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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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COMMISSIONERS MEETING

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THURSDAY

MARCH 22, 2001

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ROCKVILLE, MARYLAND

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The Nuclear Regulatory Commission met at the Nuclear Regulatory Commission, One White Flint North, Commissioners' Conference Room, 11545 Rockville Pike, at 10:30 a.m., DR. RICHARD MESERVE, Chairman, presiding.

COMMISSION MEMBERS:

DR. RICHARD MESERVE, Chairman

DR. GRETA J. DICUS, Member

MR. JEFFREY S. MERRIFIELD, Member

COMMISSION STAFF:

KAREN D. CYR, ESQ., General Counsel

ANNETTE L. VIETTI-COOK, Secretary

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ACNW STAFF PRESENT:

DR. B. JOHN GARRICK, ACNW Chairman

DR. GEORGE HORNBERGER, ACNW Vice Chairman

MR. MILTON LEVENSON, ACNW Member

DR. RAYMOND G. WYMER, ACNW Member

DR. JOHN T. LARKINS, Executive Director

MS. LYNN DEERING, Senior Staff Scientist

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

2 (10:30 a.m.)

3 CHAIRMAN MESERVE: Good morning.

4 DR. GARRICK: Good morning.

5 CHAIRMAN MESERVE: We are very pleased
6 this morning to meet with the Advisory Committee on
7 Nuclear Waste. As you noted, across the table you
8 only have three Commissioners with you this morning.
9 As it happens, Commissioner Diaz is out of town on
10 business, and Commissioner McGaffin, unfortunately, is
11 home with the flu.

12 So I apologize for the fact that you have
13 less than the full attendance this morning.

14 DR. MERRIFIELD: We will try and make up
15 for it.

16 DR. DICUS: I think we can handle it, yes.

17 (Laughter.)

18 CHAIRMAN MESERVE: There will be a
19 transcript, of course, that is available of this so
20 that even though they are not here, they will have the
21 benefit of being at least able to read your remarks.

22 And since I think we are webcasting this,
23 it is possible that Commissioner McGaffin has propped
24 himself up in bed and is viewing us at this very
25 moment.

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1 One of the very challenging tasks that may
2 be presented to the Commissioner in coming years is
3 dealing with the potential repository at Yucca
4 Mountain, and this is if and when this materializes,
5 this is going to be a great challenge to us.

6 And in preparation for that there has been
7 a very large effort by the staff to prepare for the
8 possibility that an application might be submitted to
9 us.

10 I know that you have appropriately spent
11 a lot of time in assisting us and in assisting the
12 staff, and thinking about this effort, and I
13 understand this morning that we are going to be
14 hearing about portions of that effort. We very much
15 look forward to your briefing.

16 Before we get started, however, I
17 understand that Commissioner Merrifield has a short
18 opening statement that he would like to make.

19 COMMISSIONER MERRIFIELD: Thank you very
20 much, Mr. Chairman. I have very much been looking
21 forward to the presentation today. The reason that I
22 wanted to have a brief opening comment is that I have
23 a particular bone that I picked in the time that I
24 have been here on the Commission

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1 And the bone that I pick is -- actually
2 there is two of them. One is the use of acronyms, and
3 the other one is the use of plain English. Now, one
4 of the things that I think that we have to be very
5 concerned about is that we have issues associated with
6 the possible use of Yucca Mountain raises significant
7 concerns on the part of the individuals of the State
8 of Nevada, and for understandable reasons.

9 I am pleased that we are going to be
10 videostreaming this presentation today because it will
11 allow them to have access to this information. I
12 think that is a good thing.

13 We need to do all we can to make sure that
14 we are presenting our information so that all of our
15 stakeholders can understand what we are talking about.

16 When I was reviewing the slides this
17 morning, I noted that there were some acronyms, such
18 as RIPB and YMRP that were noted here, and there is no
19 index for what those mean. Now, I now know what they
20 are, because I am familiar with them.

21 But for those of our stakeholders who ware
22 viewing this on the videostreaming, and who don't
23 otherwise have the access to that, they are not going
24 to be able to do that.

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1 And so in the future I hope that -- and as
2 you go through your presentation today, I hope that
3 you recollect that we do have people who don't
4 normally deal with these terms that have to be able to
5 understand and grasp them as well.

6 I think it is part of our raising our
7 public confidence that we need to do that. Similarly,
8 I noticed on a slide regarding the vertical slide
9 review that there are a variety of geological terms.

10 I am a lawyer and so a lot of this is
11 unfamiliar to me, such as the word anisotropic.
12 Fortunately, my staff has a copy of the Cambridge
13 Dictionary of Science and Technology, and I was able
14 to access that to determine that it is crystalline
15 material for which physical properties depend on
16 direction relative to crystal axes. These properties
17 normally include elasticity, conductivity,
18 permeactivity, permeability, et cetera.

19 That is not a word that a person with a
20 typical college education would know, and so my second
21 caution -- and this is again both in the presentation
22 today, as well as your future presentations, is to put
23 this in a manner which is understandable and can be
24 grasped by an average resident of Nevada, because

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1 those are indeed some of the most important
2 stakeholders that we have to worry about.

3 And we have to make sure that they can
4 understand what we are all talking about, too. So,
5 Mr. Chairman, I appreciate you allowing me to make
6 those comments.

7 CHAIRMAN MESERVE: Commissioner Dicus has
8 indicated that she would like to make a brief
9 statement.

10 COMMISSIONER DICUS: Yes, I want to follow
11 up just a little bit with the acronyms. It has been
12 some time ago, well over a year ago, and maybe two
13 years ago or something, the same issue arose with
14 acronyms in the slides, and with the public trying to
15 understand what they are.

16 And I asked that when acronyms are used
17 that at the beginning of the briefing that there be a
18 list of acronyms and what they mean. And for a while
19 the staff did that. Then it has kind of drifted off
20 because we are all familiar with what they are, and we
21 have not gone into it.

22 And so I am going to remind the staff
23 again that when acronyms are used, if we could just
24 for the sake of the public -- and sometimes I don't
25 know what they mean. I have a whole book, and it is

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1 about yea thick of all the acronyms that we use in the
2 NRC. So I have to look at it.

3 But for the sake of the public, it would
4 be good if we would get back to the habit of putting
5 a sheet in front of the briefing material just with
6 what the acronyms are that you are going to use.
7 Thank you, Mr. Chairman.

8 COMMISSIONER MERRIFIELD: And there may be
9 cases where we use acronyms where we could just put
10 the words, and there is no need to. I always think we
11 should be judicious about the use of acronyms when
12 they are absolutely necessary.

13 CHAIRMAN MESERVE: Dr. Garrick, why don't
14 we proceed.

15 DR. GARRICK: Thank you. And thank you
16 for your comments, because I think the Committee is
17 very sensitive to what communications and practicing
18 better communications, in terms of the use of strange
19 words and acronyms, and what have you.

20 Before we start, I want to acknowledge
21 that in addition to the Committee, we have with us, of
22 course, the executive director, John Larkins, and we
23 have one of the members of the staff that has been
24 particularly involved in this presentation, Lynn

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1 Deering, and we want to acknowledge their presence and
2 help.

3 We have a rather different kind of
4 presentation to make today, and it is perhaps somewhat
5 of an experiment. As you know, we have a planning
6 process and a self-assessment process, where we try to
7 figure out how we better do our job, and we do that at
8 least once a year.

9 And so we have come to realize that it is
10 not only important to come to grips with what we
11 consider to be important and a high priority, but how
12 we are going to deal with it.

13 And a lot of today has to do with the how.
14 One of the struggles that exists in a small committee
15 such as this is how to come to grips with the massive
16 amount of material that we review, and rather than the
17 traditional approach that we have taken with you in
18 the past, and talking about specific subjects, we are
19 going to try today a strategy that we have adopted.

20 And that strategy is to evaluate the
21 staff's capability to review a possible license
22 application for disposal of high level waste at the
23 proposed Yucca Mountain site.

24 And this strategy integrates activities
25 across three of ACNW's first tier priority topics.

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1 These are priority topics that are shown in figure
2 one, but are also cataloged and discussed in our 2000
3 action plan of which you all have copies.

4 The first tier priorities here that are
5 going to be involved in today's presentation are site
6 suitability and license application to the Yucca
7 Mountain review plan, although we are not going to
8 really discuss that because that is in a pre-
9 decisional status.

10 And risk informed performance based
11 regulation. These are all first-tier priorities for
12 us and we are going to try to illustrate how they
13 interact with each other in coming to grips with our
14 strategy.

