12 vertical slice, we might use as an opportunity to work
13 with --
14 VICE CHAIRMAN WYMER: I think that's a good
15 suggestion.
16 MR. BAHADUR: The only thing is just be
17 careful in public when you talk about uncertainties
18 and the conservatism because some of the terms which
19 really don't have a very clear definition and you will
20 get dragged into something that may be provocative
21 discussion, but may not be very fruitful from your
22 point of view.
23 VICE CHAIRMAN WYMER: It not only doesn't
24 have a clear definition, it doesn't even have a clear
25 understanding.

1 MR. BAHADUR: Clear understanding. I think
2 Lynn's idea is excellent, that we should take the TSPA
3 and apply that into other areas and bring everything
4 together and present that.
5 CHAIRMAN HORNBERGER: And we'd use the peer
6 review as the mechanism to do that.
7 MS. DEERING: If it's possible. Let's
8 explore, if we could, depending on -- that wasn't
9 international peer review. I understand it's not as
10 controlled as you might like. It's kind of a who
11 knows what we're going to get. Who knows what DOE is
12 going to get in the way of an interim report, but that
13 should be out. But maybe we could press DOE, not just
14 this panel, but DOE as a Q & A. We've done some
15 creative things before, have a question and answer.
16 Somehow bring our concerns to the table and get some
17 feedback with others on that topic.
18 CHAIRMAN HORNBERGER: How about staff,
19 including TPA?
20 MS. DEERING: Yeah, I was thinking that too,
21 but I was afraid to say it. Yeah.
22 CHAIRMAN HORNBERGER: I should have been
23 afraid, I guess.
24 (Laughter.)
25 MS. DEERING: It deserves some thought. It

1 would have to be done well, if we're going to do it.
2 MR. HAMDAN: I have an experience with this.
3 I like the idea a lot from the standpoint of you have
4 this nice framework which is risk-informed, brings it
5 to the table, and when you talk about where it fits
6 in, this is really got. When Peter Sandman came and
7 gave his presentation, he kind of made the point the
8 way we understood it, that don't try to educate
9 people. Don't try -- you don't go to these meetings
10 to educate these people what you are doing because
11 that's not where it's at. What the people are
12 interested in in these meetings is the things they are
13 concerned about specifically. So I like the idea a
14 lot, in general. I wish in all these meetings that we
15 follow this approach with the TSPA because it makes it
16 more tangible and more evidence based. I like that a
17 lot.
18 When you go to Nevada and the public
19 meetings we've had there, because of what Sandman
20 said, I would be reluctant to go there.
21 CHAIRMAN HORNBERGER: Again, though I'm
22 having trouble keeping disentangling the ACNW meeting
23 which is an ACNW meeting and it has to be an ACNW
24 meeting with a public meeting. I mean all of our
25 meetings are public in that sense, but the ACNW has to

1 do business and I think what I heard Lynn saying is
2 for us to try to look at a creative way to do our
3 business, to accomplish what we need to accomplish at
4 our meeting, but perhaps try to structure it in a way
5 that might be interesting to the interested public.
6 MR. HAMDAN: George, if I may say this just
7 one comment. From that standpoint and you are the new
8 Chairman here, I think that might be an excellent way
9 to go from now on. I really do.
10 MR. LARSON: I think you're going to get
11 lots of questions on part 63 and 197. As you read in
12 the beginning, the State says it's too loose and the
13 NEI says it's too tough and of course in the midst of
14 all this is the NRC is going to come out and issue
15 part 63 consistent with your scheduling there, so I
16 would expect that many of the people in the audience
17 are going to know what do you think of this, what do
18 you think of that? Where are we going here, where are
19 we going there? And it's going to be unrelated to
20 whatever you've got on the agenda. It's just going to
21 be a topic. Where do you go?
22 CHAIRMAN HORNBERGER: You're suggesting that
23 we need to give some thought to was it message mapping
24 or something for our 5 to 7?
25 MS. DEERING: But at the same time we were

1 going to invite Janet and some of the staff and the
2 rule is not ours to defend. We went on record with
3 comments on part 63 and as far as I'm concerned that
4 remains what we have to say about it. Unless there's
5 additional comments.
6 MR. LARSON: You're right. The audience is
7 talking to the Committee and they're going to -- they
8 don't care what the staff says or what DOE says or
9 what EPA says. They want to know what are you going
10 to tell the Commission and of course, you can't really
11 say that, what you're going to tell them. But I mean
12 they're going to want to know your thing.
13 MR. BAHADUR: As George observed, the
14 uniqueness of this meeting is we are trying to merge
15 outreach effort. We're trying to do the business.
16 And yes, we have record, we have opinions on different
17 things and we keep that in our back pocket to bring it
18 up on the table if the question is asked. Otherwise,
19 let's keep the focus on saying how best this public
20 outreach effort and our business that we need to do
21 can be put together. But I think this is a good
22 brainstorming session. I don't envy the job of Jit
23 trying to write, come up with a list, but I think
24 we'll have more time as the day progresses and if we
25 can come up with five or six topics.

1 MS. DEERING: And Latif as our TSPA person
2 and I can work with Latif to propose an idea for this
3 integrating the peer reviews ideas with some of our
4 concerns we raise in vertical slice and having a
5 session, a few hours. We can try to put something --
6 CHAIRMAN HORNBERGER: Could you steal a half
7 an hour between now and Thursday morning and bring a
8 straw person for us?
9 MS. DEERING: We can do that.
10 MR. BAHADUR: Keep Jit in the loop and see
11 how it goes.
12 MS. DEERING: The evening session remains as
13 I see it, the one where we're making a concerted
14 effort to be more responsive and literally making
15 ourselves available to the public for questions, for
16 informal interaction in a creative way that we
17 normally don't do and that still, we decided and I
18 think it's good, we do not prepare a lot of formal
19 comments and presentations where we try to educate
20 them on something. It's more come talk to us, we
21 would like to hear your concerns, some of which we
22 share, some of which we may decide to work into an
23 agenda down the road. We want your input. We don't
24 have answers to all the questions. We're not the NRC
25 staff.

1 CHAIRMAN HORNBERGER: That implies that the
2 NRC staff does have the answers to all the questions.
3 (Laughter.)
4 MS. DEERING: We don't write these
5 regulations.
6 MR. LARSON: And you know you're going to
7 get requests from the State and from the Task Force
8 and from probably Nyde County and probably someone
9 else. So go ahead --
10 MR. SINGH: I want to clarify one point, I
11 want to make sure from my perspective, if I'm going to
12 spend some time on this.
13 (Laughter.)
14 I heard from John Garrick last meeting and
15 I even got the hint this morning that you guys do not
16 want any formal presentation from these people. If
17 you don't want it, I need to know that.
18 CHAIRMAN HORNBERGER: No.
19 MS. DEERING: Which people?
20 CHAIRMAN HORNBERGER: Public.
21 MR. SINGH: State and affected governments.
22 CHAIRMAN HORNBERGER: No, no, I don't think
23 we can have a public meeting without inviting people
24 to present to us. No, no, to present to us. I think
25 that we have to listen.

1 MS. DEERING: We always do that.

2 CHAIRMAN HORNBERGER: I believe what Lynn
3 meant is that the ACNW, we, will not have very much in
4 the way of formal presentations.

5 MR. SINGH: Okay. But --

6 MS. DEERING: From 5:00 to 7:00.

7 CHAIRMAN HORNBERGER: From 5:00 to 7:00,
8 right.

9 MR. SINGH: From 5:00 to 7:00.

10 CHAIRMAN HORNBERGER: From 5:00 to 7:00,
11 right.

12 MS. DEERING: But normally we put the states
13 and the counties, whomever wants to speak, on our day
14 agenda, our daytime agenda. We usually work in an
15 hour or two for those people to make remarks about
16 what they feel are things they would like to say.

17 MR. SINGH: But that's the way we did last
18 year, Lynn.

19 MS. DEERING: What's wrong with the?

20 MR. SINGH: Nothing wrong with that, I just
21 want to make sure are we doing two things because the
22 public meeting, five to seven, that was just one-on-
23 one.

24 MR. LARSON: That's why I raised the
25 question. Do you want these other people separate?

1 I mean, Nye County always to tell you what their
2 finding out in their --
3 CHAIRMAN HORNBERGER: So you're saying is
4 what we need is a whole afternoon devoted, or part of
5 an afternoon.
6 MR. SINGH: Exactly. We need more than two
7 hours then if we're going to have a presentation --
8 CHAIRMAN HORNBERGER: Yeah. Again, we're
9 mixing things up.
10 MR. HAMDAN: I was going to say because we
11 actually are talking about too many things, let's keep
12 things in perspective. The public outreach meeting,
13 at least as of now, is two hours. And if we're going
14 to review their formulas and recommendations by
15 others, you want people to speak who want to make
16 formal presentations to them.
17 So, the inference is maybe to go back to
18 what Lynn said, and Sher, that we control the agenda
19 there, and the bigger meeting is the meeting that we
20 need to really pay more attention to.
21 CHAIRMAN HORNBERGER: Yes.
22 MR. LARSON: You know, in the past the State
23 has come and made a formal presentation, and then they
24 said, "Well, it's a public thing". The public hasn't
25 had the opportunity to hear what we've had to say on

1 their behalf as residents of the State of Nevada, so
2 we'll give a little break --
3 CHAIRMAN HORNBERGER: Okay. So let's go to
4 the two hour public interaction meeting and for right
5 now let's talk about what we're going to do there.
6 MR. SINGH: Does that include the State
7 formal presentation, or are we going to provide
8 another time?
9 CHAIRMAN HORNBERGER: So this is the
10 question. Do we want to organize this to be two hours
11 where we're available as individual members of the
12 ACNW to chat, or do we want to have an hour of it to
13 be semi-formal where we have a very brief overview of
14 what the ACNW does and then invite short presentations
15 from the public, and then break and just do it. I
16 don't know.
17 MR. SINGH: Okay, George, here is my
18 suggestion. Why don't we do this: If we, instead of
19 doing 5:00 to 7:00, we should do 4:00 to 7:00. Four
20 to 5:00 we allow the formal presentation by the State,
21 Nye County and all these people, then 5:00 to 7:00 you
22 guys have one-on-one chat?
23 MR. BAHADUR: I would go one step further,
24 and a proposal. Because outreach is one of our main
25 objectives and public education and understanding is

1 part of the success for this meeting, let's have the
2 entire afternoon session, not just 5:00 to 7:00,
3 because, you know, now that we are talking and we are
4 looking at the agenda, the agenda seems to be too much
5 filled up already and we are going to pare it down
6 quite a bit after the discussion.
7 Let's find out an afternoon session from
8 2:30 to 7:00, for example, with a few breaks here and
9 there, where we just say, "Okay, this is the one which
10 is dedicated to the State, local government,
11 Counties". That's when the people are going to come
12 make their presentations, show their concerns, and
13 this is an opportunity for the Committee to listen to
14 what people are thinking about where they should, so
15 that when we come back, we can go to the Commission
16 and say, "Hey, we went there, we listened to the
17 people, and this is what is going on in their minds".
18 DR. LEVENSON: I think five hours is a long
19 time.
20 MR. SINGH: Okay, so now we are talking
21 between 2:00 and 5:00, let's haggle it to four.
22 Three, I don't know. But, I mean, we should put this
23 as one of our major objectives to have as much time as
24 possible to allow the States and the local Counties to
25 come and talk to us, not just two hours.

1 MR. LARSON: The other thing that the
2 public, though, says, "We work. We have a job. So
3 the State can come in, and the County can come in, but
4 we can't come in at 2:00 o'clock in the afternoon, or
5 3:00 o'clock, or 4:00 o'clock".
6 MR. SINGH: That's the objection we got last
7 year because when we did that 1:00 to 5:00, 1:00 to
8 4:30 last year, similar type of thing, and we have
9 complaint from the public and they say, "We have jobs,
10 we can't come in the afternoon", so that's the reason
11 we decided to do it in the evening. They come right
12 after work, then they have to go home, change clothes,
13 come back 5:00 to 7:00. That was the whole purpose of
14 it.
15 MS. DEERING: We can still do what Sher is
16 saying, it's just that the State and the other people
17 will not really be the public thing.
18 MS. DEERING: Why do you have to call it
19 either from 2:00 to 7:00 or whatever, why not just
20 that part where the State is going to talk like we
21 always have them do, and the affected Counties like we
22 always have them do -- part of our agenda, modified
23 Jit agenda, to include those on the afternoon for two
24 hours or whatever. Don't call it anything special,
25 that's just part of our regular meeting. Then we

1 still have this so-called 5:00 to 7:00 kind of
2 experimental open house, kind of one-on-one, if you'd
3 like to come talk to us about things, still have that,
4 we don't really know how that's going to go, but we're
5 not afraid to try. We're not afraid to experiment.
6 And let's see if anybody even wants to talk to us. We
7 may close down at 5:30.
8 CHAIRMAN HORNBERGER: No, Carol will be
9 there.
10 MS. HANLON: If I'm there, you have to stay
11 there.
12 (Laughter.)
13 DR. LEVENSON: As part of this discussion,
14 we need to remember what's in this draft letter that's
15 proposed to go out, and that is we're inviting people
16 to do ten-minute formal presentations at an evening
17 session.
18 MS. DEERING: We are?
19 CHAIRMAN HORNBERGER: That's the letter.
20 MR. SINGH: It is.
21 DR. LEVENSON: That's going to be changed.
22 MS. DEERING: I didn't see that.
23 CHAIRMAN HORNBERGER: Latif?
24 MR. HAMDAN: George, I want to respond to
25 your question about how we do it in the public

1 meeting. I believe in the concept that if you want a
2 door fixed, you go to a carpenter. If you want bread,
3 you go to a baker.
4 CHAIRMAN HORNBERGER: You want to serve
5 bread, is that it?
6 (Laughter.)
7 MR. HAMDAN: They pay a man $6,000 an hour
8 to come and tell us about 20 or 30 years experience of
9 how he do these things, and he was very clear about
10 that. He said, "You sit and listen. You have a town
11 hall meeting, you don't give formal presentations, you
12 don't talk, you listen to people talk about things you
13 can think of them as problems or opportunities", and
14 if you just switch in your mind that this meeting with
15 the public from 5:00 to 7:00 is an opportunity for us
16 to learn what their problem is and to come and report
17 on it and they can tell us what they want, I think of
18 it as an opportunity without any problem.
19 MR. LARSON: That's what we've done in the
20 past. The only reason I think she put in the ten
21 minutes is if you get --
22 MS. DEERING: We've not done that in the
23 past. We've not looked at opportunities.
24 MR. LARSON: I don't know why you're saying
25 we did.

1 MS. DEERING: I don't know why you're saying
2 we did.
3 MR. LARSON: We've let them talk.
4 MS. DEERING: Well, that's different.
5 Latif's saying transform in our mind.
6 DR. WYMER: I think unless we change the
7 structure of how we do it, we're going to have the
8 same old stuff that we've heard four times before.
9 CHAIRMAN HORNBERGER: That's why we've been
10 trying to figure out a different way.
11 DR. WYMER: Right.
12 CHAIRMAN HORNBERGER: I take your point, but
13 --
14 DR. LEVENSON: We've used the term one-on-
15 one, and one possible way to do that is for you to
16 open it, George, give a little brief discussion as to
17 what the scope of the ACNW is, what it's
18 responsibility is, then identify the areas of interest
19 to the four members, and then split up and say anybody
20 who wants to talk about a topic, you look up the
21 member, go talk to Ray or to John that this is what
22 they're interested in.
23 CHAIRMAN HORNBERGER: That's an interesting
24 idea.
25 DR. WYMER: Somehow or other we need to

1 change the way we do it.

2 MS. DEERING: And we've already decided

3 that, I thought.

4 DR. WYMER: WE talked about -- it seems to

5 me we talked the last time about inviting more

6 representatives of groups than individuals, and that

7 is a change in approach that might be more fruitful.

8 CHAIRMAN HORNBERGER: Again, my sense is

9 that we're winding up mixing things here, okay,

10 because if you have a 5:00 to 7:00 public meeting

11 where it's mostly one-on-one, it's going to be, I

12 think, harder to specifically invite a representative

13 of Nye County to come to talk with us. I think that

14 that's more the afternoon session where the

15 representative of Nye County comes in and tells us

16 what they're doing.

17 So, again, we're sort of in a mix-and-match

18 kind --

19 DR. WYMER: Maybe we need two others here.

20 CHAIRMAN HORNBERGER: Yeah, that's what I

21 was wondering.

22 MR. SINGH: You know, we can do that, that's

23 just the kind of thing to give you what I intend to

24 do, but if we're going to have a formal presentation,

25 then what Lynn suggested, we're going to add that in

1 our regular agenda.

2 DR. WYMER: Do we ever invite people from

3 the State Legislature to --

4 MR. SINGH: Yeah, I said that last year.

5 MR. LARSON: We've had the Executive

6 Director come in and talk, and you've had the Senator

7 come and talk to you a couple of times --

8 DR. WYMER: Well, that's different.

9 MR. LARSON: I mean the Senator from the

10 State, the guy that's in charge of the Legislative

11 Committee.

12 MR. SINGH: The list I gave to you, that

13 includes everything, local Board member, the Assembly

14 member, and everything.

15 CHAIRMAN HORNBERGER: Okay. We're going to

16 have to take a 15-minute break, okay? I think that

17 this is a good start. We're going to have to make

18 some decisions on Thursday morning, some winnowing

19 down, but we have a plan to at least move in the right

20 direction, right?

21 MS. DEERING: By Thursday, we can modify the

22 letter to describe what we're doing in the day and

23 what we're doing in the evening. I don't think we

24 need to send two letters, but one letter to describe

25 both sessions, they're invited to both.

1 MR. SINGH: Sure, we could do that.

2 MS. DEERING: Then Latif and I are going to

3 try to better nail down this idea of a TSPA-related --

4 MR. LARSON: A new strawman agenda.

5 MS. DEERING: -- and then shake out, I

6 guess, some of what's in here that isn't our highest

7 priority and that we'd like to advise the Commission

8 on. Maybe some of this will fall out naturally, and

9 repropose on Thursday.

10 CHAIRMAN HORNBERGER: And you and Latif

11 actually, and Jit, okay, because Jit drafted the --

12 MS. DEERING: Yes, the three of us.

13 CHAIRMAN HORNBERGER: -- we don't want to

14 surprise Jit on this.

15 (Laughter and simultaneous discussion.)

16 CHAIRMAN HORNBERGER: Okay, let's take a 15-

17 minute break.

18 (Whereupon, a short recess was taken.)

19 CHAIRMAN HORNBERGER: Okay. We will

20 reconvene, and we're going to launch right into the

21 next item on our agenda, which is an update on igneous

22 activity issue resolution, and we're going to hear

23 from John Trapp and Brit Hill, and John is going to

24 lead off and I'll just let you proceed, John.

25 MR. TRAPP: I am very glad to be here this

1 morning. As I was jokingly talking about, this first
2 one we're hoping is kind of short. It is not going to
3 be an exciting one. I haven't figured out how to make
4 status exciting. Hopefully when we get to Brit, I
5 think it will get a little bit better.
6 (Slide)
7 This first slide is simply a slide to give
8 a little bit of background information because, as we
9 start on this, as you can take a look, we do have the
10 two basic issues in igneous activity, probability of
11 activity, and the consequence of the activity.
12 In the last couple of years, we've had four
13 major exchanges with DOE on this subject. The first
14 one was in April of last year when we had an all KTI
15 meeting, and that was followed by a meeting simply on
16 igneous activity in August, and Appendix 7 which was
17 held this May, and then our last meeting was another
18 technical exchange in general.
19 The documents that I've got listed here are
20 brought up there because these are the main documents
21 that we've received since the first Technical
22 Exchange. They were all basically put together to
23 address certain concerns, and each one of these was
24 specifically as specific areas which were -- that hit
25 some of our major concerns.

1 And then at the bottom, of course, is the
2 documentation of where our status can be found.
3 (Slide)
4 I'm going to go through probability first,
5 we can go through that rather quickly.
6 At the meeting in April, we sat down a
7 listing of concerns, and just leave them in general
8 concerns areas, that we felt that DOE had to address
9 in the area of probability, and the 11 that we have
10 are listed on this sheet. Next slide.
11 (Slide)
12 When we went into the August meeting, what
13 we ended up doing is taking the 11 concerns and
14 basically subsuming them all into one agreement we had
15 with DOE, and that's simply agreement to do
16 sensitivity studies against our preferred value versus
17 the value that they've got, so that we can show the
18 range in potential effects.
19 In addition at that time, there was a new
20 aeromagnetic map that came out, and we felt that that
21 needed to be looked at. DOE agreed to take a look at
22 it. This was followed up by the letter because, after
23 that letter, we started getting in some of the --
24 before that letter, we had some of the documents, and
25 we saw that in the TSPA they had been using the

1 sensitivity studies, and everything was in agreement
2 with that, so this issue has become closed.
3 CHAIRMAN HORNBERGER: John, are the results
4 of the new interpretation of the aeromag, has that
5 come out?
6 MR. TRAPP: That part is not available yet.
7 CHAIRMAN HORNBERGER: Okay. So, do you have
8 a time frame for that? Do they anticipate it this
9 year, or is that next year?
10 MR. TRAPP: They are doing the planning on
11 it. All I can tell you for sure is it's planned for
12 sometime next year.
13 (Slide)
14 In the area of consequences, we ended up
15 with, in the April meeting, 12 concerns that were
16 brought to bear. These 12 are listed right here. And
17 one point I think I should bring out is, if you take
18 a look at these concerns, where they really came from
19 more than anything else is a combination of reading
20 DOE's document plus they were all someplace in the
21 Issue Resolution Status Report that we put together.
22 These are ones that haven't been closed out. Next
23 one, please.
24 (Slide)
25 During the August meeting, we came up with

1 a series of agreements with DOE. For the first nine
2 agreements, they had all put together documentation of
3 where they were going to be addressing these different
4 items and the method that they were going to address
5 them in. Because of this, they were closed pending
6 the results of these agreements.
7 One dealing with magma interaction
8 specifically in the subsurface was left open. You
9 notice at the bottom that this is not as many
10 agreements as we had points before, while some of the
11 other agreements were closed during the meeting -- for
12 instance, self-evacuation, this type of stuff.
13 (Slide)
14 After we got done with the review of the
15 various material that had been presented, we could end
16 up closing some of the issues. First off, I better
17 explain this "N/A" because it has confused a few
18 people.
19 Several of the issues weren't planned to be
20 discussed in or closed in the documents we received.
21 A lot of them were supposed to be in the revision of
22 the TSPA-SR. Now they were supposed to be in the
23 SSPA. I think at the present time they've been moved
24 on out to a document which is coming in in 2002.
25 But we did close a series of items. Two of

1 them were left open, one of them dealing with the
2 biosphere and magma interaction was left open. In
3 both cases, there wasn't sufficient information
4 contained in the documents to close these things.
5 (Slide)
6 Now, between that meeting, or the letter,
7 and the meeting we had in June, we did have an
8 Appendix 7. The purpose of this Appendix 7 was to
9 basically lay on the table the various points that we
10 needed to have addressed. We were trying to break
11 these into a more detailed, more concise concern
12 because some of those concerns, the way they've been
13 stated, seemed to have been a little bit too broad.
14 In addition, before the meeting, we put
15 together a matrix listing all these concerns with a
16 proposed path forward. This one was given to DOE and
17 was also handed out in the meeting.
18 When we got into the meeting, you'll see
19 that there was a whole bunch of things that happened
20 with these same different issues. We ended up with a
21 series of Closed, Closed pending, but we've got more
22 issues open here, mainly, the information again was
23 not complete and we tried to put together a series of
24 agreements or proposed agreements which would get to
25 closure on these issues.

