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1 UNITED STATES OF AMERICA  
2 NUCLEAR REGULATORY COMMISSION

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4 COMMISSIONERS MEETING

5 + + + + +

6 THURSDAY

7 MARCH 22, 2001

8 + + + + +

9 ROCKVILLE, MARYLAND

10 + + + + +

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

16 COMMISSION MEMBERS:

17 DR. RICHARD MESERVE, Chairman

18 DR. GRETA J. DICUS, Member

19 MR. JEFFREY S. MERRIFIELD, Member

20 COMMISSION STAFF:

21 KAREN D. CYR, ESQ., General Counsel

22 ANNETTE L. VIETTI-COOK, Secretary

23  
24  
25  
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1 ACNW STAFF PRESENT:

2 DR. B. JOHN GARRICK, ACNW Chairman

3 DR. GEORGE HORNBERGER, ACNW Vice Chairman

4 MR. MILTON LEVENSON, ACNW Member

5 DR. RAYMOND G. WYMER, ACNW Member

6 DR. JOHN T. LARKINS, Executive Director

7 MS. LYNN DEERING, Senior Staff Scientist

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

(10:30 a.m.)

CHAIRMAN MESERVE: Good morning.

DR. GARRICK: Good morning.

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

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

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

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

(Laughter.)

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

And since I think we are webcasting this, it is possible that Commissioner McGaffin has propped himself up in bed and is viewing us at this very 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 conservatisms 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 displeased.

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 to 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 an 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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