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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON NUCLEAR WASTE

NOVEMBER 29, 2001

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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

5 130TH MEETING

6 WORKSHOP ON RESEARCH NEEDS

7 + + + + +

8 THURSDAY,

9 NOVEMBER 29, 2001

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11 ROCKVILLE, MARYLAND

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14 The workshop met at the Nuclear Regulatory

15 Commission, Two White Flint North, Room T2B3,

16 11545 Rockville Pike, at 8:30 a.m., George M.

17 Hornberger, Chairman, presiding.

18

19 COMMITTEE MEMBERS PRESENT:

20 GEORGE M. HORNBERGER Chairman

21 RAYMOND G. WYMER Vice Chairman

22 B. JOHN GARRICK Member

23 MILTON N. LEVENSON Member

24

25

1 STAFF PRESENT:

2 HOWARD J. LARSON

3 RICHARD K. MAJOR

4 LYNN DEERING

5 ANDREW C. CAMPBELL

6 LATIF HAMDAN

7 SHER BAHADUR

8 AMARJIT SINGH

9 JOHN T. LARKINS

10 RICHARD P. SAVIO

11

12 ALSO PRESENT:

13 BRET LESLIE

14 ENGLEBRECHT VON TIESENHAUSEN

15 DAVID ESH (via telephone)

16 TIM McCARTIN

17 JAMES FIETH

18 BILL REAMER

19 JOHN BARTLETT

20 GORDON WHITMIRE

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1 I N D E X

2 AGENDA ITEM PAGE

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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
4 come to order.

5 This is the third day of the 130th meeting
6 of the Advisory Committee on Nuclear Waste. My name
7 is George Hornberger, Chairman of the ACNW. Other
8 members of the committee present are John Garrick,
9 Milton Levenson, and Raymond Wymer.

10 During today's meeting, the committee will
11 discuss the following: DOE's supplemental science and
12 performance analysis; continue discussion and
13 preparations for January 9th, 2002, Commission
14 briefing; 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 staff.

24 It is requested that speakers use one of
25 the microphones, identify themselves, and speak with

1 sufficient clarity and volume so that they can be
2 readily heard.
3 Okay. So today we are going to hear a
4 couple presentations on the supplemental science and
5 performance analysis, and the item on the screen says
6 that Bret Leslie is going to address us. Bret is from
7 the staff.
8 MR. LESLIE: We're ready. Does John want
9 to make a few --
10 CHAIRMAN HORNBERGER: Oh, do you want to
11 make any introductory comments?
12 MEMBER GARRICK: Well, I --
13 CHAIRMAN HORNBERGER: Oh, I turn this over
14 to you. Sorry.
15 (Laughter.)
16 MEMBER GARRICK: It's okay.
17 CHAIRMAN HORNBERGER: This is under the
18 control of John.
19 MEMBER GARRICK: Sounds like we might get
20 done by 2:30 if we don't turn it over to me.
21 (Laughter.)
22 Okay. Well, of course as everybody knows,
23 the purpose of this presentation is to get -- to hear
24 the results of the NRC staff's review of the
25 supplemental science and performance analysis.

1 And maybe in the course of that review
2 they can help keep us straight on all of the reports
3 that are related, such as the TSPA-SR, the science and
4 engineering report, the preliminary site suitability
5 evaluation, and the SSPA itself and how they all
6 interrelate.
7 We're also going to hear, as I understand
8 it, from the Nuclear Waste Division of Clark County,
9 presided over by Englebrecht von Tiesenhausen. But as
10 I understand it, Dr. John Bartlett is going to make
11 the presentation, who is very well known to the waste
12 field as the former head of OCRAWM.
13 And, of course, the committee is extremely
14 interested in the SSPA, because we referred to it in
15 our TSPA-SR letter as an extension of the performance
16 -- ongoing performance analysis and the fact that it,
17 indeed, addressed some of the concerns we had in the
18 TSPA-SR. And those concerns have to do with such
19 matters as the uncertainty analysis, particularly the
20 uncertainty analysis of things that had not yet been
21 quantified.
22 We were also very interested in the
23 updates that it presented with respect to new
24 information, particularly for some of the process
25 models that were important to performance, and the

1 analysis having to do with the lower temperature
2 operating mode analysis.
3 So we're anxious to get the NRC's view of
4 this, and, of course, the independent view of the
5 Clark County folks. So with that, I think we'll turn
6 it over to Bret.
7 As I understand it, David Esh of the NRC
8 staff is plugged into the discussion by way of
9 telephone. Is that correct?
10 MR. LESLIE: He knows the number, and I'm
11 expecting him to call in this morning. He's in Boston
12 right now chairing a session for the symposium.
13 MEMBER GARRICK: Okay.
14 MR. LESLIE: Good morning. I'm Bret
15 Leslie from the Nuclear Regulatory Commission staff
16 and Division of Waste Management. And I'm the
17 technical assistant for the High-Level Waste Branch.
18 Before I get started, I just want to
19 emphasize that this presentation and the work that
20 stands behind it is really a team effort, and I was
21 hoping to have one of the critical members of the
22 team, Dave Esh, calling in from Boston, and hopefully
23 he will.
24 And, secondly, I'd like to express some
25 appreciation for this opportunity to brief the

1 committee again, but maybe that appreciation might
2 change by the end, depending upon the questions. So
3 with that, I'm going to go ahead and launch.
4 What I wanted to do today was to really do
5 two things. One is to talk about the DOE's
6 supplemental science and performance analysis report,
7 how we reviewed it and what were our conclusions and
8 how we addressed the comments. Also, in the latter
9 part of the presentation, I want to try to address
10 some of the issues or questions that the ACNW has
11 brought up either in their letters in September or
12 from questions that we received from the ACNW staff
13 members that were likely to arise from this review.
14 And so you'll see two distinct parts to
15 this presentation. I'll quickly go through how we
16 conducted our review. We'll describe what our
17 comments are and how the comments were addressed. And
18 I think by the end of it you'll -- I hope you'll be
19 able to see how this process was risk-informed, but it
20 was also time-constrained.
21 In terms of conducting the review, we
22 realized very rapidly that we needed to develop a
23 strategy that would allow us to quickly integrate into
24 the sufficiency comments. We got the supplemental
25 science and performance analysis report in mid-July.

1 We knew that the Commission had to send comments to
2 the DOE in the first part of November and back out the
3 schedule which required us to have our review complete
4 and comments incorporated into the sufficiency package
5 by mid-September.
6 We also realize that we wanted to use the
7 key technical issue framework because this has been a
8 successful way of interacting with the Department of
9 Energy. It allows us to focus things and be
10 consistent with how we had addressed many of the
11 technical issues before.
12 As I indicated, we use the issue
13 resolution process by -- via a public technical
14 change. We actually had two -- one in the beginning
15 of August to get a presentation very similar to what
16 the ACNW is. We brought the DOE in to have them
17 explain what it is that they did in the supplemental
18 science and performance analysis. The idea was that
19 overview would help the staff review what's going on.
20 This document was 1,300 pages, and we needed to be
21 able to review it very effectively and efficiently and
22 rapidly.
23 The second technical exchange, which is
24 where agreements were discussed and some of the issues
25 were discussed in the public, occurred in September.

1 Originally, this was scheduled for the 13th and 14th
2 of September. As a result of the 11th, we ended up
3 having to actually run this meeting three-way video
4 with no DOE folks here and no NRC folks out in Las
5 Vegas. This is the first time that we've actually
6 completed a technical exchange via remote, totally
7 remote.
8 What we did is we provided some guidance
9 to staff, and I'll go over this guidance in just one
10 second. But basically, Dave Esh and I worked on
11 quickly reviewing -- quickly reviewing the entire SSPA
12 to kind of get at, how can we best direct the staff to
13 risk-inform the review and tie it in to the
14 sufficiency framework and the issue resolution
15 process?
16 So that guidance was really twofold. The
17 primary purpose was to focus on sufficiency comments,
18 and we basically asked some questions of the staff.
19 So when you review this document, focus on what new
20 data or models were used and what new sensitivity
21 analyses were used, and look at the different
22 expectations for data and analyses that would be
23 needed for a low temperature operating mode or a high
24 temperature operating mode.
25 And also, go back -- if the new data or

1 analysis suggest that the screening of features and
2 events and processes is wrong in the total system
3 performance assessment, we need to make sure that they
4 correct that and evaluate any potential impact to
5 performance.
6 So, for instance, in this -- in these
7 areas up here, we ask questions, do the new models or
8 data result in the need for new sufficiency comments
9 because it refutes previous information or
10 assumptions? Do the new data or models suggest
11 information in the TSPA-SR is non-conservative?
12 Again, trying to tie sensitivity analysis
13 into our overall framework, we ask, were there
14 significant -- you know, in your review, in these
15 sensitivity analyses, did we identify any significant
16 areas that we haven't covered in our sufficiency
17 review, that we haven't covered in the IRSRs, the
18 issue resolution status reports, or in our KTI
19 agreement?
20 So we wanted to close the path on a lot of
21 different issues when we did this review. In
22 addition, what we also wanted to do is to try to use
23 this review process to capture some of the other
24 concerns that we've seen in the total system
25 performance assessment area and also in quality

1 assurance. So we asked the staff to look at
2 consistency in integration across the document, and
3 we'll get back to consistency and integration,
4 especially as it relates to conservatism, a little bit
5 later.
6 But, you know, did they treat uncertainty
7 and conservatism the same throughout the document? If
8 they made an assumption here, did they evaluate the
9 assumption there?
10 Again, DOE had indicated although it
11 wasn't a QA document, it had undergone a review, and
12 we wanted to look at, were there still a lot of
13 mistakes, not necessarily in terms of qualification,
14 but were mistakes falling through? And we were to try
15 to document this and provide that information to our
16 QA staff.
17 And, finally, because this is the first
18 time that DOE had really made a strong effort to try
19 to tie in multiple lines of evidence, we took a look
20 at how DOE was posing its arguments and tried to ask
21 some questions, are there multiple lines of evidence
22 independent from the model under consideration? And
23 are the lines of evidence cited applicable?
24 So these are some of the questions we
25 asked our staff to answer as they reviewed this

1 document.

2 So now getting into what our comments are,
3 and this is really an overview. As a result of the
4 detailed staff review by both the Center and the NRC
5 staff, we generated 129 comments. And similar to in
6 past issue resolution KTI meetings, what we do is we
7 generate a list, we share that list with the
8 Department of Energy and have multiple phone calls, so
9 that each side knows what the concern is and what --
10 how that concern could be addressed.

11 So we subdivided all of those topics into
12 a series of four areas, basically, waste package and
13 waste form, unsaturated and saturated zone comments,
14 engineered barriers, and then, finally, kind of a
15 catch all which included questions about design,
16 integration, geology, disruptive events, biosphere,
17 and total system performance assessment.

18 This allowed us to really have focused
19 discussions with the DOE, and it also allowed an
20 efficient use in terms of the meeting itself.