1 (Slide)

2 The area where we had the best luck
3 basically was in the biosphere, or biosphere-related
4 items as they relate to igneous activity. Because we
5 have commitments which appear to be such that we could
6 take care of most of the biosphere items, I'm fairly
7 certain that when this AMR comes in that biosphere
8 will, for all practical purposes, be taken care of for
9 igneous activity. However, this is the area where
10 we've got a lot of problems, If you notice, these are
11 agreements not reached, and the first 10 agreements
12 basically all deal with magma interactions, either
13 magma interacting with the Repository, magma
14 interacting with the waste package, or magma
15 interacting with the waste form itself.

16 If you take a look at the footnote on the
17 bottom, et cetera, DOE has acknowledged these
18 agreements and will address them as part of a
19 consolidated response.

20 The bottom three -- 11 -- well, it's only by
21 one little point that it's quite big -- this is
22 fluvial remobilization, this is one that Brit's going
23 to be talking about later -- high-level waste
24 incorporation is simply making sure that they have a
25 justification instead of just using the NRC code.

1 And this last one is another biosphere one
2 which I actually feel kind of bad about because it was
3 thrown in at the very last minute. Therefore, DOE
4 really didn't have a chance to address it. I think
5 this will also be addressed in the AMR that's coming
6 out.
7 (Slide)
8 So, if we go back kind of to the beginning,
9 where are we sitting at the present time? Well, if we
10 go back to our technical concerns, anything dealing
11 with magma interaction is open.
12 Wind characteristics, looks like that should
13 be no problem. Mass loading/biosphere, like I said,
14 I think -- I know most of that will be closed. I
15 think the whole thing will be closed once we get this
16 AMR in.
17 Remobilization, again, Brit is going to be
18 talking about that. That appears to be a concern area
19 which quite a bit of work has got to be done in. And
20 the rest are pretty well self-explanatory. Next
21 slide.
22 (Slide)
23 Where are we going from this? Well, in
24 simplest form, the NRC needs to do continued work on
25 magma interactions and remobilization to basically be

1 at the point where we can really review and analyze
2 what DOE comes in.
3 DOE? Yes, they've got to provide the
4 information, which they've already said, but more
5 important, DOE has got to come up with some response
6 to the NRC proposed agreements and some method of
7 responding to these that we can get to a point that we
8 can assume that when licensing is coming, we will have
9 the information we need. At the present time, as you
10 know, we're coming up to SR. Very honestly, at the
11 present time, we would have to have at least igneous
12 activity and negative finding SR because we haven't
13 seen the information.
14 (Slide)
15 And this isn't in your package, but we got
16 an e-mail from April Gill, and I just took the main
17 part of it -- I've got the whole e-mail if you care to
18 see it -- and as you can see, they are talking mid-
19 October or October-November time frame for getting a
20 response to us on this type of information which,
21 according to the present schedule of SR, actually
22 makes the information too late to be brought into SR.
23 So, we do have a concern on this. We're not
24 sure exactly when or how we're going to be able to
25 resolve it. And that, in simplest form, is where

1 we're sitting at the present time.

2 DR. GARRICK: Is the NRC pretty clear on

3 what it's looking for?

4 MR. TRAPP: I think the NRC has been

5 extremely clear. Like I said, we put together a

6 matrix which listed exactly what we had. We had the

7 Appendix 7 where we sat down and discussed all these

8 points with DOE and, in addition to that, we've had I

9 don't know how many different telephone conversations

10 with DOE, going over these type of concerns in great

11 detail.

12 DR. GARRICK: What form do these take

13 primarily? Are they primarily methods of analysis,

14 primarily phenomena issues?

15 MR. TRAPP: It's a combination of

16 identifying the phenomena, understanding it and doing

17 the analysis correctly. So, it's really kind of a

18 spectrum.

19 Part of your answers will actually come when

20 Brit starts talking because we've purposely chosen

21 magma/Repository interaction and the remobilization as

22 examples to give you the technical detail as to what

23 we're looking for.

24 In biosphere, that would be a little bit

25 less because we've gotten far enough along on

1 biosphere that really what we're looking at in most
2 cases is clarification of some points.
3 DR. GARRICK: Thank you.
4 CHAIRMAN HORNBERGER: Other questions?
5 (No response.)
6 John, I was reading about the last Technical
7 Exchange meeting, and there was -- I hope I have the
8 name right -- a Professor Smith who presented some --
9 MR. TRAPP: Gene Smith.
10 CHAIRMAN HORNBERGER: -- information on
11 recalculation of probabilities.
12 MR. TRAPP: He didn't do any recalculation
13 of probabilities. What he did is presented some
14 information which he thought should be taken a look at
15 again to re-examine probabilities.
16 CHAIRMAN HORNBERGER: Okay. So my question
17 then is how does this affect your agreement with DOE?
18 Are there some recalculations necessary?
19 MR. TRAPP: The preliminary response I would
20 have -- and Brit can chime in anytime on this -- is
21 what we've seen from the State on this subject would
22 not affect our calculations. It could possibly do it
23 -- I'm not going to speak for DOE, but I can't see
24 where it would affect our calculations at all. We're
25 going to do some more looking at it in detail but, so

1 far, no.

2 CHAIRMAN HORNBERGER: How about the physics

3 underlying -- or geophysics underlying his notion, is

4 this consistent with your conceptual normal of

5 vulcanism in that part of the world?

6 MR. TRAPP: Well, first off, there's two

7 things. There long has been recognized that there is

8 a Northeast trend of vulcanism through the area. And

9 what Gene is doing there in one point is simply

10 reanalyzing, just taking a look at it, and I don't see

11 anything specifically new there.

12 CHAIRMAN HORNBERGER: Okay.

13 MR. TRAPP: The concept of the "waning and

14 waxing" of vulcanism, et cetera, tectonics, et cetera,

15 we really know that that cannot be really handled with

16 the present knowledge and the information we've got

17 to-date.

18 MR. HILL: This is Brit Hill, from the

19 Center. We need to take a look at the paper that Gene

20 and others have, I believe, that's in press with JGR

21 and give it a careful read. Based on the information

22 that he presented, I think we have some potentially

23 significant differences with his interpretation of the

24 data.

25 I believe that he's looking at a very

1 regional trend over very long periods of time, and to
2 apply that knowledge to a very localized area for a
3 very short period is going to be quite a challenge.
4 So, there's nothing that a new interpretation of how
5 we would view the next 10,000 years, certainly nothing
6 came jumping out in his presentation about how that
7 would directly affect any existing probability model,
8 but we want to give it a careful read before we say
9 for sure.
10 CHAIRMAN HORNBERGER: Okay. Thank you.
11 Okay. So, I guess we'll move on to your presentation,
12 Brit.
13 MR. HILL: Let's see if we can make the
14 technology work for us. Am I allowed to kick it once,
15 or twice?
16 (Slide)
17 I understand that the ACNW would like to
18 delve a little bit into a few technical areas today,
19 in addition to some programmatic concerns, so I tried
20 to blend them all together and we would choose to look
21 at how magma interacts potentially with the
22 Repository, and once that interaction had occurred,
23 the long-term effects of surface redistribution
24 processes and how that can potentially influence risk.
25 But before we go into all of that, I want to

1 take just a few minutes and talk about our best
2 understanding of how normal basaltic igneous processes
3 operate, and then we can delve on how those processes
4 may change if it would interact with a subsurface rift
5 system.
6 (Slide)
7 What we have here is a very simplistic
8 picture of how magma is ascending in the crust.
9 Basically, down below about 2 km beneath the ground
10 surface, we have pure basaltic magma, no bubbles in
11 it, with the source region, about 30 km or so beneath
12 the earth. That magma begins to rise from a series of
13 processes that are pretty poorly understood, but can
14 be thought of at the scale of the Repository as fairly
15 random process. There's no deep structural control on
16 the scale of kilometers that operates at a source down
17 at 30 km depth.
18 So, magma begins to rise, it's rising
19 essentially vertical, and once we get to around 2 to
20 1 km beneath the crust -- excuse me -- beneath the
21 surface, we begin to form gas bubbles in the water
22 that's in the melt originally begins to exsolve and
23 form its own discrete vapor phase.
24 Now, ahead of this dike, on the order of
25 hundreds to probably thousands of meters, several

1 kilometers in advance of the dike tip, we begin to
2 propagate fractures. These fractures form essentially
3 instantaneously in front of the dike, and form the
4 pathway that the dike is going to exploit to reach the
5 surface.
6 There are several different models you can
7 choose from in the literature, but the simplest one is
8 that the dike forms a very narrow tip on the order of
9 about 100 meters length, until it gets down to about
10 a meter wide, 100 meters below the tip and, with the
11 excess pressure that's in the magma system, forces the
12 rock apart on that plane of the fracture in response
13 to a lithostatic overpressure on the order of about 10
14 megaPascals relative to surrounding with the static.
15 So, as the magma is ascending, it forms this
16 nice, little wedge, dilates the fracture where it
17 propagates hundreds of meters in advance of it, forces
18 it apart, and starts moving up towards the earth's
19 surface. Again, we know there has to be a significant
20 overpressure in the system both to overcome not only
21 the static pressure that's surrounding the rock, in
22 addition to doing the work necessary to dilate these
23 very minute fractures, it is something that has an
24 aperture of about a meter in diameter.
25 Now, a dike doesn't always have to

1 propagate, especially in the shallow surface. It
2 doesn't always have to propagate a new fracture, it
3 can exploit existing fractures that are in the right
4 orientation, and once you get about 20 degrees away
5 from trend of local horizontal stress, we begin to
6 have energetically much easier time to propagate a new
7 fracture than to dilate a fracture that's 20 degrees
8 off-trend from the principal stress.
9 So, that's the sort of uncertainty we're
10 dealing with in what kind of fractures when we get to
11 within a kilometer or so of the surface can be
12 exploited, something that's going to be off plus-or-
13 minus 20 degrees of horizontal, or in the Yucca
14 Mountain region, anywhere about North 10 degrees East
15 plus-or-minus 20 degrees, about there, is what we
16 would call an easily exploited fracture.
17 So, the magma comes up, finally gets to the
18 surface, and now we're looking at plan-view. This is
19 what we are interpreting from a number of well
20 documented eruptions, historically Heiney 1973, the
21 1975 Tolbachik eruption in Kamchatka, and 1943
22 Paricutin. All these eruptions, the initial stages
23 were pretty well observed, and are characterized by a
24 fissure of about 1 km long that forms during the
25 initial hours of the eruption.

1 By the time the dike is within a kilometer
2 or so of the surface, its neck-down from potentially
3 many kilometers long in depth, down to about a
4 kilometer long when it gets up fairly close to the
5 surface. We're also seeing a slowing in ascent that
6 can be driven primarily by gas escape.
7 So, when we get to the initial stages of the
8 eruption, that first 24 hours, there's a very bubbly
9 flow and in terms of bulk composition, fairly low
10 total volatile abundance. A lot of the volatiles have
11 escaped from the dike during ascent.
12 So, to get this nice Hawaiian sort eruption
13 of fire fountains along this 1 km long fissure, not
14 much ash coming up and generally the nice, spectacular
15 things you see on the Discovery Channel from these
16 nice Hawaiian fire fountains.
17 That goes on for about the first 24 hours.
18 And in response to a fairly complex process of cooling
19 and different pathways right along that plane of the
20 dike ascent, we begin to cool the edges of the dike
21 and localize vertical magma flow around a central part
22 of the initial dike. This is what we see at these
23 historical analogs, the fissure, the 1 km long
24 fissure, localizes into a single vent within about 24
25 hours, and we begin to focus the flow generate

1 eruption columns that can go up to maybe 8 km high
2 during the first several days of the eruption, and
3 begin to develop a conduit.
4 Now, one of the key things that we observe
5 at historical eruption is the first stages of this
6 focused flow is really poor in wall rock. Even though
7 we have the highest columns and the highest eruption
8 velocities, there isn't much of that subsurface rock
9 that's being reamed out. There are very few wall rock
10 fragments. It's only later in the stage, after we've
11 had a significant amount of flow and what I think to
12 be heating in this conduit system, that you begin to
13 pluck off sides of the wall rock and fling them out
14 all over the countryside and widen that conduit from
15 an initial several meters in diameter out to 10s of
16 meters in diameter during the course of the eruption.
17 A lot of this is based on over- and
18 underpressure relationships as we have magma flow in
19 this channel -- overpressure, stress the rock;
20 underpressure, pluck it out. There's also localized
21 interactions with groundwater and simple mechanical
22 plucking that serves to widen out this conduit.
23 An important from all this is these
24 eruptions are very dynamic. It's hard to take a
25 simple, stead model and apply that for the duration of

1 several weeks of an igneous event.

2 Now, how do we take all this and try to
3 figure out what happens if ascending magma interacts
4 a series of tunnels 300 meters below the surface? It
5 started off with a very simplified one-dimensional
6 flow-to model that has a closed end, and conceptually
7 we just have a 5 meter in diameter dike and a 1 meter
8 wide dike, and we're modeling what happens in 1 D as
9 that center of the flow path turns the corner and
10 flows down about a drift length of about 200 meters.

11 The beauty in all of this is that we allow
12 the area term to change from about an 80 square meter
13 area down to a 20 square meter area and calculate the
14 effects of decompression and acceleration as we come
15 up from this confined dike into an essentially
16 nonconfined drift.

17 With an 80 meter drift spacing, we have
18 enough volume in the proposed Repository structures to
19 capture the ascending magma flux in its entirety, with
20 a minimal amount of acceleration. A 1 meter wide dike
21 with an 80 meter long segment coming up with an ascent
22 rate of about a meter per second, which is on the high
23 end for magma ascent rates, gives us a flux of 80
24 cubic meters per second.

25 Now, a drift being 20 meters in diameter,

1 you can see if we have a flow rate of about 4 meters
2 a second, we can capture that ascending 1 meter a
3 second dike by focusing flow and accelerating it to 4
4 meters a second in the initial drift. Let's just keep
5 that sort of sense of scale in mind that we're not
6 talking about having to have much acceleration to
7 capture the ascending mass flux.
8 Now, this is from the Woods, et al, 2000
9 paper, which I believe you all have a copy of, and I
10 know it's a fairly complex problem -- excuse me --
11 complex figure, but this point right here represents
12 the interface between the dike with depth increasing
13 as we move off to the left, and the drift, the 200
14 meter long segment, as we move down to the right, and
15 the Roman numerals represent time steps.
16 So, here under Step I is the initial point
17 of intersection where the pressure is essentially the
18 lithostatic pressure as we move down in the dike
19 system, and the initial period of flow -- I believe
20 it's a .02 second time step. This is the first .02
21 seconds after intersection with the drift. And we
22 move on -- point IV, point VI, and I believe this one
23 we have a little jump in time, we're at 1 second after
24 initial intersection.
25 What happens is as the magma accelerates,

1 departs from the dike, we of course remove that mass,
2 lower the pressure in the subsurface dike system, but
3 also it begins to reflect off the back of the drift
4 and form this pressure wave that propagates back in
5 the system to ultimately, within several seconds, we
6 get an amplification of that interaction that gives a
7 buildup in pressure to about 40 megaPascals towards
8 the end of the drift.
9 Now, I've got to emphasize this is a very
10 transient phenomena, it's only related to the shock
11 phenomena of having that initial magma flow
12 decompress, accelerate and hit the end of the drift
13 and be reflected backwards. If the drift was entirely
14 open, you would not get a reflection phenomena like
15 that. But we believe that the possibility of backfill
16 on the drift may be sufficient to stop that flow and
17 have this act like a simple closed system.
18 We are also seeing acceleration in velocity
19 in terms of meter per second, but the initial
20 decompressive flow could get on the order of 150 to
21 200 meters a second, but drop down very quickly to a
22 low-flow velocity, but still above the 4 meters a
23 second that we would need to be capturing the mass
24 flow into the system.
25 The reason we're worrying about all this is

1 the concern that this initial interaction may develop
2 sufficient pressures or flow rates to cause damage to
3 the waste package or, more importantly, to create
4 fractures at the point of reflection, at the end of
5 the drift.
6 Can you have enough overpressure develop to
7 instantaneously hydrofracture and develop a series of
8 fractures at the end of the drift relative to anywhere
9 else within the drift?
10 I wouldn't want you to just believe a one-
11 dimensional numerical model. We are doing a series of
12 analog experiments at the Center to validate the
13 numerical models, both the one-dimensional and two-
14 dimensional models that we're working on. We're using
15 a mixture of gum resin and acetone as an analog for
16 magma with water in it, and in terms of the rheology
17 and decompression characteristics, this behaves very
18 similar to what we believe magma behaves in the
19 shallow crust.
20 We're using what's called a "Hele-Shaw
21 cell", which is nothing more than a large pressure
22 vessel where we can regulate the pressure, that's
23 connected to an acetone and gum resin reservoir that
24 we can monitor, with a hole up here that's gated.
25 Now, if we turn around to the side -- there is again

1 our Hele-Shaw cell -- we have this glass tube with
2 pressure transducers in it. We conduct a series of
3 experiments where we have a known pressure and known
4 volume in the Hele-Shaw cell, open the gate, and look
5 at flow rates and pressure gradients within this glass
6 tube, measure them very quickly because these
7 phenomena occur very rapidly, and then try to model
8 with the numerical codes that we're using, should we
9 expect the same sort of thing with the gum
10 resin/acetone as we're modeling for the basalt.
11 The key problem that we're having to address
12 is the pressure density variations for acetone are not
13 well known. We have to look only at the expansion of
14 acetone as we decompress it. There is also the
15 possibility that we're getting acetone coming out of
16 solution into a volatile phase when we decompress it
17 in the same way that we're currently modeling the salt
18 water interaction. The water vapor that's expanding
19 is only the water vapor that exists at the point of
20 decompression. We are not allowing water vapor to
21 diffuse out of the melt and migrate into the vapor
22 phase. We think it is diffusion-limited for the time
23 scales that we're dealing with. We have to verify
24 that.
25 The end result, though, is we've got the

1 initial experiments done. We have the initial
2 equation of State. We have to do some confirmatory
3 experimental work and some additional pressure ranges
4 to fully account for the pressure ranges that we're
5 modeling but, ultimately, I think we're going to be
6 able to validate or invalidate the numerical approach
7 with the analog experimental approach and have some
8 confidence what we're modeling numerically actually
9 means something realistically.
10 Of course, we can't go out to an analog
11 system and look at where magma has come in contact
12 with the drift system 300 meters below the surface, at
13 least we haven't found any yet.
14 DR. GARRICK: Is this a procedure, or
15 analysis of a model that's customarily used in
16 igneous?
17 MR. HILL: There have been a number of
18 experiments that have been done for dike ascent using
19 gum resin/acetone as a basalt analog. So the concept
20 and the technique has been reported in the literature
21 and it would be recognized as a relatively standard
22 approach.
23 DR. GARRICK: Thank you.
24 MR. HILL: While we're worried about the
25 pressures in the initial stage of magma interaction,

1 it can also be explained by looking at potential
2 topographic effects. WE know that in the Repository
3 we have significant variations in the amount of
4 overburden from the proposed drift to the proposed
5 Repository site. This is just one example cross-
6 section I want to use to illustrate the gist of the
7 problem.
8 If we have an assumption of integrated rock
9 density of about 2400 kg per cubic meter, I'm just
10 looking at the simple vertical component of stress.
11 We can have a variation using the geologic framework
12 model. They have a variation of about 8.3 megaPascals
13 beneath the highest point of Yucca crust, down to
14 anywhere from about 6.7 to even 4.3 megaPascal based
15 on variations in the amount of overburden.
16 So, if we're propagating a dike and the dike
17 is coming up with no real structural control on it,
18 which is the way we believe is most proper to
19 represent this system, and we potentially have an
20 interaction with a drift, we believe the one-
21 dimensional model and the two-dimensional model I can
22 talk about, would show that magma would be flowing
23 into the drift, and that substantial, if not all, of
24 that magma would be captured by the drift system for
25 the 80 meter segment we discussed earlier.

1 As that magma flows, of course, in both
2 directions and we develop this initial shock
3 reflection, where that shock reflection occurs at its
4 highest magnitude appears to be at the points that
5 would have the lowest amount of overburden and
6 potentially the lowest amount of strength. And we saw
7 pressure variations on the order of 40 megaPascals
8 during that initial shock reflection, from the USW G-2
9 well projected down from the North a few kilometers
10 will hydrofrac experiments 300 meters below the
11 surface. Well, all you do is, you seal off the well,
12 pump it full of pressure and say, "Hey, at what point
13 do we generate fractures in the weakest plane of
14 stress in that well?" Well, 300 meters in G-2, it's
15 a 5 megaPascal essentially stress.
16 So, variations on the order of megaPascals
17 in addition to the strength components appear to be
18 very reasonable for developing fractures at the
19 proposed drift horizon, and the amount of initial
20 stress may be sufficient to generate a fracture
21 preferentially toward the end of these drifts relative
22 to someplace randomly along that drift.
23 The reason that's important is if you
24 develop a flow path that comes up towards the ends of
25 the drift and the initial point of intersection is

through here, there is a possibility of entraining much more waste than if you just had a simple vertical ascent pathway and a conduit developing in a much more narrow area.

Now, there's many steps to go before you can say exactly how this impacts risk. We need to know how the system interacts in the steady-state, how flow throughout the duration of the eruption can occur, whether we're getting phase segregation, and with this potential deflection, how do the waste packages respond and how could waste potentially be entrained, and how could this deflection potentially affect the character of the resulting eruption? Many steps to go. But, clearly, this is a non-negligible problem and one that we're going to have to attack technically from detailed numerical analysis, again, because we just don't have any analogs to go on.

We've done some initial calculations on a more steady model as well, not just the initial seconds of interaction, but what could happen once we've breached the conduit to the surface and flow continues, like we see for many weeks in analoging these events.

What we have are three alternative conceptual models that we need to consider that we

1 believe scopes the extent of the problem. The first
2 is the one that we've all been using where we have
3 Magma ascent along the initial vertical plane, no
4 significant horizontal deflection, and the conduit
5 forms essentially along the same plane of initial dike
6 propagation.
7 The second one is where we have blockage at
8 the end of the drift, the Magma flows into the drift,
9 refills or fills into the drift, repressurizes until
10 it's an equilibration with the surrounding Magma
11 system, and then fractures at the point of greatest
12 weakness, wherever that may be. We think there may be
13 a bias toward the drift ends, but it could be that an
14 existing fracture towards the center of the drifts may
15 provide the zone of greatest weakness that would allow
16 propagation. Again, that would have to be modeled
17 explicitly.
18 And, finally, if the access drifts are open,
19 they are not backfilled -- and we recognize that the
20 current design has backfilled access drifts -- that a
21 non-backfill access drift could allow Magma from
22 multiple intersected drifts to flow out and
23 potentially breach to the surface at another point of
24 greater weakness.
25 So, flow paths to the surface really depend

on a complex series of processes. Where does the dike initially intersect the drift? What kind of interactions do we have within the drift? What sort of blockages are in the drift, both engineered blockages and ones that could potentially arise from chewing up waste packages or rock fall? We don't know. But, more importantly, what's ultimately the roof strength? What is controlling the localization of breakout? Is it a randomized process, or is it biased towards specific locations? That bias may induce a much longer flow path and potentially much more waste entrained than were currently modeled.