15 Now, as part of our strategy, we are
16 conducting a vertical slice review of the DOE's
17 technical basis documents for site recommendation as
18 a way to evaluate NRC's staff, tools, guidance, and
19 capability to do its intended job.

20 The idea here is not to do anything of a
21 different kind than we have done in the past, but to
22 emphasize it a little different, to put the emphasis
23 on the NRC's capability, and whether they are really
24 ready to evaluate a license.

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1 The vertical slice therefore becomes a
2 part of an integrated evaluation and decision making
3 process. Now, if we turn to the next figure, figure
4 two, we see if we take the issue or the priority of
5 site suitability and license application, and
6 decompose it into some of its parts that we are going
7 to address, the idea here is to illustrate how we go
8 from perhaps a process and the evaluation of a
9 process, to the evaluation of specific issues; process
10 being a vertical slice review, and a specific issue
11 being the role that Alloy-22 plays in the performance
12 of a waste package.

13 And the other things that we are going to
14 address here are the performance assessment tools of
15 the staff and the key technical issue resolution
16 process.

17 The strategy includes our ongoing efforts
18 to evaluate the staff's KTI issue resolution program.
19 It includes the implementation of the vertical slice
20 review process itself, and George Hornberger in a
21 moment is going to pick up on that and discuss it in
22 the context of a method, and in the context of an
23 example.

24 Milt Levenson is going to present some
25 information on the KTI, the key technical issue

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1 resolution program, and how that enters into the
2 overall site suitability and license application
3 process.

4 And then Ray Wymer is going to illustrate
5 the example of a specific issue, like the performance
6 of Alloy-22 under the conditions that the repository
7 is asking it to perform.

8 And then we will continue with an
9 evaluation of what might be considered the granddaddy
10 vertical slice of all, and that is the performance
11 assessment, which in a sense starts with the bottom
12 line result, and peels back the information that leads
13 to what that bottom line result is.

14 And I will make an attempt in addressing
15 that. In addition, the strategy integrates the
16 staff's regulatory framework, including the proposed
17 10 CFR 63, and draft white the Yucca Mountain review
18 plan, and the Yucca Mountain review plan guidance for
19 reviewing DOE's technical basis document for site
20 recommendation.

21 We will not discuss those today for the
22 reasons indicated earlier. So with that, I would like
23 to jump right into our example of treatment of a
24 vertical slice evaluation and ask George Hornberger to
25 take the lead in that discussion.

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1 DR. HORNBERGER: Thank you, John. We
2 basically I think stole the term vertical slice from
3 the staff. The staff had used the term vertical slice
4 for an approach earlier that they had used to focus in
5 on a topic almost in an audit like basis, and that
6 really is our use of the term as well.

7 We had sent a plan on the 29th of June of
8 last year which outlined our approach to a sufficiency
9 review. And we have subsequently done some work in
10 terms of really identifying how we intend to do that.

11 There was perhaps an implication in our
12 original document that our review would be
13 comprehensive, which really is impossible, and we did
14 not really intend that. So I think our current
15 approach outlined in what we would term the vertical
16 slice really does our approach more justice.

17 It is to focus in and to basically take an
18 audit-like approach. Let's see. On page 9 of this
19 third slide, I guess, in my presentation, if we look
20 at the vertical slice objectives, we basically wanted
21 to address three things, and that was to evaluate
22 whether or not the staff's approach was consistent
23 with a risk-informed performance based approach to
24 regulation.

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1 And ultimately, of course, the staff is
2 going to be required to produce sufficiency comments
3 as detailed in the nuclear waste policy act, and our
4 aim is to be able to look at the staff's comments and
5 to be able to say something about how they are
6 defensible and logical.

7 So that is our second objective, and then
8 finally we typically look at the way that the staff
9 approaches things to see if we think that they have
10 everything covered sufficiently or whether there may
11 in fact be some gaps in the available tools, or
12 expertise that is required, or whether they fully
13 integrate across all of the NRC.

14 Our vertical slice approach then is to
15 review selected key technical issues. The KTIs are
16 the way the NRC has up until now identified the issues
17 that they want to address.

18 And we basically are going to -- well,
19 because that is the structure that the staff has used
20 up until now in their interactions with DOE, we intend
21 to look at selected key technical issues and look at
22 issues like traceability and transparency, and how
23 this goes through the documents, not only of the NRC
24 staff, that the NRC staff produces, but also looking
25 at the Department of Energy documents as well.

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1 And as the bottom bullet on the slide
2 says, we do need to become familiar with the
3 Department of Energy's technical basis documents,
4 which are numerous.

5 And this again reemphasizes why we need to
6 take a vertical slice approach, because just the sheer
7 volume of the documentation on site characterization
8 and the approach is quite formidable.

9 On the next slide, I wanted to point out
10 that in fact the staff has progressed, and there is a
11 predecisional Yucca Mountain review plan, and we may
12 in fact use that as guidance in our review. We will
13 also use the IRSRs, which are issue resolution status
14 reports.

15 Issue resolution status reports are the
16 way the staff develops the status of the treatment of
17 key technical issues and the interactions with the
18 Department of Energy.

19 We also have met -- the staff and the DOE
20 staff, have met on selected key technical issues.
21 Well, actually, I think on all of the key technical
22 issues now, and they have had technical exchanges.

23 There have been reports from the technical
24 exchanges on what the status issues are. And we also
25 intend to interact with the NRC staff as we go

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1 through, because the staff is moving forward basically
2 in parallel because of the time line we are all faced
3 with.

4 We have selected four topics for our
5 vertical slice review. These were topics that were
6 selected in-part on the basis of the committee's own
7 expertise, but also we looked at potential mis-
8 significance.

9 We considered the fact that these issues
10 cut across several subissues across key technical
11 issues, and also the visibility of these particular
12 topics right now. That is, there are aspects of these
13 topics that are very current, or are of current
14 importance.

15 The four topics are high level waste
16 chemistry review, a review of the chemical aspects of
17 the problem, and saturated zone flow, a flow beneath
18 the water table; thermal effects on flow.

19 The fact that there is going to be a
20 thermal pulse associated with the repository, and that
21 is going to drive moisture and heat flow for that
22 thermal period.

23 And then as John said, we will look at
24 total system performance assessment, which John at

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1 least likes to refer to as the granddaddy of all of
2 them.

3 CHAIRMAN MESERVE: The granddaddy of
4 vertical slices.

5 DR. HORNBERGER: The example that I want
6 to go through, and you may guess that I chose this
7 example because of my particular expertise, is to just
8 give you a flavor. This is very definitely a work in
9 progress. All of this is a work in progress.

10 I don't have conclusions and results that
11 I can present to you, and I just wanted to give you a
12 flavor of how we are going about this, and some of the
13 -- the way that some topics' issues may arise.

14 The subissue that the NRC staff has, or
15 the way that they have defined it, is called ambient
16 flow and dissolution in the saturated zone flow. It
17 is basically to deal with processes by which ground
18 water will flow from beneath the repository to
19 Amargosa Valley, where there is a farming community.

20 And obviously the time of transient of
21 this water has to do with how radionuclides may be
22 transported from the repository to the accessible
23 environment.

24 The status of this subissue is closed-
25 pending, and the NRC staff has -- they itemize these

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1 issues as either closed, closed-pending, or open. And
2 again I should reemphasize that being closed does not
3 mean that there can't be questions raised later.

4 A closed issue is simply one that the
5 staff currently agrees that DOE has produced enough
6 information to carry forward for evaluation. A closed
7 pending in capsule summary just means that the staff
8 is confident that the agreements with DOE to produce
9 information will result in sufficient information to
10 carry things forward.

11 I think the next slide I have already
12 covered. It is amongst the repeat of the objectives,
13 and our approach is that we are going to look at the
14 basis for this closed-pending status of the saturated
15 zone subissue, and to look at the way the staff has
16 used risk information in dealing with the issue.

17 The Department of Energy, their current
18 modeling approach, continuing on, they have gone to a
19 three dimensional flow and transport model. The
20 principal axis -- this is a grid-based system on which
21 they do their numerical calculation.

22 Numerical calculations are done on a grid,
23 and therefore the grid has to point in certain
24 directions, and their first principal axis is oriented
25 in a southwest/northeast direction.

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1 The perimeters in the model are treated
2 stochastically. This means that there is a
3 distribution of values that can be chosen. This in-
4 part reflects the uncertainty that the DOE believes is
5 incorporated in this.

6 There is an alluvial uncertainty zone.
7 Again, for those of you who are geologically
8 challenged, an alluvium is material that has been
9 transported from the mountains, and the basin, and the
10 range, that are classed and then fill in the valleys,
11 the broad basins.