21 As we went through this process, we also
22 realized that the -- in terms of issue resolution,
23 which is part of this process, we could kind of bin
24 all of those comments into three areas. Really, some
25 of the questions were purely clarifying. What did you

1 mean, DOE, when you said this? And DOE would provide
2 us a response, and that was fine.
3 So about a third were of a clarifying
4 nature and really weren't the focus of the discussion
5 and the technical exchange.
6 About 50 were covered by an existing
7 agreement. One of the things we asked the staff to do
8 is, when they came up with a comment, could it -- we
9 asked them to say -- to indicate, is this an area
10 that's already covered under an existing agreement?
11 Or is this an entirely new area? If it's an existing
12 agreement, do we need to add scope because of the new
13 information or analyses to that existing KTI
14 agreement?
15 So we saw about 50 required additional
16 scope or were covered by an existing agreement. And
17 what I'm going to do after this is kind of go through
18 examples of each, so that you'll get a better
19 understanding of what I'm trying to say.
20 Finally, we also -- you know, DOE
21 indicated that the supplemental science and
22 performance analysis report supplants the total system
23 performance assessment for SR. It doesn't replace it.
24 So what we also did is notice that if DOE decided to
25 go with a lower temperature operating mode, or used an

1 approach in a potential license application, would
2 there be additional information needs?
3 And so, basically, we tried to capture,
4 what if they go down this road? Giving them an early
5 heads up of what additional information would be
6 needed. And this is because DOE has not said that
7 they're going to go to a lower temperature operating
8 mode or will necessarily incorporate the new approach
9 that they used in the supplemental science and
10 performance analysis report.
11 In terms of a clarification example, you
12 can walk between the science and engineering report,
13 the total system performance assessment for SR, and
14 the supplemental science and performance analysis
15 report, and see that there are a bunch of different
16 footprints of the repository. Well, that affects how
17 models are incorporated and affects consistency.
18 And this really comes into place
19 especially for the low -- for different operating
20 modes, temperature modes. So we asked, you know, "So
21 how are you going to address this?" And they -- DOE
22 came back and said, "Well, we'll show you how the
23 footprints were used, follow through the models, in
24 which documents, and we'll document that in future
25 documents."

1 One of the things Dr. Garrick talked about
2 was keeping clear all four of the documents. And the
3 one that I haven't talked about is the preliminary
4 site suitability evaluation. We will not be
5 discussing that here. It was not within the scope of
6 our sufficiency review, and I won't say anything more
7 about that.
8 Next, I'm going to talk about those that
9 we thought could be tied to an existing KTI agreement.
10 But that the information provided in the supplemental
11 science and performance analysis report indicated
12 there was probably additional work that needed to be
13 incorporated into an existing agreement.
14 So, for instance, the new treatment of the
15 waste package closure weld -- and this is, again, a
16 critical issue because it led to early waste package
17 failures in the supplemental science and performance
18 analysis report. Well, already in the CLST, container
19 life and source term, and also in the preclosure area
20 we had already focused on the welding issue.
21 And so all we did was to tell DOE, as a
22 result of this process, that you need to take into
23 account this new information or this new approach when
24 you address our concerns that you've already agreed to
25 address.

1 So, basically, we -- for this particular
2 topic, we questioned their technical basis for
3 sensitivity study, and they agreed to address that
4 when they provided the information for the other
5 agreements.
6 Now, for the third category, which was
7 lower temperature or newer analysis, for the lower
8 temperature a good example was the extrapolation of
9 data to the expanded areas, and basically we said,
10 one, you're going to need geotechnical information,
11 you're going to need geophysical information and
12 geologic information, and DOE says, yes, we understand
13 that.
14 And, you know, for a potential license
15 application, if they take that broader scope into
16 account, they will consider that additional need based
17 upon the footprint.
18 One of the other things that DOE agreed to
19 do is if they go to a lower temperature operating
20 mode, they're going to come back and we're going to
21 have a discussion, when they make that decision. Not
22 at the time of potential license application, but when
23 they make the decision, they've agreed to meet with
24 the NRC to review some of these types of issues, so
25 that they can get a better understanding what our

1 expectations are.

2 An example of an area where they've used
3 a new approach in the supplemental science and
4 performance analysis was really the temperature
5 dependence for uniform corrosion of Alloy 22. And,
6 again, DOE agreed to modify or qualify the document
7 and qualify the model if it was used in a potential
8 license application.

9 One of the reasons why we brought this one
10 up is because, again, maybe the risk insight isn't
11 obvious, but when we're doing this we're trying to
12 focus on those things that most impact performance.
13 And I'll -- part of this is a function of us being so
14 intimately involved with the nuts and bolts of it that
15 sometimes we lose -- that the audience doesn't
16 necessarily appreciate that we got -- we're focusing
17 on the right thing.

18 For this, the temperature dependence for
19 uniform corrosion really determines when the waste
20 package fails. And because the TSPA-SR and the SSPA
21 really show that performance is a function of when the
22 waste package fails, we focused on welding, and we
23 focused on those aspects that are most important to
24 performance.

25 So those are some of the comments. Now,

1 how did we actually do -- come to some sort of issue
2 resolution agreement or path? Basically, for those 49
3 comments in a variety of different areas, where we
4 could tie them to existing agreements, DOE agreed when
5 they provide those documents in the future to capture
6 those concerns as we've expressed in the meeting
7 minutes.
8 Again, we had asked the staff to look at
9 the screening of features, events, and processes, and
10 one of the comments that came out is that DOE's
11 treatment of criticality assumes zero waste package
12 failures. And so, therefore, it was excluded for the
13 period of performance for 10,000 years.
14 The new supplemental science and
15 performance analysis had waste packages failing within
16 10,000 years. That assumption was no longer valid.
17 We said, "Provide a technical basis for your screening
18 of criticality," and we revised an existing agreement.
19 And, finally, we noted in the meeting
20 minutes that DOE would address us once they make a
21 decision. And one thing I would like to point out is
22 that DOE is actually right now undergoing a process
23 with Bechtel SAIC to look at a staged repository and
24 a variety of things, including lower temperature
25 operating mode.

1 And they expect a report by the end of
2 March that would talk about staged repositories. So
3 staff is following this issue.
4 Now, kind of jumping and moving into some
5 of the ACNW questions and issues that have been raised
6 in the recent letters, and, you know, some of these
7 are -- I hope I've touched upon a little bit already,
8 but if I haven't I'm hoping to touch a little more
9 directly here.
10 The first one is somewhat of a
11 philosophical issue, but we'll spend some time on, you
12 know, in a performance assessment, is conservatism or
13 realism -- which -- how much do you depend upon one?
14 And how does that fit into the regulatory framework?
15 And I guess one of the staff questions
16 from the ACNW staff was, you know, what happens if
17 there's a cold repository? Well, I've talked a little
18 bit about that, but I'll go into a little bit more how
19 the staff would respond if DOE chose to go to a cold
20 or a cooler repository design.
21 One of the questions that the NWTRB has
22 asked and other people have said, "Why is there no
23 difference in repository performance between hot and
24 cold designs?" Well, I think I'll be able to show you
25 that we've used some risk insights to focus on what

1 aspects, what drives that actual conclusion that there
2 is no difference.
3 And there has been some question of, will
4 DOE address the NRC concerns in terms of the issue
5 resolution process? I'll provide some information
6 about that. And, finally, we'll talk a little bit
7 about the use of simple or complex models in the
8 performance assessment arena.
9 All right. In terms of conservatism and
10 realism, one of the things that the staff and the
11 Commission has said is DOE has the flexibility. They
12 can develop a realistic performance assessment or
13 introduce conservatism. Whichever path they choose,
14 they must demonstrate compliance. And, you know, why
15 would DOE choose to use a conservative approach?
16 Well, it may be an effective and efficient
17 way to demonstrate compliance. For instance, when
18 uncertainties are large, your data collection is
19 difficult.
20 In terms of the compliance must be
21 demonstrated, NRC can make the objective regulatory
22 decisions based on conservative performance
23 assessment. NRC regulations require DOE to provide
24 the risk information regardless of which approach they
25 take.

1 And because of our issue resolution status
2 agreements -- again, we have several that focus on
3 conservatism and uncertainty -- NRC will have the
4 information necessary to conduct a risk-informed
5 review.
6 And, finally, the use of conservatism is
7 consistent with allowing flexibility for license
8 applicants and reducing unnecessary regulatory burden.
9 I'm going to continue on the conservatism vein for a
10 second and talk a little bit about how DOE has dealt
11 with conservatism and also uncertainty in the total
12 system performance assessment for site recommendation
13 and also in the supplemental science and performance
14 analysis report.
15 DOE took conservative approaches in the
16 TSPA-SR, as the ACNW has clearly pointed out, and I
17 think we've pointed that out as well. But we don't
18 believe that they necessarily indicate arbitrary
19 attempts to produce higher consequences. These are
20 often the technical opinions supported by the
21 interpretation of the evidence.
22 DOE also realized that they were dealing
23 with conservatisms and uncertainties and needed to get
24 a better handle on that. And for that reason, one of
25 the four focuses of the supplemental science and

1 performance analysis report was to address those
2 conservatisms and uncertainties.
3 As a result of both our review of the
4 TSPA-SR and the supplemental science report, we have
5 required the DOE to strengthen or clarify the links to
6 the data. And this is something that the ACNW has
7 brought up, something that the international peer
8 review of the TSPA-SR has brought up in terms of risk
9 dilution, and the consistency of using conservatism
10 across.
11 And also, we have agreements to improve
12 that consistency in their use of conservatism. And
13 these are -- many of these agreements are actually in
14 the TSPA area. For instance, we have an agreement
15 requesting -- requiring DOE to develop guidance in the
16 model abstraction process that can be adhered by all
17 modelers, so that the abstraction process, the
18 selection of conservatism in components and
19 representation of uncertainty are systematic across
20 the TSPA model.
21 And it goes on to say not only do you have
22 to have this guidance, you actually have to implement
23 it. And DOE has agreed to do that. So I think we
24 share some of the concerns that the ACNW has on the
25 use of conservatism, and I think we've -- we're

1 requesting the right information from DOE to address
2 those concerns.
3 Continuing on, here's an example -- and I
4 know Ray is going to like this one. It's a
5 geochemical one. But we evaluated a variety of
6 assumptions and differences between what was
7 documented in the TSPA-SR and what was done in the
8 SSPA. And, again, we asked the staff, you know, is
9 the new analysis in the SSPA suggestive that what they
10 did in the total system performance assessment non-
11 conservative?
12 Well, they did a new analysis in terms of
13 the chemistry, which suggests that water may be
14 present at higher temperatures. Okay. Why is that
15 important? That means the time period for -- both the
16 time at which initiation occurs and the time period
17 over which corrosion could occur on the waste package
18 and/or drip shield is longer than what was used in the
19 TSPA-SR.
20 So this is an example where a new sort of
21 analysis in the supplemental science and performance
22 assessment suggested that their approach wasn't
23 conservative. And the Center has been working very
24 actively on this issue. When is the timeframe of
25 initiation, and how long could water exist because of

1 differences in chemistry?

2 And DOE -- as a result of that, we've

3 asked DOE, in the near field and also probably in the

4 container life and source term, in issue resolution

5 space, provide us the basis for what environment would

6 control the initiation and time period for corrosion

7 during the thermal period.

8 Some people have suggested, well, things

9 will change if DOE goes to a cooler repository design.

10 So what happens? How will NRC deal with this? Well,

11 basically, as a result of the review of the

12 supplemental science and performance analysis, we

13 analyzed what we believe are the general areas that

14 are going to need more information should they go down

15 that route.

16 Moreover, DOE agreed to meet with us and

17 discuss those items if they make that decision. And

18 as I said earlier, the staff is following DOE's

19 ongoing design study to see whether they are going to

20 go forward.