The other problem is that we've seen from real eruptions that changes occur. We can take any steady model and apply it instantaneously and describe an instantaneous aspect of an eruption, but we know that conduits will change shape, will widen in the course of an eruption. The amount of volatiles will change. The column heights will change. A normal eruption evolves through time as different flow conditions occur.

So, we may have a situation where the initial stage could be something like a traditional conduit, but because of backpressure in the system it becomes easier to flow and breakout in Model B at some

later stage in the eruption, and propagate a new conduit than it is to continuously widen the conduit. We know this happens in normal eruptions, we've seen multiple events form from single eruptions where one volcano shuts down, stops for about 12 hours, and then the locus of activity moves a kilometer to the north and the whole thing starts off again. That's what happened at Paricutin, it's happened at Cerro Negro, it's happened at Tolbachik, quite dramatically.

So, for any model that we develop, we have to recognize that in the course of an eruption that model could change dynamically. This is Figure 5 from Woods, et al, that takes a very instantaneous look at the flow conditions but, again, recognizing that this is only a brief snapshot in time, to coin the phrase. For these alternative flow paths, we could have a pressure profile from depth below the surface that can be anywhere from under lithostatic pressure to slightly around lithostatic with a decrease in response to flow through a short segment of the drift, to something where we'd have a very large horizontal flow path with choke conditions that could result in a lot of backpressure in the system. And you can see here that these pressures that we're talking about fairly shallow beneath the crust, are well in excess

1 of what you would consider to be the confining
2 pressure.
3 So, just to say logically how we think this
4 could evolve, you would start off with a Case 3 model,
5 that would be something where you would have flow into
6 an access drift. You develop the very initial stage
7 of that conduit toward the surface, but as you
8 continue to move Magma through that system, it became
9 choked and would overpressure itself quite
10 dramatically, but overpressure would probably lead to
11 development of additional breakouts in response to
12 that pressure. So, you wouldn't keep this kind of a
13 situation going for many weeks of the eruption, the
14 system would have to adjust in response to the choked
15 conditions. A lot of this comes into the problem of
16 you're putting on an additional path for decompression
17 and volatile evolution as the Magma flows horizontally
18 for some distance.
19 During equilibrium ascent in an undisturbed
20 volcano, that Magma is coming up and in that last 300
21 meters, it's rising to the surface fairly quickly, so
22 the volatiles aren't all coming out, you're still
23 letting some of the volatiles evolve as you're having
24 the eruption progress during atmospheric transport.
25 But under these alternative models, the volatiles are

1 being kept in and coming out of solution as we flow
2 horizontally in the drift system for many more
3 hundreds of meters, potentially hundreds of meters.
4 So, once we come out to the surface, there
5 is much more of the gas phase that's evolved, but
6 still coming out of a small typical conduit. That's
7 why you're getting a choked flow condition. You've
8 allowed too many more volatiles to come out relative
9 to a normal undisturbed basaltic eruption, that's why
10 we believe that while these are nice mathematical
11 calculations, we're not going to see these
12 overpressured choke conditions stay too long in any
13 potential interaction. We're going to have to develop
14 additional conduits in response to these sort of
15 overpressures.
16 So, to just wrap up the Magma Repository,
17 the ones we're pretty confident of is that a
18 decompression of Magma into a drift gives a short
19 duration overpressure. Now, I wouldn't want to
20 stretch a one-dimensional model very far, but I think
21 this statement holds true. We know we're
22 overpressured in the system. We know the drifts are
23 essentially atmospheric, and if the drifts are non-
24 backfilled, we expect an overpressure to develop due
25 to that initial shock reflection. It's a basic shock-

1 to problem.

2 It appears -- and I just say "appears" --
3 that that pressure transient is sufficient to generate
4 a fracture based on analogy with the hydrofracturing
5 experiments that have been doe at Yucca Mountain.
6 Five megaPascals is about all you need to start to
7 generate a fracture.

8 We recognize that in that one-dimensional
9 model, the pressure that you get is very sensitive to
10 the intersection geometry. How wide is that opening
11 between the dike and the drift? We are conducting
12 additional sensitivity studies to try to look at both
13 the rate of opening and the aperture of opening to
14 look at the variations in pressure. We know it's not
15 going to be an instantaneous 1 meter wide dike
16 intersecting, but that's what we started with for
17 simplicity. We know it's probably going to be a much
18 narrower opening, and it's going to be a rate of
19 opening as the Magma interacts with those drifts.

20 The magma flows into the drifts until we get
21 fairly re-equilibrated with the underlying magma
22 system. We're not sure about the rate of volatile
23 resolution, but it's probably not significant. It's
24 a fairly compressible system until we get down back to
25 the incompressible or relatively incompressible magma.

1 So, even though we can argue about the initial couple
2 of seconds to couple of minutes, that magma is flowing
3 into the drift. It seems to be a very inescapable
4 conclusion.
5 Then, as we fill up the drift, it's going to
6 have to re-equilibrate with the pressure in the
7 underlying fluid system. So, breakout seems likely at
8 some point. Now, whether that breakout continues
9 along the plane of initial intersection or develops in
10 a zone that may be weaker, we've got a couple of steps
11 to go before we get there, but that breakout really is
12 going to depend about where the roof is weakest. It
13 has nothing to do with any controls of the initial
14 point of intersection.
15 And, finally, we recognize that the eruption
16 character and conduit location can change
17 significantly during an event in ways that we haven't
18 begun to model yet. We don't know how many conduits
19 could potentially evolve, and we don't know what the
20 effect on eruption characteristics may be. Would we
21 get is sustained convective eruption after one of
22 these alternative models? I don't know. That's one
23 of the problems we're trying to work on is, if you
24 have flow during this horizontal system and you begin
25 to fragment it more extensively than you would during

1 equilibrium ascent, would you have enough thermal mass
2 at the surface to ingest air and rise buoyantly, which
3 is the dominate force of rise for a volcanic plume.
4 Would you have enough thermal mass there to continue
5 to rise buoyantly, or would your thermal mass be
6 diluted enough from that initial fragmentation that
7 you wouldn't have enough to ingest air, essentially
8 quench the eruption and go to a fire fountain? That's
9 a question that we're trying to answer with a number
10 of our consultants.
11 Why is this important? Ultimately control
12 the extent and duration of magma flow into the system.
13 That controls the temperatures and pressures that we
14 need to evaluate for waste package response. We
15 recognize that there's likely dynamic pressure
16 variations during the course of an eruption where we
17 can have over- and underpressures beyond what we've
18 been talking about initially. Our concern is that the
19 damage may be more extensive than is currently modeled
20 in the TSPA-SR. In other words, with the Zone 1 which
21 is related primarily to the initial intersection may
22 be much more extensive than currently is modeled, and
23 that we may not have substantially complete
24 containment within Zone 2 following the duration of an
25 igneous event. The groundwater source term may be

1 much larger than currently modeled.

2 Also recognize that we have alternatives for
3 the number of flow paths to the surface. We may have
4 more conduits possible than we're currently modeling
5 based on these alternative flow models. And while we
6 talk about the waste package response for the
7 intrusive scenario, we also recognize that any
8 horizontal flow has the potential to entrain more
9 waste that were currently modeled for the volcanic
10 disruption component as well.

11 But, again, how that all translates into a
12 quantitative measure of risk has many steps to go
13 because we have to first take that disrupted waste
14 package and look at how possibly we can entrain that
15 material and what effects on transport this process
16 may have.

17 Before I move on to the remobilization, I'd
18 just like to take a pause and see if there's any
19 discussions about magma/Repository.

20 CHAIRMAN HORNBERGER: Questions on
21 magma/Repository interaction? Milt?

22 DR. LEVENSON: It sounds to me, from what
23 you've just said, that -- well, let me ask a question.
24 If after the placement of the waste containers the
25 drifts were backfilled, it looks like that might

1 reduce very, very substantially the effects of
2 volcanic activity, is that correct?
3 MR. HILL: It depends on the extent of
4 backfill and how large of a gap that you'd have on --
5 between the backfill and the roof. You would need --
6 I'm not sure how small the opening would have to be,
7 but based on analogy with lava flows, an area of less
8 than a meter to half-a-meter appears to be a critical
9 distance between a large surface area for cooling
10 versus a small volume of mass to keep the thing
11 flowing.
12 DR. LEVENSON: But even if it continued to
13 flow, if it flowed above the backfill, it wouldn't be
14 interacting with the waste container.
15 MR. HILL: That's correct for the initial
16 stage, but you have to remember that as it flows into
17 the drift system, it would again re-equilibrate -- it
18 flows in until it is blocked at the ends of the drift,
19 then you repressurize and the thing propagates again.
20 DR. LEVENSON: Yes, but it propagates by
21 cracking and going somewhere else, not necessarily by
22 dissolving the waste container.
23 MR. HILL: During the initial stage of
24 propagation to the surface -- I'm answering your
25 question -- during the initial stage of propagation,

1 you're correct. As that flow path -- let's say it's
2 flowing horizontally along the rubble during the very
3 initial stage of reascent, it's not interacting with
4 the waste package, but the volume of material that's
5 coming out indicates that the eruption would have a
6 duration on order of weeks. And as these flow
7 conditions continue to evolve, it's going to be
8 entraining all that loose material. We know that
9 conduits go from a 1 meter wide dike into solid rock
10 in the order of 10s of meters in diameter conduits, in
11 response to these over- and underpressure variations.
12 So, during the course of an eruption, if we
13 establish a flow path to the surface that has flow
14 along the top of the backfill or rubble that occurs,
15 we think it's highly likely that that rubble would be
16 entrained very quickly in the course of the eruption.
17 So, all you've done is delayed -- you certainly have
18 mitigated the initial shock damage effects, but if you
19 get the flow breaking out through the roof in the
20 course of the eruption, you will be entraining that
21 material in the way that all conduits entrain
22 material, and probably exposing the waste packages
23 very quickly to the flowing magma system. So, don't
24 think you're buying too much. The key is stopping
25 that flow from ever occurring across the top of the

1 rubble. You need enough backfill, you've got to fill
2 it to the rim to keep that magma out.
3 DR. LEVENSON: I understand that part of it,
4 but the significantly reduced cross-section
5 significantly increases the backpressure, and
6 therefore it seems to me the likelihood that it
7 doesn't go a long ways and then pop up, but in fact
8 continues upward from the original conduit is
9 significantly increased by having backfill.
10 MR. HILL: Right.
11 DR. LEVENSON: You already have fractures
12 above because the rear diagram, the factors precede by
13 a long ways. The only reason flow started into the
14 tunnels is at that instant that was a lower
15 backpressure.
16 MR. HILL: Right.
17 DR. LEVENSON: Now, if you modify that
18 backpressure, I'm not concerned what goes on way down
19 there, it seems to me that a significant fraction of
20 the magma just continues straight up on its original
21 path.
22 MR. HILL: As part of our scoping
23 calculations, we looked at a cross-sectional area 5
24 meters in diameter and didn't see in one-dimensional
25 models an appreciable change. We still were getting

1 a change, of course, a variation in the flow rates,
2 but not enough to actually stop the flow. It's not
3 choked enough to keep it from propagating forward.
4 But, again, one-dimensional model, we're not
5 explicitly accounting for particle/particle
6 interactions, any of the roughness characteristics in
7 the drift could be very critical to this, and I
8 thoroughly agree that the presence of backfill could
9 have a very significant effect on the magnitude and
10 extent of magma flow.
11 CHAIRMAN HORNBERGER: Ray?
12 DR. WYMER: I would just observe that I'm
13 impressed by what you have yet to do.
14 MR. HILL: And this is to enhance our review
15 capability.
16 DR. GARRICK: Let me ask you something. One
17 of the disappointments in the mountain, I guess, has
18 been the fracture density is higher than a lot of
19 people had hoped it would be. But isn't that good
20 news with respect to the initial shockwave and from an
21 energy dissipation standpoint, and how much of an
22 effect might that have? I think the way your model is
23 now, you're not taking any credit for that.
24 MR. HILL: Right. The thing that I try to
25 remember is that we're not dealing with just simple

1 air pressure, it's an air/magma mixture, and any sort
2 of overpressure we have in the system -- and, say, we
3 have a lot of fractures through there, the fractures
4 are very small aperture. I think any of this mixture
5 that starts to flow into a fracture is going to pretty
6 well seal itself by quench very quickly. So, coming
7 down the drift, we have an overpressure developing in
8 the drift even though we have a fair amount of
9 fracture that's obvious under atmospheric condition
10 for permeability, the actual aperture on those
11 fractures is pretty narrow. And trying to force a
12 viscous magma mixture into there, given a very small
13 opening, I think you're going to seal these very
14 quickly from any sort of little flow into the system.
15 So, I don't see too much of a shock
16 dissipation occurring and, based on again some scoping
17 calculations, I think it's less than 10 percent.
18 DR. GARRICK: Doesn't that depend on what
19 the form of the initial shock is, whether it's mostly
20 gas, as to what the dampening effect would be?
21 MR. HILL: We haven't modeled that
22 explicitly. I'm trying to answer the question
23 directly about at drift ends, given those kind of
24 fractures, but what sort of fracture density are we
25 really talking about? I think I would calibrate your

statement a little bit on the number of fractures there while from a hydrological perspective may seem very large, from a volcanic mass perspective, actual opening and volume perspective, may be very, very small.

I'm biased towards what I've seen dikes do. When I look down 500 meters to a kilometer below the surface, you get the very small fractures right around the dike. You rarely get intrusion more than a centimeter or so before the thing just quenches out, and I think the same process would occur here.

DR. GARRICK: But there is quite a bit of surface area with the tunnels, and I was just curious as to whether that would have an effect or not.

MR. HILL: We, again, have very simplified calculations of -- we're not accounting explicitly for the geometry of the waste package in here. We're just using the area term. We're not looking at any of the engineering materials, drift supports, turbulence is not modeled explicitly. We're trying to get a handle on how bad could this be because we have no other information to go on. And I respectfully add that it is the Department of Energy's obligation to evaluate the processes if they believe they are important to safety. We believe these analyses are sufficient to

1 demonstrate a likely impact on systems important to
2 safety.
3 DR. GARRICK: If an igneous event was the
4 only thing we had to worry about, is there any -- on
5 the basis of what you've done so far and learned so
6 far, is there any profound recommendation you could
7 make relative to the design that would suppress the
8 consequences of an igneous event?
9 MR. HILL: Well, sure. I think the initial
10 statement about backfill it right to the rim would be
11 a very good one to mitigate a lot of the initial
12 effect. Don't let that initial flow happen. I think
13 also that when we look at the response of metal
14 alloys, metal alloys in terms of igneous events are
15 not the best alloys of choice. There may be other
16 alloys aside from chrome-nickel alloys that would be
17 more robust against both direct contact to magma and
18 exposure to magmatic gases. The conditions of an
19 igneous event are not like the sun. We're not putting
20 it out there into the solar system, these are pretty
21 well constrained physical chemical conditions.
22 I believe if we were just talking abstractly
23 for igneous events in isolation, these could be
24 engineered around for a waste package that could
25 withstand one of these events. But the common wisdom

1 would be, while it's really good at high temperature,
2 it probably stinks for ambient and corrosion. So,
3 that's the tradeoff we're in, and how are we going to
4 balance the trade in a risk-informed, performance-
5 based scenario.
6 CHAIRMAN HORNBERGER: You just make the
7 outer shell high temperature.
8 MR. HILL: Don't forget ductility.
9 DR. LEVENSON: I have a follow-up to John's
10 question. I understand your answer, and I accept it.
11 I've seen a fair amount of similar things. In fact,
12 I just came back from eight days -- a fair part of it
13 was walking across some of the results of volcanic
14 activity in Oregon. My question is, doesn't the
15 shockwave move down the tunnel faster than the magma
16 flow, so that the sealing of the pores as the magma
17 eventually reaches there is not really relevant to
18 venting energy from the shockwave?
19 MR. HILL: Part of the shock is due to
20 compression of the air in front of it, but the main
21 shock is occurring in response of that reflection and
22 buildup.
23 DR. LEVENSON: Yes, but that reflection is
24 only in the air space, and the areas in which that is
25 occurring, the magma has not reached there, so the

1 sealing that you refer to has not occurred.

2 MR. HILL: I think that's part of it, you're

3 right, but we're still seeing a shock amplification.

4 DR. LEVENSON: But the question is, does the

5 modeling that shows the shock include the porosity in

6 the gas --

7 MR. HILL: No, it does not.

8 DR. LEVENSON: Okay.

9 CHAIRMAN HORNBERGER: But the assumption is

10 that the air would be pushed out.

11 DR. LEVENSON: No.

12 MR. HILL: No.

13 DR. LEVENSON: No. They are assuming no

14 porosity in the air space. I mean, where the magma

15 is, I agree it's sealed, but it isn't sealed ahead of

16 the magma.

17 CHAIRMAN HORNBERGER: Of course, it happens

18 very fast, so --

19 DR. LEVENSON: It doesn't matter. I mean,

20 if the gas space is there --

21 DR. GARRICK: All the energy goes to

22 building up the pressure.

23 MR. HILL: Yeah, and I think that's clearly

24 an improvement of the model, is for that volume, for

25 that compression, how much can you get. For this

1 permeability and porosity in the fracture network, do
2 you have enough to accommodate that compression?
3 Sure. I would love to have a research budget and FTE
4 equivalency that would allow me to make a four-
5 dimensional model here. I would remind the ACNW that
6 this KTI has been the lowest-funded KTI throughout the
7 history of this program.
8 CHAIRMAN HORNBERGER: Throughout the
9 history, is that right?
10 MR. HILL: Yes.
11 CHAIRMAN HORNBERGER: Two quick questions,
12 Brit. Something you said, turbulence isn't modeled
13 explicitly. I was just curious, if you have this
14 going down, what is it, a 20-meter diameter tube at
15 100 meters per second, what's your Reynolds number?
16 MR. HILL: I don't know. I wouldn't want to
17 guess off the top of my head. We're modeling friction
18 explicitly as a parameter, but --
19 CHAIRMAN HORNBERGER: You're doing it --
20 MR. HILL: The partial parameterization,
21 some of that friction is also coming in as a
22 turbulence, in my understanding.
23 CHAIRMAN HORNBERGER: Oh, I see. I see.
24 It's just a one-dimensional, so it's a simple
25 parameterization of friction, right?

1 MR. HILL: Yeah.

2 CHAIRMAN HORNBERGER: The other question
3 that occurred to me is, you responded to John by
4 saying, sure, you backfill it to the rim. This would
5 include the statio between a drip shield and a
6 canister, though, right?

7 MR. HILL: I'm not 100 percent sure on the
8 gap, but I believe that gap is very small, on the
9 order of 10 centimeters or so, and if somebody could
10 give me a better number, I'd welcome it. For most of
11 the waste packages, it's a very small gap between the
12 drip shield and there, so I would want to see -- but
13 my suspicion would be that once you get this kind of
14 a very small gap in the same way that you're quenching
15 in little fracture invasions, you just have such a
16 surface area that has a thermal mass to it that you're
17 quenching out the flow before it can really propagate
18 sufficiently. And that's where I may be a bit
19 facetious in filling it to the rim. There's a
20 critical gap, but it may be on the order of 10s of
21 centimeters, but you just have such a surface area per
22 unit volume that you can't propagate the flow
23 completely.

24 DR. LEVENSON: What is the magma flow rate
25 down the drift?

1 MR. HILL: Unrestricted, it can be on the
2 other of 100 meters a second.
3 DR. LEVENSON: Two hundred miles an hour.
4 MR. HILL: I think it's closer to about 300,
5 but, yes, close to that.
6 CHAIRMAN HORNBERGER: The stuff I've seen in
7 Hawaii never moved that fast.
8 MR. HILL: Right. Hawaii is a very low gas
9 system. It has about .1 to about .2 weight percent of
10 water in it. Also, that magma that you're seeing in
11 Hawaii has sat around in the shallow subsurface for
12 quite a while. It's a very, very degassed magma. The
13 thing that's driving the flow here is not just simple
14 hydrostatic pressure, but it is the rapid expansion of
15 that discrete volatile phase that's driving the magma
16 flow down the drifts.
17 CHAIRMAN HORNBERGER: Okay. Remobilization.
18 MR. HILL: Remob. The basic truth -- I even
19 said the truth word -- is the persistence of a high-
20 level waste contaminated tephra that strongly affects
21 the probability weighted annual dose calculations for
22 a volcanic event. That's something that we have to
23 worry about. It is not the eruption itself, but how
24 long does this potentially contaminated fall deposit
25 persist in an accessible environment.

1 One of the reasons this is a problem is that
2 tephra fall deposits, based on analog studies, are
3 commonly distributed over areas of hundreds to
4 thousands of square kilometers for a basaltic cinder
5 cone eruption. We also know that the 10 to 10,000
6 year characteristics of these kind of tephra deposits
7 in Yucca Mountain region environments are very poorly
8 known. The only data point we have is the 80,000 year
9 old Lathrop Wells eruption, where we know that, well,
10 there's a pretty appreciable tephra fall deposit
11 there. We know it went to the north because we can
12 find traces of it up in some of the trenches about 10
13 to 15 kilometers north of the volcano, and the trace
14 patterns would tell us it certainly went up to the
15 north. You walk around on all the bedrock up there,
16 it's gone, which in some of the depositional valley,
17 if you dig very deep, you can find remnants of it, but
18 it in 80,000 years been stripped off.
19 I don't for a minute think, from what I'll
20 show you later, I don't think it really takes 80,000
21 years to get rid of all that, but that is the datum
22 that we have for the Yucca Mountain region. So, we've
23 got to go look at analog studies and have some
24 geologic process modeling to get a handle on how long
25 this tephra can lie around.

1 The other concern is that we have both
2 depositional and erosive processes at the proposed
3 critical location, so we've got a flux problem that
4 has to be considered. We have not just the initial
5 mass of tephra that's deposited from air fall, but we
6 also have fluvial remobilization that can bring
7 material in and out from the system, and wind blown
8 remobilization, eolian remobilization, that brings
9 material in and out from the system. And some of
10 these models, when we talk about the output from
11 fluvial, it also includes leaching and plowing, things
12 that can remove mass from the system, and the wind out
13 includes inhalation, particles that would be inhaled
14 by the proposed critical group occupants.
15 The best we can start with is what the real
16 volcanoes do, and this is the tail of two volcanoes.
17 Paricutin that erupted in 1943-'44 from the main fall
18 deposits, and Cerro Negro where most of what you are
19 seeing here was erupted since the 1960s. At
20 Paricutin, this picture is taken about ten years after
21 the main fall deposits were formed, deposits several
22 meters thick, they are blanketing an older cinder cone
23 and associated lava flows. At Paricutin, you get
24 about 1 and a half meters of rainfall a year, so it's
25 a little wetter than Yucca Mountain. But you can see

1 from these and many other pictures in the published
2 literature, there is extensive rilling, channeling,
3 overland flow very quickly developed in the Paricutin
4 system.
5 I believe the reason you get all this is
6 that the underlying cone and lava flows are relatively
7 impermeable. Of course, the tephra fall deposits are
8 highly permeable, very nonconsolidated, lots of
9 porosity and permeability in them, so the water comes
10 in, infiltrates, and then if you have an impermeable
11 cap, it's very easy to move it down gradient as the
12 water flows at the permeability contrast.
13 At Cerro Negro, here we are four years after
14 these fall deposits. Again, the deposits are several
15 meters thick. They're sitting here on an older cinder
16 cone and surrounding lava flows, and we know very well
17 at Cerro Negro, rainfall from 2 to 4 meters per year.
18 This picture was taken February of '99. I would
19 remind people that Hurricane Mitch dumped 2 meters of
20 rain in about 36 hours right where we're standing.
21 There's absolutely no overland flow or any channeling
22 on these deposits. You can come out to the flow
23 fronts where your angle of repose is over 45 degrees,
24 and you will not see any erosion or gullying in these
25 deposits, in spite of dumping 2 meters of rain on it

1 in 36 hours.