12 So it is this sandy material that fills
13 the basins if you will, and it is an uncertainty zone
14 because we are not sure where the bedrock contact is,
15 and that this has not been sufficiently characterized.

16 And Commissioner Merrifield has given you
17 a definition of anisotropic. I will perhaps embellish
18 on that in the next slide. If we look at the next
19 slide, I will say that I should confess that I
20 shamelessly stole this, the graphic, from the
21 Department of Energy. I didn't do this myself, but it
22 does I think illustrate things.

23 The anisotropy basically deals with the
24 fact that there are preferred directions for flow of

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1 water in the rock. If you push in one direction, the
2 water doesn't necessary go in that direction.

3 It will go in a direction determined in
4 part by the orientation of fractures in the bedrock,
5 and the flow path from Yucca Mountain to Amargosa
6 Valley is through a fractured volcanic rock tough.
7 The fractures control the flow to a large extent.

8 There also is some anisotropy in the
9 alluvium because of the way that the alluvium
10 developed. As I said, the NRC staff has expressed
11 concerns in their technical exchange with DOE about
12 DOE's treatment of anisotropy, about their flow paths
13 in the alluvium, because we have this uncertainty
14 about what the distance of the flow path is in the
15 alluvium, and also the fact that there can be
16 alternative conceptual models about how this flow
17 occurs.

18 COMMISSIONER MERRIFIELD: A clarifying
19 question regarding the slide on the legend. It talks
20 about advection, which I am led to believe may mean
21 horizontal flow. Would that be correct?

22 DR. HORNBERGER: That is good enough. It
23 doesn't necessarily have to be horizontal, but it has
24 to do with the water movement, per se.

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1 COMMISSIONER MERRIFIELD: The direction of
2 the water movement?

3 DR. HORNBERGER: Yes, the direction of the
4 water movement and the water being carried along, the
5 water substance itself. And the potential
6 contaminants, like radionuclides, can be moved along
7 by advection, i.e, with the water.

8 But it can also participate in other
9 processes, like diffusion, so that even though it is
10 being carried along with the water, some of it may run
11 ahead because there is are diffusion processes.

12 COMMISSIONER MERRIFIELD: My cautions
13 about the use of language -- and since this is a DOE
14 slide, I presume that you have some DOE people, and I
15 might translate a similar concern to them, given the
16 fact that these very same stakeholders are going to
17 have to read their documentation as well.

18 And having an understanding of the
19 scientific terms for individuals who don't necessarily
20 have a lot of basis for scientific understanding is
21 helpful.

22 DR. HORNBERGER: I certainly don't want to
23 get into the business of defending the Department of
24 Energy, but I will say that I agree with you. But I
25 think what will have to happen is that there will

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1 probably have to be documents at several different
2 levels, because it is very difficult to convey precise
3 scientific notions without using some scientific
4 jargon.

5 COMMISSIONER MERRIFIELD: No, I agree with
6 that.

7 DR. HORNBERGER: Okay. The next slide is
8 -- and again this is the figure itself. The graphic
9 reflects work that the Department of Energy is going
10 cooperatively with Nye County, and I did not produce
11 this graph. I lifted it from something else.

12 The important point that I wanted to make
13 here is this notion of the uncertainty of flow paths
14 in the alluvium. There is information that will be
15 coming, and one of the reasons that this issue is
16 closed-pending is that the NRC staff has requested
17 from DOE detailed plans for their testing in the
18 alluvium.

19 This map shows the location of a whole
20 series of wells that have been drilled, bore holes
21 that have been constructed in the alluvium. Prior to
22 this effort, there was precious little information on
23 the alluvium, and we are getting a lot of information
24 from this new endeavor.

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1 Finally, I just wanted to go over the fact
2 that we anticipate that there may be several products
3 that we come forth with as a result of these vertical
4 slices.

5 First of all, we have been keeping track
6 of the status of these issue resolution process for
7 quite some time now, and we will continue to do so
8 through this vertical slice approach.

9 In going through these selected vertical
10 slices, we anticipate that we will come forward with
11 some material that would be of interest to the
12 Commission on our reports on just what we have learned
13 from doing these particular vertical slices.

14 In looking at the Department's technical
15 basis documents, we anticipate that we may in fact
16 also have some comments that would be worthwhile for
17 the staff, not that we would review the DOE documents
18 for DOE.

19 But we may wind up having some comments
20 that we think would be useful for the staff on the
21 Department of Energy's documents as well. And then
22 finally, of course, as I said, we know that the staff
23 has to produce these sufficiency comments.

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1 And we anticipate that we will interact
2 with staff, and we will be able to comment on how the
3 staff has produced these sufficiency comments.

4 If there are no questions at this time, if
5 you will notice the first of the products listed on
6 that last slide was the status of issue resolution,
7 and we actually have taken at least a look at that, an
8 up-to-date look at that recently. And Milt Levenson
9 is going to give you a presentation on key technical
10 issue resolution.

11 MR. LEVENSON: Thank you, George. Let me
12 just say first in the matter of definitions and
13 acronyms that I have my own definition for vertical
14 slice, and that is to help me understand what we are
15 doing.

16 I think a vertical slice is a method of
17 sampling what to review when the time and resources do
18 not permit a detailed review of everything and that is
19 what we are really trying to do, is cut a slice
20 through, rather than arbitrarily pick some things to
21 sample, and try to do a slice.

22 The key technical issue resolution process
23 is a little different than what George covered. It is
24 a process. It is a process that is really a tool used

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1 by the staff to bring order to the complex matter of
2 a pre-review.

3 There are so many things to be done in
4 the pre-review that this seems to be a good tool to
5 make an orderly process. The questions that we plan
6 to pursue in the future as part of our ongoing
7 evaluation of issue resolution, and our vertical slice
8 review are two.

9 This is an ongoing work in progress. The
10 risk of the various KTI subissues -- I'm sorry.
11 Somebody shuffled my slides.

12 CHAIRMAN MESERVE: It is slide 23, I think
13 is the one.

14 MR. LEVENSON: Well, 20 is the one that I
15 want to go to, which comes after 19.

16 CHAIRMAN MESERVE: It does in mine.

17 MR. LEVENSON: Only if you have a card
18 dealer that shuffles. The goal of the issue
19 resolution is to clarify what is needed for the
20 license application.

21 The resolution takes place based on
22 technical exchange meetings, DOE submittals, and staff
23 reviews, and the issue of resolution is not a
24 compliance determination.

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1 Issue resolution does not mean that the
2 issue has been resolved. It doesn't even mean that
3 the issue has been completely reviewed. It only means
4 that there is agreement on what information DOE will
5 provide so that the licensing review, if and when it
6 takes place, can occur.

7 It is not a part of the license
8 application review. In retrospect, for interacting
9 with the public, it turns out to probably be an
10 unfortunate choice of words, to use words like closed,
11 and even closed-pending.

12 That has led to a lot of misunderstanding,
13 and I want to make clear that in our review, in no
14 case do we consider this is part of the review of
15 licensing compliance or anything else.

16 Our observations were that the issue
17 resolution process appears to be working. Members of
18 the Committee and members of our staff have attended
19 a significant fraction of the KTI meetings.

20 The observation that we have is that the
21 staff has the capability to evaluate the closure
22 requirements, and that progress has been made in
23 adopting risk informed and performance based
24 approaches by the staff.

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1 At the technical exchange meetings, but
2 the NRC and the Center for Nuclear Waste Analysis that
3 supports the staff in our opinion have demonstrated a
4 sound grasp of the technical issues, and we are
5 prepared to negotiate an acceptable way of not closing
6 the issues, but identifying what needs to be done so
7 the review can be done.

8 We think that the staff has made
9 significant progress in adopting a risk-informed and
10 performance based approach. It is not so obvious to
11 us how far DOE has gone in that direction.

12 The staff is modifying some of their
13 acceptance criteria to avoid unnecessary
14 prescriptiveness, and allowing DOE some freedom. A
15 few examples of why we make this statement that the
16 staff is moving in this direction.

17 The treatment of seismic and volcanic
18 events is risk-informed performance based, and the use
19 of TSPA to identify -- the total system performance
20 assessment, to identify issues, as well as the work on
21 Part 63, sort of support our conclusion that the staff
22 is moving in that direction.

23 We have a slide that lists concerns, and
24 I want to point out that these were our concerns going
25 into the review. It doesn't mean that that is the

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1 concerns that we will have at the end of the review.
2 This is a work in progress.