21 The purpose of this ongoing design study

22 is to really provide options to DOE on both modular

23 design, staged repository, and thermal -- subsurface

24 thermal modes. And so, basically, they're going to be

25 making recommendations to DOE on how to proceed in the

1 design space.

2 Okay. I think in the subsequent

3 presentation by the Clark County -- and also, again,

4 the NWTRB has questioned, why is there no difference

5 in performance for hot or cold repository? Does this

6 mean the model is wrong?

7 Well, what we did is we looked at what the

8 DOE did, and really, you know, the waste package

9 dominates the overall system performance assessment.

10 And so what we tried to do is to use some risk

11 insights, and say, "Okay. Well, what controls waste

12 package?" Well, it's -- again, when does it start

13 corroding? How long does it corrode, and how fast

14 does it corrode?

15 So, in essence, the risk insight is the

16 thermal period. The integrated corrosion of that

17 thermal period is too small to cause waste package

18 failures. So if there was some way you could make

19 that thermal corrosion period longer or faster, then

20 the difference between hot and cold would likely show

21 up.

22 Again, the thermal period is much less

23 duration -- is much less in duration than the cold

24 period. This conclusion that the repository is

25 insensitive is really, again, thinking about what are

1 the things that are driving that conclusion. Really,
2 it's the general corrosion rates, the temperature
3 dependency, and initiation temperature.
4 And if you go back to what the staff has
5 requested in container life and source term, and in
6 the near field, and in TSPA-SR -- I mean, in the TSPA
7 KTIs, we've asked for additional information in these
8 areas, because these control -- these three things
9 control your conclusion.
10 Some people have asked whether we have
11 confidence that DOE will address these concerns. Jim
12 Anderson wasn't available. He was on military duty
13 for this technical exchange, and he is also now -- on
14 travel now. So I'm trying to project Jim's thoughts
15 here.
16 But basically, this issue resolution
17 process has been done in a public form and has
18 resulted in about 293 agreements. DOE has provided
19 information for about 60 of the agreements, and we've
20 been documenting our review in letters back to DOE,
21 documenting the review of that information in public
22 letters.
23 DOE has agreed to provide information for
24 about 110 agreements in fiscal year '02, and DOE has
25 stated it intends to address the staff concerns and

1 will provide the necessary information. And,
2 basically, in our comments to DOE on the site
3 recommendation, it's based upon DOE's statements that
4 they will meet these things, that we have confidence
5 that they will deliver.
6 Simplified model versus a complex model --
7 how -- what should we be using? Should we be using
8 both, in terms of performance assessment space? As I
9 looked at this presentation last night, you can think
10 of this first slide as the simplified model and the
11 next slide as the complex model. You'll get that in
12 a second.
13 But basically, performance assessment
14 needs to use both a combination of simple and complex
15 models, because they do different things for you.
16 While simple models can focus on important
17 interactions in the processes, and they allow a wider
18 variety of sensitivity and uncertainty studies,
19 complex models provide the basis or the support for
20 the simplified models. And they allow us to focus on
21 more complicated processes -- for instance, in-package
22 chemistry.
23 All right. The complex slide. It's a
24 little dense, but basically here are some of the
25 advantages and disadvantages of both approaches. No

1 single approach will work in terms of performance
2 assessment or in determining overall risk insights.
3 For example, in the complex model, you
4 would want to use it to represent some of the more
5 complicated processes and natural events. So in a
6 simple model you wouldn't be able to address something
7 like, well, are fault zones important? All right?
8 So this is -- this is an example where if
9 you just use a simple model, you couldn't address one
10 of our KTIs, to understand what its relevance
11 importance is in terms of the overall process. If you
12 don't include it, in a simple model you can't
13 determine its performance or its impact to
14 performance.
15 In terms of disadvantages, basically the
16 integration with other models is complicated. For
17 instance, output from detailed models may need to be
18 averages or interpolated to be applied to other
19 models. And demands on the computer resources may
20 replace restrictions on sensitivity. So we agree with
21 Dr. Garrick that use of simple models is necessary if
22 you want to do a lot of sensitivity analyses and
23 uncertainty analyses.
24 So for the simplified model, we've -- some
25 of the advantages are really the integration -- for

1 instance, interactions between models is
2 straightforward. You have much more flexibility and
3 variety of types of uncertainty and sensitivity
4 studies you can do, and you can verify the results in
5 a variety of ways -- hand calculations, barrier
6 analysis, etcetera.
7 Some of the disadvantages -- again, you
8 can't capture some of the things, so that you don't
9 actually know whether it's important or not.
10 All right. Trying to summarize here. I
11 hope in the first part of the presentation I provided
12 you a review that showed, one, that it was
13 multidisciplinary. All of the KTIs contributed to
14 this effort. They did it under a tight time
15 constraint.
16 If you look at the number of agreements
17 both here in terms of all the KTIs, you'll find that
18 the number of agreements on the things that are most
19 important to risk fairly well correlate to what is
20 most important to risk. And partly because we were
21 asking leading questions of the staff, we tried to use
22 the guidance to risk-inform the review as well.
23 I believe we've completed this process
24 within the key technical issue framework, and we did
25 it in a timeframe in which to support the sufficiency

1 comments -- again, a very short timeframe.

2 And, finally, I think we've left the path

3 clearly defined forward, in terms of those comments

4 that we made in terms of the supplemental science and

5 performance analysis were incorporated in our

6 sufficiency review. We've outlined the process in

7 which if DOE goes down the road of taking a lower

8 temperature operating mode, we're going to come back

9 and we're going to discuss these issues and clarify

10 things.

11 And, finally, I hope I've partially

12 addressed some of the ACNW questions and issues that

13 have arisen recently in the letters and also that are

14 likely to arise from this presentation. So with that,

15 I'm done.

16 MEMBER GARRICK: Thanks, Bret. That was

17 very helpful. Let me see if the committee has some

18 questions. Milt?

19 MEMBER LEVENSON: Well, it isn't so much

20 a question as a comment. I always have trouble with

21 the use of the word "conservatism" when it isn't

22 conservative. Here we have two separate categories.

23 One is overestimating consequences is very seldom

24 conservative, even though we call it that. And

25 overestimating temperatures, pressures, or flows may

1 or may not be conservative in such a complex issue.

2 And I think the committee is absolutely in

3 favor of conservatism in the normal sense of the

4 definition of the word. But we're a little concerned

5 about all of the things being done in the name of

6 conservatism.

7 One of the questions I have, because when

8 we did the vertical slice and we talked to individual

9 people and people doing programming, etcetera, it

10 wasn't at all clear that there was any central

11 inventory if you will of all of these overestimates.

12 Almost everybody along the way was rounding numbers up

13 or given a choice of values using what they thought

14 was in the direction of more conservative.

15 Is there any hope of getting your hands

16 around that really, and getting a feel for thinking --

17 the end point is to really make sure it is

18 conservative.

19 MR. LESLIE: Right. You know, I'm going

20 to try to find -- go back to one of the TSPA

21 agreements. I mean, the total system performance

22 assessment group has really focused on this use of

23 conservatism. Is it really conservative? What's the

24 basis for that? Is it being used consistently

25 throughout? And so let me see if I can find that --

1 MEMBER LEVENSON: Yes. See, part of the
2 question, Bret, is that pieces of this TSPA go back a
3 long time, and written under different conditions by
4 different people. And how do we assure ourselves, you
5 know, not what's being done today but that -- it must
6 be a very large --
7 MR. LESLIE: Well, what we've requested of
8 DOE in any potential license application is that they
9 provide the basis for those conservatisms, you know.
10 In an effort to make sure that they do that, you know,
11 we've put up that one agreement that I talked briefly
12 about, which is basically provide the guidance to the
13 people who are doing the review on how to consistently
14 deal with conservatism.
15 DOE is going to have to provide that
16 guidance to us, and we're going to review it and
17 provide comments. So, for instance, if they're not
18 adequately documenting their assumptions, that's
19 something that the staff can review and reply back to
20 DOE, "Okay. What you need to do for this is to
21 provide all of your assumptions and the basis for your
22 assumptions."
23 So we're allowing DOE to -- the
24 flexibility to address this. We recognize that it's
25 a systematic issue, and that's one of the reasons why

1 we've requested the guidance -- not only the guidance
2 but also to implement that and to have that period of
3 NRC review in between that would get the information
4 we need.
5 MEMBER LEVENSON: Mr. Chairman, can I ask
6 a "have you stopped feeding your wife" type question,
7 or is Bret too nice a guy for that?
8 MEMBER GARRICK: No, go ahead. Go ahead.
9 (Laughter.)
10 MEMBER LEVENSON: If you -- how do you
11 cope with the following situation? If DOE comes in
12 and says they want to move from a hot to a cold
13 repository, because there is less uncertainty and it's
14 easier to calculate it, but intuitively you feel it is
15 slightly less safe to go in that direction, how do you
16 deal with that?
17 MR. LESLIE: What the Department of Energy
18 would have to do, regardless of their design or their
19 operating mode, is, whatever their proposal they would
20 have to demonstrate compliance and meet Part 63.
21 Whatever that method was, it would have to provide
22 sufficient information so that the staff could make
23 its finding.
24 MEMBER LEVENSON: Well, the context of the
25 question really, in a way, tied back to one of your

1 slides where you said, if they made a change in
2 something, they needed to notify you unless there was
3 no change in safety. But, really, the question is you
4 need to identify that it's safe enough. So that
5 changes which reduce safety might still be perfectly
6 acceptable if the result is safe enough. Is that
7 correct?
8 MR. LESLIE: Who has to identify?
9 MEMBER LEVENSON: If DOE makes some
10 change, and they say, "This reduces safety," that
11 would not be automatic reason for rejecting that
12 change if the result is safe enough. Is that correct?
13 MR. LESLIE: That's my understanding.
14 MEMBER LEVENSON: Okay.
15 MEMBER GARRICK: Ray?
16 VICE CHAIRMAN WYMER: A couple of
17 comments. One is I was pleased to see, and I'm sure
18 you are, too, Bret, that the chemistry is finally
19 being recognized as fundamentally important to the
20 repository performance.
21 (Laughter.)
22 But on a more substantive point, the thing
23 that caught my attention was that DOE was looking at
24 what you call a staged approach, what we've been
25 calling a phased approach to the repository

1 performance. And I wondered if we'll get an
2 opportunity to hear more about that when Bechtel gets
3 a little bit farther into its study.
4 MR. LESLIE: Yes. There is a November 2nd
5 technical guidance to Bechtel SAIC that I think the
6 NRC has a copy of that outlines what they want to do
7 in this and a schedule. It's a very aggressive
8 schedule. I think it's -- you know, they were first
9 meeting with DOE at the beginning of November, and
10 they are supposed to have a final report and
11 recommendations by the end of March.
12 VICE CHAIRMAN WYMER: Oh, wow, that is
13 aggressive.
14 MR. LESLIE: Yes. So their holidays will
15 be full.
16 VICE CHAIRMAN WYMER: I would sort of be
17 interested, personally at least, in hearing more about
18 what the study comes up with or --
19 MR. LESLIE: We're probably not the right
20 people to --
21 VICE CHAIRMAN WYMER: Yes, I recognize
22 that. That's all.
23 MEMBER GARRICK: George?
24 CHAIRMAN HORNBERGER: Bret, the analysis
25 of the low temperature versus high temperature

