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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE

(ACNW)

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126TH MEETING

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TUESDAY

MAY 15, 2001

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ROCKVILLE, MARYLAND

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The Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 10:30 a.m., B. John Garrick, Chairman, presiding.

COMMITTEE MEMBERS:

B. JOHN GARRICK, Chairman

GEORGE M. HORNBERGER, Vice Chairman

MILTON LEVENSON, Member

RAYMOND G. WYMER, Member

A-G-E-N-D-A

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

(10:40 a.m.)

CHAIRMAN GARRICK: Let's come to order. We're not at the agenda item that's referred to as the key technical issues, vertical slice report and the purpose of this particular session is for the Committee Members to give a progress report on where they are in their assigned KTIs. And unless somebody has a suggestion of a different order, we'll just take it as it's shown on the agenda.

So Lynn and George, you've got an update on the saturated zone flow?

Where's Lynn?

VICE CHAIRMAN HORNBERGER: I think that I can go ahead. There's not too much of an update, all right? Neither Lynn nor I have -- you sort of got our views last time.

CHAIRMAN GARRICK: Yes.

VICE CHAIRMAN HORNBERGER: The only thing -- I just simply have --

CHAIRMAN GARRICK: By the way, we are now on the record, I'm told.

VICE CHAIRMAN HORNBERGER: So I'm going to have to use this?

CHAIRMAN GARRICK: Yes.

VICE CHAIRMAN HORNBERGER: One thing, just as a bit of an update, at the High Level Waste Conference I did go by and heard John Kessler gave a paper for Frank Schwartz. Frank Schwartz is a hydrogeologist, a consultant to EPRI who looked at the saturated zone flow modeling. And well, not to go on at length about hydrology which I know is near and dear to everyone's heart, the bottom line conclusion that they come to, that EPRI came to was that the DOE approach was overly conservative in their treatment of the saturated zone transport. Frank Schwartz, depending upon -- he felt that with his most realistic assumptions, he felt that ground water travel times might be on the order of 30,000 years. That may be pushing it, but nevertheless, their bottom line conclusion was that the DOE model was and I think this was in their slide, overly conservative.

MEMBER WYMER: What's the downside of being overly conservative? Is it a credibility issue?

CHAIRMAN GARRICK: It is leaving the public in ignorance as to what the experts think can realistically happen. It's a very serious downside.

MEMBER LEVENSON: We are involved in the EPA versus NRC, should it be 15 MR or 25 MR, when in fact, if it's .01 MR it's a pretty important issue.

It's just a poor way to practice risk communication.

VICE CHAIRMAN HORNBERGER: Besides, it can lead to you think that some trivial things like chemistry are actually important.

(Laughter.)

CHAIRMAN GARRICK: When we know it's all hydrology.

(Laughter.)

It's been suggested that we do want to change the order here and for reasons of availability of people, maybe we ought to ask Milt to give us an update on his next thermal effects on flow.

You've got to use your mike.

MEMBER LEVENSON: Our objective was to do a vertical slide on thermal effects on flow. Decided to interpret that rather than a strict vertical slice, try to follow a drop of water from rain that fell on the surface to what might get to the repository, so the slide might be slightly diagonal because it goes through a lot of different issues. But we visited the Center and talked to a number of people there and then came back here and talked to people here. And the question came up, first of all, what are we trying to do and I decided that before to decide whether I

thought the staff was doing a good job or an acceptable job or whatever, really needed to have an understanding of what the staff's role was which is why in the book there's the item on page 7 which was an attempt to condense down what is the staff's role. And I think an important part of it is the recognition that it's not the NRC's responsibility to minimize risk. It's only to assure that the standards are set and are met by the licensees. And in the area of ALARA, it's not NRC's responsibility to implement an ALARA program, but only to assure that the licensee in this case, DOE has one. And have to keep coming back to recognizing that because otherwise why doesn't the staff do this or do that? It's not the responsibility of the staff to minimize risk. And so that sort of dictated how we were going to review things.

VICE CHAIRMAN HORNBERGER: Of course, minimized risk is sort of a bad concept anyway, right?

MEMBER LEVENSON: Right.

VICE CHAIRMAN HORNBERGER: It potentially might lead you to do some goofy things, unless it's minimized risk in a global context.

MEMBER LEVENSON: Or unless you're doing quas. benefit, but the key point is that minimizing risk by itself is not only the staff's job, it's

probably not in the public interest.

VICE CHAIRMAN HORNBERGER: Right.

MEMBER LEVENSON: Because you divert resources for more important other things.

CHAIRMAN GARRICK: But it is in the public interest to manage the risk.