3 Our concerns were that since the KTI, the
4 key technical issue, program follows a rather formal
5 format, have all the subissues been identified.

6 And if they have been identified, they
7 will be treated and reviewed. Has integration been
8 achieved, and has risk informed performance based been
9 implemented, and has public participation been
10 appropriate.

11 And a real worry is will design evolution
12 require major changes. At this point, midstream, it
13 is a little difficult for us to assess whether the key
14 technical issue program, as extensive as it is, will
15 accomplish its objective primarily because of concern
16 of the evolving design.

17 Some closed issues may no longer be
18 relevant, and there may no longer be a need to collect
19 or submit the agreed to information, and new issues
20 may arise from design changes and not be in the
21 program.

22 And in fact in the worst case not even be
23 obvious until a licensing review is in progress. We
24 think, for example, that examination of coupled
25 processes in the waste package and near field

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1 environments may lead to some questions that are not
2 subsumed in the current structure.

3 With respect to integration, we agree with
4 the continued use of the total system performance
5 assessment code as a guide to determine how the pieces
6 fit together.

7 I would like to note that the staff in the
8 center has their own, somewhat simplified, model to
9 help them in understanding the DOE model. They are
10 not just plain following blindly. They have their own
11 independent assessment of that.

12 We are disappointed -- and I think we have
13 discussed previously -- with the matter of innovative
14 ways of engaging the public in the evaluation process.

15 Sort of a specific example is that I
16 think, Commissioner, you would be appalled if you
17 attended one of these KTI meetings, which are public
18 meetings, to find that the jump in with both feet
19 directly into the technical resolutions which have
20 been started even at a previous meeting, and there is
21 no overview for how this is important or where it
22 fits.

23 So it isn't just terminology and acronyms.
24 If we are going to interact with the public, we have
25 to do some other things. The questions that we plan

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1 to pursue in the future as part of our ongoing
2 evaluation of the issue resolution and our vertical
3 slice review includes is the risk of the various key
4 technical issues, and subissues, and integrated
5 subissues known or understood.

6 And are the key technical issues the most
7 risk significant issues identified by the performance
8 assessment. Those are the words that we use. The key
9 technical issues are really not the critical thing.

10 We really should be -- the slide should
11 have talked about the subissues. We say that we are
12 doing a key technical issue review, but we are really
13 looking at how the subissues are being handled because
14 the important is all in the details down at that
15 level.

16 And so when I say we are reviewing a key
17 technical issue, that includes the subissues that come
18 under it. In closing, after we get done with all the
19 language and all the words, the most important, the
20 very critical issue for risk informed performance
21 based, or almost any other safety assessment, is have
22 the risks been defined and identified.

23 Because if you can't do that, then the
24 rest of it doesn't fit, and this is a work in
25 progress, and that is what we are going to try and do

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1 with it. And from here I think we move on to an even
2 more specific event, which Dr. Wymer will cover.

3 DR. WYMER: Thank you. This is a very
4 narrowly focused presentation, and I hope that it will
5 become apparent as I go along why it is included in
6 this presentation, and how it made the cut to arrive
7 at this table.

8 Last October, we heard presentations on
9 the corrosion of these nickel-based alloys, which
10 Alloy-22 is one, from consultants to Nevada. And in
11 their presentations they questioned the ability of
12 waste packages made of Alloy-22 to survive for 10,000
13 years based on these experiments that they carried out
14 using trace impurities to catalyze or in some way
15 affect the rate of corrosion.

16 Then following that, last November, we
17 heard presentations from the Center for Nuclear Waste
18 Regulatory Analysis, and from the Department of Energy
19 on their Alloy-22 studies.

20 Now, the reason that this presentation is
21 being made here today, and the reason that it did make
22 the cut, was because the longevity of the waste
23 package is a key attribute, and I mean a key attribute
24 of DOE's repository safety strategy.

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1 And DOE expects and models based on the
2 expectation that Alloy-22 will in fact contain
3 radionuclides to the extent that it has to for more
4 than 10,000 years.

5 And I would like to read just a couple of
6 sentences out of a DOE document which catches the
7 essence I think of our position on this issue. They
8 say, "Uncertainty is in the presentation of waste
9 package performance will be extremely importantly to
10 the post-closure safety case for the site
11 recommendation and the licensing considerations."

12 "And of particular importance in this
13 regard is the current waste package degradation model.
14 The current model is based on two years of project
15 data, and a few decades of related data from other
16 sources. Consequently, extrapolation of performance
17 to 10,000 years is a challenge."

18 Now, we agree with all of that, and so it
19 is extremely important. We have written a letter to
20 the Commission on the Alloy-22 performance, and this
21 letter followed the results by the Nevada consultants,
22 which brought the issue to the surface rather
23 dramatically.

24 And in that advice we said that the
25 environmental conditions that affect corrosion need to

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1 be bounded better. We would need to put the limits on
2 the temperature and the amount of water, and the
3 constituents that will be in the water that will
4 enhance corrosion.

5 So we had to bound the environmental
6 conditions better. This is complicated somewhat by
7 the fact that the repository conditions are not
8 totally set. This is a hot versus cold repository,
9 for example.

10 So the conditions are not completely
11 bounded, although they are in the process of being
12 bounded. We commented in our letter to you folks on
13 the corrosion issues, and specifically pit, crevice,
14 and stress corrosion, which are specific kinds of
15 corrosion that this alloy is subject to under the
16 conditions in the repository.

17 And the principal point that we made was
18 that the NRC needs to understand the mechanisms of
19 these corrosion processes before they can take credit
20 for the very long term protection that DOE is
21 ascribing to this material.

22 Now, by that we don't mean that they have
23 to understand it at the very basic level the
24 mechanisms of corrosion. There are only just a few
25 processes in the literature where the true fundamental

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1 mechanism of corrosion is really understood at a very
2 basic level.

3 But there is an intermediate level of
4 mechanistic understanding which we think needs to be
5 reached, and so far we are not convinced that that
6 level has necessarily been met, although there are
7 experiments underway, and there is work underway
8 moving toward that objective, both at the NRC Center
9 for Nuclear Waste Regulatory Analysis and by a larger
10 effort by DOE.

11 And in particular the mechanism has to
12 take into account the effects of these catalyzing
13 trace impurities that the Nevada group pointed out,
14 and things like lead and mercury, and in particular
15 lead, and what is the influence of these materials on
16 the rate of corrosion.

17 Now, the experiments done in Nevada as we
18 pointed out in our letter are not representative of
19 any conditions that we expect to exist in Yucca
20 Mountain. They are very extreme.

21 They go from very high pHs to very low
22 Phs, and at both ends, both higher and lower than is
23 anticipated in the Yucca Mountain environment. And at
24 acidities which are the particular hydrochloric acid
25 concentrations which we think would be very hard to

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1 reach in the Yucca Mountain repository, if not
2 impossible.

3 Nonetheless, the fact that there are
4 corrosion data that suggest that these trace
5 impurities, particularly lead, can influence and
6 enhance the rate of corrosion, that this needs to be
7 elucidated.

8 It has to be understood so that we know
9 whether or not this would be important of the
10 conditions in the repository that are most likely to
11 exist.

12 And as I said, experiments are under way
13 to identify these conditions. We have recommended
14 that the effect of these trace elements that were not
15 necessarily included are accounted for in the earlier
16 work that was reported by DOE, and that the facts be
17 elucidated.

18 And that it was not anticipated, or it was
19 not expected, that there would be such a profound
20 effect, even under these extreme conditions, of things
21 like lead in the corrosion of Alloy-22.

22 So although they may have been present in
23 the experiments, they were not specifically examined
24 with respect to their influence. They now are being
25 examined, and we do have to understand the mechanisms.

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1 And one other point that came out of the
2 work sheet, the earlier work sheet that we had on the
3 corrosion of Alloy-22, was that there is a window of
4 susceptibility for corrosion, and that if you get too
5 hot in the repository, then the water is driven out
6 and you can't have corrosion.

7 And if you get too cold, the kinetics of
8 the reaction are such that you can't proceed fast
9 enough to be of import, and so there is appears to be
10 based on the evidence that we have had presented to us
11 a window, if you will, a range of temperatures where
12 corrosion is likely.

13 So this window, and how wide open the
14 window is, needs to be understood and looked at. And
15 finally as a -- and this is a very abbreviated
16 discussion of this topic.

17 But finally as a follow-up question, we
18 asked are the expectations of the waste package
19 performance, and that is the fact that it will last
20 for more than 10,000 years, does this expectation
21 limit the study of other features or processes that
22 might affect performance.