2 You can find on some of the older cinder
3 cones on very steep slopes a little bit of gravity-
4 induced flow, but that doesn't really get to why
5 you're not seeing any significant erosion out here.
6 Again, I believe it's the permeability contrast, the
7 underlying deposits are also highly permeable. So,
8 even though you're dumping meters of rainfall in
9 single events, you're just not able to mobilize these
10 deposits. So, which is Yucca Mountain. Well, Yucca
11 Mountain is more like Paricutin.

12 If we had an eruption at the proposed
13 Repository site, it would be falling on primarily
14 bedrock in the steeper sloped areas. So we have this
15 high permeability tephra fall deposit sitting on top
16 of essentially barren bedrock, or very low
17 infiltration rate soils.

18 So, what would happen if we had a fall
19 deposit that was on the larger size that came out
20 after the proposed Repository? Let's just take the
21 1975 Tolbachik example because we have good quality
22 data and it went more than a couple of kilometers.

23 What I've done is constructed a simple
24 topographic map which shows the outline of the 40-mile
25 wash drainage system. The green shaded areas are

1 slopes that are greater than 5 degrees of gradient to
2 them. So, out on the flats, we're not seeing any real
3 potential for mobilization.
4 All I've done is put in this fall deposit
5 that would have given us a couple of centimeters worth
6 of fall at the proposed critical group location, put
7 that into the GIS and said, hey, how much mass falls
8 on green shaded areas within the 40-mile drainage
9 basin, and assumed that that mass is instantaneously
10 remobilized and comes down into the depositional basin
11 which is down here in the Amargosa Desert. And let's
12 just assume all that mass is deposited uniformly
13 throughout this very broad area. We know the active
14 drainage basin for 40 mile is a much narrower channel,
15 but this is based on the topographic extent of the
16 basin as well. I'm also pretty sure that you're not
17 going to see uniform deposition of coarse material
18 that would fall out closer towards the transition from
19 eroding to depositing, but let's just assume it
20 anyway. What would we see?
21 With that kind of assumption, we'd quickly
22 get about a factor of 10 increase from the initial
23 fall deposit, from a couple of centimeters to a couple
24 of 10s of centimeters based on instantaneous
25 mobilization of this material.

1 I also have a similar example for the 1995
2 Cerro Negro eruption. It would be on the very small
3 end of fall deposits, about 1 million cubic meters.
4 This is, I believe, 8 x 10^7 cubic meters. You'd see
5 the same thing. If you had the fall deposit directed
6 to the south and you had on order of a millimeter of
7 initial deposition from Cerro Negro, that would
8 remobilize to about a centimeter -- again, a factor of
9 10 increase from very simple redistribution.
10 Another potential problem in remobilization
11 is even if we're not looking exactly at this dose
12 point in the 40 mile of drainage, we're taking
13 material from this area and putting it down much
14 closer to the critical group where it could be
15 remobilized by wind blowing predominantly north-south
16 through this area. So, it's not just the direct
17 fluvial remobilization that's a problem, it's
18 enriching another eolian source region with material
19 coming off of the bedrock surfaces in the proposed
20 Repository location.
21 Well, we all know that it's not going to
22 happen instantaneously. Even at Paricutin, it didn't
23 happen instantaneously. It's the rate of
24 remobilization that's the key to understanding the
25 effect on risk. How fast is this material moving off,

1 and how fast is it being deposited?

2 So, let's just take, again, a very simple

3 scope on what could be happening here. We start by

4 saying, all right, we had an initial load of tephra

5 mass in terms of kilograms per square meter, so this

6 is something on the order of a couple centimeter

7 deposit. Well, we just allow it to roll with an

8 exponential function. Say it's got a half-life of 100

9 years, which would be a very quick removal rate.

10 Here, through time -- and, again, I've only

11 modeled a thousand years -- is what just simple in

12 situ erosion, no influx, would look like.

13 Let's go up the basin, back to those bedrock

14 surfaces, and say, okay, those surfaces are being

15 stripped, again, with a simple exponential function,

16 but the half-life upgradient is going to be a 10-year

17 half-life. So, 100 years we've stripped off our

18 bedrock. Based on Paricutin, that might not be a bad

19 number.

20 Let's combine what would happen when we put

21 in situ erosion and influx from upgradient into the

22 net deposit. With this sort of a 10-year half-life

23 upgradient, we can see we're getting about a factor of

24 6 increase, about 100 to 200 years after the event.

25 All I've done in Part B is change the half-

1 life from the eroding bedrock surfaces from 10 years
2 to 100 years. First, we're rolling a little bit
3 slower, and maybe based on Paricutin that's a good
4 number, too. What would be the net effect? Well,
5 initially, not too much, but we push out the
6 accumulation point to about a factor of 3 or so, that
7 would occur several hundred years after the event.
8 So the end result is that we're getting that
9 factor of 3, factor of 6 increase in tephra mass
10 accumulating in any given area around the depositional
11 system.
12 Now, you can't just go from tephra mass to
13 risk. We have to evaluate any potential dilution
14 effects because we know it's not pure tephra coming
15 down there, there's some sediment in the system and
16 some sediment that will be mobilized along with it, so
17 we're diluting the aerial concentration of tephra. We
18 also have to address how the high-level waste
19 particles that could potentially be in that tephra,
20 how are those particles behaving in the fluvial
21 system. What the effect of concentration and dilution
22 could be the dosimetry on that, and that's how we have
23 to get to qualifying the effect on risk.
24 Well, we're at the stage right now of saying
25 that given these sort of mass increases, given rates

1 that appear reasonable based on analogy, this appears
2 to have a potentially significant impact on risk
3 because we are in a sediment starved system. There
4 isn't that much coming off. And so if we're seeing a
5 10 percent, 20 percent dilution effect from existing
6 sediment in there, that may not be significant in
7 terms of the total mass of tephra that's being
8 remobilized.
9 The behavior of high-level waste
10 contaminated particles in this high-energy system,
11 again, is a real challenging problem. It's hard
12 enough to try to figure out what the tephra are going
13 to do because they are fairly fragile, glassy
14 material. We know as we move down the high-energy
15 regime in a highly concentrated flow environment that
16 characterizes the 40-mile drainage system, we're going
17 to be banging particles together quite a bit. As we
18 bang the tephra, it's going to break down into smaller
19 pieces. Will that liberate waste particles and have
20 them fall into the bedload, or will everything be
21 staying in suspended load? We've got to figure this
22 out.
23 That's just for the water-borne stuff.
24 Water is easy compared to the wind. With the water,
25 we have a good idea of the area terms. We know what

1 the deposition of basins are. We have a good way of
2 constraining the flux. Out here, for wind-blow
3 remobilization, we've got a fairly large potential
4 area of source particles. The eruption itself likely
5 goes on order of a hundred to thousands of square
6 kilometers, and all of that can be blown around by the
7 wind.
8 We also know that our near-surface winds are
9 topographically controlled. However, we don't have
10 many good data points off of the Nevada test site. We
11 can see here where we have actual data, where we're
12 strongly north-south oriented winds. We think it's
13 likely in Crater Flat, with similar topography, they
14 are north-south oriented. But once you get out in the
15 Amargosa Desert, there's a northwesterly component in
16 this region, and then down in here it's pretty
17 complicated. It's much more complicated than I've
18 drawn it, but again there is a significant north-south
19 component that comes through here.
20 So, tephra, over any of these regions, has
21 the potential to be mobilized through time as part of
22 a flux that can move through the proposed critical
23 group location. One of the areas of concern why I
24 think we're realistically looking at an important
25 process is right out here at Big Dune. Over the past

1 couple thousand years, a big, old sand dune developed
2 right out in proximity to the proposed critical group
3 site. Now, why do we have a sand dune setting here
4 and not somewhere else?
5 The best interpretation that we've come
6 across is this is where you have an intersection from
7 the northwest trending winds and the north-south
8 trending winds interacting and getting this
9 depositional effect as a possibility. It may just be
10 random. It may just be kind of chaotic. It just
11 stays there from time to time. But I think it's a
12 non-negligible point that these intersection of
13 different wind trends gives the potential to bring in
14 multiple sources, overload the system, and cause
15 deposition within the wind field.
16 One of the other factors to consider is that
17 throughout this region it's a fairly nonvegetated
18 area. It's going to be even more nonvegetated if we
19 have a volcanic eruption. The proposed critical
20 group, whether it's farmers or some other type of
21 individuals, they've going to be putting up fences,
22 outbuildings, vegetation, that are all going to serve
23 as sediment traps. So, while we have a fairly trap-
24 poor area around this zone, if we're moving north-
25 south, this area has the potential for more sediment

1 trap than the areas upgradient from it. Again, it's
2 not like it's all moving and focusing down to this
3 location, there's a output component through here, but
4 it is a flux problem, and the problem is how much area
5 is being tapped as a potential source region? How
6 much area is potentially trapping and how much area is
7 potentially ablating and material being removed from
8 the proposed critical group location?
9 And right now, by playing with those area
10 terms, you can get just about any answer you want to
11 out of wind-blow remobilization. We not only, as we
12 talked about earlier, we not only have the initial
13 depositional area as a source for windblown particles,
14 but as this material washes down the 40-mile drainage
15 system and is deposited in the Amargosa Desert, that
16 north-south component can again locally rework and
17 potentially deposit at the proposed critical group
18 location. So, it's not just the initial source
19 through time, that source zone could be changing
20 through time, and even if we're taking material down
21 40 mile -- and it really doesn't drop out until we get
22 close to the southern part of the Amargosa Desert 10s
23 of kilometers from the critical group, that subsequent
24 windblown remobilization could again contribute to
25 accumulation of waste and tephra at those critical

1 group locations.

2 All we need really are data on the surface
3 winds, the evaluation of airborne particles from
4 source regions, how they evolve through time, and how
5 analog studies that have been done in arid farmlands
6 where we're looking at a flux problem that's supported
7 by a very large reservoir -- we're not dealing with a
8 limited extent like post-eruption. In places like the
9 San Joaquin Valley, you have a huge zone of farms,
10 each of which is contributing to the flux that's
11 measured instantly at a single point. That's
12 different from the situation that we have at this
13 single point. It's not supported by an infinite area,
14 it's supported by a very heterogeneous area that in
15 part can wash in and out from the system.

16 DR. GARRICK: I would think that given the
17 Nevada Test Site history, that you would have very
18 good wind rows data for that area.

19 MR. HILL: We do have good wind data for the
20 NTS, but I have not done an extensive search. I just
21 took a look around at some of the supporting reports,
22 tried to get some information from other -- look
23 through other reports around this area, and didn't
24 find anything, but we need to take a look at it.

25 DR. LEVENSON: In addition to the Test Site,

there must be good data from the Air Force bombing sites which are not too far away, which would be additional information. It's not necessarily down here, but would give you something else in the area.

MR. HILL: The problem is, once for ground surface winds, winds below several hundred meters below the ground surface -- well, that one really is going to look good on the record. For winds occurring at altitudes of several hundred meters above the ground surface, they are very strongly topographically controlled.

DR. GARRICK: Spoken like a geologist.

(Laughter.)

MR. HILL: Well, I'm in sufficiency mode for depth site characterization. So, the information that we can have from up to the north may not tell us too much about what's happening in the Armargosa Desert. What we really need are some of the data -- and perhaps we can get this through the Desert Research Institute or some other monitoring stations, for example, DR stations down in through here could give us some more locative information, or better ways, given these sort of general topographies, what would be the more expected wind fields. I don't think that's the real limiting problem. The real limiting

1 problem is defining the area terms for your flux.

2 Why does all this matter? ACNW always wants

3 to hear why do things matter. We have a modified

4 figure from SR and presentation Peter Swift gave very

5 recently at the SSPA presentation to the NWTRB. And

6 here we have two curves from TSPA-SR showing the

7 effect of primarily vulcanism before several thousand

8 years, and intrusion after several thousand years, at

9 a probability equal to the DOE's preferred value and

10 at a probability equal to the NRC's preferred value in

11 red. And you can see from the analyses in SR, the

12 highest probability weighted risk comes in from the

13 intrusive pathway and about an order of magnitude

14 lower risk from the volcanic pathway.

15 Now, in the presentation that Dr. Swift gave

16 to the TRB on June 20th, he's showing about the same

17 magnitude of risk but the risk pathway has shifted

18 from the volcanic pathway down to the intrusive

19 pathway based on very preliminary analyses. I want to

20 make sure we're talking all about the same up-to-date

21 information. If we were to take that curve and put it

22 at a level of a probability value that we believe is

23 appropriate for prelicensing issue resolution, that

24 would be the net effect.

25 I would point out that these changes between

1 TSPA-SR and what's shown in the Supplemental Science
2 and Performance Assessment Report address concerns
3 that were raised in the August 2000 meeting regarding
4 wind speed, biosphere dose conversion factors, and
5 changes in probability based on area terms from low
6 temperature to high temperature repository. These
7 analyses are not addressing our key technical
8 uncertainties relating to the number of waste packages
9 potentially damaged and released during extrusive
10 events, during intrusive igneous events, or any of the
11 potential effects of remobilization.
12 So, we really need to go forward on here,
13 and John's already provided a brief overview, but here
14 is some of the technical information that we're
15 looking for magma/repository interactions. To support
16 closure, we need from DOE a technical basis for the
17 extent and character of the initial flow conditions
18 that's consistent with currently proposed designs.
19 We need initial interaction with race
20 packages, drift rills, and any potential debris plugs
21 that may form in the drifts, the potential to develop
22 conduits, all the processes that lead to conduit
23 localization and development, the extent and character
24 of sustained and steady flow conditions, how those may
25 change during the course of the eruption, appropriate

1 waste package and waste form responses to the
2 sustained flow -- and I might add, initial flow
3 conditions -- and entrainment and dispersal mechanics.
4 If we have intersection and if we have flow into the
5 drifts, how could waste packages respond and how
6 potentially could, if a waste package would disrupt,
7 could the waste be entrained and dispersed?
8 What we're doing and propose to do in fiscal
9 year '02 is to continue with our sensitivities both on
10 volatile content, try to look at wall roughness,
11 volatile loss through cracks, and drift opening
12 diameters, how we're going to be going about all that
13 in trying to address some of the concerns that were
14 even raised here on the initial one-D and two-D
15 models.
16 A key activity is verifying our numerical
17 models with analog laboratory experiments. We're going
18 to attempt to couple some of the flow models to rock
19 mechanical response, to try to get a little better
20 handle on if we have these sort of pressures at drift
21 ends. What would be the extent and character of
22 fractures that could develop? Very importantly, look
23 at volatile segregation and potential effects on waste
24 entrainment and the eruption. If we get a low
25 volatile phase developing on the lower part of the

1 drift and a high volatile fragmented phase on the
2 upper part, what sort of churning could happen? Would
3 it be sustained that way? How would the eruption
4 evolve? These are very important questions to looking
5 at entrainment and dispersal dynamics. And, of
6 course, continue to evaluate DOE progress in these
7 areas.
8 For remobilization, what we need form the
9 DOE is a technical basis for looking at rates of
10 tephra removal from slopes, rate of transport in the
11 40-mile wash drainages, deposition rate in the
12 critical group area, potential changes in particle
13 size distribution during fluvial transport, and also
14 the rates of transport and deposition from eolian
15 processes.
16 What we're doing and plan to do in fiscal
17 year '02 is some additional sensitivity studies for a
18 remobilization flux model that we've been working on
19 that's trying to capture more of the processes than
20 the simple exponential decay model that I showed this
21 meeting. We're developing some analog data from
22 Sunset Crater. We're looking at slopes with variable
23 permeability contrasts and potentially how particles
24 may abrade downgaradient from ephemeral streams out in
25 the higher altitudes of the Flagstaff area in Arizona.

1 We're also modeling some initial ranges of rates for
2 downslope movement, downstream flow and sediment
3 deposition from episodic events -- again, biased
4 toward the Paricutin numbers -- and some scoping
5 calculations on eolian transport and deposition, in
6 addition to working with the models that the DOE may
7 choose to get with us. Just some technical
8 information for the Committee.
9 CHAIRMAN HORNBERGER: Thank you, Brit.
10 Questions about the remobilization? Milt?
11 DR. LEVENSON: Unlike John, I can't say that
12 I've read all of the TSPA-SR, so my question is based
13 on ignorance. Is the risk relevant to remobilization
14 come from proposed inhalation?
15 MR. HILL: Yes. It's about 90 percent.
16 DR. LEVENSON: Is that being done for the
17 conservation of mass, and the context of that question
18 is two years ago I did some analysis of contaminated
19 soil around Rocky Flats, and it turned out that in
20 order to approach what is allowable dose of plutonium,
21 you would have between 3 and 4 pounds of dirt inhaled
22 into your lungs. My medical friends say, "Why are you
23 worrying about plutonium?" Is, in fact, the
24 inhalation calculations here being done including
25 conservation of mass, or are we assuming that we are

1 only inhaling pure atoms of radioactive material?

2 MR. HILL: About half of the dose is coming

3 from just generally inhaled particles. This is a big

4 difference from other models that are looking at deep

5 respirable fraction. So, we're considering a mass

6 load, an airborne particle concentration, for all

7 particles from 100 microns down to 1 micron. A

8 concentration would be on an order of 10^{-3} grams per

9 cubic meter.

10 Now, given the respiration rate, number of

11 days in a year, I believe that comes out to an order

12 of 10 grams per year. It's not all being inhaled.

13 The nasally pharyngeal dose is also appreciable for

14 the americium and plutonium that constitute the two

15 largest contributors for radiological dose from

16 inhalation pathway.

17 So, the surficial loading that we have to

18 deal with is also very different from many other

19 inhalation models, in that we're dealing with about

20 1200 kg per square meter -- excuse me -- per cubic

21 meter of tephra in terms of weight. So you can see

22 that for a 1 centimeter thick deposit, where roughly

23 20 to 30 percent of that deposit is inhalable particle

24 -- 100 microns and finer -- there is a very

25 appreciable mass of inhalable particle per unit area.

1 DR. LEVENSON: I understand that, but a
2 very, very small percent of that mass is radioactive.
3 MR. HILL: Yes.
4 DR. LEVENSON: And that's the question I'm
5 asking.
6 MR. HILL: Well, we're using the standard
7 Gen ES dosimetry for waste concentration appropriate
8 for that site, that 20 kilometers, based on airborne
9 transport. So, we're not making any real assumptions
10 about the amount of waste that's on the ground, that's
11 modeled explicitly.
12 DR. LEVENSON: I understand that. My
13 question was whether the calculations included the
14 total mass so that if you look at something and say
15 this person got 1 MR, but he also got 3 pounds in his
16 lungs, then you know something is wrong.
17 MR. HILL: Okay. The complete answer is no,
18 it is not modeled explicitly as any part of this code,
19 but it is captured implicitly by the mass loads and
20 scoping calculations that are showing that you are
21 using about 9 grams per year from the deposit. That's
22 what's giving you the dose.
23 DR. LEVENSON: Well, it isn't obvious to me
24 that it is implicit from what I've done in previous
25 calculations, but I accept it.

1 The second, I guess I should ask Ray's
2 question, is in the remobilization -- not the
3 remobilization, but the washout, the first part of it,
4 it sounded like this was a mechanical process that you
5 were modeling, and that chemistry was excluded.
6 Question of whether the rainfall wash or separated or
7 concentrated, or diluted, or whatever, is not included
8 in your analysis, this is just mechanically what
9 you've moved from the high areas to the low areas, is
10 that correct?
11 MR. HILL: That's correct. I don't believe
12 that the rate of dissolution from poorly to
13 nonoxidized rates would be rapid enough given the
14 mechanical redistribution on order of 100 years or so.
15 DR. LEVENSON: Oh, you're probably right,
16 but that also means that the solubility is so low that
17 it isn't going to move very rapidly into the drinking
18 water, if it's insoluble.
19 MR. HILL: That's really outside of my area
20 of expertise.
21 DR. LEVENSON: Yes, I know.
22 MR. HILL: And the drinking water
23 contribution from volcanic disruption dose or igneous
24 activity -- or volcanic disruption dose, excuse me --
25 is very, very minor component. It's 90 percent driven

1 by inhalation which is heavily 90 percent americium
2 and plutonium.
3 MR. TRAPP: Just to add an aside, one of the
4 questions that DOE has been asked to take a look at is
5 exactly the one that you're talking about, the
6 solubility of the stuff, how much would actually be
7 leached out.
8 CHAIRMAN HORNBERGER: Ray, Milt already
9 asked your question.
10 DR. WYMER: But I have another one.
11 (Laughter.)
12 MR. McCARTNEY: Tim McCartney, NRC staff.
13 Just one of the questions with respect to how much
14 dust is inhaled, we are looking at the models and how
15 much you have to inhale of dirt and dust to get these
16 numbers, as part of what's a reasonable parameter. We
17 have not done all the work yet, but it is certainly an
18 aspect that, yes, you don't want to have someone
19 inhaling 10 pounds of dust to get a 10 millirem dose
20 or something.
21 DR. LEVENSON: Thanks.
22 CHAIRMAN HORNBERGER: Ray.
23 DR. WYMER: Well, I want to back up a little
24 bit before mobilization and make a more general
25 question. You addressed this, I think, in your Key

1 Technical Uncertainties, but I want to raise it again.
2 If you were unfortunate enough to have the volcano
3 right up under the repository, how many drifts would
4 abe affected? What fraction of the total inventory --
5 MR. HILL: I'd say right now on order of 10
6 because we're dealing with a roughly kilometer-long
7 dike, and when we get to 300 meters below the surface.
8 So, any drift spacing, we can refine that number a
9 bit, but on order of 10.
10 DR. WYMER: That's a percent of the total.
11 MR. HILL: I believe it was 50 drifts or 53
12 drifts right now.
13 DR. WYMER: Well, it depends on the thermal
14 loading and all.
15 CHAIRMAN HORNBERGER: Is there a preferred
16 dike orientation?
17 MR. HILL: It would be about north 10, north
18 20 east.
19 CHAIRMAN HORNBERGER: So this also depends
20 upon the design of -- the orientation of the drift.
21 MR. HILL: And the drift orientation now is
22 about north 70 east, I believe. I just remember that
23 there is a significant difference between our and the
24 Department's models for probability. Our event has --
25 the probability of our event is for an event that is

1 centered within the repository, within the repository
2 footprint. It is not crediting for an event that
3 would localize several kilometers away, but
4 potentially impinge upon the repository.
5 DR. WYMER: Now let me ask my second
6 chemistry question, my first having been asked. It
7 has to do with the accessibility of the waste. You
8 have -- the magma has to go through high nickel alloy,
9 it has to go through steel, and has to go through
10 zirconium, finally gets to the waste. By the time you
11 get to that point, you've got some pretty highly
12 altered magma chemically. It isn't what it was at
13 all, has a lot of other stuff in it. Who is looking
14 at these chemistry problems, or where does that stand?
15 You have two things. You have corrosion,
16 which I've just alluded to, and then once you get all
17 the stuff corroded into the magma, what you have to
18 have in order to get to the waste itself, then you
19 have to dissolve the waste. That's an extraordinarily
20 complicated system.
21 MR. HILL: Well, the problem we're looking
22 at really is one of mechanical disaggregation rather
23 than anything for dissolution. And we're looking --
24 again, we have not had sufficient information to look
25 at deformation maps for these alloys at temperature,

1 nor have we really seen what happens after the event.
2 That's one of our requests to the Department is to
3 provide the data necessary to analyze at-temperature,
4 at-pressure response, but we're not really looking at
5 a corrosion dissolution process.
6 The basalt that we're dealing with is a
7 solid at 950 degrees Centigrade. So, even if we have
8 a quench at 950 C against a waste package, the
9 potential for ductile deformation is very high. We're
10 also looking at a waste package designed that is
11 lending itself to differential expansion because the
12 inner alloy or the inner stainless steel has a
13 coefficient of thermal expansivity that is roughly 30
14 percent greater than the outer C-22. Now, of course,
15 that depends on the amount of gap that you have, and
16 the appropriate three-dimensional strain response, and
17 that will need to be analyzed mechanistically.
18 DR. WYMER: You're thinking of the things
19 that are going to be crushed by the magma then.
20 MR. HILL: I think you have competing forces
21 of overpressuring and underpressuring. You've got
22 internal pressurization of the gas. The Department
23 has done an ideal gas expansion to look at the
24 response of NCAPs primarily. We also have the
25 potential for differential expansion as an external

1 outward force. We have for an external force, forcing
2 it inward as you're saying, we have the physical load
3 of the magma, both static and dynamic, in addition to
4 the pressure in the magma system itself contributing
5 to an external force.
6 We also have a differential loading because
7 the waste package is not suspended in a uniform
8 homogenous fluid pressure either, it's sitting on
9 different kinds of supports. There are different
10 forces that can be acting upon that.
11 So, I think the -- our initial concern is
12 that based on the apparent lack, or the apparent
13 ductility of these materials, the number of stresses
14 that are operating on them, there appears a very high
15 potential for waste package disruption based on the
16 current design and igneous condition.
17 DR. WYMER: When you say disruption, what do
18 you mean disruption?
19 MR. HILL: Lost containment.
20 DR. WYMER: But what does that mean
21 physically?
22 MR. HILL: Breaking apart.
23 DR. WYMER: Just fracturing.
24 MR. HILL: Into small pieces, especially in
25 the conduit itself.