1 operating modes, as you pointed out, it's almost a no-
2 brainer that if you don't have container failures
3 during the compliance period, and if the thermal
4 period doesn't last as long as the compliance period,
5 it's not a big surprise that one doesn't show any
6 effect.
7 Is staff at all skeptical about that
8 result?
9 MR. LESLIE: I think part of that
10 skepticism was the three bullets at the end. It's
11 really critically important. That conclusion is
12 important upon the general corrosion rate, initiation,
13 and I forget what the last one was. But those three
14 issues are important to that conclusion, and that's
15 why they are already a focus of the issue resolution
16 agreements. We want more technical basis for those
17 topics.
18 CHAIRMAN HORNBERGER: But it's
19 interesting, in your response to Milt's question, a
20 reduction of uncertainty doesn't really play into the
21 NRC regulations at all. So if a high temperature
22 operating mode -- make up numbers, if the calculated
23 dose was .01 millirem with a thousand percent
24 uncertainty, and if you went to a low temperature
25 operating mode and it was 10 millirems with a 10

1 percent uncertainty, either one is okay with you guys,
2 because it satisfies the standard.
3 But there has been some criticism to high
4 temperature operating mode. For example, the USGS
5 letter on the SR said they had a strong preference for
6 -- still had a strong preference for a low temperature
7 operating mode, because they thought that it would
8 reduce uncertainty.
9 MR. LESLIE: The difference between a
10 scientist and a regulator is a regulator has to make
11 a decision in the face of uncertainty. And, you know,
12 while that may be true, as long as DOE provides the
13 necessary information to make a finding that it would
14 comply, that's all that's required.
15 It's not an optimization process. We
16 don't require that. In fact, if the DOE wanted to do
17 something to make it even safer, we wouldn't tell them
18 no. That's the license applicant's responsibility, to
19 make that decision.
20 But I think one of the things that we're
21 trying to get at, why are we addressing those three
22 points? Well, basically, it means if what they've
23 said is wrong, there could be lots of container
24 failures. So we're requesting information so that
25 it's not a difference of, you know, way down at the

1 low numbers, but do you get those high doses very
2 early?
3 So that's really, you know, what we're
4 trying to do. There are still some outstanding issues
5 in terms of, you know, the level of support for
6 welding, and, you know, is there a temperature
7 dependence on corrosion, and so on and so forth, that
8 could make a difference in performance in an early
9 timeframe.
10 CHAIRMAN HORNBERGER: Just one more, John.
11 In that same vein, my suspicion is when I
12 look at your three -- or my inference is when I look
13 at your three bullets that you're focusing on the
14 Alloy 22 and the welds and temperature dependence
15 there.
16 My suspicion, although I don't know this,
17 is that the USGS might be more worried about
18 condensation and reflux and things like that in the
19 disturbed environment. Is that a -- do you think that
20 that is a distinction between you and scientists?
21 (Laughter.)
22 MR. LESLIE: Well, I guess one of the ways
23 to address that is, can we live with that uncertainty?
24 And one of the things I did recently was to evaluate,
25 okay, what controls, for instance, the drip shield?

1 We worry a lot about the chemistry of the drip shield.
2 Okay?
3 Really, one of the key parameters for a
4 concentration -- well, you could say, "Well, there's
5 going to be a lot of reflux, and, therefore, there's
6 going to be a lot of uncertainty." Well, you can
7 literally take very bounding estimates of how much
8 water could contact a drip shield, make ridiculous, I
9 would say, assumptions.
10 All the water -- seepage is 100 percent of
11 percolation. All that reflux water, even though it's
12 a short period of time, that percolation rate would be
13 much higher. Integrate over all of that and use the
14 broadest range of fluoride chemistries available. And
15 at most, you could dissolve 10 percent of the drip
16 shield.
17 So you can do some mass balance, not in PA
18 space but auxiliary analysis, to say, "Okay. Well,
19 you know" -- and then, even to focus on the thermal
20 period, you know, the thermal period is so short that
21 even uncertainty in that, that's only 10 percent of
22 the 10 percent. So it's one percent of the fluoride
23 gets -- could be transported within that thermal
24 period.
25 So is that acceptable? You know, that's

1 the kind of argument or analysis where we can try to
2 address, is the uncertainty acceptable? I think, you
3 know, if we were seeing -- you were getting 200 or 300
4 percent of the amount of fluoride, that literally you
5 could titrate the titanium away. Well, then, that's
6 a different situation.
7 MEMBER GARRICK: Bret, one of the
8 encouraging exhibits you have provided is the one on
9 page 6 that -- where you've attempted to classify
10 comments in terms of issue resolution. I think that's
11 very important when -- all of the review activities
12 that you're engaged in, to make sure that somebody is
13 looking across the board and connecting them to the
14 other review process that's going on.
15 And I think that's a very important move
16 on the part of the team to do that, and even to
17 attempt to quantify it a little bit in terms of the
18 distribution.
19 Now, in that spirit -- and you don't need
20 to do it numerically -- but on your Exhibit 5, where
21 you said the 129 comments are subdivided into subject
22 areas, can you just qualitatively give us some
23 indication of how they were distributed along those
24 lines, the 129 comments?
25 MR. LESLIE: I could do it a couple

1 different ways. In terms of how they ended up being
2 clarifying, or -- what you'll find is for the -- for
3 instance, in the geology and design and integration,
4 those are strongly focused on whether DOE goes down
5 that path. Okay?
6 The numbers might all be equal overall,
7 but how they subdivide into those areas is different.
8 So, for instance, for waste package and waste form, we
9 probably had 35 comments, if I can recall, overall.
10 But if you look at the percentage that were tied to
11 additional scope and issue resolution, it was much
12 higher than the other fraction.
13 MEMBER GARRICK: Okay.
14 MR. LESLIE: I could give you that
15 information later, but I, in fact, did that exercise.
16 I could have presented it here.
17 MEMBER GARRICK: Yes, okay. All right.
18 Thank you.
19 The committee has to make a decision as to
20 whether we want to conduct a review of the SSPA.
21 We've somewhat committed to do that. But on the other
22 hand, I'm told we have a right to change our mind from
23 time to time.
24 And I guess I'm -- I was going to take
25 advantage of your presentation and of you and ask,

1 what's next in the way of a milestone document? And
2 whether or not maybe it's more productive and
3 efficient for the committee to be thinking about
4 reviewing that than this particular document, which is
5 in a kind of a swirl of three or four other documents.
6 MR. LESLIE: DOE documents or NRC
7 documents?
8 MEMBER GARRICK: Well, since SSPA is a DOE
9 document, I suppose we're talking about a DOE
10 document. But we'll take it either way.
11 MR. LESLIE: I'm going to let Jim answer
12 this one.
13 MR. FIETH: Yes. DOE has recently
14 released a set of documents that they updated their
15 performance assessment and sensitivity analyses, so
16 that it would be more current for making a site
17 recommendation decision. And those documents DOE put
18 on their website in I guess early to mid November, and
19 I can get you the names of those documents that they
20 had released at a break.
21 MEMBER GARRICK: Well, I guess the context
22 of the question should be, what would be most
23 beneficial to the staff? Because we'd like to be as
24 proactive as possible. And if we -- if the staff is
25 not going to get much benefit from an SSPA review by

1 the committee, what can we substitute for that where
2 you will get some real benefit?
3 I'm not sure you're the ones who we should
4 be asking this, but we're going to ask you it anyhow.
5 MR. LESLIE: Well, I'm looking for a
6 manager, but --
7 (Laughter.)
8 I can address it, but --
9 MR. REAMER: Bill Reamer, NRC staff. I
10 think we have informed you that we're working on a
11 technical basis document or integrated issue
12 resolution status report to state the technical basis
13 for issue resolution. And, you know, that's one
14 document that occurs to me that we'd be very happy to
15 have the committee's views on.
16 Now, the timing of that I think is the
17 tail end of the second quarter of the fiscal year. So
18 I'm not -- don't know whether that matches up well or
19 not with the committee's own workload, work schedule.
20 MEMBER GARRICK: Okay. Thank you. That's
21 the kind of information we wanted to have.
22 Let's see. One of the other things that
23 I wanted to just raise here -- in the last two days,
24 we had some interesting discussion about the research
25 program and what ought to be done to deal with some of

1 the issues of the agency. And, of course, a lot of
2 that was related to Yucca Mountain.
3 The NRC has indicated, on many occasions,
4 the desire for the repository to provide protection,
5 both from its engineered systems and from the natural
6 setting. And we know that DOE has done some analysis
7 along these lines of one-offs with respect to
8 engineered barriers.
9 And we heard the last two days from some
10 other investigators such as the Electric Power
11 Research Institute of some very interesting analyses
12 in that regard, particularly to get a better handle on
13 what the impact is of some of the natural barriers.
14 And maybe this is a Tim question, I don't
15 know, Tim McCartin. But does the -- is the NRC, in
16 their review activity and in their prelicensing
17 activity, looking at the specific case, for example,
18 of no barriers, no engineered barriers, in order to
19 establish some sort of a baseline, independent of the
20 DOE, of how the mountain might perform?
21 MR. LESLIE: And I will let Tim answer
22 this one.
23 (Laughter.)
24 MR. McCARTIN: I think we're certainly
25 using a variety of different techniques, be it one-

1 off, one-on, to examine what -- the contribution for
2 each of the barriers of the repository system, be it
3 natural or engineered. And we've done calculations
4 like that. I think we continue in the performance
5 assessment area -- keep trying to push the
6 understanding in terms -- are there additional
7 techniques that we can be doing?
8 And, unfortunately, I don't know if Dick
9 Codell is here, but I know he has been looking at
10 other ways to pull out some of the statistical meaning
11 of combinations of parameters, which is also trying to
12 get at the, really, what barriers are important and
13 why. I mean, matrix diffusion is one of the ones for
14 the natural barrier that we've heard.
15 And key to it, though, is really the
16 retardation in the matrix. Without the retardation,
17 coupled with the matrix diffusion, it really isn't
18 that significant. But that's one that I think we're
19 certainly looking at that, but I will say it's all
20 done to improve the understanding of --
21 MEMBER GARRICK: Yes.
22 MR. McCARTIN: -- what -- what's working
23 and why.
24 MEMBER GARRICK: Yes. And that's the
25 context of the question.

1 MR. McCARTIN: Yes. And I think it's a
2 fair thing to say that maybe there is some
3 presentation that I'll commit Dick Codell. It's easy.
4 He's not here. But in general, the PA group, I think
5 we do try to come back to the committee as we do more
6 and more analyses, and there's always this lag between
7 documentation and results.
8 But we are in the process of doing some
9 additional analyses and trying to do new types of
10 things that maybe the committee would be interested
11 in.
12 Dr. Garrick, clearly, I know you've been
13 -- for your years on the committee have always been
14 pushing us to try to squeeze more out of that
15 knowledge lemon, if you will, that is the PA. And
16 it --
17 (Laughter.)
18 CHAIRMAN HORNBERGER: That's a very good
19 description.
20 (Laughter.)
21 MR. McCARTIN: I do like lemonade, though.
22 CHAIRMAN HORNBERGER: I'm really glad you
23 said that, Tim.
24 (Laughter.)
25 MR. McCARTIN: I do like lemonade. But

1 there are --

2 MEMBER GARRICK: You could have said

3 peach.

4 (Laughter.)

5 MR. McCARTIN: Well, that's true. But

6 along the lines -- and I think the research and what

7 was said in the last two days in the workshop, I think

8 there is value to trying to push more and more how you

9 can get more understanding and more information from

10 the results, which ultimately gets you to the I think

11 one of the -- just one final thought that people

12 brought up, public confidence.