23 Are these other things being given short
24 tripped and being bypassed in the expectation that
25 they will not be important, because the alloy will

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1 last so long that these things will not show their
2 importance.

3 And that question needs to be answered,
4 and as a particular example, this radionuclide
5 transport in the near field being adequately
6 addressed, and as we heard the presentation on the key
7 technical issue resolution meetings that said the
8 transport of certain radionuclides was under some of
9 the conditions not really being looked at because it
10 wasn't going to transport.

11 There wasn't going to be any leak in the
12 container, because the Alloy-22 was going to last, and
13 therefore it wasn't important to discuss these, which
14 is consistent with the logic that DOE is pursuing, but
15 it raised a question to us.

16 And that is all that I am going to say
17 about that. Any questions?

18 (No audible response.)

19 CHAIRMAN MESERVE: Okay. The last topic
20 on our review today is the NRC staff performance
21 assessment capability. I know that this Commission is
22 very much aware of a number of recommendations that
23 this Committee has made about performance assessment
24 and the performance assessment capability.

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1 For example, as indicated in Slide 31, we
2 have talked and recommended in the past about
3 strengthening the staff capability, and the
4 engineering analysis material science, and chemistry.

5 We have been very persistent in pushing
6 the notion of improving the methods for exposing this
7 is an element of transparency, and exposing the
8 contribution to the performance of the repository of
9 individual barriers.

10 And as a fallout of that, of course, we
11 have talked much about being able to rank the
12 contributors to risk by importance on the basis that
13 that is really what we mean by risk informed.

14 Continuing with Slide 32, we have written
15 letters to you recommending that the staff seek peer
16 review of the NRC's TPA code to enhance its acceptance
17 in the peer community, and among the experts in this
18 field, as well as the public.

19 We have talked a great deal about in our
20 meetings and recommended in our letters the matter of
21 using realistic models. The real virtue of risk
22 assessment is that it is not a bounding analysis.

23 It is an attempt to tell us what
24 realistically can happen, and the supporting
25 uncertainty analysis gives us a basis for what kind of

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1 conservativisms might be appropriate with respect to
2 actions that are actually taken.

3 But the risk assessment -- that is to say,
4 the performance assessment -- should be a frame of
5 reference as to what the best technology available
6 indicates what actually might happen.

7 We have talked about the whole issue of
8 generally improving the transparency and
9 comprehensiveness of the analysis tools. That is to
10 say the issue of understanding the analysis, and
11 understanding and feeling confident that the scope of
12 the analysis has been sufficient to cover the events
13 and activities that can occur.

14 So those are the things that we have said
15 and discussed, and documented, and I think that the
16 real purpose of this presentation is to kind of
17 report.

18 But we have been very pleased with the
19 progress that has been made. Many of the
20 recommendations are still very much a work in
21 progress, but it is true that a major effort has been
22 made to respond to these recommendations.

23 And our confidence has increased
24 considerably that the PPO code has been improved very
25 much over the last few years, and it is structured so

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1 that in the near term it should be an effective tool
2 for evaluating the U.S. Department of Energy's total
3 system performance assessment of the proposed Yucca
4 Mountain repository.

5 One of the things that is always an
6 important piece of evidence as to the quality of any
7 analysis is peer review, and I just want to make a
8 couple of comments in Slide 33 about that.

9 There was a peer review performed, and we
10 were pleased to hear that the staff as a result of
11 this peer review intends to modify the PA code, and
12 the TPA code, the total performance assessment code,
13 to calculate such things as the chemical composition
14 of water at various locations in the repository,
15 because the most important threat to the integrity of
16 the waste package of course is water.

17 And as to the extent that it is a threat
18 is very much dependent upon the composition and
19 quality of that water. So that is something that is
20 very critical to nailing down the capability of the
21 waste package.

22 Now, there were many other comments that
23 came from the peer review and the staff is considering
24 its responses to other recommendations, and they will
25 be reported on at a later date.

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1 The only slight negative that the
2 committee had relative to the peer review is that we
3 would have preferred a peer review group consensus
4 report, rather than the way that it was done, which
5 was a series of independent reports from each
6 reviewer.

7 Now, it wasn't completely in the sense
8 that there was an absence of interaction among the
9 peer reviewers, because the process was kicked off
10 with a meeting that involved them working at least
11 during the introductory meeting together, and there
12 were a number, we are told, of briefings and very
13 intense discussions among and between the peer
14 reviews.

15 But from that point on, it was pretty much
16 a matter of dealing with individuals. So as far as
17 the total system performance assessment code, and the
18 NRC is concerned, we are reasonably satisfied that the
19 staff is addressing our concerns, and improving their
20 overall PA capability.

21 I think that when we first started looking
22 at this that it was clearly not a risk informed
23 performance assessment process, but much more of a
24 traditional subsurface hydrogeological transport
25 model.

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1 It has since become very much
2 probablistic, and very much in keeping with the desire
3 to get increasing insights as to what the risks are.

4 We are also in full realization that the
5 purpose of the code is not to calculate the
6 performance of Yucca Mountain so much as it is to be
7 an effective tool for evaluating the DOE total system
8 performance assessment.

9 It is a very different kind of end
10 requirement, and as I say, we are reasonably satisfied
11 with the progress that has been made. And I think
12 that is about all that we want to say about that at
13 this time.

14 We will do a vertical slice of the TPA,
15 and a vertical slice in this sense will be somewhat
16 along the lines of turning the analysis upside down
17 and starting with the end result and peeling away
18 things that allow us to see in a systematic fashion
19 how that result was developed, and we are just getting
20 that under way now.

21 So we do have some questions on Slide 35,
22 and there is always the question of uncertainty, and
23 uncertainty can be described in many complicated and
24 esoteric ways.

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1 But two components of uncertainty that
2 turn out to be very important are information
3 uncertainty and modeling uncertainty. That is to say
4 how you process that information.

5 And the state-of-the-art is much more
6 advanced with respect to the information uncertainty
7 than it is with respect to modeling uncertainty. So
8 we will be continuing to track that and convincing
9 ourselves that the concept of uncertainty has become
10 an inherent and integral part of the whole performance
11 assessment process.

12 The other questions have to do with are
13 the key issues treated with conservative bounding
14 assumptions or assessed more realistically. Perhaps
15 this is one of the areas where the risk assessment
16 process as envisioned by its founders has been abused
17 more than any other area.

18 And that is that some of the practitioners
19 have viewed risk assessment as a bounding process,
20 when in fact it is not intended to be that. It's more
21 valuable contribution to our understanding is when it
22 attempts to indicate realistically what is really
23 going on.

24 As far as today's presentation is
25 concerned, just a couple of comments to summarize it.

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1 We have attempted to describe our integrated strategy
2 to evaluate the staff's licensing capabilities, and
3 sufficiency review of DOE's technical basis for its
4 sight recommendation decision.

5 We have discussed both work in progress,
6 such as the vertical slice reviews, as well as
7 information from the letter reports that we have
8 issued you since our last public interaction.

9 We will continue to keep you appraised of
10 our progress in our vertical slice review. I think we
11 are very much looking forward to implementing that
12 because it not only challenges our review skills, but
13 it gives us an opportunity to see if we have still got
14 it in the area of technical evaluation.

15 And we realize that there is some risk to
16 this, but we are very much looking forward to it. And
17 we look forward to briefing you on other aspects of
18 our strategy that we were not able to address today,
19 such as Part 63 and the draft Yucca Mountain review
20 plan, and the attendant guidance documents.

21 So, with that, Chairman Meserve, we are
22 open for questions.

23 CHAIRMAN MESERVE: Well, good. I would
24 like to thank you all for a very helpful discussion.

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1 I am sure that we all have questions, but let me first
2 turn to Commissioner Merrifield.

3 COMMISSIONER MERRIFIELD: Thank you very
4 much, Mr. Chairman, and I appreciate the explanations,
5 particularly of Mr. Hornberger or Dr. Hornberger, on
6 some of the issues that were brought up. I thought it
7 was very helpful.

8 I guess the first question that I have got
9 is a general one. You made a decision, and I
10 understand why you did it, to make the vertical slice
11 of the technical basis documents.

12 Can you give me some sense of the decision
13 making process you used to define the particular
14 vertical slice you did, and to the extent that you
15 have issues that evolve as you are conducting that
16 vertical slice, how will that influence where it goes
17 from here?

18 CHAIRMAN MESERVE: Well, that is a good
19 question, and I will comment on it and let other
20 committee members comment as well. The Committee has
21 not been completely absent of information that would
22 give us some insight as to what appears to be the
23 important issues associated with the performance of
24 this repository.