MEMBER LEVENSON: But somehow, some part of the public thinks the target ought to be zero risk and that's (a) not achievable, but form our standpoint of --

VICE CHAIRMAN HORNBERGER: But I mean the following comment only to assure that the standards are met presumably Part 63 is a risk-based or at least a dose-based --

MEMBER LEVENSON: Oh yeah, there's a lot of different standards. It's not a single standard. It's all the codes and standards, all the licensing requirements, that they're met. There's no -- it's not the staff's role to see that they do better than any requirement or code or standard. And where that comes in is in this discussion and John and I both saw an awful lot of this in connection with WIPP where DOE went way beyond the requirements of any codes and standards. In some cases, in fact, increased the risk because they've done that.

We had a lot of interesting discussions at the Center. Some of the things that impact the vertical slice is that some of the concerns that I had, that had them after talking at the Center were resolved when we came back here and talked to the staff and got how I interpret the staff's version, that the KTI -- just because something was resolved in the KTI did not mean that that particular issue was resolved for the TSPA. It only meant that it was resolved for the data input stage and that whether the abstractions and the modeling and everything else on that issue were acceptable, the staff is not inferring all of those other things are acceptable when they say that the KTI is resolved and that, in fact, the staff is moving forward now in studying all of those other issues and aspects of it. I must say that made me feel much more comfortable because in a lot of cases when I saw something in the KTI and I said yeah, but that doesn't mean it's being handled right and I got the feeling the staff had just about that same point and it's going to be moving on.

One of the -- a couple of things that came up and the answers we got out, I have to qualify because I don't know whether it's real or not. I'll tell you the answer we got. One of the questions I

asked was in connection with long-term humidity in a repository, how important was the effect of barometric pumping because I know some cases in Idaho it's been very important, quite different conditions, but barometric pumping is important. And the answer I got was that they don't think anybody had looked at that at all.

VICE CHAIRMAN HORNBERGER: That's not true, barometric pumping is known to be important at Yucca Mountain and there are papers that have been written on it.

MEMBER LEVENSON: Okay.

VICE CHAIRMAN HORNBERGER: I think the question you asked was would the effect be on humidity. That's probably what they were talking about, but not necessarily had been looked at.

MEMBER LEVENSON: That's why I said the answer I got from the people I talked to was that they said as far as they knew nobody had looked at.

VICE CHAIRMAN HORNBERGER: What aspects is it important if it is not relative to humidity?

MEMBER LEVENSON: Are you asking with respect to the repository?

VICE CHAIRMAN HORNBERGER: Yes.

MEMBER LEVENSON: I believe that the

biggest question would have to do with C^{14} and Iodine 129, that is the gas phase transport.

VICE CHAIRMAN HORNBERGER: The place the inconsistency comes up is that you assume that the repository, the drifts, etcetera, always stay saturated with oxygen or at equilibrium, but at the same time they don't allow any moisture movement and so clearly that's an area that needs to be looked at because --

MEMBER LEVENSON: My gut level feeling is that the barometric pumping is not going to significantly affect the relative humidity in the repository which is the question that I think you are asking.

VICE CHAIRMAN HORNBERGER: Well, my gut feeling is not that because --

MEMBER LEVENSON: That's fine.

VICE CHAIRMAN HORNBERGER: Because the humidity becomes very high because it's treated as a closed box and so it slowly builds up. If it's not a closed box --

MEMBER LEVENSON: Well, except all of our experience in mines would dispute that.

Relative humidity in mines, once they're in salt are very high.

VICE CHAIRMAN HORNBERGER: But not 100 percent.

MEMBER LEVENSON: In caves, not in mines, where the ventilation is not forced, it is darn close to 100 percent most of the time.

VICE CHAIRMAN HORNBERGER: In this type of terrain?

MR. CAMPBELL: Yep. You basically need open caves to get the dry atmosphere where you get the presentation of organic --

MEMBER LEVENSON: That's a great bit step. The difference between 90 percent and 100 percent can be quite important when you're talking about condensation and things like that.

VICE CHAIRMAN HORNBERGER: My suspicion is you're talking perhaps of 98, 99 percent instead of 100 percent.

MEMBER LEVENSON: The more important point is it hadn't been looked at.

MR. CAMPBELL: John Walton looked at this quite a few years ago and wrote a paper and I think it's in Water Resources Research. Anyhow, I have a copy of it, but the effect of even a very highly unsaturated rock, with a very high matrix potential is on the order of a couple percent.

MEMBER LEVENSON: I just think you need an analysis of this thing.