13 I think all that knowledge, once you

14 understand how all the barriers are working from a

15 technical standpoint, I think you can go out and make

16 a simple, half-hour to hour presentation in a public

17 forum that explains why the results are the way they

18 are and why we believe the results. And I think

19 ultimately that's where public confidence is enhanced.

20 MEMBER GARRICK: Yes. And it's related to

21 the whole issue of defense-in-depth as well. Okay.

22 CHAIRMAN HORNBERGER: You know, I might

23 just comment, following on what Tim said. And your

24 first question, John, about whether we should even

25 consider a review of the SSPA. It might be more

1 valuable for us, as well as for staff, if we were to
2 just have a harder look at the progress that the staff
3 has made on the use of TPA and orient our comments
4 that way and perhaps do it partially in light of the
5 SSPA results.
6 MEMBER GARRICK: Sure. Good. Good
7 comment.
8 All right. I guess we're going to hear
9 from the Nevada, Clark County people. Is that
10 correct?
11 MR. BARTLETT: Yes.
12 MEMBER GARRICK: Oh, there he is.
13 MR. BARTLETT: You should have seen me
14 getting through the security --
15 (Laughter.)
16 With two metal hips, it's --
17 MEMBER GARRICK: It's nice to see you
18 again. Be sure and introduce yourself and tell us
19 what you've been up to.
20 MR. BARTLETT: Well, I'll tell you, if I
21 ever felt I was preaching to the choir --
22 MEMBER GARRICK: You need to be wired up.
23 MR. BARTLETT: As I said, if I ever felt
24 I was preaching to the choir, this is certainly the
25 occasion.

1 I am John Bartlett. As John mentioned, in
2 a prior incarnation I was Director of Locker-Winn, and
3 in the time since then we've been doing support work
4 for the EPA's promulgation of their regulations, and
5 also recently did this review for Clark County of
6 various documents, including, of course, the
7 preliminary site suitability evaluation and the
8 documents supporting that PSSE.
9 So we did look at the PSSE and the other
10 documents, with the objective, basically, of looking
11 at total system performance assessment as a basis for
12 the findings, conclusions, and posture of the
13 Department of Energy, as represented by these
14 documents that were reviewed. And so we have, as
15 you'll see, comments on the documents and also
16 comments on the findings and the DOE position and
17 information.
18 We looked at a lot of paper. DOE must
19 have its own forest somewhere. We did look at the
20 preliminary site suitability evaluation, the PSSE, the
21 supplemental science and performance analyses, and we
22 called the performance analyses in Volume 2 the S or
23 supplemental TSPA, to distinguish it from the TSPA-SR,
24 the independent document.
25 We looked at the science and engineering

1 report, the TSPA-SR, and the rather obscure -- there
2 are two major documents that support the TSPA-SR.
3 There's one that deals just with models, and there's
4 one that deals with assumptions. And so the total
5 pile of paper associated with the SR is really quite
6 enormous.
7 And then we also looked at the AMRs and
8 PMRs. It says there "where available." What that
9 means is we looked at all of them that were provided
10 to the Nuclear Waste Technical Review Board library by
11 the Department of Energy, which was most of them.
12 There are only a relatively few that weren't available
13 for our review.
14 We have some observations concerning the
15 documents, not only what they say but the documents
16 themselves as instruments of presenting the
17 information. And here I've summarized our findings.
18 To make a long story short, we found it very difficult
19 to work with because of the way the information was
20 presented.
21 Specifically, the substandard technical
22 information in these documents is spread out, very
23 difficult to trace, very difficult to integrate, or at
24 least we found it to be so, for our purposes of trying
25 to interpret the information that was provided in

1 terms of TSPA and the TSPAs of basic -- for DOE
2 findings.
3 And I might say that what we were going
4 about in comparison with what the staff is doing was
5 what I would call essentially an informed layman's
6 review. We're not trying to get into the details of
7 the kinds of things that the staff is involved in, but
8 trying to get a good feel for the documents, the
9 information, and how well it supports and gives
10 confidence in the DOE findings.
11 We had a very hard time establishing in
12 the documentation the relationships between the models
13 and the assumptions in the data. You have to go
14 through the tiers of the documents to find these
15 relationships.
16 And, in fact, what we found is that when
17 you really wanted to get into the technical nitty-
18 gritty, you had to go to the AMRs and PMRs, because
19 the other document simply said, "We did this," but
20 there's no indication of why that was chosen, what the
21 implications are, etcetera.
22 So the substantive information we found
23 was actually in primarily the AMRs and the PMRs. And
24 I had a lot of trouble also with the fact that the
25 information is scattered in various documents, and I

1 have an illustration of that.

2 And that's the fact that with the

3 viability assessment you could go through, for the

4 cladding degradation, for example, and pull out all of

5 the relevant information and make an independent

6 assessment of how much conservatism there was in the

7 final result based on their assumptions.

8 It was all there. It's not all there in

9 any one of these given documents. You have to trace

10 through various documents and eventually actually get

11 into those AMRs and PMRs if you're looking for that

12 kind of capability or ability to interpret the

13 information.

14 The Technical Review Board has made a big

15 case, or at least about a year or so ago, about the

16 need for traceability in the DOE documents. Frankly,

17 I found that it's not there very well. What they've

18 done is a marvelous job of what I call information

19 accounting, cross-referencing. You'll find

20 information about this in such-and-so a document,

21 etcetera.

22 So the accounting is very complete and

23 accurate. But the ability to interpret the

24 information with respect to the technical content, the

25 flow of the information that's relevant to the topic

1 at hand, we found to be very difficult based on these
2 documents.
3 And needless to say, as it does say, it
4 made it very difficult for us to meet the objectives
5 of our reviews.
6 Now, also, I guess needless to say, you're
7 going to see that there's a lot of stuff here that's
8 very similar to what you've just heard, because we're
9 all looking at the same documents, and we're all
10 working in the same bases fundamentally. And so what
11 we've found is, for example, many of the assumptions
12 that were presented in these documents are, in fact,
13 quite extreme.
14 And you've heard Bret talk about part of
15 their purposes for that, but that's what you find.
16 The assumptions appear to be either highly
17 conservative or non-conservative. And it's very hard
18 to trace the basis for these, because you don't know
19 what the anchor point is in many cases.
20 They are asserted to be conservative or
21 non-conservative. But what is the anchor point that
22 makes an assessment of that status possible? One of
23 the things that was very hard to find in the
24 documentation.
25 And I think you are all probably well

1 aware of the fact that the TSPA-SR and the S-TSPA are
2 very, very different in terms of their approaches and
3 results.
4 And, frankly, we found this to indicate,
5 as it indicates here in the last item, that this
6 suggests that the information that was provided, at
7 least in these documents, indicates that the results
8 of performance assessment and the results of the
9 performance -- assessment of the performance of the
10 repository, are, in fact, artifacts of these
11 assumptions that were made with respect to, in this
12 case, the two alternative approaches used in the
13 TSPA-SR and the S-TSPA. In other words, it calls into
14 question --
15 CHAIRMAN HORNBERGER: Could you give some
16 example about how the methods were different?
17 MR. BARTLETT: Two major things that
18 showed up, very hard to trace at least at our level of
19 review. One was the -- in the case of the S-TSPA, of
20 course, they turned to an assumption that there's an
21 early failure.
22 So you have releases in the early stages
23 where you had none for the first 12,000 years in the
24 TSPA-SR, because there was no assumption in the SR
25 that there were no package failures or no corrosion

1 failures until after approximately 12,000 years.

2 And then the other one is the intermediate

3 range -- 10,000 to 100,000 years. The slope of the

4 curve is very different of the dose rate as a function

5 of time. And this appears to be, primarily because of

6 assumptions concerning the solubility of Neptunium,

7 that the details are very hard to find, at least as

8 our level of review with the way the documentation was

9 done.

10 Those are two major factors that really

11 jump out at you.

12 CHAIRMAN HORNBERGER: Okay. So when I see

13 methods here in your slide, that refers to assumptions

14 made --

15 MR. BARTLETT: Yes. Yes.

16 CHAIRMAN HORNBERGER: -- in the analysis.

17 MR. BARTLETT: Yes.

18 CHAIRMAN HORNBERGER: Okay.

19 MR. BARTLETT: And it gets back to this

20 question of the -- again, the results being an

21 artifact of those kinds of assumptions. My God, we

22 haven't got any releases from the early -- let's make

23 an assumption that there is a failure for some reason,

24 even though in reality the data do not support that.

25 Now, it's a strategy. It's a strategy of

1 information for licensing reviews, but that should be
2 made clear I think.
3 We found it rather interesting that the
4 DOE really hasn't selected a repository design. They
5 have a hot design, and then when they start
6 considering the cold repository they simply fiddle
7 with the operating conditions of the hot design.
8 There's no cold design, and there's no selection of a
9 cold or hot repository in the documents.
10 And this leads you to a situation in which
11 the results for the low temperature repository, as
12 they call it, are simply variations on the results for
13 the high temperature repository. And it's a real
14 question as to whether you really have an appropriate
15 suite of results as a basis for choice or description
16 of the two repositories at this stage of
17 documentation.
18 And I think as we all know, as indicated
19 in the second item here, once you introduce the
20 supplemental TSPA and the Alloy 22, the way the design
21 is presented, the repository is essentially an
22 underground engineered storage facility, because the
23 performance during the regulation period depends
24 virtually totally on the Alloy 22.
25 Now, that's a strategy, and it's the one

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2 made clear I think.
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20 supplemental TSPA and the Alloy 22, the way the design
21 is presented, the repository is essentially an
22 underground engineered storage facility, because the
23 performance during the regulation period depends
24 virtually totally on the Alloy 22.
25 Now, that's a strategy, and it's the one

1 they've used. But it certainly is a characteristic of
2 the current presentation of information. But as is
3 well known by everybody, comparatively speaking, the
4 technical basis for Alloy 22 performance is rather
5 fragile and rather narrow in comparison with other
6 alternative materials.
7 And ultimately, if the stability of the
8 film is the key factor, long-term performance of the
9 film can be estimated probabilistically but it's not
10 finally knowable. So it's the key factor in
11 performance the way the description has been presented
12 to date, or at least in these documents.
13 Here's the temperature independence item
14 again. The fact that the -- whether you have a hot or
15 cold repository, it doesn't matter. That's what the
16 results seem to show. And I think the explanation
17 that we heard here earlier is probably true, because
18 if you look at the two temperature curves, temperature
19 as a function of the time, for the hot and cold as
20 they defined it, they come together at 10,000 years,
21 and the spread isn't very great up to 10,000 years.
22 And so the impact of potential corrosion,
23 to have any release at all during that period up to
24 10,000 years, is relatively small. So I think
25 qualitatively you can come to this conclusion that

1 there operationally isn't significant difference
2 overall with the repositories as they define them for
3 these analyses, and the assumption about very limited
4 corrosion of the Alloy 22.
5 Another factor that relates to that, then,
6 is that because nothing is happening, in effect you
7 also have no coupled effects, which has been of
8 concern, or no significance of coupled effects, which
9 has been a concern to some parties.
10 That it either isn't significant, or, when
11 you look at the performance in the long range, there
12 is no persistence of these effects once the repository
13 gets down to the lower temperatures at 10,000 years
14 and beyond, so that the blips in the short term
15 actually, in the regulatory period, are not
16 significant, and the uncertainties having to do with
17 the coupled effects may not be all that important if
18 you believe these analyses and the bases for them.
19 DOE has performed, as we all know, these
20 one-off analyses, where they take out a performance
21 factor and see what the impact on performance is. One
22 that they seem not to have done is to take out the
23 Alloy 22, just take it out in total as opposed to
24 pieces of it. They've taken out stress corrosion and
25 cracking.