1 DR. WYMER: Like a piece of glass breaking.

2 MR. HILL: No, I think more like a piece of
3 Silly Putty. You stretch it and it has a strength,
4 and that strength has not been analyzed.

5 DR. WYMER: So, just tearing it.

6 MR. HILL: Yam-hmm. Actually, I believe the
7 correct term is a "creep dislocation". We're talking
8 about the waste package components themselves. I
9 agree that this is a very complicated process, and I
10 am just at a loss on how you're going to model that
11 explicitly for every waste package.

12 We have an agreement with the Department
13 that for the current models for waste packages
14 contained within the volcanic conduit, there is no --
15 I don't want to try to say resiliency -- the waste is
16 available for transport. Our main disagreement is for
17 the waste packages outside of the conduit remaining in
18 the drift. Based on SR, that was the key component
19 for risk, how many waste packages?

20 DR. WYMER: You've got pursers in and you've
21 got pursers out, and you don't know yet what the
22 balance is.

23 MR. HILL: Right. And then let's just say
24 that there is enough ductility to accommodate that
25 stress during the event. The problem is then now

1 after the event, you've had significant aging effects,
2 and a great amount of recrystallization that's leading
3 to extraordinarily significant embrittlement of this
4 material. So, even if you've got the waste package
5 walls intact after the event, and cool the ambient
6 conditions and give a little magnitude 4 earthquake
7 and shake that couple of meters worth of basalt that's
8 sitting on top of it differentially, I believe the
9 data from Haynes International says that the sharp
10 impact tefluous is on order of 10 foot pounds. So,
11 about 10 foot pounds of force is all you need to
12 fracture --
13 DR. WYMER: The nickel alloy.
14 MR. HILL: Yeah, C-22 nickel alloy, after
15 it's been up to 1,000 degrees C. on order of less than
16 100 hours.
17 DR. WYMER: And then you have the steel
18 inside of that.
19 MR. HILL: And you've got the steel inside
20 of that that's also had to respond to at-temperature
21 problems. So, it may be that you can demonstrate
22 waste package resilience during and following an
23 igneous event, but it is not something that I believe
24 you can support as an assumption. We would need to do
25 a real mechanical and engineering analysis of waste

1 package response to these conditions and subsequent
2 behavior after those conditions. If you can do that,
3 we will review it and go forward, but right now it is
4 a very limited set of analysis and a number of
5 assumptions that we would disagree with that forms the
6 basis for the DOE safety case for the waste packages
7 that remain in a drift following an intrusive event.
8 We've talked to the Department with that at
9 the recent meeting and at the Appendix 7 meeting about
10 our basis for our concerns.
11 DR. WYMER: One other humorous point, if
12 there is any about this, when I say words like
13 "eolian", I'm reminded of the NRC Directive for
14 simplicity in our terminology and our writing and our
15 discussions of things. I'm not familiar with the word
16 "eolian".
17 CHAIRMAN HORNBERGER: Windy.
18 (Simultaneous discussion.)
19 MR. HILL: George, you can back me up, you
20 remember we used to spell "eolian" with an "e" first.
21 CHAIRMAN HORNBERGER: That's correct. I was
22 going to challenge you on the spelling.
23 MR. HILL: It's not truly the God Eolius
24 anymore. I will endeavor to use "windblown".
25 DR. GARRICK: I would only observe that if,

1 in California, like your analogs, we had 1 to 2 meters
2 of rain a year, we wouldn't have anymore problems in
3 California because it would dissolve. I don't have
4 any questions.
5 CHAIRMAN HORNBERGER: Just sort of following
6 up on Ray's points, it would be very hard for me to
7 imagine even magma going down a drift approaching 100
8 meters per second and a waste package still left
9 sitting there. That would be tumbling down along with
10 the rock, would it not, the magma?
11 MR. HILL: I might disagree because the
12 amount of friction that you've got -- and think also
13 we've got a line eroding geometry, but it may be able
14 to knock off one or two of the waste packages off
15 their supports, you just don't have enough drag on
16 those waste packages to really pick them up and toss
17 them around like Godzilla on the freight train. So,
18 based on very simple scoping calculations, at the
19 velocities we're talking about for the initial
20 interaction, you're probably not picking them up and
21 throwing them around.
22 CHAIRMAN HORNBERGER: That depends upon your
23 Reynolds number, the question I asked earlier.
24 MR. HILL: Yes.
25 DR. LEVENSON: Well, you don't need

1 friction, do you, you have an end to push on.

2 MR. HILL: Right. If it's creeping flow,

3 then they're not going to move, but, boy, if your

4 Reynolds number -- and I don't have a clue what the

5 Reynolds number is. I don't know what the viscosity

6 of it is.

7 CHAIRMAN HORNBERGER: Latif.

8 MR. HAMDAN: Thanks, George. If this was

9 not Yucca Mountain and if I did not hear all your

10 presentation, the thing that I would ask about is this

11 calculation here, and I would ask you how sure are you

12 about these graphs, and whether you believe they are

13 reasonably representative of what you think might

14 happen, but since this is Yucca Mountain and I have

15 listened to the presentation, would it be fair to ask

16 what is the minimum that you would want me to do in

17 order for you to firm up this risk, because the risk

18 is .1 and even 1 millirem. We don't need maybe to

19 read about everything else. So, what do you need?

20 Can you come up with something, the minimum that we

21 can do for you to team up with these graphs?

22 MR. TRAPP: I think we already have. We've

23 said a number of times, we've given them agreements,

24 we've given them proposed agreements, we've talked

25 about the studies which we feel that need -- the

1 amount of uncertainty in those graphs right now is
2 tremendous.
3 MR. HILL: Latif, I just want to emphasize,
4 these concerns arise not because we are thinking up
5 new things to worry about, but these are based on
6 detailed reviews of the relevant AMRs and PMRs from
7 the Department where we believe these are critical
8 assumptions that need to be supported by a technical
9 basis to form the basis of their safety case.
10 MR. HAMDAN: And you are saying that there
11 is enough uncertainty that these numbers could go a
12 lot higher than this?
13 MR. HILL: I am not going to speculate
14 anymore than saying that there are significant
15 uncertainties on all of those numbers, and that they
16 have not addressed key technical concerns as I've
17 listed.
18 MR. HAMDAN: This is my point. We do use
19 to make a judgment as to how much research or how much
20 work we need to do. Can we come up with some numbers
21 within the bounds of certainty that we know the
22 current state of knowledge to recalculate this and
23 figure out what numbers we come up with before we
24 request that long list of information?
25 MR. HILL: Sure. Let's just say that we

1 changed one simple assumption in TSPA-SR, and that's
2 the waste -- more than three waste packages on either
3 side of the dike are losing containment and are
4 exposed to groundwater flow. That would have, in
5 TSPA-SR number, a factor of 10 based on the
6 Department's own number.
7 Now, for the vulcanism one, that's even
8 harder to say about how variations in the source term
9 as I've listed, but right now I would observe that we
10 are -- the Department is modeling, on average, 10
11 waste packages per intersected drift forms a source
12 term for volcanic disruption. We did some scoping
13 calculations in support of the TPA code where we let
14 the dike randomly intersect the drift and a dike
15 randomly break out from a drift, and found that on
16 average you would have 45 waste packages, if it was a
17 purely randomized process. So there is roughly a
18 factor of 5. I've shown you factors of 3 to factor of
19 6 potentials for remobilization today, so how many
20 multiple factors of 5 would you need in order to go
21 from a level of risk that would be on order of a
22 millirem to a level of risk that would give you a
23 concern?
24 MR. HAMDAN: But it's listed 1 millirem
25 that's the number I'm starting with --

1 MR. HILL: But probably would be weighted
2 risk.
3 MR. HAMDAN: Yes, but isn't that all we are
4 doing?
5 MR. HILL: Yes.
6 MR. HAMDAN: So my point is, instead of
7 thinking about the whole activity and trying to model
8 it and so forth, we start thinking about the risk
9 because the licensee has just tried to show you that
10 he can meet a standard, so to speak. So, if you start
11 with this evidence that you did, and do all that you
12 do in order for you to come up with numbers that you
13 are comfortable with, and maybe John, and go from
14 there, maybe there the workload would be risk and
15 maybe the agreements is easily reached.
16 MR. TRAPP: I have no idea what you're
17 getting at because we're just talking about --
18 MR. HILL: I can't be anymore explicit
19 responsibly than what I've just said to you, you know,
20 in terms of risk informing, why these are important
21 technical issues.
22 MR. TRAPP: Brit has basically talked about
23 the various areas where we've got factors of 2,
24 factors of 3, possibly orders of magnitude that could
25 be varying around. We don't know what they are. They

1 need to be taken a look at. We can go up or down.
2 The number may be too high, the number may be too low,
3 but it needs to be studied.
4 CHAIRMAN HORNBERGER: I think we'll have to
5 call it quits here. I believe the question related to
6 whether or not you would agree that some kind of
7 bounding analysis might, in fact, be appropriate and
8 how you would define that, rather than a full four-
9 dimensional modeling of magma drift interaction.
10 MR. HILL: I believe a bounding analysis
11 could be presented based on the uncertainties that
12 we've talked about many times.
13 CHAIRMAN HORNBERGER: But you want to see
14 it, I understand that.
15 MR. HILL: I'm not going to speculate on
16 what a bounding analysis would show.
17 CHAIRMAN HORNBERGER: Oh, no. That we don't
18 know, I agree with that.
19 DR. LEVENSON: I have a question -- it
20 should be Ray's question --
21 CHAIRMAN HORNBERGER: This is Ray's third
22 question.
23 DR. LEVENSON: I accept as reasonable the
24 assumption that the magma sweeps along, eventually
25 erodes out rock and debris, if there's backfill, and

1 maybe it destroys the waste containers. Is there any
2 evidence that ceramic uranium oxide dissolves in
3 magma?
4 MR. HILL: No.
5 DR. LEVENSON: Because if it doesn't
6 dissolve in it, then it's a whole other story of how
7 you get on with risk, even if the container is
8 destroyed.
9 MR. HILL: Well, you're right, but none of
10 the models use uranium dissolution.
11 DR. LEVENSON: How do they get all of the
12 radioactivity dispersed if --
13 CHAIRMAN HORNBERGER: Particles of fuel --
14 you break it up. I mean, if you look at what comes
15 out of a volcanic, except for the stuff plucked off
16 the wall rock, there are pretty small pieces.
17 MR. HILL: Yes, it breaks apart its
18 crystals, it breaks apart the wall rock, and you can
19 go down to the micron sizes on wall rock --
20 CHAIRMAN HORNBERGER: My point is the only
21 big pieces you get are from wall rock.
22 MR. HILL: Sure. And you can chuck out
23 things from a meter in diameter to a micron in
24 diameter, broken apart. I think Dick has something
25 valuable to add on this, too.

1 MR. CODELL: Dick Codell. Actually, there
2 have been some experiments with uranium dioxide
3 dissolution in the salt, and these were done for core
4 catchers in reactors. And it is soluble up to about
5 40 percent.
6 Now, the key question here is, what is the
7 rate of dissolution, and I have done some preliminary
8 calculations that for the time scales involved, there
9 could be a few percent dissolution. I don't think
10 this is the main factor, though.
11 MR. HILL: Dick, were those under oxidizing
12 or reducing conditions?
13 MR. CODELL: These were reducing.
14 MR. HILL: Okay.
15 DR. GARRICK: Highly metallic environment
16 whereas here you have a lot of rock.
17 CHAIRMAN HORNBERGER: Okay. We're coming up
18 on 12:00 o'clock noon --
19 (Laughter.)
20 CHAIRMAN HORNBERGER: Our first presentation
21 of the afternoon has to do with the SSPA, and I think
22 that's Carol, and I wonder if Carol would mind if we
23 push that until 1:15.
24 MS. HANLON: That's fine.
25 CHAIRMAN HORNBERGER: Okay. So, what we're

1 going to do is break for lunch and reconvene at 1:15.

2 (Whereupon, at 12:22 p.m., the luncheon

3 recess was taken.)

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1 A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

2 1:15 p.m.

3 MS. HANLON: Carol Hanlon. I'm with the
4 Department of Energy, Yucca Mountain. Originally we
5 had scheduled a presentation by Dr. William Boyle who
6 has had the responsibility for shepherding the process
7 of the Supplemental Science and Performance Analysis
8 document through its inception and its completion.
9 Bill was planning to be here today, and he would have
10 been very happy to be here today. What he is doing
11 instead is he's accepting and finalizing Volume 2 of
12 the SSPA itself. So he's moved his presentation,
13 after consultation with the Committee, to August.

14 Because you may already have copies of this
15 document or will soon be getting it, and because of
16 the importance of this document, Howard Larkins and --
17 excuse me, John Larkins and Howard prevailed upon me
18 --

19 DR. HORNBERGER: I actually like that.

20 (Laughter.)

21 MS. HANLON: Howard Larson and John Larkins
22 prevailed upon me to discuss with you the Supplemental
23 Science and Performance Analysis, and what I would
24 like to do just is show you how it fits in with the
25 documents that the Department is releasing over the

1 summer time frame, some of them in preparation for the
2 hearings we will hold later this summer, as well as to
3 introduce you to the document.
4 DR. GARRICK: That was very helpful, putting
5 everything in context.
6 MS. HANLON: We'll see.
7 DR. HORNBERGER: Was that the first time
8 you've been called helpful?
9 (Laughter.)
10 MS. HANLON: In a while. In a while. Can
11 I get a letter? No.
12 So going into some background for this
13 document, we're all aware that in late -- in December
14 of 2000, we had completed the Total System Performance
15 Assessment SR. DOE, through the summer, had also
16 initiated work to quantify uncertainties. We've had
17 a lot of discussion in this Committee over the
18 unquantified uncertainty work and getting closer to
19 realistic assumptions. So DOE had been working on
20 that last summer.
21 We had also completed the Yucca Mountain
22 Site Recommendation Consideration Report, Volumes 1
23 and 2. They were completed last fall. They were not
24 released for several reasons, one of which was they
25 superseded by the Yucca Mountain Science and

1 Engineering Report, which I discussed with you last
2 time. And also by the Preliminary Site Suitability
3 Evaluation, which will be coming out at either the end
4 of July or the first part of August.
5 With this information before us, however, we
6 had additional information, and DOE was determining
7 how to capture that additional ongoing information.
8 And the decision was to develop the Supplemental
9 Science and Performance Analysis Report to capture new
10 scientific work. The results of the ongoing,
11 unquantified uncertainties consider the range of
12 operating temperatures and evaluate the subsystem and
13 system sensitivities of that new information. That
14 was the purpose of the SSPA. And that is one of the
15 very few acronyms I allow myself, the SSPA. I think
16 it's a nice one.
17 So because we were moving from the December
18 time frame, and we had these upcoming documents that
19 needed to be available this summer, there was a quick
20 turnaround of this information in getting this
21 information available and usable in a format and in a
22 reference that could support the Preliminary Site
23 Suitability Evaluation itself. So it was an intense,
24 quick turnaround kind of thing. Dr. Boyle and I think
25 the people that have worked on it have done an

1 excellent job.

2 You can see that it was initiated in March,
3 middle March 2001. That's really barely four months
4 ago. It is a contractor document; it is not a DOE
5 document. It was prepared under a technical
6 management plan, and the document is approved by DOE.
7 So that allows us to get the document out a bit more
8 quickly.

9 Volume 1, the Scientific Bases and Analyses,
10 was issued last week, July 9. I think it's available
11 on the web. I know that copies have been mailed out,
12 both to the NRC and to the Committee, and I've brought
13 copies of the CD for that. It's in two volumes, which
14 I know you'll enjoy reviewing. It's actually about
15 1,200 pages, so it's quite an in-depth discussion.

16 Volume 2 is what Bill is shepherding through
17 the final processes of today. I spoke with him at
18 lunch, and the document is expected to come over to
19 DOE today. It will go through the final approval
20 process, and hopefully it will be out by the end of
21 this week or early next week. So it is also imminent.

22 And the main focus for getting this
23 information out in this time frame -- a main focus of
24 the information, in addition to compiling it in a
25 useful fashion, was so that it can serve as a

1 reference for the Preliminary Site Suitability
2 Evaluation, which is coming out very soon. And that,
3 of course, is DOE's evaluation against its own
4 proposed siting guidelines.
5 DR. GARRICK: Carol, maybe we asked this
6 before, I don't remember, but now why is this being
7 separated from the performance assessment since much
8 of it is performance analysis based on just redoing a
9 lot of the performance assessment issues.
10 MS. HANLON: Well, I think the answer to
11 that, basically, is that we had, in this time frame,
12 discussed originally, and we'd had some of our
13 meetings with the NRC based on the fact that there
14 would be a revision to the TSPA-SR, and so this is a
15 way of updating the TSPA-SR, that portion of it that
16 pertained to this new information. So especially
17 Volume 2 really is a TSPA update of sorts.
18 DR. GARRICK: Yes, yes. I was wondering if
19 it's just a game that we're playing here to show to
20 the TRB, for example, that there's documentation other
21 than the TSPA that is the basis for the review.
22 MS. HANLON: Well, the other documentation
23 would have been a TSPA-SR rev. And that was --
24 originally the thought would have been to be out this
25 summer. And Dr. Boyle can more specifically address

1 the thinking that went into doing this sensitivity
2 analysis work rather than the TSPA-SR rev itself.
3 DR. GARRICK: Well, does this suggest
4 there's going to be a TSPA-SR 2 or something?
5 MS. HANLON: No. The next TSPA-SR -- excuse
6 me, the next TSPA, Total System Performance
7 Assessment, will be for the license application,
8 should there be one.
9 DR. GARRICK: Okay. So this is just a
10 bridge.
11 MS. HANLON: Right.
12 DR. GARRICK: Yes. All right. Thank you.
13 MS. HANLON: So perhaps this slide gets a
14 bit at your questions, Dr. Garrick. Supplemental
15 Science and Performance Analysis is intended to
16 supplement but not supplant the TSPA-SR. It has
17 incorporated new scientific data -- the unquantified
18 uncertainty work that's been going on since last
19 summer and models to represent a range of temperature.
20 It examines the effects of alternative conditions by
21 evaluating repository operating modes, including the
22 higher temperature operating mode and lower
23 temperature operating mode.
24 I wanted to speak to the Committee a bit
25 about how we have looked at and prioritized some of

1 the information that's gone in here. I know that's a
2 continuing concern of yours. And in the back of your
3 document, you'll find this table in its entirety. But
4 just to discuss with you a little bit about the
5 process that was used as we took the new information
6 that had been collected since these other documents
7 had been prepared in about the six- to nine-month
8 period, we looked at a variety of information. We
9 categorized that information, as you see in the right-
10 hand column. And hopefully that will look familiar to
11 you. It's the same type of column that we've used in
12 the VA and so forth. So those, essentially, are
13 process model sections. And over on the extreme left
14 is the key attributes of the system that you've seen
15 repeatedly. So the new information that's been coming
16 in was evaluated in this three center columns, in
17 terms of three things to evaluate how important it was
18 and how consequential it would be to our analyses to
19 include was evaluated for whether it helped to
20 quantify uncertainties, whether it was an important
21 update to the scientific information or whether it
22 correlated with the lower temperature operating mode.
23 So with that in mind, the Xs indicate which
24 one of those categories it fits into. Additionally,
25 we've given you the sections of Volume 1 of the SSPA.