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1 We have followed the analyses that have
2 been taking place and as you know, the performance
3 assessment now has gone through a number of cycles,
4 and although the conditions have changed quite
5 dramatically as a function of those cycles, but
6 nevertheless, the committee between its knowledge of
7 the performance assessment activity and the
8 presentations and briefings that we have received on
9 the technical issue, has developed a reasonable sense
10 of what are considered at least by the committee to be
11 the most important issues associated with quantifying
12 the performance of the
13 repository.

14 And we tried to identify those. We all
15 know that the 800 pound gorilla in this repository is
16 water, and if the design is such that that threat is
17 minimized, and if the analysis is such that it is
18 convincing with respect to how a source term is
19 mobilized, then we are in a position maybe to
20 understand the results of the analysis.

21 So that was one aspect of it, is our
22 collective experience, our collective involvement, and
23 the integration of that information indicated that
24 there are certain fundamental issues that are key,

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1 such as the waste package integrity, and such as the
2 flow -- the subsurface flow conditions.

3 And such as the effect of temperature on
4 flow and so on. So that was important to that. And
5 then as we said earlier -- and I think this was a
6 secondary consideration, because we have at our
7 disposal consultants and experts to move in the
8 direction that is most important to quantifying the
9 performance here.

10 But the other issue was our expertise as
11 we have said. So those were factors. Now, as to why
12 we went vertical slice, I don't think that by that we
13 are suggesting that we are going to shirk our
14 responsibilities in reviewing as much basic material
15 as we possibly can. We are.

16 We are going to do that, but if you really
17 are sincere about taking a risk informed approach, we
18 have tried to practice what we are preaching in that
19 regard.

20 We have tried to come with something that
21 would allow us to move towards the issues that
22 all of this information is beginning to suggest is the
23 most risk sensitive, and in kind of an aggregated
24 sense that is what was behind our choice, and what was
25 behind our strategy. Do you want to add to that?

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1 DR. HORNBERGER: Just one quick addendum.
2 You asked how we might deal with where the path takes
3 us, because we may define a linear path at the moment,
4 but come across things that have to be pursued.

5 And we will have to do that on a basis.
6 For example, in the saturated zone flow, radionuclide
7 transport is separate from the saturated zone flow
8 processes, and yet we all know that it is the
9 radionuclide transport that we are fundamentally
10 interested in.

11 And so it is conceivable to me that we
12 could be led to look at across the way into another
13 key technical issue if the need arises.

14 COMMISSIONER MERRIFIELD: Speaking of the
15 associated issue, the Agency has been focusing on what
16 it believes are the key technical issues. Are there
17 any areas in the review that you conducted so far
18 where we have missed the mark where there are areas
19 outside of the key technical issues where perhaps the
20 staff needs to focus greater discipline and time?

21 MR. LEVENSON: I don't think we have
22 identified any to date, but our concern is that the
23 evolving design may bring some of those into the
24 picture, and that's why we keep coming back to this

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1 issue that the staff at this point is not working with
2 a fixed package.

3 COMMISSIONER MERRIFIELD: Fair enough. I
4 guess also in the association change is the issue of
5 specific disciplines that our staff has. I noticed
6 that you have commented previously about weaknesses.

7 Have we resolved some of those weaknesses
8 or are there still outstanding technical areas where
9 we don't have the expertise that we should?

10 DR. GARRICK: Well, yes. We have as we
11 indicated been quite satisfied with the steps that
12 have been taken to resolve those weaknesses. The
13 committee, if you take a snapshot in time, at one time
14 was quite concerned about what we perceived as an
15 absence of engineering based analysis capability that
16 could really challenge the information that DOE was
17 presenting to us on the performance of the waste
18 package.

19 We were looking for a capability that
20 could address the technical issues in a more
21 mechanistic fashion and in a more engineering fashion.

22 The way that we have been able to be much
23 more satisfied with that is the interaction we've not
24 only had with the immediate staff, but with the
25 scientists and engineers at the center.

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1 And I think if you take the aggregate of
2 the center and the staff, as well as the directions
3 that they have now taken to address some of these
4 issues, we are more pleased than unpleased.

5 But we are sure that there will come along
6 issues and problems that some aspects of our concerns
7 will probably resurface. But we are going to be very
8 quick to point those out if that does happen.

9 COMMISSIONER MERRIFIELD: Good. I
10 appreciate that. I mean, both as it relates to key
11 technical issues and areas where our staff does not
12 have the resources at its fingertips.

13 The earlier that you can identify those
14 and get that information to the Commissioner, the
15 earlier we can act if we feel it is appropriate to
16 resolve them.

17 The final thing I would want to mention is
18 that I know that there are a lot of issues which are
19 on the plate of ACNW in addition to the things that we
20 have discussed to day.

21 I do appreciate the focus that you have
22 made on high level waste, as this is probably the most
23 noteworthy issue that the Commission may face within
24 the next few years on waste issues.

25

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1 That having been said, Mr. Levenson, you
2 mentioned your own insight on the key technical issue
3 meetings at which you think in response to my comments
4 that the staff has jumped into the middle of some of
5 these discussions without putting them in to the
6 proper context.

7 Without adding additional burden to ACNW,
8 if there are some specific recommendations that you
9 might be able to make without spending a lot of time
10 on it, or deviating from other more important efforts,
11 I certainly would like to take the benefit of those if
12 you could follow those up. Thank you very much, Mr.
13 Chairman.

14 CHAIRMAN MESERVE: Thank you,
15 Commissioner. I have just a few questions, and a few
16 general ones at first. As I have understood the
17 strategy that you have laid out is that you are
18 confronted with an immense mass of materials, and you
19 have to try and find some way to assess it, and to
20 assess how we are working with it.

21 So the strategy was to pick a few areas
22 and go in those in considerable depth to make sure
23 that you evaluate them, and as you described it, it is
24 one where you judged those areas in part on the basis
25 of their risk significance and with some consideration

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1 of the expertise that the ACNW itself could bring to
2 bear.

3 And it was not a random selection for the
4 audit process by any means, and it seems to me to be
5 a risk informed approach applied directly in your own
6 strategy.

7 I take it that you emphasized in
8 describing it that your emphasis was on NRC
9 capabilities, and I take that to mean that your thrust
10 on this is to make sure that the staff is asking the
11 right questions of do you have the right capability
12 that is being brought to bear, rather than necessarily
13 going in depth into the answers that are being
14 derived. Have I got that correct?

15 DR. GARRICK: Yes, that's exactly correct,
16 but also we are very aware of the fact that in order
17 for us to do that we need to dig deeper than just the
18 NRC documentation to make any kind of judgment on
19 that.

20 And that digging deeper will get us
21 heavily involved into the safety case that is
22 developed by the DOE, but at least it gives us some
23 direction, the strategy and some focus as to what our
24 priority ought to be as far as that investigation
25 process exists.

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1 CHAIRMAN MESERVE: And I take it that the
2 probable sensible, but implicit, assumption is that if
3 the staff is doing well in those areas, then we should
4 be comfortable, and that perhaps in the less important
5 areas they have similar capabilities?

6 Is that the premise of the way the strategy is?

7 DR. HORNBERGER: Yes. That's why I said
8 it is sort of an audit like approach, and that is the
9 premise of any audit, and so I think the simple answer
10 is yes.

11 CHAIRMAN MESERVE: I have another related
12 issue that is a matter for me of terminology, and that
13 you have indicated there are a few areas where you are
14 going to burrow in deeply and those are parallel to
15 the key technical issues.

16 You are looking into specific key
17 technical issues. You used the term of vertical
18 slice, which to me suggests it is an orthogonal cut to
19 something, and is vertical slice the same thing as an
20 in-depth review, or is this in fact orthogonal to
21 somebody's arraying of issues or what have you?

22 DR. HORNBERGER: I don't think it is quite
23 simply the in-depth look at a particular issue. I
24 think the verticality has to do more with how these
25 issues have been set up historically, and we

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1 recognize, for example, that even within the NRC
2 structure of these key technical issues that we have
3 always had concerns that while we have ground water
4 flow, and then we have radionuclide transport, and
5 then we have unsaturated zone flow, and then we have
6 saturated zone flow.

7 And these things don't come apart that
8 way. It is a continuous process, and so in that sense
9 the slices have almost been set up within the NRC
10 structure, but the bottom line is that we just made an
11 in-depth review of a particular topic.