1 They take out little subsets of it, but
2 they don't just take it out and see what the
3 performance would be if you didn't have the Alloy 22
4 as they have it postulated as a performance factor.
5 So that seems to be missing from the analyses, at
6 least as represented by these documents.
7 They also haven't looked in detail, at
8 least we didn't look in detail, at what they did look
9 at -- in great detail, that is -- at the difference
10 between the hot and cold repositories. But they posed
11 very different issues for the path forward I think
12 depending on which one you pick, because the hot
13 repository may have a significant performance issue
14 associated with the coupled effects and their effects
15 on the natural system.
16 That may be negated by the fact, if you
17 believe it, that the Alloy 22 is going to dominate the
18 performance. But that's a possibility that really has
19 to be looked at if they go hot. If they go cold, then
20 you have potentially a more significant role for the
21 natural features of the system, and potentially a
22 significantly bigger repository footprint.
23 The only way -- direction you can go is
24 north, and north puts you into the area of the high --
25 the high gradient and the Eleana formation, and a very

1 complex situation with respect to site
2 characteristics. It might require a reevaluation and
3 an extension of the characterization of the site
4 features relevant to performance. So there are
5 different factors, depending on which path forward is
6 chosen.
7 And, finally, we conclude that there's
8 just so much here that there really has to be a
9 comprehensive and independent peer technical review of
10 the work that's been done.
11 Now, I heard a comment I guess, Bret, that
12 there's additional documents already on further
13 information on TSPA, etcetera. We're not familiar
14 with that at this point yet. And, obviously, the
15 staff is doing this kind of peer independent review.
16 Let me underline, again, the fact that our
17 effort is what I call the informed layman effort, not
18 trying to replicate or get into the kind of
19 information that the staff is. It's not for that
20 purpose, supporting Clark County's interest in -- does
21 DOE have a sound basis for its conclusions, its
22 potential for finding -- making a finding that the
23 site is suitable, etcetera.
24 I think, frankly, based on this review
25 that this documentation leaves a lot of issues open

1 with respect to the ability to defend a finding with
2 respect to suitability at this stage of the game.
3 So there's our story. I'd be glad to
4 answer any questions.
5 MEMBER GARRICK: Okay. Thanks.
6 George?
7 CHAIRMAN HORNBERGER: No, I don't have
8 any, John.
9 MEMBER GARRICK: Ray?
10 VICE CHAIRMAN WYMER: No, I don't either.
11 It was a very clear explanation of what you found and
12 what you believe.
13 MR. BARTLETT: Thank you.
14 MEMBER GARRICK: Okay. Milt?
15 Englebrecht, do you want to make a comment?
16 CHAIRMAN HORNBERGER: Find a mike, and you
17 need to introduce yourself.
18 MR. VON TIESENHAUSEN: My name is
19 Englebrecht von Tiesenhausen. I think most of you
20 know me by now, after all these years.
21 CHAIRMAN HORNBERGER: It's for the Court
22 Reporter.
23 MR. VON TIESENHAUSEN: Okay.
24 (Laughter.)
25 I'm with Clark County. I just wanted to

1 make a short statement. This review was done in a
2 totally independent fashion. As you know, Clark
3 County is basically politically opposed to the
4 repository, and we wanted to I guess at least even at
5 home and here gain a degree of credibility by having
6 somebody who is not at all associated with us in any
7 way, shape, or form to do this kind of review.
8 And I did not even see these slides until
9 this morning, and I didn't want to have any input. I
10 wanted this to be totally independent.
11 MEMBER GARRICK: Thank you. Well, I was
12 going to ask a couple more questions, but --
13 MR. BARTLETT: Okay.
14 MEMBER GARRICK: Actually, you can pull up
15 a chair and use a microphone, and then it --
16 MR. BARTLETT: Yes, please.
17 MEMBER GARRICK: You had said that there
18 are lots of issues that are open. Based on your wide,
19 vast experience and wisdom in this business, would you
20 care to comment on just what you believe to be the one
21 or two or three most important open issues?
22 MR. BARTLETT: They do depend on the path
23 forward, but yes.
24 MEMBER GARRICK: Yes.
25 MR. BARTLETT: In any path forward, given

1 the current reference design, certainly the
2 performance of the Alloy 22 is just absolutely
3 critical. The whole repository depends on that.
4 Potentially, if you go hot, this secondary or second
5 critical factor is this potential for coupled effects,
6 to effect the system in uncertain ways. And you're
7 left with a residual uncertainty that you simply
8 cannot reliably evaluate.
9 You can probably bound it, I think. But
10 bounding it in context, with the rest of the
11 uncertainties, I think is going to be the trick of the
12 week, because the uncertainties with the complexities
13 of the models and the performance factors is very hard
14 to sort out, if not impossible.
15 MEMBER GARRICK: Yes.
16 MR. BARTLETT: So picking that part out of
17 the uncertainty picture and getting some confident --
18 having some confidence, as you've well characterized,
19 whether or not there's going to be a cap formed,
20 whether or not you're going to affect the fracture
21 structure of the rock, whether or not it matters that
22 these things occur, especially if you have the
23 Alloy 22 is a -- is a very important factor.
24 If you allow the possibility that the
25 Alloy 22 will not perform with whatever probability,

1 then this becomes very important as an auxiliary
2 factor. So those are probably the two most
3 significant things with the design that they've
4 established to date, I think, and within the context
5 of the information as it's available in these
6 documents.
7 As I said, and I can't emphasize it
8 enough, I found these documents very hard to work
9 with, to try and get the information out of them,
10 because it's all over the place and it's -- the
11 presentations in the top-level documents are
12 descriptive but not informative in terms of being
13 interested in the real technical basis for the
14 information that's presented.
15 MEMBER GARRICK: Just as a matter of
16 curiosity, and you don't have to give this in terms of
17 dollars, but man -- person-minutes or months or weeks
18 or whatever -- what was the magnitude of your review
19 effort?
20 MR. BARTLETT: Oh, roughly a manyear.
21 MEMBER GARRICK: Okay.
22 MR. BARTLETT: A little less than that.
23 Very helpful for going to sleep a lot of nights.
24 (Laughter.)
25 CHAIRMAN HORNBERGER: We've been there.

1 (Laughter.)

2 MEMBER GARRICK: Well, any other comments?

3 Okay.

4 MR. BARTLETT: Okay.

5 MEMBER GARRICK: Thank you very much.

6 MR. BARTLETT: Thank you.

7 MEMBER GARRICK: All right. Well, I think

8 that what I'll do now, given where we are, is turn the

9 chairmanship back to the Chairman.

10 CHAIRMAN HORNBERGER: Just in time for us

11 to take a break.

12 (Laughter.)

13 Because we do have time, I wonder if I

14 could ask the -- Bret and others to come back after

15 break, because we may want to pursue this a little

16 farther.

17 MEMBER GARRICK: Do we need the --

18 CHAIRMAN HORNBERGER: We probably don't

19 need the recorder any more for the rest of the

20 morning, because we're going to move to our

21 presentation to the Commission. So the need for --

22 MEMBER GARRICK: I think there's going to

23 be a continuation of --

24 CHAIRMAN HORNBERGER: Pardon?

25 MEMBER GARRICK: This is going to be a

1 continuation of this subject. You probably ought to
2 keep the recorder.
3 CHAIRMAN HORNBERGER: Until we're --
4 MEMBER GARRICK: Until you're through.
5 CHAIRMAN HORNBERGER: Until we're
6 finished. Okay. So strike my comment.
7 We'll take a 15-minute break and then
8 reconvene.
9 (Whereupon, the proceedings in the
10 foregoing matter went off the record at
11 9:57 a.m. and went back on the record at
12 10:16 a.m.)
13 CHAIRMAN HORNBERGER: Okay. We will
14 reconvene.
15 I asked Bret and others to hang around
16 just in case we had further questions that occurred to
17 us over break. So let me first ask, are there any
18 followup questions for Bret -- or, also, John is still
19 here -- on what we heard about the SSPA? Raymond?
20 VICE CHAIRMAN WYMER: Well, in the review
21 of the research program, one of the speakers made the
22 observation that doing -- there was a lot of one-off
23 studies made where you take away one barrier, another
24 barrier, but nobody has done much one-on, which does
25 give you a very different look at what the repository

1 might do.

2 I just wondered if anything has been done

3 by the staff or by DOE on this one-on approach, which

4 is a -- it's enough different that it deserves

5 thinking about, I thought.

6 CHAIRMAN HORNBERGER: Whose bailiwick is

7 that? Tim?

8 MR. McCARTIN: Yes, I guess.

9 (Laughter.)

10 Well, I was trying to think of with

11 respect to DOE. I know with respect to NRC we are

12 doing some of those analyses, just to get a better

13 sense of what our -- what's contributing. And, yes,

14 you start with let me assume basically the worst case,

15 add on one feature, what did it do.

16 And, in fact, recent things we've done, I

17 think we've seen that alluvium versus matrix diffusion

18 in the saturated zone with retardation, they are

19 somewhat comparable, that depending on which one you

20 -- you have -- if you have both, you -- and that's the

21 key part of the sensitivity. If you have both, the

22 sensitivities are affected, depending on what you're

23 looking at because obviously the matrix diffusion

24 occurs before you get to the alluvium.

25 But we certainly are, as I indicated

1 before, we're trying to explore all of the different
2 techniques that we can. The more, the merrier, in
3 terms of understanding the results.
4 VICE CHAIRMAN WYMER: There probably are
5 some differences, Tim, between doing it one way and
6 doing it the other way.
7 MR. McCARTIN: Absolutely. I would say --
8 I mean, I just did this two weeks ago, so I can say I
9 was not as sensitive that matrix diffusion in the
10 saturated zone was almost completely redundant to the
11 alluvium. Both had the potential I'd say two to three
12 orders of magnitude reduction in dose.
13 And that -- I wasn't aware that -- I knew
14 matrix diffusion was contributing. I didn't realize
15 quite that effectively, as much as the alluvium. That
16 was a surprise to me, but all the more reason, as I
17 indicated, I think you can run the TPA code overnight
18 and now you have a bunch of results.
19 The question is: how many different
20 techniques do you use to analyze those results? And
21 I think each year we get more and more tools in our
22 tool chest to do that, and you find out more and more
23 things. We spend months and months evaluating the
24 results.
25 The one-on analyses, as one might typify

1 those, is another technique, and I think it does add
2 some additional understanding in --
3 VICE CHAIRMAN WYMER: Thanks.
4 MR. McCARTIN: Now, with respect to DOE,
5 I'm not as -- I think they also are similar to our
6 program, in that they are constantly trying to look at
7 additional ways. And so my guess is they would be
8 looking at some of the one-on analyses also.
9 VICE CHAIRMAN WYMER: Okay. Thank you.
10 MR. McCARTIN: Yes.
11 CHAIRMAN HORNBERGER: Milt?
12 MEMBER LEVENSON: Yes, I have a question
13 which is probably for DOE, Tim, but you may know.
14 There's been talk about natural analogues, and it
15 suddenly occurred to me that there exists in Idaho a
16 manmade analog maybe.
17 In the end of the '50s, 1960, when the
18 experimental breeder reactor site was being built, it
19 had no liquid waste, sodium-cooled reactor,
20 pyrometallurgical processing. But there was an
21 analytical lab. The primary waste from the analytical
22 lab was made into concrete, but the suspect waste,
23 stuff that was at the margin of detection of those
24 days, was pumped into a specific cavity carved in the
25 tuff.