1 And over here in these two, we're talking about
2 whether it was a TSPA Sensitivity Analysis and whether
3 it is a supplemental analysis. So that's our attempt
4 to look at the body of information, determine how
5 important it would be to including it where and where
6 we should include it. And that was really more of a
7 qualitative section where our folks deliberated the
8 information available to them. So it's not really a
9 quantitative process.
10 I've chosen a couple examples here that are
11 of interest, because we've spoken about them at length
12 here before. One is the coupled effects on UZ flow,
13 and you can see that we have new information in three
14 areas of the mountain scale thermal: the mountain
15 scale thermal-hydrologic effects, mountain scale
16 thermal-hydrologic and chemical effects, and mountain
17 scale thermal-hydrologic and mechanical effects. So
18 those have been considered, and they don't make --
19 they have not made a big impact on the SSPA analysis
20 themselves so they're not included in that column.
21 Down in the next one, limited release of
22 radionuclides from the engineered barrier. That's,
23 again, a case where I thought it was interesting,
24 because the new information fits in all three columns:
25 unquantified uncertainty, new information, as well as

1 the lower temperature operating. In the case of the
2 high-level glass degradation, it, again, did not make
3 a great difference to the sensitivity. But for the
4 solubility of neptunium, thorium, plutonium, and
5 technetium, they were considered both in TSPA and in
6 the SSPA, so there is an update. And the rest of that
7 table, as I said, is for your information in the back,
8 so you can see a bit more about how we evaluated it.
9 These are just some general conclusions, and
10 this is for the nominal base case. This doesn't speak
11 to the cases that John and Brit made this morning.
12 This is basically just for the nominal cases. But, in
13 general, we had some conclusions, and they're not
14 expected, and that is that by having more precisely
15 quantified parameters, we make a difference in our
16 evaluations and the curves that we show. So there was
17 some difference, and I think that's a good thing. So
18 you will see that more, and Bill will demonstrate that
19 more in August.
20 But in addition, we have some early waste
21 package failures that have resulted in very small
22 doses during the regulatory period. And those come
23 from allowing -- estimating the very low likelihood
24 events of failure of the undetected flaw and failure
25 of the welding in the waste containers. So with that

1 very, very small number of failures they result in
2 some small doses during the regulatory period, and
3 I'll show you that on the next slide.
4 Also, most of our doses now fall -- doses
5 beyond 10,000 years are actually less, and the peak
6 doses are occurring later in time.
7 DR. GARRICK: How much of this is due to
8 just tightening up the models, and how much of it is
9 due to new information?
10 MS. HANLON: I think it's probably due to
11 both. And what Bill had emphasized is by having a
12 more realistic parameters we're seeing.
13 DR. GARRICK: Yes.
14 MS. HANLON: This is just one of the curves
15 that I've selected to show you, and you'll note that
16 we are now seeing some early releases, pre-10,000
17 years. And that, as I mentioned, is because of a few,
18 in the number of two to four, failures of waste
19 containers due to the undetected flaws in the welding.
20 So those are showing up at a low level here.
21 Here you can see the nominal case that we
22 showed in TSPA-SR. And based on the -- the high
23 temperature operating mode is the red, lower
24 temperature operating mode is the blue, and running
25 those through the Supplemental Science and Performance

1 Analysis we note that our releases are lower and
2 they're occurring later.
3 DR. LEVONSON: It looks at the map like
4 there is -- I would assume from looking at that graph
5 that one would come to the conclusion that the
6 temperature is irrelevant.
7 MS. HANLON: What we're finding is that when
8 we look at both of those in terms of compliance, we're
9 not finding that it makes a great deal of difference.
10 DR. HORNBERGER: Carol, when this was run,
11 do you know the answer to the question as to whether
12 or not it was done essentially exactly the same way as
13 TSPA-SR except for the changes noted in the table?
14 That is, the full range of uncertainty in all the
15 other parameters is embodied in the new curves as
16 well?
17 MS. HANLON: Yes. Well, let me take a cut
18 at your question, and see if I can get close to it.
19 Basically, when we did the new models, we used the
20 modeling from TSPA-SR as the departure point and
21 included the new information that we had, the new
22 scientific information, as well as the quantification
23 of some of those uncertainties and ran those. So that
24 was the modification to the SSPA analyses, and based
25 on that, that's what we ran to get that. Did that get

1 anywhere close to your question?

2 DR. HORNBERGER: Yes. I just wanted to make

3 sure that you didn't -- or I was just curious as to

4 whether or not you had fixed some parameters or

5 whether you had done some other changes besides the

6 upgrade. But evidently not. You used exactly the

7 same approach and just used the upgrades noted in your

8 table.

9 MS. HANLON: Right. And, again, this is one

10 of the points that I'm sure that Bill will be able to

11 speak with you about in August. And he's also -- we

12 were going to use the same approach that we used with

13 the Science and Engineering Report of having Bill and

14 somebody from TSPA here, as well as the video con back

15 to answer. Because I noted last time that you all

16 were very interested in the SSPA and had those kinds

17 of technical questions. Are there any more questions

18 on this chart? If not, then we'll move on.

19 So there has been some discussion about the

20 quality status for the Supplemental Science and

21 Performance Analysis, and this document was prepared

22 in accordance with our own quality assurance

23 requirements and the description document. The

24 analysis that was done in this document was to provide

25 additional insights with this new information and the

1 quantified uncertainty. And as you're aware, and as
2 I've mentioned, our time frame was more rapid than
3 perhaps otherwise to support the Preliminary Site
4 Suitability Evaluation.
5 So the analysis was done to provide
6 insights. We followed scientific and technical
7 practice, documented all the work performed. We've
8 retained all our data input files. We've maintained
9 our appropriate records. So in the SSPA, we would
10 have data models and analyses that are both qualified
11 and non-qualified. If we carry this -- for the
12 information that we carry forward into any license
13 application that might be submitted, the validation
14 and quality documentation will be completed.
15 Volume 1. Volume 1 of the SSPA contains a
16 scientific bases and analyses, the unquantified
17 uncertainty analyses, the new information/new data
18 analyses and models, and the cooler/thermal operating
19 mode analyses. Whereas Volume 2 is the performance
20 analyses, performance assessment sensitivity analyses,
21 the supplemental total system performance assessment
22 model analysis for both the higher temperature
23 operating mode and the lower temperature operating
24 mode. So that's the way the volumes break down.
25 One piece of good news is that while Volume

1 is around 1,200 pages, Volume 2 is quite readable; I think it's only about 200.

This is for your information. I won't go through all the chapters. Just to show you, for your information, your reference, what the document chapters are in Volume 1. There are 16 chapters and one appendix, plus references. I may mention to you -- I might mention to you that Chapter 5, Effects of Decay, Heat on Interthermal Hydrologic Conditions, there were some calculations that are being reworked and redone in that. So there will be an ICN to Volume 1 to correct some miscalculations.

And I don't know if they're exactly -- if I should categorize them as miscalculations or just corrections to more specifically refer to what was done in that area. So that will be coming out as an ICN. The question was whether it would be an ICN or an errata, and we thought it would be preferable to have all the information in one place, so that will be in ICN. And these are the remaining sections in Volume 1, leading to, finally, an appendix on the human intrusion scenario.

Volume 2, Performance Analyses, it has six chapters and one appendix. Basically, with the introduction followed by methods and approach, leading

1 on to supplemental performance evaluations of
2 uncertainty, supplemental performance evaluations of
3 the new information and the alternative thermal
4 operating modes and summary and conclusion. And then
5 an appendix on the date of tracking information.
6 And this interesting diagram is an attempt
7 to show how the documents we've got coming out over
8 the summer kind of fit in with our process. Our
9 process across the top is the Nuclear Waste Policy Act
10 requirements and our own need to evaluate our
11 information against our proposed 10 CFR Part 63
12 guidelines, the departmental siting guidelines. And
13 hopefully those will be final in the near future, as
14 soon as 63 is final. So it's the Nuclear Waste Policy
15 requirements, our own evaluation, the site
16 consideration hearings that are coming up later this
17 summer, leaning to a potential site recommendation
18 decision.
19 And as we spoke last June, the Yucca
20 Mountain Science and Engineering Report addresses the
21 Nuclear Waste Policy Act requirements. And TSPA-SR
22 was an important component of the Yucca Mountain
23 Science and Engineering Report. This Preliminary Site
24 Suitability Evaluation is our evaluation of our
25 ability to meet with the siting guidelines. It will be

1 followed later this summer by a -- later this fall,
2 excuse me, by a suitability evaluation.
3 The TSPA-SR also contributed to the SSPA as
4 well as the suitability evaluation. So it's a big
5 complicated, but the TSPA-SR contributed both to the
6 Science and Engineering Report as well as the
7 Preliminary Site Suitability Evaluation. Also
8 influenced the Supplemental Science and Performance
9 Analysis document, which is also considered in our
10 evaluating the guidelines. And those documents will
11 be part of the pyramid, which supports any site
12 suitability -- excuse me, any site recommendation.
13 DR. HORNBERGER: This is the diagram, but
14 you chose the color scheme.
15 MS. HANLON: I didn't choose the colors, but
16 I would have probably chosen these colors. I'm a fan
17 of pink and purple, I confess.
18 (Laughter.)
19 So, in summary, the Supplemental Science and
20 Performance Analysis document presents new data,
21 achieved since TSPA-SR. It presents the results of
22 the unquantified uncertainty, analyzes a range of
23 temperatures, and analyzes system and subsystem
24 performance analyses. And, again, it supports the
25 Preliminary Site Suitability Evaluation as an

1 important reference.

2 Like the Science and Engineering Report, the

3 Suitability Evaluation, Preliminary Site Suitability

4 Evaluation, has no new information that's not

5 referenced otherwise. So it contains no new

6 information which is part of the driver for having the

7 SSPA out. Volume 1 of this document is already

8 available on the web. I have disks for you. I guess

9 you all haven't received your copies yet? They're

10 hard to miss.

11 (Laughter.)

12 Volume 2 is coming quickly, hopefully, and

13 we'll have a detailed briefing by Dr. Boyle and his

14 colleagues in August. So may I answer any questions

15 for you on the process or introduction?

16 DR. HORNBERGER: Thank you, Carol. So,

17 obviously, as Carol said, we'll defer our detailed

18 questions on the technical matter until August when

19 Bill Boyle is here. But are there questions related

20 to how this was constructed and the purpose and what

21 not? Milt?

22 DR. LEVONSON: Well, I've got a question

23 which is very unfair to Carol, but she's standing

24 there. This is a semi-independent related question.

25 There was a matter of whether in fact barometric

1 pumping had been taken into account in some of the
2 modeling and what have you. And with a simple
3 reference that our chairman gave me, I spent some four
4 hours in a USGS library trying to find whether in fact
5 something had been done. I found it. I just got the
6 report this morning. It's 160-some pages with a great
7 deal of information, not only about barometric pumping
8 but about thermal siphoning and wind-induced flow
9 through the mountain, et cetera.
10 The reason I raise the question is this is
11 a USGS report done in conjunction with the DOE Nevada
12 Operations Office. It's irretrievable. We got this
13 copied by going to the author, because it was never
14 given a number, and so you can't even get it from
15 anybody's web page or anything. And since I just got
16 it this morning, for instance, for 6,000 hours they
17 took readings every 15 minutes on air flows in and out
18 of the Mountain. And for another 4,000 hours,
19 readings once an hour.
20 And my concern is, is there more of this
21 kind of stuff floating around that we don't know
22 about? I have no idea whether this is a plus or a
23 minus to the consequences, but it kind of disturbs me
24 that this extensive amount of work doesn't appear to
25 be a matter of record.

1 MS. HANLON: Well, first of all, I think
2 that what we would want to do is ask Dr. Boyle and the
3 people whether or not they were available with that
4 particular document in another format. So if that was
5 done at the Mountain, it would surprise me if it
6 weren't captured in another document. And as you
7 know, during the last two to three years, we've gone
8 through quite an extensive period to create references
9 and traceable references, and we've gone through the
10 AMR and PMR process. Oftentimes if information was
11 available in that format, such as you mentioned, the
12 decision was made to capture it, the relevant
13 information, in an AMR and subsequently a PMR to give
14 us a traceable path. So if you'd like, we can speak
15 with Dr. Boyle and see the extent to which that
16 information was included and how it was included.
17 But I think, basically, our rigorous path
18 during the last is at three, perhaps even more -- may
19 have been longer than that, basically since the VA,
20 was to have a traceable path to be able to take all of
21 our information and have references for it that could
22 be referred to. That kind of goes back to what I said
23 about the Preliminary Site Suitability Evaluation and
24 Science and Engineering Report containing no new
25 information.

1 So what we've always been trying to do is
2 have a consolidated referenceable document that you
3 can pull out of our information database and the DIRS
4 System so that we can recover it. And sometimes it
5 may be that a particular document like that the
6 decision was made not to put it in. So we can check
7 on that.
8 DR. LEVONSON: Yes. Because even though if
9 the results were included, I assume somebody
10 abstracted it, and something as important as this I'm
11 surprised that such a thing -- that this wasn't funded
12 out of discretionary funds from USGS or something,
13 funded by DOE. But somehow things like this end up
14 not being part of the basic record.
15 MS. HANLON: Well, I would be very surprised
16 if it wasn't included in the set of AMRs that support
17 the PMR for the climate sections and biosphere and so
18 forth. But what we really do need to do is pull that
19 thread. We can look at that document and check with
20 our authors of the AMRs and PMRs and check with Bill
21 and see the extent to which the information --
22 DR. LEVONSON: The only thing I can tell you
23 is that USGS and the authors said this was the only
24 way to get a copy.
25 MS. HANLON: And just going back one more

1 time, that was -- you know, we've discussed how
2 information might be included, and that's why we
3 developed our system of having the analysis and
4 modeling reports. That was the basic information.
5 They drew on references and were abstracted into the
6 PMRs. And that was to have a traceable flow and clear
7 flow of information.
8 DR. HORNBERGER: Carol, just to follow-up on
9 that, I'm curious, completely aside -- well, not
10 completely aside -- but I'm just curious, since this
11 is USGS, I know at least there was a time when
12 qualifying some of the data was a difficulty. So how
13 have you handled that? I mean are there some old data
14 that are not qualified, that simply they don't use and
15 therefore are not part of the record?
16 MS. HANLON: Well, I think the decision has
17 been if the information is going to be used, it needs
18 to be qualified.
19 DR. HORNBERGER: Okay.
20 MS. HANLON: If it's not qualified, then
21 it's identified clearly as not qualified and used as
22 corroborating information.
23 DR. HORNBERGER: I see. So you can still
24 use that, but it's corroborating information.
25 MS. HANLON: Right. So there are kind of

1 three paths to use: Either have it fully qualified,
2 go back and qualify it if it hasn't been qualified,
3 and if you're not going to go back and requalify it or
4 qualify if it wasn't originally done under the
5 pedigree to use it as supporting information.
6 DR. HORNBERGER: Okay. Ray?
7 DR. WYMER: Yes. I'll just make a comment.
8 One of the problems we've had in the past, Carol,
9 that's been sort of frustrating to us as a Committee
10 is that this whole business with the scientific basis
11 for a lot of the TSPAs has been a moving target. You
12 keep adding information and adding information, and we
13 take the time to read the documents and try to
14 understand them, and then next thing we discover is
15 that, "No, that's right. We've moved well beyond
16 that, and now we've got the real scoop here now. And
17 this is what you should have read instead of what you
18 did read."
19 MS. HANLON: Or this is what you should read
20 also.
21 DR. WYMER: There's only another 1,200
22 pages, Ray.
23 (Laughter.)
24 So let me ask now -- I'm getting around to
25 a point here -- let me ask, is it DOE's position that

1 they have now arrived at the point where they felt
2 that they had enough new information, they were sure
3 enough that it was pretty good stuff, that they went
4 to the trouble to put out these documents, and they
5 were probably maybe sort of the word until the license
6 application comes in? I mean are we kind of at the --
7 do we see the light at the end of the tunnel?
8 MS. HANLON: Well, I think we're coming to
9 a point where we're wrapping a lot of this information
10 up for the site recommendation. However, you know,
11 we're continuing to collect information. We have
12 ongoing studies in the laboratory, ongoing studies in
13 the field, we have performance confirmation that we'll
14 be doing. So I would doubt that in the foreseeable
15 future we came to a point where we said, "This is all.
16 This is it. We've got our answers." And I would not
17 think that the staff would be too pleased if they
18 heard that from us.
19 So, basically, this is, again, our attempt
20 to take that information, sizable amount of
21 information, that had been being accumulated since we
22 did our last wrap-up, which is why I put that
23 background slide that had the Site Consideration --
24 Site Recommendation and Consideration Reports, TSPA,
25 and the unquantified uncertainty. From that time

1 forward, we had done additional information. We
2 thought that information was important enough that it
3 needed to be put in the public record and needed to be
4 referenceable.
5 So there will be additional documents coming
6 out, as we've spoken, this summer, the Preliminary
7 Site Suitability Evaluation. Then this fall there
8 will be a revision to the Science and Engineering
9 Report to accommodate comments that are made during
10 the hearing process. There will be a final Site
11 Suitability Evaluation. There will be other
12 documentations, so I don't think that the answer is,
13 "This is all."
14 DR. WYMER: So this is another snapshot.
15 MS. HANLON: This is another snapshot, and
16 there will be snapshots as we move forward in the
17 program. In fact, one of the things that we're
18 looking at is how we will continue to accumulate and
19 present that information as we go forward, especially
20 the performance confirmation type of information and
21 the information that we would accumulate in the
22 license application.
23 DR. WYMER: Okay. Thanks.
24 DR. GARRICK: Carol, you may have answered
25 this, but on your view graph 12, you said that the

1 SSPA was prepared in accordance with requirements of
2 the quality assurance requirements and description
3 document. Is that a DOE requirement?
4 MS. HANLON: Yes, that is exactly a DOE
5 requirements document, and it's how we prepare -- it
6 gives us avenues of how we prepare documents. One is
7 fully qualified and the other is, in the case of this,
8 where we have information that we want to do rather
9 quickly and turn out and that wouldn't all be
10 qualified, the steps we would take to do that. So it
11 regulates our preparation of documents.
12 DR. GARRICK: Is that a document that the
13 NRC has ever reviewed or looked at?
14 MS. HANLON: Oh, I'm sure.
15 DR. GARRICK: Yes.
16 MS. HANLON: Many times.
17 DR. GARRICK: Yes. Okay. Then I was
18 looking at Exhibit 17 in your presentation and 27 in
19 your backup and trying to map from one to the other.
20 Maybe you can help me. Because they both seem to be
21 somewhat addressing the same thing, and yet they're
22 taking a little different format.
23 MS. HANLON: Yes, they are taking just a bit
24 of a different format. So let me go to this back one.
25 And that, basically, is -- and I showed this to you --

1 I keep getting them crooked -- but I showed this to
2 the Committee last --
3 DR. GARRICK: Right.
4 MS. HANLON: -- month when we were here.
5 And these are just basically the components that are
6 going into the basis for the recommendation. These
7 are the underlying parts of this triangle, this
8 pyramid. And those, basically, the ones that we're
9 going to rely on, on the Science and Engineering
10 Report, the Site Suitability Evaluation, the final
11 Environmental Impact Statement, NRC's sufficiency
12 comments, the SR comment summary document, which is
13 the document that we will prepare after the hearings
14 to summarize and account for the comments that we've
15 received, and Nevada Site Characterization Impacts
16 Report, should we receive it, one, and other
17 information. So that's a snapshot that I wanted to
18 use that gives you the modules that will go into our
19 basis for recommendation.
20 This is just another way of -- sometimes
21 it's presented in this format where you have a large
22 pyramid that you might have a chance of actually
23 reading. And that has down here our technology
24 products, our technical documents, and then these
25 other documents appear, such as TSPA, draft EIS and so

1 forth, leading up to these particular ones, the
2 Science and Engineering Report, Site Suitability, and
3 so forth. So this is just like a different way of
4 rolling out what our products are going to be for the
5 basis and how the interim ones feed that whole process
6 and feed our process across this summer. Does that
7 help at all, Dr. Garrick.
8 DR. GARRICK: Yes, sure. Thank you.
9 DR. HORNBERGER: Carol, when I look at your
10 performance assessment result that you showed, the
11 sample, and if you look at the differences between the
12 base case and the new calculation at 100,000 years,
13 that's six orders of magnitude different. I wanted to
14 ask John's question, I guess, in a slightly different
15 way. Is that mainly due to what you call the
16 unquantified uncertainties or to new scientific
17 information or do you know?
18 MS. HANLON: You know, I think that's
19 probably something that would be best left for --
20 DR. HORNBERGER: For Bill.
21 MS. HANLON: -- a more accurate answer from
22 Dr. Boyle.
23 DR. GARRICK: I think that figure is a basis
24 for about an hour's discussion.
25 DR. HORNBERGER: Yes, probably. Okay.

1 Well, then I'll change the question. When you look at
2 that figure and you see six orders of magnitude
3 difference, does that give you pause at all?
4 MS. HANLON: Well, you know, we've talked a
5 lot about the last month, about the fact that, you
6 know, we have overestimated things or we've bounded it
7 on the very high ends, and that by bounding it on the
8 high ends and take the conservative approach in all
9 cases, what it does is it masks our ability to
10 understand how the system is working. And I think
11 that's what we're seeing here, is we're taking the
12 masks away, and we're taking the extreme conservatism
13 away, and we're beginning to get what you all refer
14 to, I think, as the realistic assumptions, the
15 realistic parameters, how the system is really
16 behaving.
17 And so what we see here is -- you know,
18 maybe I should put it back on -- is originally with
19 all those bounding considerations and bounding
20 conditions, we were getting the higher peak. And as
21 we really began to hone in on what the quantified
22 uncertainties are and the parameters are, then we get
23 a more realistic, and it's actually down in the lower
24 range, and it's further out in time. So we've
25 introduced precision there that we did not have

1 before, and I think that's what we would expect.

2 You know, when you're working on assumptions

3 and you're working on bounding conditions and you're

4 working without the exact information, you would

5 expect that extreme conservatism. And when you begin

6 really having the basis to do your evaluations,

7 hopefully you would see that your system is performing

8 the way you'd like it to.

9 DR. GARRICK: The interesting thing here is

10 if you did any kind of a regression analysis, you

11 wouldn't detect any difference between the HTOM and

12 the LTOM.

13 MS. HANLON: And that's the other thing that

14 we're finding.

15 DR. HORNBERGER: As DOE moves forward,

16 assuming it goes forward with a license application,

17 would DOE's intent be to produce a quite realistic

18 performance assessment or to opt more for a bounding

19 kind of analysis?

20 MS. HANLON: Well, again, you know, I would

21 like to defer that to Bob Andrews and Bill when they

22 get in here, but I would say to the extent that we

23 have the accurate information and the real

24 information, I would think that we would certainly

25 want to put that into the license application, because

1 that gives us our ability to really predict and really
2 demonstrate what our information is and what direction
3 we're going.
4 DR. HORNBERGER: Other questions? Staff?
5 Brit?
6 MR. LESLIE: Brit Leslie from the NRC Staff.
7 I've actually got three questions. One is, can you
8 help me understand what the difference between an
9 operating mode is and its design and how that is
10 perceived by DOE? For instance, if you say, "We have
11 an operating mode," that mode has certain design
12 parameters that if they went forward would have to be
13 quantified. Can you explain the difference between
14 those terms?
15 MS. HANLON: Well, basically, we've been
16 talking about the last several months that we have a
17 basic design, and that design is underground drifts
18 and its canisters and containers. And at the current
19 time, that's basically what we're looking at. So
20 that's the parameters of our design. So the things
21 that we have changed is in terms of we've changed
22 consideration of the drift spacing, we've moved to
23 align loading rather than point loading. So those are
24 things that are more in consideration of perhaps
25 operating over the design -- the basic design that we

1 have.

2 And, again, Brit, I just might mention to

3 you that in August Paul Harrington is going to be in

4 here, and he's going to be talking about an update to

5 our design information and our pre-closure

6 information.

7 MR. LESLIE: And next question I've asked

8 Bill Boyle this but not on the record, and I'll ask

9 you. Does DOE believe that the NRC sufficiency

10 comments should include review of the Supplemental

11 Science and Performance Analysis Report?

12 MS. HANLON: What did Bill tell you?

13 (Laughter.)

14 Well, you know, basically, you have this.

15 This information is available to you. And this is one

16 of the things, as we went through the process of

17 having the key technical issue technical exchanges, we

18 knew this information was coming out. And we knew,

19 for instance, the areas where it would be pertinent.