12 DR. GARRICK: Yes. As we have talked
13 today, various visions have come to me about how we
14 could better communicate that to the Commission. But
15 the idea here --

16 COMMISSIONER MERRIFIELD: And our
17 stakeholders.

18 DR. GARRICK: Yes, that's right, but the
19 idea here is that if we take something like the waste
20 package and its performance, it is to decompose the
21 analysis that leads to some performance measure of
22 that waste package in such a way that we begin to see
23 various inputs come into play.

24 The issue resolution reports is an example
25 from the NRC, and the technical basis documents as an

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1 example from DOE, and so one possible graphic that we
2 could experiment with maybe time next time around is
3 some sort of a line function which we would orient
4 geometrically vertically with the various inputs, in
5 terms of what they are and where they appear as you
6 evolve to this particular performance calculation.

7 But George was right. The answer to your
8 question is that this is not to suggest that we are
9 going to not be thorough. On the contrary, one of the
10 appeals of this approach was that it allowed us to be
11 very thorough.

12 All we had to do was to accept our ability
13 to pick the topics that when we got down we had a
14 pretty good envelope of what was going on. And that
15 may have to be aerated.

16 And as we go through this process, we may
17 find, oh, no, we should have picked radionuclide
18 transport, or source term development, or something
19 else as the start topic.

20 CHAIRMAN MESERVE: I have a question for
21 Dr. Levenson. I appreciate your comments about the
22 challenges on defining the key technical issues in
23 light of the fact with changes in the repository
24 design, and that some may drop way, and some of it
25 might emerge.

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1 And I join Commissioner Merrifield that
2 that would be interesting to sort of monitor that
3 process. But it seems to me that there is a related
4 issue, and I want to just inquire if you have any
5 sense of this.

6 And that is that there seems to me a
7 possible danger, and not necessarily a real one, is
8 that because you are focusing on things issue by issue
9 that you can lose the integration across the
10 interconnections between issues, and that our way of
11 structuring the way we look at the problem may cause
12 us to lose some things or sight of some things that
13 end up being important.

14 And I wonder if you have any concern about
15 that, or whether that there is enough fought being
16 made to that issue that the interconnections are all
17 being made as well.

18 MR. LEVENSON: I think that we have a
19 significant concern about it, and the way that we deal
20 with that is we keep coming back to the performance
21 assessment, which ties things together. And not as
22 a tool for what is the bottom number, but how do these
23 things tie together, and if you change "A" and then
24 what is its effect on "B" and "C" then. And its why
25 that part of the review is not a one time thing

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1 That is kind of a tool that we keep coming
2 back to, and as kind of a follow-up, maybe if I tell
3 you how -- well, I mean, we talked about what we
4 intended to do. Let me just give you what happened in
5 my own case when we decided do look at key technical
6 issues.

7 There are obviously many more of them than
8 there are members of the committee. So we each had to
9 pick one, and then the four of us agreed that this was
10 a reasonable sampling or representative.

11 But how I went about picking one is that
12 I put the whole list of key technical issues and
13 crossed out those that had words in them like
14 anisotropic, and things which I knew that I couldn't
15 understand.

16 And of those that I thought that I could
17 understand, I then sorted them into those from the
18 performance assessment that were significant to risk.
19 Not necessarily the most important, but were
20 significant to risk.

21 And thirdly which ones seemed to be
22 somewhat complex, and therefore maybe are worthy of
23 looking at it. After I attended one of the meetings,
24 my follow-up was to contact a couple of the NRC staff
25 members and arrange a one-on-one meeting with a couple

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1 of staff members and a conference call with someone
2 from the center, to in fact go into details way beyond
3 what I had heard at the meeting.

4 But just to make sure that I understood
5 not just the process, but that I could understand why
6 -- at the meeting I heard the staff say, well, we need
7 this information and we need that before we can close
8 it.

9 It wasn't obvious to me from the meeting
10 why that was needed, but I pursued that and all the
11 rest of us are doing the same kinds of things. So
12 there are technical details being pursued as we try to
13 develop a warm, fuzzy feeling about the piece of the
14 slice that we are looking at.

15 CHAIRMAN MESERVE: In your February letter
16 to us, you raised the prospect that the examination of
17 coupled processes in the waste package and the near
18 field environments may lead to some surprises that are
19 not subsumed in the current structure.

20 And Dr. Levenson made passing reference to
21 this in his comments. Is this a shorthand for the
22 issue that you raised, Dr. Wymer, about the problems
23 with trace constituents and the thermal window with
24 regard to the alloy, or is the letter referring to
25 something else?

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1 DR. WYMER: No, that's exactly what it is,
2 and I can elaborate on it just a little bit more to
3 give you a better understanding of what was meant.

4 For example, I pointed that the Phs that
5 were done or that were looked at in this work by the
6 Nye County people got very, very low, and they were
7 unrealistically low.

8 However, we heard some information from
9 the people at the Center for Nuclear Waste Regulatory
10 Analysis that there might be conditions where once the
11 package was breached and you got in to the actual fuel
12 material, where you have fairly high alpha
13 concentration from the uranium and a few aconites that
14 are in there, that you may have radiolysis that would
15 produce nitrous and nitric acid from the nitrogen in
16 the air that would be present in the package.

17 And this could in fact drop the Ph
18 considerably, and maybe down into the range where you
19 might in fact get conditions where you might be able
20 to oxidize or reduce the neptunial ion. How, that is
21 important.

22 And the reduction would be caused by the
23 corrosion of the iron, with the stainless steel in the
24 inner waste package, which would be favus while it was
25 still in contact with the elemental iron.

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1 And you could reduce the neptunium to a
2 neptunium-4 while the radionuclide transport of the
3 neptunium-4 would be expected to be considerably
4 slower. This is a surprise and a positive direction.
5 This would be a salubrious conclusion.

6 So we did not mean to imply by that that
7 all surprises are bad. There can be surprises on both
8 sides of the null point.

9 CHAIRMAN MESERVE: My experience has been
10 that surprises are usually bad.

11 (Laughter.)

12 DR. WYMER: But we got some feed back from
13 the staff on what do you mean by that, and what are
14 these surprises. They must be horrible, and we didn't
15 mean that. We just meant that there could be
16 surprises, and we probably should have made it
17 clearer.

18 CHAIRMAN MESERVE: But it is this Alloy-22
19 interaction issue that you were focusing on here?

20 DR. WYMER: That was the example that I
21 had in mind. There could be other things, but that
22 was the specific example that I had in mind, yes.

23 CHAIRMAN MESERVE: Let me make sure, but
24 I think the bottom line that I am getting from all of
25 your presentations is that there is lots of work to be

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1 done and it is your efforts of evaluating is a work in
2 progress, but that fundamentally you are comfortable
3 with the way that we are proceeding, and with the
4 resources that we brought to bear, and the skills the
5 staff is bringing to the task? Is that a fair
6 evaluation?

7 DR. GARRICK: Yes. We are not by that
8 saying that we are going to become complacent, but I
9 think that we are feeling much better about the
10 primary concerns that we have.

11 CHAIRMAN MESERVE: Okay. Thank you.
12 Commissioner Dicus.

13 COMMISSIONER DICUS: Thank you. I am
14 going to go back to the vertical slice objectives a
15 little bit, and quiz you a little bit on the criteria
16 that you are going to use to make your evaluations,
17 and whether you are going to use like the Yucca
18 Mountain review plan guidance, or have your own
19 criteria, or is it a combination?

20 DR. HORNBERGER: To the extent that we
21 can, we hope to use the Yucca Mountain review plan
22 because that is the direction in which NRC is going.

23 Now, having said that, the technical
24 exchanges were all based on the key technical issues,

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1 which have been or are likely to change once the Yucca
2 Mountain review plan is released.

3 And I think that the staff has been
4 focusing more on what they call integrated subissues,
5 which the -- and the vertical slice by the way,
6 sometimes the staff presents this in a matrix form,
7 and the columns are the key technical issues, and then
8 going down the side there are other items.

9 And that is part of the vertical, okay?
10 Although for plain English, we should change the name.
11 At any rate, what one can do is one can go and look
12 and there are processes that are important in several
13 issues, in several subissues, and the staff has done
14 a good job of collapsing these things. And so to the
15 extent that we can, we are going to follow along that
16 track.

17 COMMISSIONER DICUS: I will go now to the
18 subject of terminology, which we have all hit on in
19 one way or the other, and how the public perceives
20 what we are saying, and whether that has any
21 connection with what we meant when we said it.

22 And this is the issue that the public has
23 brought to us in Nevada with regard to the closed-
24 pending issue, and whether that terminology

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1 -- well, is there a better way for us to explain to
2 the public what we mean by closed pending, or should
3 we change terminology? Do you have an opinion on
4 that?