1 And for about 15 or 20 years, waste that
2 was monitored was pumped in there, so there were known
3 volumes, known quantities. By the, I don't know, mid-
4 '80s or something, people realized that the levels of
5 detection had gone on, and that was dug up and removed
6 to remediate the site.
7 But the question of retardation and tuff,
8 there would be a tremendous source of data there. Has
9 anybody gone back and mined that or looked at it?
10 CHAIRMAN HORNBERGER: That would, first of
11 all, be basalt, right?
12 MEMBER LEVENSON: Yes. It's a different
13 type, but --
14 MR. LESLIE: Well, this is Bret Leslie
15 from the staff, and it's -- as George pointed out, it
16 would be basalt, which, you know, has a lot of
17 different major characteristics in terms of porosity
18 and permeability structure than --
19 CHAIRMAN HORNBERGER: They're both rocks,
20 right?
21 (Laughter.)
22 MR. LESLIE: Yes, they're both rocks.
23 That's the fundamental assumption.
24 (Laughter.)
25 But so --

1 MEMBER LEVENSON: Very porous because the
2 -- it was never able to fill it, no matter what the
3 pumping rate was.
4 MR. LESLIE: Right. So the answer is, no
5 one has gone back to look at that.
6 CHAIRMAN HORNBERGER: Let's see. Go
7 ahead, Andy.
8 MR. CAMPBELL: Norm and Budhi were working
9 on a method of analysis before Norm retired. Is that
10 still being used, or, you know, things like risk
11 achievement worth type of measurement techniques and
12 things like that?
13 MR. McCARTIN: Well, certain aspects of
14 the TPA code have -- you know, in terms of
15 neutralizing barriers, are still there and it's --
16 it's a part of the TPA code. That kind of -- now are
17 you referring to things --
18 MR. CAMPBELL: There are importance
19 measure methodology that they were developing. Has
20 that gone any further? I mean, there were a number of
21 projects going on --
22 MR. McCARTIN: Right.
23 MR. CAMPBELL: -- down at the Center, and
24 even up here in the staff, that were attempting to
25 develop methodologies that went beyond just basic

1 sensitivity studies. And I know Dick has worked on
2 some of these. But I know Norm and Budhi were working
3 on importance measures has staff --
4 MR. McCARTIN: Right --
5 MR. CAMPBELL: -- and employing that --
6 those different methodologies to kind of ferret out
7 some of the --
8 MR. McCARTIN: Right. I'm not aware of
9 anything that went beyond the --
10 MR. CAMPBELL: Development stage.
11 MR. McCARTIN: Yes. Now, I don't know if
12 Jim has anything to --
13 MR. FIETH: James Fieth, NRC staff. We've
14 not really been developing it much further. I mean,
15 we're now in the midst of doing some sensitivity
16 studies using the TPA-4, version 4, code. DOE has
17 also looked at that information in terms of some of
18 the work that they had done in their repository safety
19 strategy revision 4, where they did try and do some of
20 the similar techniques.
21 And what they indicated to us during our
22 technical exchanges is that that information would no
23 longer be in future revisions of the repository safety
24 strategy, but to the extent that they're carrying it
25 forward would be included in their future TSPA

1 analyses and would be in those documents.

2 So it's -- a lot of these people are doing

3 some of it, but in terms of developing techniques that

4 has not been a direct focus of our work of late.

5 CHAIRMAN HORNBERGER: Okay. John?

6 MEMBER GARRICK: Tim, in our TSPA-SR

7 letter, we were fairly blunt in our criticism of the

8 TSPA.

9 CHAIRMAN HORNBERGER: We toned that down,

10 John. Remember?

11 (Laughter.)

12 MEMBER GARRICK: And a lot of the issues

13 centered around trying to figure out just exactly what

14 it was they were calculating, whether it was, in their

15 judgment, a bounding value or -- and how far it

16 departed from philosophy of -- the philosophy of risk

17 assessment, which attempts to tell you what -- what

18 the risk analysts expect to happen.

19 Is the work you're doing on TPA -- is this

20 -- are you adopting some of the suggestions that we

21 made in that letter?

22 MR. McCARTIN: I believe so. I mean, part

23 of the -- we have certainly taken up the challenge

24 that in terms of explaining what you've calculated --

25 MEMBER GARRICK: Yes.

1 MR. McCARTIN: -- you need to be very
2 precise in explaining what you've done and certainly
3 where you use the word "conservative," if you're going
4 to use that word, which I'm not sure we recommend
5 using that word. Explain what the information is.
6 Here's what we're calculating, and this could be why.
7 And you can decide for yourself whether
8 you think that's conservative or not. I think the
9 word -- certainly, what the committee said about the
10 -- some of the DOE reports, that the word
11 "conservatism" was used a lot.
12 MEMBER GARRICK: Yes.
13 MR. McCARTIN: With very little
14 explanation of what was meant by it. And as Bret
15 indicated, it could be a gut feeling by the researcher
16 doing the work that this is conservative. Well, I
17 think we are going to try to --
18 MEMBER GARRICK: Connect the evidence to
19 the analysis.
20 MR. McCARTIN: Yes, exactly. The harder
21 question is, but I know we are thinking about it, and
22 it -- a very critical point that I think was brought
23 up today, certainly a part of your letter. What does
24 it mean? If you have some conservatisms and they're
25 stretched through four or five different places, do

1 you truly have a conservative result?

2 Is it -- what does that result actually

3 mean when -- are you compounding conservatisms, or

4 even maybe a little -- you know, you just sort of

5 shade it a little bit in a few areas, and the end

6 result, what does that mean to the result? And I

7 think we are trying to understand that.

8 But, once again, I think we -- the desire

9 is to connect the dots, as you said, not really say

10 whether it's conservative. Let everyone else decide

11 whether it's supportable, not whether it's

12 conservative or not.

13 MEMBER GARRICK: Right. And I agree with

14 your comments that the word "conservatism" is one we

15 have to use very carefully, because, as we said in the

16 letter, we weren't sure whether it was conservative or

17 non-conservative in some cases.

18 And we're not against bounding analysis if

19 through bounding analysis you've got clear indication

20 that there is something that can be eliminated and not

21 considering -- considered further. In fact, most of

22 our comments relate to important contributors and not

23 to the noise in the background.

24 And the other thing that the committee has

25 tried to be very clear on, when we say, "Take your

1 best shot at what the risk really is," we're not
2 saying that you shouldn't also address the issue of
3 uncertainty.
4 MR. McCARTIN: Yes.
5 MEMBER GARRICK: The uncertainty
6 distribution should be about parameters that
7 characterize what you think will really happen. And
8 so sometimes we have to be careful about saying "best
9 shot," because if that's interpreted as best estimate,
10 and that's interpreted in a statistical sense as the
11 median, that's not what we're talking about.
12 We're talking about the best shot being
13 what the experts, equipped with the tools of analysis
14 that we're associating with the risk business, telling
15 us in whatever form is suitable, whether it's a PDF or
16 a CCDF, or whatever, what constitutes the best
17 expression of what they think will happen.
18 MR. McCARTIN: Yes, I think we agree 100
19 percent. And we're certainly thinking along those
20 lines. And, once again, hopefully in the next set of
21 sensitivity analyses we're going to try to explain
22 things better. I think we certainly can do a better
23 job of it, and the desire is to -- as you have I think
24 correctly stated many times, what's your degree of
25 belief in some of these parameters and these

1 assumptions? Let's put that down, some expression, be
2 it a range, be it -- some cases it might be a point
3 value, but absolutely.
4 MEMBER GARRICK: Okay.
5 CHAIRMAN HORNBERGER: Latif?
6 MR. HAMDAN: Yes. I have maybe this --
7 this is for Bret. In your presentation, Bret, you
8 said that we give DOE the flexibility of going --
9 doing a realistic performance assessment or going --
10 introducing conservatism. On the same -- later on, on
11 the same slide, you said something like we require DOE
12 to do the evaluation of risk.
13 The problem that you have, and that's I
14 think the underlying issue for the committee, is that
15 should DOE go with the conservatism approach, even
16 though they might view the evaluation of risk, that
17 evaluation may not be realistic, and that's the
18 problem.
19 MR. LESLIE: This is Bret Leslie from the
20 staff. I agree with that assessment, and that's one
21 of the reasons why, in terms of the realistic
22 assessment of the conservatism, it's making sure that
23 they, as Tim has said, kind of pass through the
24 various different models. You know, have they dealt
25 with it consistently and integrated the same technique

1 and documented the same thing?

2 MR. HAMDAN: My point is if they go with

3 the conservatism, then, really, you preclude the

4 possibility of doing any -- well, not any, but, I

5 mean, then you always are risking having your risk

6 assessment being realistic.

7 MR. LESLIE: I guess --

8 MR. McCARTIN: I guess --

9 MR. LESLIE: Okay.

10 MR. McCARTIN: -- the big difference --

11 and I think what drives our statements as an agency in

12 that regard -- is that what we're asking DOE is to

13 defend what they're relying on. And it is their

14 choice, if they would not -- say we will take no

15 credit for the unsaturated zone. We will assume

16 whatever comes out of the repository goes to the

17 saturated zone.

18 If they want to do that, they can. It's

19 not realistic. We can't see it getting there any

20 quicker, so it's conservative. But if they can

21 support a compliance demonstration based on just the

22 saturated zone and some other things, they're allowed

23 to do that.

24 What we're asking is that what they rely

25 on, they need to defend. And so you're right. I

1 mean, they don't -- they don't have to be realistic,
2 if there are some things they choose not to rely on,
3 and maybe the unsaturated zone has the ability to give
4 them quite a bit of benefit. But that's not our call,
5 and that's what we're trying to get at.
6 But what they do rely on, from a risk
7 standpoint, the -- we want a full explanation of how
8 it impacts the risk number they're calculating and how
9 they've defended it. But what we're looking for is
10 support and --
11 MR. HAMDAN: Tim, I understand where
12 you're coming from, and I agree with you. But the
13 next time you want to think about this and then hear
14 debate about it -- and we had this yesterday,
15 actually, in the research workshop -- the question
16 really is, even though to achieve compliance you look
17 at conservatism, and you accept it, would you still
18 require DOE, as was suggested yesterday in their
19 workshop, just for analysis sake, to do a realistic
20 risk assessment, just so that the scientists we heard
21 from yesterday are satisfied that you have the
22 numbers.
23 MR. McCARTIN: Well, this is my
24 understanding of the process, and I would say no, that
25 we don't need it.