20 And as we had this information, in fact we have a

21 technical exchange on the low temperature coming up,

22 so of course you'll be using this. And what we have

23 discussed is the fact that basically we think that

24 this is going to be confirming the case that both

25 areas, both the lower and the higher ranges allow us

1 to comply in our estimation with our regulations. So
2 of course you'd be using it.
3 MR. LESLIE: Okay. And the last clarifying
4 question --
5 MS. HANLON: And if that's not what Bill
6 said, they can shoot me.
7 MR. LESLIE: Close enough. The last
8 question is just clarification on, I guess, slide 27.
9 The SR comment summary document would also include
10 responses to the NRC sufficiency comments?
11 MS. HANLON: That one is specifically
12 comments made at the hearing and especially -- let me
13 see if I got this quite right -- yes, I think it's
14 basically comments made at the hearing, and it may
15 have a special section for comments that are mandated
16 in the Nuclear Waste Policy Act that we have to
17 receive from legislatures and governors. But it does
18 not include the sufficiency response, if there were to
19 be one.
20 DR. HORNBERGER: Okay.
21 MS. HANLON: That's only two, Brit, isn't
22 it?
23 DR. HORNBERGER: No. He snuck three in.
24 MS. HANLON: Oh, he did?
25 DR. HORNBERGER: He's very cagey that way.

1 MS. HANLON: So are there any other
2 questions?
3 DR. HORNBERGER: Any other questions? No?
4 MS. HANLON: If not --
5 DR. HORNBERGER: Thank you very much, Carol.
6 MS. HANLON: Thank you.
7 DR. HORNBERGER: We'll look forward to all
8 of the technical details in August. We have an hour
9 before -- we have an hour and 15 minutes before the
10 next presentation. Maybe we should -- do you want to
11 do the chemistry letter? Okay.
12 (Whereupon, the foregoing matter went off
13 the record at 1:59 p.m. and went back on
14 the record at 3:15 p.m.)
15 DR. HORNBERGER: Okay. We're going to
16 reconvene, and our topic for this afternoon is the
17 research plan for the Radionuclide Transport Program,
18 and it looks like we have tag team -- Cheryl, Bill,
19 and John. Are you just going to man the overhead
20 projector, John?
21 MS. TROTTIER: No. He's got to rule.
22 (Laughter.)
23 DR. HORNBERGER: All right. Cheryl, I
24 assume --
25 MS. TROTTIER: I'm going to start, the big

1 manager's oversight position here.

2 First, I'd like to thank you for taking the
3 opportunity to listen to our presentation, and
4 hopefully you've all gotten copies of the plan. We
5 did send it around. I want to start out by making
6 sure you understand this is the very first steps of
7 the plan. We started on this process about a year
8 ago. This basically represents the staff's expertise
9 and their ideas. We have taken it to our primary
10 customer, NMSS, initially, but we intend to continue
11 the dialogue. But just so as long as everybody
12 understands that we're in the very early stages with
13 the plan.

14 What we're really hoping to do with this
15 plan is to use it to maximize our resource allocation.
16 In the past, you've commented to us about the size of
17 our program, and how do we know that the research
18 we're doing is really the research that's absolutely
19 the most needed. And that's what we're hoping that
20 we'll be able to accomplish by using the system. And
21 what you will see is we have developed a
22 prioritization scheme which we intend to use on these
23 projects. We have not yet done that. We thought we
24 needed to have the full set of projects before we go
25 through the prioritization process. And we certainly

1 intend to get as much stakeholder support and input on
2 this as we can. John, do you want to go to the next
3 slide?
4 This is just two reiterate what the purpose
5 of this research is. It's confirmatory and
6 anticipatory research. I would guess that the bulk of
7 it will always be confirmatory, but we always do try
8 to have a little bit of anticipatory research. And
9 our goal is to come up with credible, realistic, and
10 defensible estimates of risk to the public. And those
11 are what is key to the help for the Program Office in
12 making decisions. Next slide.
13 This just is our attempt to define the
14 difference between anticipatory and confirmatory
15 research. I think the one advantage of having
16 anticipatory research is the program offices cannot
17 always think far enough ahead when they're dealing
18 with day-to-day licensing decisions. So the hope is
19 that those in research can see, through their
20 interactions with the outside world and other
21 organizations doing similar work, where there may be
22 places where research is needed, and that's the type
23 of anticipatory research we hope to include. As I
24 said before, the bulk of our Program is really
25 confirmatory research, and that is based on user need.

1 Okay, John, the next one.

2 What we've attempted to do in the plan is to
3 put our issues into basically four groups. There may
4 be better ways to do it, but this has been our
5 traditional way of dividing up the issues starting
6 with source term. We need to be able to characterize
7 that properly. We've got one area we call engineered
8 barriers, and then on the next slide, transport, and
9 finishing up with performance assessment where most of
10 the dose modeling type of work is captured, along with
11 some other analysis. Next slide, John.

12 These are the areas that we hope to cover in
13 the plan. Primarily decommissioning, because
14 currently that is the most significant that the
15 Agency's undergoing where there are still a lot of
16 open questions. Some of our work would cover uranium
17 recovery, some of it is applicable to low-level waste.
18 And we do anticipate, although you won't see it in
19 there now, including a little anticipatory high-level
20 waste research. Next slide.

21 As I mentioned earlier, our primary customer
22 is NMSS, the Division of Waste Management. There may
23 be customers in some of the other offices and possibly
24 even out in the agreement states, since they are the
25 ones currently handling the low-level waste issues.

1 We're just trying, at this point, to identify possible
2 stakeholders that we could provide copies of the plan
3 to to get their input. We will also put it out on the
4 web, so it will be available to the public. We have
5 already, as I said, had NMSS take one look at it. We
6 have incorporated a lot of their comments, and then I
7 will show you in a little while that we do have plans
8 of going out and getting other stakeholders involved.
9 This just gives you an idea of where our
10 budget is. Now, of course the -- they're not in gray,
11 but the hard copy is there in gray -- the last three
12 years, for 2002, 2003, and 2004, of course, are
13 planning numbers; they haven't been confirmed. But if
14 you look at the line entry marked "Waste/CL," CL is
15 stands for clearance, we've moved the work that we're
16 doing now to develop a technical basis for the
17 clearance task of establishing release limits for
18 materials from facilities. That is separated out,
19 because that will not go on and has actually been
20 covered under other areas before. We had it under the
21 Materials area before.
22 Just so you have -- it gives you an idea.
23 I think it shows you actually there's a moderate
24 increase in the budget from 2000 up to 2004, if you
25 look at the $2.5 million going up to $2.9 million. If

1 you look at the totals, it looks like less, but we
2 have a fairly significant effort going on in these
3 first two years for clearance, falling off in 2002.
4 We should be done with a significant portion by 2003.
5 Next slide, John.
6 And as I said, we're going to continue our
7 coordination efforts. My goal is by the end of this
8 year, I'm saying January at the latest, to have this
9 plan in a final form. I intend this plan to become a
10 living document that every year we would revisit, but
11 we start our budget process in February, and I need
12 this before I go into the budget processes.
13 It's key, because the Office of Research now
14 goes through a prioritization every year, all the
15 projects. And so we need to have our piece of it done
16 ahead of that so we can make use of it during that
17 budget time. So the schedule is geared around meeting
18 that date with the intent that we will have pretty
19 much all the projects collected by November. November
20 we'll go through a prioritization, and then we will
21 modify the plan as needed. Most of that modification
22 will involve putting more meat on it.
23 If you've looked at the plan, you notice
24 that the descriptions are very short. They don't have
25 deliverables, they don't have dates, schedules, and

1 that all would need to be added as we moved forward.
2 I didn't want the staff putting a lot of resources
3 into that at this point when the main issue is to try
4 and identify what are the important projects. As the
5 write-ups were complete enough for people to
6 understand what the projects were going to accomplish.
7 And with that, I'm going to turn it over to
8 Bill.
9 MR. OTT: Hi. As you recall, last November,
10 I discussed a little bit of this program with you,
11 basically the first four chapters, and said that we'd
12 be coming back to you later with a version that had
13 Chapter 5, which is where we are today. But there's
14 a little bit of information that I wanted to provide
15 with regard to what's in Chapters 1 through 4,
16 primarily on the planning base and the prioritization
17 scheme and our current budget structure. And I should
18 be able to do that fairly quickly, and then we'll get
19 into John's part, which is to deal with the detail.
20 As we discussed in November, we've tried to
21 structure the plan around the strategic plan for the
22 Agency. Because that's the way the Agency is going
23 and it's the way all the performance goals are
24 written, it's the way the budget is structured, we
25 didn't feel we had any choice other than to use that

1 particular structure. So this first page here just
2 goes through those, and I won't read them off.
3 They're the Agency's goal in the waste arena area.
4 And then we talked in November about a
5 proposed change to the modification to the Office's
6 prioritization system. Those pages are repeated here
7 as well, primarily just the part that would apply to
8 the waste research. I haven't bothered to go into
9 putting in the slides here, the part that's in the
10 conventional program.
11 You'll recall that some parts of the way
12 this prioritization system was structured the
13 individual criteria ratings spoke directly to things
14 that really had no relevance to the waste arena. They
15 were talking about things like core damage frequency
16 and large early release fractions and things like
17 that. And we wanted to develop corollaries that dealt
18 with the performance goals that we deal with in the
19 waste arena, which are primarily those dealing with
20 small doses over long periods of time, stochastic
21 effects, as opposed to the problems in the reactor
22 area, which are dealing with early releases due to
23 reactor accidents. So the structure here is designed
24 to the look at the prioritization problem from the
25 point of view of assessing research that will help us

1 come to grips with problems that deal with those long-
2 term effects.
3 And, again, I don't want to go into a lot of
4 detail on this part of it, because we talked about it
5 before. So I'm going to go to that next page. And
6 this is the budget structure, and this probably is, if
7 you've looked through the view graphs, it's probably
8 the most confusing part about this.
9 In the prioritization scheme, we prioritize
10 by activities. We don't prioritize by schemes within
11 the -- by fin within the Office; we prioritize at the
12 activity level. Our previous activity level had
13 almost all research in the branch under one activity
14 -- not the branch, in the RTE Program. It was like
15 $1.5 million out of $2 million was in one activity.
16 And it didn't give you a lot of ways to discriminate
17 between the various things that go on in the Program.
18 So we thought very hard this last budget go
19 around about ways of characterizing the various parts
20 of the Program. And we came up with a new structure
21 which has six activities in it, and those six
22 activities have a fairly balanced weight in terms of
23 the amount of dollars in them. They're all between
24 $400,000 and $600,000. So now have a balanced
25 resource allocation, and I'll go through here very

1 briefly and actually talk a little bit about these.

2 The notations in here, 341AAA, there's no

3 reason to try and explain those. They basically go

4 back to how the budget is structured and numbers and

5 stuff like that. They're meaningless.

6 But the first issue -- and there are three

7 major issues that are listed for the waste portion of

8 the Program. The first one issue is monitoring

9 strategies and measurement techniques. And the first

10 block here and the top block on the next page refer to

11 activities that divide up the work that we consider

12 doing under monitoring strategies and measurement

13 techniques. And those primarily to support assessment

14 of long-term compliance with containment requirements,

15 and this is where we put in the work on barrier

16 performance and on monitoring systems.

17 And the other one is to develop the

18 methodologies for assessing low levels of radiation,

19 primarily this activity, this 341AAB is looking at

20 dealing with complicated geometries and volumetric

21 contamination. It's an extension of the work that's

22 already been documented in MARSOM, but this would go

23 on to dealing with much more complex contamination

24 problems. How do we assess what's actually there from

25 a measurement perspective, as opposed to knowing

1 what's there from inventories?

2 The next issue, information for assessing
3 radiation exposure for released materials, deals with
4 a good bit of the problem in terms of a performance
5 assessment model and in terms of source term. This is
6 where we'd look at the quantities, the chemical and
7 physical forms, and the data and modeling techniques
8 to determine the rates of release from whatever the
9 contamination is. And the other part of this
10 particular issue would be the assessment of natural
11 processes controlling transport.

12 Now both of these are under, if you go to
13 the previous page, sorry to switch you up there, John.
14 You notice it says up there, "planned accomplishment,
15 maintain safety." These are primarily things that we
16 think are necessary to be able to adequately determine
17 the level of safety with any given problem that you're
18 dealing with.

19 The last activity, you'll notice, has a
20 different planned accomplishment on the top. This
21 planned accomplishment is effective sufficiency in
22 realism. And this is where we talk about -- where
23 we're talking about the problem of putting together
24 models into a composite form in which they can be
25 efficiently used. So we're not developing fundamental

1 new information about the processes, about the
2 radiation involved, about the waste forms, but we are
3 developing frameworks in which these can -- the
4 individual models can be put together.
5 This is where we would do the new work with
6 regard to developing multimedia models, with regard to
7 a replacement for the SUDS Program, which we
8 terminated last year. It's where some of the work
9 that we'll be doing with regard to the new MOU and
10 multimedia modeling will eventually be funded. And
11 the third part of this is the MARMOD effort that's
12 basically being run through its course and is really
13 going to be MARPAR as opposed MARMOD for the first
14 phase, which is trying to get agreement amongst the
15 federal agencies about what the correct parameters are
16 to use in given situations or the correct parameter
17 distributions.
18 This is basically structure of what we would
19 prioritize within the Office's prioritization system.
20 Now, each one of these activities may have multiple
21 fins within it. And the next logical question is how
22 do we decide which fins we're going to fund within any
23 given activity? The prioritization system that we're
24 using at the activity level is not necessarily
25 appropriate, because you're going to find very few

1 ways to discriminate between projects at the fin
2 level. We have not resolved that question, and we
3 will continue to look at it as we collect more
4 information and more ideas from other participants and
5 stakeholders with regard to the proper content of the
6 total list of issues that we ought to address.
7 DR. GARRICK: Bill, I'm still trying to
8 understand a little more clearly the level at which
9 you actually do your prioritizing. Are these
10 activities pretty much that level?
11 MR. OTT: The activities are the level at
12 which the prioritization is done, yes. So these six
13 activities would go in the Office's list of something
14 like 180 activities.
15 DR. GARRICK: Now are these compared with
16 other things that are trying to get outside of the
17 waste field --
18 MR. OTT: Yes.
19 DR. GARRICK: -- or trying to get research
20 dollars?
21 MR. OTT: Currently, yes. Now, the Office
22 does reserve the right to go in and make decisions
23 that activities that don't score high by their nature
24 still need to be done. And I think one of the reasons
25 why you see our budget going up is that was done this

1 year, because we weren't able this year to apply the
2 proposed new criteria. We were still operating under
3 the reactor-oriented criteria, and some of the scores
4 came out fairly low, and there were decisions made at
5 the Office level that we needed to differentially make
6 decisions that continued to fund this work and perhaps
7 increased it. There has been sensitivity at the
8 Office level that everybody -- ACNW, the Rodgers
9 Committee -- has said that we aren't adequately
10 funded, and there has been a deliberate attempt to
11 increase that, and that's reflected --
12 DR. GARRICK: Are you going to say anything
13 about the actual algorithms that result in the scores?
14 MR. OTT: The numbers are given here. The
15 algorithms is very simply to do a weighted sum of each
16 one of those factors depending on the --
17 DR. GARRICK: Okay.
18 MR. OTT: Okay. Now, it's based on an
19 analytical hierarchy process.
20 DR. GARRICK: Is this what we heard about --
21 MR. OTT: Yes.
22 DR. GARRICK: -- sometime back?
23 MR. OTT: Yes.
24 DR. GARRICK: Okay.
25 MR. OTT: Okay. And with that, I'll turn it

1 over to John, and John will start going into Chapter
2 5 where the more detailed information on the project
3 is.
4 MR. RANDLE: I'd just like to -- can you
5 hear me okay? I'd just like to start with what we're
6 doing now, our current projects. And if you'd bear
7 with me a second. This slide, page 17, is one that I
8 replaced. I gave everybody a blank sheet -- well, not
9 a blank but a separate -- it would be better if it was
10 blank -- a separate sheet of paper. It's just adds a
11 few more projects that I had omitted. And the
12 organization here on this and the next page is the
13 same as what Cheryl had told you earlier.
14 In the first category, release of
15 radioactive material, source term common jargon.
16 Currently, you have work on radionuclide solubilities
17 and release rates and colloids. It's applicable to
18 low-level waste and decommissioning. At PNNL and at
19 Johns Hopkins, through one of our staff members, Linda
20 Bevlin, who's here today, we're working on slag and
21 soil characterization. Most of the slag work is done,
22 but there is equipment there that we can use, Linda
23 can use when slags become -- new slag samples become
24 available. Recently, we did take advantage of an
25 opportunity to get some samples from the Whittaker

1 site in Pennsylvania.

2 And the last one is a project that's
3 wrapping up on characterizing and leasing reactor
4 decontamination waste. The engineered barriers, we
5 recently finished the project on testing of a code
6 that would estimate transport of radioactive material
7 and concrete that was called Foresight, written at the
8 National Institute of Standards and Technology. And
9 we're just starting a project on long-term behavior of
10 concrete structures as barriers to radionuclide
11 movement from -- the application could be entombment.
12 That's the primary one nowadays. Also could be
13 applicable to low-level waste, either as a disposal
14 option or as a short storage option.

15 In the transport area, there's two projects
16 dealing with uncertainty. I think you heard about a
17 year ago on parameter uncertainty at PNNL and the
18 conceptual model uncertainty project at University of
19 Arizona. And shortly -- it was around that same time,
20 give or take a few months, we also had some briefing
21 on the Sandia project on fundamentals of sorption.
22 You got a briefing on plume migration, historical case
23 analyses of plume migration. We're also doing a field
24 test of sorption models at the U.S. Geological Survey.

25 And the third area that we just started, or

1 we started it last fall, and it has gone through its
2 first phase as the OECD/NEA Sorption Project
3 coordinated by NEA in Paris. And we're working with
4 organizations from several other countries and going
5 through test cases for sorption modeling that improves
6 on the KD approach for estimating retardation of
7 radionuclides. And the last project is another one
8 that's finishing up on the radionuclide chelating
9 complexes.
10 The next slide is just a PA. Currently,
11 we're just funding at the moment maintenance of D&D,
12 which I'm sure you've heard a lot about before. And
13 we're doing some additional work on the probablistic
14 version of RESRAD. It's a DOE code. DOE always
15 builds a deterministic version, and the NRC wants to
16 know what the uncertainty is and the estimates made by
17 RESRAD, so we have Argonne redo it so it can be
18 handled probablistically. What's omitted here is a
19 project that would integrate models from the other
20 research areas that I mentioned on the previous slide.
21 And we're kind of between projects here. We
22 had to close a contract at Sandia, because we had gone
23 in there with support from other agencies, and they
24 all backed out, and we couldn't afford to continue
25 working there. That was SUDS. And we're now

1 exploring a framework that is supported by other
2 agencies, and it's one that they've started working
3 on, and we're thinking of joining them. We haven't
4 put any money into it yet.
5 And in addition to the projects, we also do
6 a lot of leveraging kind of work with other
7 organizations that give us research ideas, do things
8 that we can't do in exchange for which we can do
9 things that they aren't doing. Two of our staff
10 members, especially, Jacob Phillips and Tom Nicholson,
11 work a lot with the National Academy of Sciences Board
12 on Earth Sciences and Resources. And this week, in
13 fact, there's a meeting at the end of the week,
14 Thursday and Friday, that Tom and Jake motivated.
15 Another area that I've already mentioned is
16 this OECD/NEA Sorption Modeling Project. Really if we
17 did by ourselves, it wouldn't amount to much, but
18 there's a lot of other organizations who have
19 alternative models to sorption, what we're looking at.
20 They have data that we don't have. I think that it
21 will work out pretty well. I was at the Management
22 Board meeting last month in Paris, and we were
23 reviewing a report by the Project's technical
24 direction team recommending test cases, and I think
25 they came up with some very good test cases. We made

1 a few modifications, and this fall we plan to have all
2 the modeling teams get to work and actually produce
3 some results, which should be out by next spring.
4 We also had memoranda of understanding with
5 various agencies. The U.S. Geological Survey we had
6 for a long time, since 1992. More recently the
7 Agricultural Research Service where some of our staff,
8 especially Tom Nicholson and Ralph Cady, actually
9 worked over there in cooperation with ARS staff. Just
10 recently issued a report from that work. And this
11 multiagency agreement, multimedia transport modeling
12 actually alludes to the gap I mentioned in the PA
13 work. This involves DOE, EPA, Army Corps of Engineers,
14 and other organizations. I know I'm leaving out --
15 there are also some organizations planning to join, in
16 in addition to those organizations and the NRC. So
17 the prospect for continued multiagency funding looks
18 really good, and we hope that it will pan out better
19 than the SUDS effort did.
20 Another area that we're going back to is we
21 have in the past had bilateral agreements with
22 agencies in other countries with interests common to
23 ours, and the first one that we're trying to
24 reestablish is an agreement with the Swedish Nuclear
25 Power Inspectorate, otherwise known as SKI. And we

1 hope also to get involved again with some of the other
2 European agencies that we've dealt with before, like
3 the French Atomic Energy Commission and Swiss
4 Regulatory and Development Waste Authorities. We also
5 plan to exploit our relationship with these various
6 organizations to get feedback on this plan.
7 I don't want to go through as much detail as
8 I just have with the new projects, because as Cheryl
9 pointed out, the planning for them is fairly
10 superficial at this point on your sleeve. But I can
11 just run down through them. If you have questions,
12 stop me and I'll try to get the responsible staff
13 member to give you a few more words on what these are
14 about.
15 Basically, we've gone through each of our
16 areas and come up with several ideas for projects that
17 would fill information gaps that we think still need
18 to be filled to support the regulation of
19 decommissioning and waste disposal. And you can see
20 there's quite a few here in release of radioactive
21 material and --
22 DR. GARRICK: It's an impressive list.
23 MR. RANDLE: It's an impressive list, and
24 we'll have to do some prioritizing, and they won't all
25 make the cut, and we may end up combining some of

1 these things. What we've laid out right now as
2 projects could be one project, could be more than one
3 project in the end or could be merged with what appear
4 to be other projects in our current plan.
5 DR. GARRICK: Yes. How many of the old
6 projects will carry over, because your budget seems to
7 be --
8 MR. RANDLE: Oh, our budget isn't big enough
9 to support everything here.
10 DR. GARRICK: Yes.
11 MR. RANDLE: That's for sure. The idea is
12 to let our Management know we have ideas and there are
13 needs that the money's not paying for. One of the
14 reasons for having the plan is to stabilize the budget
15 right along these lines, show that there's need for
16 the work.
17 MS. TROTTIER: A number of the projects that
18 we have ongoing are about to end.
19 DR. GARRICK: I see.
20 MS. TROTTIER: We are at a point where we
21 need to look to the future, because we have, I would
22 say, more than half of the projects have only another
23 year to go. So we are at a point where we really do
24 need to think of what new things to be doing.
25 DR. GARRICK: Well, some of these are a

1 mouthful, like the determination of solubilities of
2 radionuclides.
3 MR. RANDLE: And that's one of the short
4 ones.
5 (Laughter.)
6 One of the short ones you could spend your
7 entire budget on.
8 DR. GARRICK: I can think of one
9 radionuclide where they could spend a whole lot of
10 money.
11 MR. RANDLE: One of them down the list here,
12 performance assessment for sites containing thorine,
13 the goal here is to see if we have to keep going back
14 and looking at thorine sites and doing PAs or is there
15 some way just to bound the problems so that a lot of
16 the sites could be written off? Is that really the --
17 thorine amount is a big hazard. It's just the
18 opposite. Is it that much of a hazard that we have to
19 keep going back and doing PAs? It's a way to try to
20 close an issue. And that's probably the least open-
21 ended of the projects on the list. If you want to
22 follow these in detail, you could go on forever. But
23 I think, you know, we need enough information to
24 provide adequate support regulations.
25 DR. GARRICK: I'd say one of the areas that

1 strikes me, based on what I hear around the corridors
2 and among the licensees, would be a variation on this
3 one, for performance assessment for sites containing
4 thorium, would be performance assessment for non-
5 complex sites. In other words --
6 MR. RANDLE: Yes.
7 DR. GARRICK: -- get people away from this
8 mentality that a PRA is complex just because it's a
9 PRA. It should only be driven by the complexity of
10 the site. And I think the NRC training programs don't
11 do a very good job of training to address sites that
12 are less than complex facilities.
13 MR. RANDLE: Well, the PRA training I took
14 here was all addressed to reactors.
15 DR. GARRICK: That's right. Right. And I
16 think that it would make the whole idea of embracing
17 the risk-informed approach much more acceptable if we
18 began to realize that the complexity of the analysis
19 only should be as necessary and driven by the
20 complexity of the facility or the site.
21 MR. RANDLE: Yes.
22 DR. GARRICK: And you can certainly do PRA-
23 based assessments without a great deal of complexity.
24 MR. RANDLE: I agree. The next category is
25 -- I should be putting up the slides, sorry. Well we

1 went through the first list. Engineered barriers. So
2 far an engineered barrier is all we've had resources
3 for is concrete barriers. Probably the biggest effort
4 in concrete barriers is the one that we'll do for the
5 next three years. It's one that we're just starting
6 on the long-term performance, but there are other
7 possibilities that are listed here having to do with
8 evaluation and inspection of existing structures,
9 enhancing the foresight code, which we recently
10 completed an effort on that just getting it developed
11 and getting documentation out. And looking at other
12 types of concrete and also taking a harder -- possibly
13 taking a harder look at one of your flies up here.
14 (Laughter.)
15 It likes me better than it likes you. I
16 took a shower today too.
17 (Laughter.)
18 But anyway, mobilization comes and goes, but
19 if it stays in the picture, we would like to take a
20 harder look at it. I'm not sure today what Maine
21 Yankee's plans are with mobilization. That seemed to
22 be the lead reactor considering that. We'd like to
23 expand in engineered barriers, from concrete over to
24 non-concrete barriers. There, again, the emphasis
25 would be on long-term performance. And these are

1 several areas that on the basis of a lot of homework
2 and scholarly type research that Jake Phillips came up
3 with. Probably -- well, two of them will depend on
4 leveraging. We don't do them without the leveraging,
5 the last two. And also the asphalted concrete area
6 could be pretty promising. Did you want to add
7 anything to that, Jake?
8 MR. PHILLIPS: This was an area that we were
9 really interested in, and we've worked with the
10 National Academy of Sciences and particularly the
11 Board that we support, Board on Sciences and
12 Resources. And we talked to one of the committees
13 extensively for a couple of years, and they felt that
14 it was important that this particular issue should be
15 addressed on engineered barriers, because it just
16 envelops this whole waste management issue, because if
17 you have high level waste we're talking about the
18 corrosion and the packages and all that sort of thing.
19 You're talking about low-level waste. You always have
20 these engineered barriers. A lot of states have even
21 banned shallow land burial. Then you come to covers
22 which you can have over decommissioned sites,
23 contaminated sites, ponds, et cetera. And always the
24 issue of how to get credit for these barriers has been
25 a problem.