5 DR. HORNBERGER: First of all, I will say
6 that every meeting which I have attended the staff has
7 done or has bent over backwards to explain this
8 terminology every time that it comes up.

9 So at least people who attend these
10 meetings I believe should get a fair impression of
11 what the staff means. My own personal opinion, and
12 this is not an ACNW opinion, because you caught us
13 cold on this one, is that we are probably so far down
14 the line on this closed and closed-pending that we
15 should live with it.

16 I think we should learn a lesson that when
17 we go forward in the future with such things that we
18 might be a little more careful in how we choose the
19 words.

20 DR. WYMER: In the interest of
21 communicating with the public, Mr. Chairman, and which
22 Commissioner Merrifield is interested in, and we all
23 are, we did when we were out at Las Vegas get a pretty
24 good tongue lashing from one of the participants that
25 closed-pending is a biased way of saying it.

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1 If it isn't closed, it isn't closed was
2 the position, and therefore it is still open. So
3 don't say it is closed pending. Say it is open and
4 there are still some issues to be resolved, or
5 something like that.

6 COMMISSIONER DICUS: So it may be the
7 definition and how we explain it, rather than the
8 terminology itself.

9 DR. GARRICK: So that is an example of a
10 case for having just two categories.

11 COMMISSIONER DICUS: And the same thing
12 applies coming in behind Commissioner Merrifield and
13 his question regarding the issue of resolution or
14 issue resolution process.

15 You expressed, Mr. Levenson, some concern
16 that the public is not really being served with how
17 these are being dealt with, and perhaps we need to
18 start out on the front end explaining, even if it is
19 the fifth time that it has been explained, or the
20 sixth time, or whatever. It doesn't matter.

21 If it is good to say that this is where we
22 were, and this is where we are going, and then get
23 into the technical issue. But how can we -- it is
24 another situation, because the public may not

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1 understand that the issue resolution doesn't mean that
2 the issue has been resolved, and that it is compliant.

3 Who would better explain that? Again, is
4 it an issue that we need to change terminology or is
5 it too late to do it?

6 MR. LEVENSON: Well, I think for the key
7 technical issue resolution program that it is too late
8 to change, because a significant fraction of them are
9 done, and we are down the road.

10 I think what could be done is even though
11 they are pretty much done, there will be a significant
12 flow of paper yet, documentation reports, and what
13 would probably be worthwhile is somebody carefully
14 preparing an introduction which defines that this does
15 not -- that the key technical resolution does not
16 resolve the issue. It only addresses whether enough
17 information is going to be provided.

18 And similarly with the closed and closed
19 pending, and just stick that at the front of every
20 document that reports on or summarizes the key
21 technical program. You only need to do it once.

22 COMMISSIONER DICUS: Okay. Thank you.

23 MR. LEVENSON: By the way, it isn't only
24 the general public. A significant part of the
25 technical community has problems with it.

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1 COMMISSIONER DICUS: I understand that.
2 You mentioned that the staff is doing a pretty good
3 job of doing a risk informed performance based
4 approach in the high level waste area if I understood
5 you right.

6 But that DOE is not going in that
7 direction, and that they are in fact staying rather
8 prescriptive and deterministic in what they are doing.
9 Does that present a problem down the road?

10 DR. GARRICK: Who made that comment?

11 COMMISSIONER DICUS: You did.

12 CHAIRMAN MESERVE: And we have it on the
13 transcript.

14 DR. GARRICK: Well, it has to be put in
15 the proper context, because the truth is that the TSPA
16 that DOE is doing is a rather pioneering effort in the
17 use of probablistic methods to assess geologic
18 repositories. There is no question about it.

19 Where we are seeing sometimes the absence
20 of a risk perspective is when we isolate issues, and
21 analyses, and activities, and hear briefings from
22 people, and sometimes we don't get the sense that
23 there is a real connection between what they are
24 doing, which could end up being an important part of
25 a total system performance assessment, and what has

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1 actually ended up being used in the performance
2 assessment.

3 So it is kind of at a lower level or a
4 lower tier. I don't think that the risk thought
5 process has really been embraced across the board. It
6 hasn't even in the NRC, because we will sometimes have
7 the same experience in briefings from the NRC people
8 and follow it with the question of, all right, how do
9 you risk inform what you are doing.

10 So I think it is more of a degree thing
11 than a kind. I would really hate to be unduly
12 critical of the DOE attempt to bring probabilistic
13 thought processes into the total system performance
14 assessment, because that is a pioneering effort, and
15 has major impact on the way repositories are going to
16 be analyzed in the future.

17 But we find individual situations,
18 specific situations, where we have trouble making the
19 connection between what we hear in the TSPA and what
20 some presenters are telling us.

21 DR. WYMER: But we do hear a lot from the
22 DOE about sensitivity analyses. They are doing a lot
23 of those, which is certainly related.

24 DR. GARRICK: Right.

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1 COMMISSIONER DICUS: Okay. Thank you for
2 that explanation. And one final thing, and it is a
3 curiosity question on my part, and this would probably
4 go to any of you, but I am going to address it to Dr.
5 Wymer.

6 You talked about the trace elements and
7 what effect it may have, and things along those lines.
8 Has the committee looked at, or are you going to look
9 at, what effects, for example, bacteria might have on
10 waste packages?

11 Because I know that at the center they may
12 be doing a little bit of work on that if I recall, but
13 I have read a little bit about that this is not
14 something to be ignored.

15 DR. WYMER: Well, we have not paid much
16 attention to it so far in all honesty, and most of
17 what we read that is presented to us says that this is
18 probably in the final analysis a non-issue. So we
19 have sort of taken that at face value at the moment.

20 Actually, I have independently read some
21 things that suggested that perhaps it is not something
22 you can actually ignore, but so far we have not paid
23 much attention to it.

24 COMMISSIONER DICUS: Okay. I might
25 mention that again next year.

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1 MR. LEVENSON: Well, let me add that it
2 isn't that DOE is ignoring the subject of microbial
3 corrosion because they have a program underway on
4 support of the WIPP program. So they are doing work
5 in that field, but it just has not been applied to
6 this field.

7 COMMISSIONER DICUS: Okay. Thank you.

8 CHAIRMAN MESERVE: Thank you very much.
9 We very much appreciate your efforts in these very
10 helpful briefings. I have a brief closing remark, but
11 I know that Commissioner Merrifield does as well. So
12 let me turn to Commissioner Merrifield.

13 COMMISSIONER MERRIFIELD: Thank you, Mr.
14 Chairman. I do appreciate that. I agree that it was
15 a very good briefing and a very useful briefing.

16 Today, I had earlier made some comments
17 regarding in some cases schematic issues, but I think
18 they are important because public confidence is
19 clearly something that we care a great deal about
20 around here.

21 And certainly in issues associated with
22 high level waste, and that is near or at the top of
23 the list. In that regard, I just want to make a note
24 -- and I am careful in how I choose my words, but if
25 DOE moves forward and makes a recommendation regarding

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1 a high level waste site, and if that site happens to
2 be Yucca Mountain, we will have a lot of work to do.

3 And the public certainly in the State of
4 Nevada will look very closely at how we are conducting
5 that. Our decision, if we were to receive such an
6 application, will have to be based on the science, and
7 we will have to take it wherever it goes, wherever it
8 leads us, and that will be a decision one way or the
9 other based on the science and the recommendations
10 that we have from you.

11 The only caution I would make regarding
12 the presentation today -- and this goes to Dr. Wymer
13 -- is that when we were talking about surprises, and
14 you utilized the word good surprises versus bad
15 surprises, and I just caution -- and not to go into
16 this too far, but I think it is more appropriate to
17 talk about surprises even do or don't validate our
18 previous understanding without putting any kind of an
19 evaluation in terms of what those are.

20 DR. WYMER: That's a good point.

21 COMMISSIONER MERRIFIELD: So that is my
22 final comment in that regard. Thank you, Mr.
23 Chairman.

24 CHAIRMAN MESERVE: I would like to express
25 my appreciation to the ACNW. I know that you are very

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1 overworked, and that you have a singular
2 responsibility in providing assistance to the
3 Commission in this, and what could be and prove to be
4 an enormously important area for us, when and if there
5 were an application submitted.

6 And on behalf of the Commission, I want to
7 express our appreciation for the efforts that you have
8 made. It has been very careful. With that, we are
9 adjourned.

10 (Whereupon, the meeting was concluded at
11 12:04 p.m.)

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