1 CHAIRMAN HORNBERGER: Right. Simple
2 answer.
3 MR. McCARTIN: Yes.
4 CHAIRMAN HORNBERGER: That's right.
5 Let's see, I have a question for the group
6 I guess. We heard this morning about the stack of
7 paper and the fact that it's difficult, you have to
8 trace through a lot of times to the AMRs and PMRs all
9 the way down there. And we've heard enough -- we've
10 been through some of this ourselves in our vertical
11 slide.
12 And also, it's clear that there are
13 modules, and so things have to get passed from one
14 module to another in a -- in the TSPA. And my
15 question is: in the reviews, is everybody who has
16 looked at it confident that the zeroth order -- I call
17 it zeroth order check, which is a mass balance, is
18 mass conserved in the TSPA? Are we confident that
19 water, substance, and radionuclides are conserved?
20 MR. McCARTIN: We certainly have raised
21 comments of that before. And I'll say there's one
22 benefit of the barrier analysis. The initial waste
23 package analyses DOE did, they found there was a mass
24 balance problem. They actually were creating more
25 technetium or iodine -- I think it was technetium --

1 than was in the repository with the analysis.

2 And so I'll say along -- some of the

3 barrier analyses are very good, because you look at

4 it, gee, does that make sense? And in that sense,

5 they have looked into that, and I think they pay

6 closer attention to mass balance as a result of --

7 that was around two years ago or so. And we certainly

8 have stressed that with them.

9 Have we, in particular, looked at the

10 results and done our -- an independent review to make

11 sure at intermediate points have we seen that mass is

12 checked? I'm not aware that we have done that. We

13 certainly are in the process, as a group -- we have

14 GoldSim in-house.

15 We have the ability to look at the results

16 all along the way. Have we -- we have plans or --

17 plans may be too strong -- desires to do that mass

18 balance and look at things. We have not -- I'm not

19 aware that we've done that yet, but we certainly --

20 one of the purposes of getting the GoldSim code from

21 DOE and the results therein, that they ran that we

22 could go through and systematically check, as fine as

23 we could and in a very simple mass balance is not --

24 at a fairly rudimentary level is certainly a

25 worthwhile thing to do.

1 But we have -- the issue has been raised
2 to DOE, like I said. You know, two years ago, they
3 did find problems. I know they have spent resources
4 to check on that, but --
5 CHAIRMAN HORNBERGER: The second part of
6 my question. How confident are we that TPA-4
7 conserves mass?
8 MR. McCARTIN: Very, very high is my
9 reaction.
10 CHAIRMAN HORNBERGER: So you have done
11 those analyses?
12 MR. McCARTIN: Yes. Generally, way back
13 when, the first version of the code, we did hand
14 calculations along the way to make sure, indeed, what
15 got out was consistent with what ended up. We
16 occasionally do additional calculations, just
17 verifying things when we get new versions, where there
18 are calculations with the code that are done every
19 time we create another version.
20 And I'm very, very confident that there is
21 mass balance there. I don't know if Gordon wants to
22 -- from the Center wants to talk to --
23 MR. WHITMIRE: Gordon Whitmire from the
24 Center for Nuclear Waste Regulatory Analysis. Part of
25 our verification and testing of a new version of a

1 code does include tests of things such as mass
2 balance.
3 I don't know if it goes all the way from
4 the very beginning of the code, or the beginning of
5 the flow path, from the surface all the way to the
6 receptor location, but certainly points along there,
7 subsystems we look at, we design some tests, we
8 document those and put it in our QA package for that
9 code.
10 CHAIRMAN HORNBERGER: And just a follow
11 up. Like I said, around I'll say -- boy, I don't want
12 to -- I don't know how good I am at thinking that far
13 back, but let's say somewhere between three to five
14 years ago we spent a -- I would say probably six
15 months doing hand calculations to verify all of the
16 different modules of the code and how they linked up,
17 etcetera.
18 We haven't -- that's a fairly intensive
19 effort. Takes a lot of time. We have not duplicated
20 that effort. I know we have talked about, is it time
21 to do another set of hand calculations again? Even
22 though we have confirmed every upgrade, is it -- and
23 maybe it is.
24 But, like I said, it -- I know we put a
25 lot of stock in a la Bret's simple versus complex.

1 Although the TPA code is fairly complex, it also is --
2 isn't that complex. As things go, it's relatively
3 simple, which allowed us to do simulations where we
4 did hand calculations to verify.
5 VICE CHAIRMAN WYMER: It's my
6 understanding, Tim, that there are some differences in
7 your intermediate results of calculations, not
8 necessarily in the final result, between the TPA codes
9 and the DOE code. Are any of these related to mass
10 balance factors?
11 MR. McCARTIN: I wouldn't think -- I don't
12 believe there's any significant -- I'm not aware of
13 any significant mass balance problem. We have some
14 large differences in assumptions sometimes between the
15 codes and sometimes parameters. And we certainly look
16 at why those differences are, but I would say in the
17 intermediate results there are -- I mean, I can point
18 to one big one, not so much intermediate, but iodine
19 technetium. I mean, we flip-flop.
20 I mean, DOE has a larger dose from
21 technetium. We have a larger dose from iodine. I
22 believe it's completely related to the diffusional
23 release model. They have a very large diffusional
24 release, and there is more technetium inventory than
25 iodine. We have essentially all an invective release.

1 And so we are aware of differences, but
2 there are -- we have always tried to trace back why do
3 those differences exist and what's the technical
4 basis. And I think generally we can, in all the
5 instances I'm aware of, we know why those differences
6 exist.
7 MEMBER LEVENSON: Tim, the hand
8 calculations is fairly extensive, etcetera.
9 Understand that. How complicated would it be to just
10 pick a single isotope and just follow it through, not
11 in detail but follow, from what's in the source,
12 what's inside the waste container, out to the time of
13 receptor, etcetera, and see if there is a material
14 balance on just a single isotope.
15 MR. McCARTIN: Well, with some of the hand
16 calculations, that's exactly what we did. We followed
17 a single isotope.
18 MEMBER LEVENSON: I'm not saying not
19 necessarily following it, but run the code --
20 MR. McCARTIN: Yes, right.
21 MEMBER LEVENSON: -- and see -- yes, okay.
22 That --
23 MR. McCARTIN: Yes.
24 CHAIRMAN HORNBERGER: I guess, so the
25 final part of my question, as Gordon said, the Center,

1 as part of the analysis, part of the QA, they do this,
2 document it. And my final part of my question is: is
3 that part of the requirement, DOE's QA requirement for
4 TSPA code?
5 MR. FIETH: DOE does have some QA
6 requirements that -- and procedures that they follow
7 for developing codes and such. There was some
8 question that we had identified -- or that came up
9 during the QA audit of whether they followed the right
10 procedure in terms of all of the steps that they would
11 have to do for checking the calculations.
12 And I guess there was feeling from some of
13 the contractor's staff supporting DOE that they had
14 two separate types of procedures, and they felt either
15 one could apply. One had a lower threshold in terms
16 of the types of checks, the hand calculations, looking
17 at the errors, than is required for the other.
18 So they do have procedures. We do have
19 some questions that we've asked at the technical
20 exchanges for issue resolution that address some of
21 the things that we found when we had questions trying
22 to reproduce DOE's hand calculations. So that is
23 something that we have been following and will
24 continue to follow.
25 CHAIRMAN HORNBERGER: Good. Thank you,

1 James.

2 Let's see. Let me just ask the question

3 in -- since we had a 15-minute break, did you all

4 cogitate at all any further on what you might see as

5 valuable for us to do in light of reviewing

6 performance assessment things?

7 MR. REAMER: We talked a little bit during

8 the break just to make sure we were on the same page

9 with the committee -- this is Bill Reamer, NRC staff

10 -- about the projects that we're working on this year.

11 And maybe I could summarize those.

12 CHAIRMAN HORNBERGER: Sure.

13 MR. REAMER: We talked about the

14 sensitivity study on 4.0 TPA, which may have been

15 referenced I think in terms of timing. The second

16 quarter we would be in a position to tell you about

17 that.

18 Bret has been tasked to work on a project

19 relating to how we show and work into our work risk

20 information. He might say a couple of words about

21 what he's going to do and the timing of that as well.

22 MR. LESLIE: Yes. One of my jobs is,

23 really, integration. And in this case, it's the

24 integration of risk information into the actions we're

25 doing, and together with the PA group, which already

1 had on its books a milestone from the Center, that
2 it's basically a documentation of the risk insights
3 that have been derived from the variety of sensitivity
4 studies.
5 This is going to be part of this group.
6 The purpose is threefold, really. One is really the
7 documentation. Second is the communication. I kind
8 of address that up there. You know, we work so
9 closely with it often that we don't communicate those
10 insights, and so we're -- one part of this project is
11 to evaluate how we can better communicate those risk
12 insights.
13 And then, finally, to look at how we're
14 implementing the risk insights. Are we implementing
15 them in terms of the sensitivity, in terms of the work
16 we're doing, in terms of how we would review? And so
17 this -- we just kind of had a kickoff meeting
18 yesterday afternoon with Gordon here, kind of
19 outlining -- I haven't had a chance to summarize, but
20 I think in the January or February timeframe I will
21 have completed something where we've worked with the
22 KTI teams, kind of come up with some draft risk
23 insights, and kind of come up with a process of how
24 we're going to try to improve our risk communication,
25 or talking about how we're risk-informing our

activities, and also how we're -- we would be implementing it.

So that's something that's in the process right now. And once this meeting is over, I know what my next task is.

(Laughter.)

MR. REAMER: Okay. Thank you, Bret.

Earlier I mentioned the integrated issue resolution status report as another item that we'd be interested in the committee's help on.

And the last item, the Yucca Mountain review plan, and the two areas that I guess I'd mention now, just because they're on my mind, performance confirmation -- it seems to me, and I imagine it has occurred to everyone in the room, that the -- part of the path forward on the question of research is populating a performance confirmation plan, the DOE's population of a performance confirmation plan with a suitable array of research and development work aimed at providing the information the Commission will need when it makes future decisions.

And the second area I'd mention as to the Yucca Mountain review plan is the way in which it captures the conservatism versus realism issue,

1 something we've mentioned earlier and as -- interested
2 in continuing that interaction with the committee, so
3 that we reach some convergence on that.
4 CHAIRMAN HORNBERGER: Good. Bill, one of
5 the things that we've kicked around in terms of an
6 idea for a workshop -- as you know, we find these
7 workshops stimulating, and they stimulate our ideas.
8 But one of the things that we've talked about is the
9 possibility of having a workshop on performance
10 confirmation. What's your gut reaction to that? Are
11 we too early, or is it a good idea, or --
12 MR. REAMER: I can't say that you're too
13 early. You may have a limited -- may have limited
14 results right now. But, you know, I think our own
15 timeframe is to put together our action plan, which is
16 to help to further our own thinking, by the end of the
17 fiscal year. And any assistance that we can get from
18 you in putting together --
19 CHAIRMAN HORNBERGER: So if we had a
20 workshop and brought in experts, it might help you
21 with your action plan.
22 MR. REAMER: Yes, yes, yes.
23 CHAIRMAN HORNBERGER: Okay. Very good.
24 MEMBER GARRICK: Bill, when is the action
25 plan actually due?

1 MR. REAMER: End of the fiscal year,
2 September, I think is what we have as our date.
3 CHAIRMAN HORNBERGER: Okay. Anything
4 else? Hearing none, what I'm going to do is -- let's
5 see, we're not going to actually adjourn, but this
6 will end the portion of the meeting that we need a
7 recorder. So we won't record -- we won't need a
8 recorder anymore.
9 We are going to transition smoothly here
10 into talking about all sorts of exciting things like
11 our viewgraphs for the Commission briefing and a few
12 other things.
13 So, again, those of you who want to sneak
14 out, we will forgive you.
15 (Whereupon, at 10:50 a.m., the
16 proceedings in the foregoing matter went
17 off the record.)
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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

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