1 We've only looked at concrete, basically.
2 And, basically, when we first went to the National
3 Institute of Standards and Technology they were really
4 intrigued by this, because when you talk about
5 concrete, they have a deterministic way of looking at
6 its importance. It's just for 20 years, 30 years, and
7 there has been continued maintenance and stuff like
8 that.
9 But then we want to ask them to look at all
10 the information that they have on concrete codes to
11 predict performance. And that's what we got out of
12 the full site work, which was the first of its type
13 that you can actually look at the mechanistic
14 degradation characteristics and try to make some
15 predictions on how concrete performs. And we started
16 that out for the Low-Level Waste Program, but then it
17 has applications for entombment, because that's one of
18 the things that's being addressed now. So that helped
19 us looking forward-looking on many projects that even
20 though low-level waste was now at the lower emphasis,
21 it has picked up in the entombed area.
22 MR. RANDLE: Thank you. Moving on to the
23 next category is transport, and this is a big
24 category. Lots of waste divided up. It is the focus
25 of our program. You can tell by the title. If

1 there's no transport, there's no safety problem.

2 First category is flow, which is a driver

3 and ground water contacts or surface water contacts,

4 driver transport. We're proposing to continue the

5 conceptual model in hydrologic parameter work. And

6 also the last bullet, estimating infiltration and

7 recharge using real-time data goes on in the work

8 recently finished under our cooperative agreement with

9 the Agriculture Research Service. They have the

10 facilities there to collect real-time data. And an

11 area we'd like to expand into is monitoring of ground

12 water flow over long terms in waste facilities.

13 Going to the next slide, chemical effects on

14 transport.

15 We would like to spend some more time

16 looking at case analyses, historical case analyses of

17 plumes. The briefing you had from Sandia was based on

18 a fairly short study. That may need some elaboration.

19 The reactive chemical transport models

20 refers to possibly continuing the absorption modeling

21 past our current efforts. Characterization of soil

22 particle coatings is actually something we started in

23 coordination with the USGS. We are just getting that

24 underway.

25 Finally, I would like to do some more

1 collection of retardation coefficient or Kd data. To
2 use those data as possible ways to test the validity
3 of absorption models, more mechanistic absorption
4 models.
5 We would also like to get into colloid
6 transports. People talk about it and we have had it
7 on our agenda, but funding hasn't allowed us to start
8 it up. So it sort of hangs there all the time. It is
9 an area that we would like to get into.
10 MEMBER LEVENSON: John, historically people
11 have analyzed plumes with things like cesium,
12 strontium and all of those sorts of things. For Yucca
13 Mountain, it looks like the limiting dose may come
14 from rather unusual things like technetium or iodine
15 129. Has there been any thought about going back and
16 looking at old plume data to see if we really know
17 anything about those isotopes which now appear to be
18 important?
19 MR. RANDLE: That is one possible thing that
20 we could do. Just as a general area, we would like to
21 find out why plumes, some plumes stop. The obvious
22 answer is it must have to do with absorption. Kd
23 models won't tell you that. They will just say they
24 slowed down.
25 MEMBER LEVENSON: This is where the plume

1 stops. This is, is in fact things like magnesium and
2 iodine so much more mobile than cesium and strontium
3 as present computer models say they are.
4 MR. RANDLE: Yes. We would certainly want
5 to look into that.
6 Some more areas of transport that we haven't
7 been able to do much about, one is biotic transport.
8 This is something we looked at in the 1980s in the
9 context of low level waste transport. The estimates
10 made in that effort showed that biotic transport could
11 be comparable to the intruder agricultural scenario
12 that was looked at in the EIS for Part 61. It's just
13 something that has been sort of collecting dust for a
14 long time, and we would like to take another look at
15 it and see what the application to decommissioning
16 might be, and what kind of improvements have been made
17 in this area. Are our old estimates too high, too
18 low? We're trying to scope out the problem here.
19 Likewise, with bio accumulation and also air
20 and food really pertains to environmental pathways.
21 I think it is time to go back and look at a lot of the
22 coefficients in environmental pathways models, see if
23 they are up-to-date, see if there are better values
24 that could be used in the NRC safety assessments.
25 The last one is on -- the idea here is to

1 take advantage of an opportunity to exploit data that
2 exists at the Chalk River site in Canada, a chance to
3 do some testing of validity of transport models. The
4 C-14 application, whether that is important or not, I
5 am not sure. We have been arguing it back and forth,
6 whether even to keep it on the list. But I think as
7 a chance to test, if you think of it more generically,
8 to test the validity of transport model, I always like
9 to if there is an opportunity to take advantage to do
10 that, I like to do it. I think that is going to be
11 the Achilles heal in any PA calculation. We're
12 talking about such long performance periods. So
13 anything that could support that or suggest how to
14 improve it is worth looking at.
15 PA itself is our integrator. Framework
16 development for complex sites. You mentioned simple
17 sites earlier. I don't know how much our program is
18 going to help on simple sites, because I think they
19 can write them off faster than we can do the research.
20 I think we can help with the complex sites. This
21 framework, exploring the framework is where we are
22 getting involved with other agencies. That
23 cooperative agreement I mentioned earlier with Corps
24 of Engineers, DOE, and EPA and others is the context
25 for exploring the framework.

1 I am plugging validation again. Any aspect
2 of a PA model that can be tested and we have an
3 opportunity to do it economically, I would like to be
4 able to seize this advantage. That is in there as
5 sort of a placeholder.
6 The last few slides go back to coordination.
7 When we sent the plan to the Division of Waste
8 Management, most of the comments we got were on
9 Chapter 5. There were comments also on other parts of
10 the plan. I am just going to highlight a few of the
11 comments and very briefly summarize what we have done
12 and plan to do about it, about each comment.
13 Let me catch up with you here. One comment
14 right up front that they made was the plan just seemed
15 to start off without any obvious reason for starting
16 off. Of course there is a history behind the research
17 and how we got to where we were. We have tried to
18 improve that in Chapter 5, to show that these just
19 aren't new ideas that came off the wall, that they did
20 come from our experience and our past research and
21 expertise.
22 In our original, the plan that we sent to
23 the Division of Waste Management, we proposed what
24 appeared to be an awful lot of engineering projects.
25 We reduced them quite a bit.

1 The next slide is about -- this is just a
2 matter of our doing a better job of explaining how
3 everything in this plan fits together. But the
4 comment was to use PA as a framework for linking
5 together all the research. Yes. That is the idea.
6 The extent that we can get a mathematical model out of
7 any of the other research areas, it should be factored
8 into the PA or if we can get data to support existing
9 model that's out of any of the research, that should
10 go into the PA.
11 We think most of our descriptions place the
12 projects in the PA context. In a few cases, we have
13 added onto that, and welcome your comments on that as
14 well. The idea is to use PA as a unifying framework
15 to the extent possible.
16 The next one is -- it's two. This is the
17 last one. The framework that we were looking at for
18 PA, alternative to SEDS is called FRAMES. Out of the
19 suggestions from Division of Waste Management was well
20 think about other ones as well. We will.
21 We do think FRAMES is a good place to start,
22 primarily because it handles legacy codes very well.
23 Some of the other frameworks don't. It has a lot of
24 support from other agencies. We are giving that a
25 very hard look. I think we will commit ourselves to

1 it at least for a while. If it doesn't work out,
2 we'll get out and try a different approach, and try to
3 do it through leveraging other agencies.
4 The final was to -- this goes back to
5 something Cheryl said too, to coordinate the plan with
6 other NRC offices. We certainly plan to do that,
7 especially NRR and Office of State Programs, through
8 state programs with agreement states.
9 That's it. We're open for questions.
10 CHAIRMAN HORNBERGER: Good. Thank you. Let
11 me start. I have a couple of I think fairly quick
12 questions. First of all, you give us this list of
13 projects. Can you give me just some quick assessment
14 of how you came to these projects? Is this staff
15 sitting around thinking deep thoughts?
16 MR. RANDLE: Partly. Deep thoughts are
17 based on their past research projects and what we
18 think is important for decommissioning and what we
19 think would apply to other -- to the theories as well.
20 MR. OTT: I want to add a little bit to
21 that. I think when Jake spoke a minute ago, he talked
22 about extensive discussions they have had with the
23 National Academy Board. They meet with them probably
24 three or four times a year. They talk to them about
25 what we are doing. They talk to them about what ideas

1 they think. They talk about something that comes up
2 in the literature and whether it is a good idea or a
3 bad idea. They talk to them very specifically about
4 the PA problem of the performance of engineering
5 barriers. They are assuming performance of
6 engineering barriers for 500 years.
7 They take that feedback back to the office
8 with us. They talk to the management. They talk to
9 me. They talk to Cheryl. They talk to John. They
10 integrate it into their thoughts on what research
11 needs to be done. It's not just Jake and Tom that do
12 that. Everybody is out there interacting with their
13 colleagues in the profession. We are interacting with
14 our NMSS counterparts. We are getting user needs from
15 them.
16 NMSS is actively working right now on a new
17 user need for the decommissioning program. We
18 understand it is in draft form. We expect to get it
19 within the next couple of weeks.
20 We understand they are also working on a
21 user need in the area of anticipatory research in high
22 level waste. So we will get additional information
23 there.
24 But the staff doesn't work in a vacuum, and
25 they don't work in the absence of knowledge of what is

1 going on in the literature.

2 I would like to say that one additional

3 thing that I hope to get out of this new MOU in

4 multimedia modeling is an even greater coupling with

5 other parts of the Federal agencies that are working

6 in some of these areas. You'll notice on one of those

7 slides that John had, he mentioned follow work with

8 EPA and DOE on reactive barriers. We know of work

9 that is being done by those two groups on reactive

10 barriers. We want to become more familiar with it.

11 I think we now have the mechanism for doing that

12 through the MOU which specifically targets cooperation

13 and coordination on such efforts.

14 So I think in the past we have tried to be

15 as aware of what's going on as we could. I think we

16 are now stepping up our efforts to be more aggressive

17 in that area.

18 CHAIRMAN HORNBERGER: I didn't mean to imply

19 that I thought that staff locked themselves away in an

20 ivory tower and didn't talk to anyone. My question

21 was, and I think you answered it, it is staff who put

22 together the lists?

23 MR. OTT: Yes.

24 CHAIRMAN HORNBERGER: You will, as you

25 indicated, have to make some decisions as to which of

1 these projects to move forward. Can you give me any
2 quick idea as to how you are going to make those
3 decisions?
4 MS. TROTTIER: Well, beyond the list that we
5 have, we are hoping that we will have refinement from
6 our stakeholders. There will be input from them on
7 projects that may be missing from the list, that they
8 feel are important. There may be projects that are on
9 the list that they can't support at all.
10 We will then take the end list, which may be
11 longer than this, and run through the prioritization
12 scheme.
13 CHAIRMAN HORNBERGER: At the project level?
14 MS. TROTTIER: At the project level. Even
15 though Bill says he is not sure how we are going to do
16 that. For our purpose of developing a plan, I think
17 we have to do that.
18 We will then have to go back and go through
19 the office prioritization process when February comes.
20 But I think in order to select those projects that end
21 up in the funding list, you have got to have some one
22 to end list. Otherwise, it is impossible to choose.
23 So my intent is that we will take our
24 prioritization scheme that we have drafted to apply to
25 this kind of work and use that in prioritizing the

1 projects.

2 CHAIRMAN HORNBERGER: Those of us of course
3 in the research community have all sorts of
4 familiarity with how one chooses projects. We have
5 all been on panels and what not. So the bottom line
6 really comes down, as we all know, to then who is it,
7 who assigns the weights in your prioritization scheme.
8 Can you give me just a clue? Is it people at your
9 level? Is it all of staff? How do you decide on the
10 weights?

11 MS. TROTTIER: We haven't made that decision
12 yet. But my guess is that I am going to try to use an
13 approach where maybe I bring in one person from a
14 program office and several staff members. We have
15 done that before. I think that kind of system can
16 work. I would rather not be the one to do it, but I
17 think if you have a collegial effort to assign the
18 weights, it is more likely that you are going to have
19 some agreement.

20 CHAIRMAN HORNBERGER: But part of it would
21 not be outside peer review. This is an internal staff
22 decision making?

23 MS. TROTTIER: Yes. At this point, that is
24 where we are on prioritization.

25 CHAIRMAN HORNBERGER: Just wanted to check.

1 Finally, in this era of GPRA, people always
2 think about how one decides on whether performance is
3 good or not. I am just curious as to how much thought
4 you have given to deciding on the far end whether you
5 have been successful. Again, if you follow GPRA,
6 those things get defined, those performance measures
7 get defined beforehand and not after the fact where
8 you can gerry rig it. Have you thought that through?
9 MS. TROTTIER: Well, we will have to define
10 performance measures, clearly. That is how the
11 office's operating plan is based on, performance
12 measures. But I guess because I may not clearly
13 understand your question, that would be based -- the
14 performance measures would be set for those projects
15 that we selected. Yes, but we would definitely assign
16 performance measures. We do that today.
17 CHAIRMAN HORNBERGER: You do that today?
18 MS. TROTTIER: Yes, we do.
19 CHAIRMAN HORNBERGER: So in other words,
20 these ongoing projects, you know whether they have
21 been successful or not?
22 MS. TROTTIER: Yes, we do.
23 CHAIRMAN HORNBERGER: Okay.
24 Milt?
25 VICE CHAIRMAN WYMER: As you have indicated

1 and as George has too, you certainly have got far too
2 many projects. I think you know that.
3 MR. RANDLE: Or too little money.
4 MS. TROTTIER: Our division director is
5 here, so you need to say that louder.
6 (Laughter.)
7 VICE CHAIRMAN WYMER: With respect to
8 prioritization, we all know that there are half a
9 dozen different kinds of priority systems you can set
10 up and screens that you can use. But it would seem to
11 me that one of the criteria would be related to the
12 potential risk to the public. That is, put your
13 effort where it will do the most good as far as the
14 goal of the Commission. It doesn't seem to me that
15 that would necessarily always be consistent with what
16 the needs and desires of the industry are.
17 MS. TROTTIER: That's true.
18 MR. RANDLE: That is why the office level
19 prioritization scheme talks about burden reduction.
20 MS. TROTTIER: But the system is designed so
21 safety is first, as it should be. Safety is the
22 primary driver. That falls within the purview of
23 protecting the public.
24 VICE CHAIRMAN WYMER: Superimposed on that
25 of course is the real priority issues of the

1 Commission itself. From our point of view, we see the
2 Yucca Mountain repository sort of sticking up like a
3 mountain out of a lowlands. It seems to me things
4 that are related to things like that might also get
5 your attention. I don't know whether those comments
6 are gratuitous or not.
7 MS. TROTTIER: They are factored into the
8 prioritization system. In fact, a lot of projects
9 that fall down into that burden reduction category end
10 up getting funded because there are multiple factors.
11 You know, leveraging rates high because that means
12 less resources are needed if you have others
13 supporting it. User needs, Commission-directed
14 activities, they get high consideration.
15 So you know, I think the system isn't
16 perfect. There's no perfect system out there. But
17 this one seemed to work. I mean we got through it at
18 the end of whenever -- I don't remember, Tom, was it
19 March or whatever, with our prioritization? A few
20 projects had to be moved up because they didn't pass
21 the test, but I think the bulk of them worked well
22 within the prioritization system.
23 This is the second year the office has used
24 it. Each year we refine it a little bit. So it's not
25 flawless, but it is better than where we were three or

1 four years ago, where it was those who yelled the
2 loudest got the money. I yell loud, but it didn't
3 always work.
4 MR. OTT: I would like to point out if you
5 look at the prioritization criteria that we put in the
6 presentation, they are well suited to making decisions
7 at the activity level, but not necessarily at the fin
8 level. So we are going to have to figure out a way of
9 discriminating. If you just think about the process
10 of prioritization, you come to the conclusion that you
11 don't always use the same sort of criteria at one
12 level as you do at another level. So we do have to
13 give some thought to that.
14 With regard to the other, one of the other
15 observations, the list isn't finished. I mean if you
16 guys have ideas, we would welcome having them brought
17 forward. We expect when we send this out to other
18 people to be soliciting additional ideas, as well as
19 comments back about well, with regard to some of the
20 things on the list, why are you doing this, it has
21 been done. Or, why are you doing this, we don't think
22 it is important.
23 So by all means, this is a work in progress.
24 We do expect to get additional input before we
25 finalize it.

1 CHAIRMAN HORNBERGER: John?

2 MEMBER GARRICK: Yes. You mentioned the
3 state programs somewhere along the way. Maybe you
4 did, Cheryl. Are you getting any kind of constructive
5 feedback from the states on needs from a research
6 standpoint?

7 MS. TROTTIER: We are going to solicit it.
8 We thought it would be appropriate to solicit that
9 input. Whether or not we will be able to do that
10 research, I don't know. But we will solicit it
11 because I think that there is a population out there
12 that has issues that probably do need addressing.
13 Just because there are no low level waste sites in an
14 NRC jurisdiction now doesn't mean there wont' be in
15 the future.

16 MEMBER GARRICK: That's right.

17 MS. TROTTIER: So that's it. I think it is
18 appropriate for us to go out and solicit from the
19 states ideas that they may have. So that is our plan.

20 MEMBER GARRICK: There's areas that are not
21 covered by agreements or compacts that could become
22 issues for the NRC, even with the agreement state
23 program.

24 MS. TROTTIER: Yes.

25 MEMBER GARRICK: The other thing I wanted to

1 ask is when you think of waste management in the
2 broader context, there's more to managing it than just
3 storage and disposal. There is the whole arena of
4 processing and destruction and what have you. Are
5 these latter categories something that you are not
6 involved in or interested in?
7 MR. OTT: It is something we are interested
8 in, but not directly involved in. We have tended to
9 follow what the Department of Energy is doing. They
10 have a very large decontamination and decommissioning
11 focus area that is doing extended research on
12 remediation techniques, cleanup techniques, and all
13 that kind of stuff.
14 We try to follow their publications. I
15 distribute -- I get a lot of them myself and I
16 distribute them to people on the staff that would be
17 interested in those particular developmental ideas.
18 To a certain extent, a lot of the technology
19 development is stuff that we traditionally have not
20 done, and that has been left to DOE.
21 MEMBER GARRICK: I was just curious by the
22 absence of what I would call the front-end issues of
23 waste management, such as pre-treatment or process
24 issues, not to mention the whole arena of
25 transmutation and partitioning and what have you.

1 The reason I bring it up is because some of
2 the proposals that are being kicked around are
3 proposals that strike me as meeting regulatory
4 guidance because of the same thing that industry
5 sometimes gets into with a new reactor design or a new
6 nuclear facility, that they haven't really put it in
7 the context of the full fuel cycle, and challenge
8 themselves with respect to the regulatory issues.
9 Ongoing activity in that category right now
10 that I am pleased to see at least that there is an NRC
11 presence is the Generation IV work that is going on by
12 the Department of Energy through the nuclear energy
13 research activity, and in particular, the Subcommittee
14 on Generation IV and the working group. That is a
15 pretty elaborate program. There is a tremendous
16 emphasis, finally, which is very encouraging, that the
17 context is nuclear energy systems, not nuclear
18 reactors. The context is the full fuel cycle, not
19 just again, the reactor.
20 One of the very important components of that
21 whole thought process and exercise that's going on,
22 and it involves a lot of people, is the whole waste
23 management issue. There's a lot of very creative
24 ideas being kicked around. I was just struck a little
25 bit by kind of the absence at the NRC of what I would

1 call front-end thinking in waste management.

2 It is only maybe because I am not seeing all

3 of the dark corners of this agency, but I would think

4 that especially in the context of research there would

5 be some visionary kind of thinking about some of those

6 goings on.

7 MR. OTT: In general, in terms of thinking,

8 there's probably thinking in terms of concrete work.

9 Much of that front-end development stuff is sometimes

10 fairly expensive and we don't get a lot of resources.

11 MEMBER GARRICK: Yes. I understand.

12 MR. OTT: Now when the Nuclear Energy

13 Research Initiative began, DOE solicited participation

14 from a whole group of other agencies. NRC was one.

15 I believe we provided five or six staff that

16 participated in the original evaluation of those NERI

17 proposals in almost all of the areas. I was one of

18 those that was participating in the waste management

19 initiatives review of the proposals that came in from

20 NERI. So our views were solicited and we did

21 participate in a major way.

22 We aren't following that as closely as the

23 Generation IV work. Perhaps we should be looking for

24 a way to follow that more closely.

25 MEMBER GARRICK: We can talk about that off-