One of the things which came out of some of the discussions was my own opinion that the sensitivity analysis being done by DOE is probably not of much use because they appear to be using the extreme bounding values and in fact, that can be very misleading because if you do a sensitivity analysis, you use that to pick the things you want to focus on and if you're bounding values are in some cases high by a factor of 2 and in other cases high by a factor of 20, you come out with the wrong identification of the wrong things that are important. And so that was not a happy finding on my part, that unless you really either are consistent in your safety factor or are using best estimates, your sensitivity analysis is going to cause you to focus on wrong things.

One of the other things that I mentioned, this tirade came out of following the drop of water is that apparently most of the analysis being done at the Center, at least, on the evaporation and build up of salts and the corrosion problem in the container are all being done as a, I guess I'd call it a semi-permeable closed box. That is, everything comes in, but as you boil the water off, nothing leaves except

the H_20 and you don't lose any chlorine, any nitric acid. You don't lose anything by boiling it to dryness and that certainly has to lead to significant over-estimates of concentration. In fact, I was pointing out to Ray this morning, I poured some water from this container into the glass and this is cold water. You can smell the chlorine coming off it by just smelling it. You boil it to dryness, you certainly lose amounts. That's being called conservative, but again, I don't know.

I think we may have -- we discussed some of the experiments that are being done and of course, DOE picks which experiments to do, but there is some concern as to how relevant they are to the real cases that are being done.

But let me summarize it by saying since I understand the intent of the vertical slice is to determine whether we think the staff is doing what it's supposed to be doing, my answer to that in the areas I've looked at, I think the answer is pretty much yes.

That doesn't mean there isn't a long ways to go yet, but they've recognized that and they're going there.

CHAIRMAN GARRICK: So are you pretty clear

on how you're going to implement your vertical slice?

MEMBER LEVENSON: Yes, I think so. If we accept that the intent of the vertical slice is to determine whether we think that the staff is doing what it should be doing in preparing for a license application.

VICE CHAIRMAN HORNBERGER: On the page 8, I guess, where you discuss emerging issues, that's sort of a list of things that we all might be alert for in terms of as we proceed to see if there are commonalities.

MEMBER LEVENSON: Oh yeah, one other thing which may be one of the most important things and again, I'll tell you what I was told.

The people at the Center say that they're pretty sure that there is no conservation of mass or conservation of energy that threads through the entire TSPA. Some of the modules have it internal to the modules and most cases it does not go from module to module and in one case that they gave an example, there's an absolute conflict, because in the seepage model the assumption is made that all water moves into the drift and then the thermal hydrological model, the assumption is made that under thermal effects all the water moves away from the drift.

But that overall, there is no conservation of mass.

MEMBER WYMER: That's time dependent though.

MEMBER LEVENSON: No, for the same time period.

MEMBER WYMER: Okay.

VICE CHAIRMAN HORNBERGER: Of course, that might result in local inconsistencies in terms of treatment, but not necessarily a violation of conservation of mass --

MEMBER LEVENSON: But the point is there is no specific module to assure conservation of mass.

Now this becomes most important, not in the context of --

CHAIRMAN GARRICK: What you're saying is that the model isn't modularized in a pinch point fashion such that the outputs of module A become the inputs of module B.

MEMBER LEVENSON: In mass.

CHAIRMAN GARRICK: In mass and energy and liquid and --

MEMBER LEVENSON: How this turned up some years ago, when this question first came up was when some -- at that time, much more primitive models were

run for a very small amount of aluminum fuel to be added to Yucca Mountain. It turned out that that was the controlling, eliminating contaminant. It couldn't possibly have been the case. And we went back and dug in into the models, maybe five years ago, got involved in this. This was on an academy committee.

We discovered that they had no conservation of mass and without a conservation of mass you can have a one curie source and 10,000 years later you have one curie per cubic meter 20 miles out. And so conservation of mass, if it's not an integral part of the total TSPA, it's not so much the water problem, you don't know what the hell you've got.

MEMBER WYMER: I'm surprised at that.

VICE CHAIRMAN HORNBERGER: My guess is that that is not an overriding problem with either TPA or TSPA

MEMBER LEVENSON: The only thing I can tell you is that the people we've talked to said they are pretty sure there is no overall conversation.

VICE CHAIRMAN HORNBERGER: But at the scale, for example, the unsaturated zone, we're pretty sure that they're not putting more water into the water table than is coming in. Okay? So we're pretty sure they're conserving water mass on the

mountain scale. And I would be really surprised if somebody hadn't looked at whether or not they were keeping track of their total inventory of radionuclides.

On the overall basis, I would have grave difficulty believing -- unless it's a blunder, that they could get more aluminum out than they had --

MEMBER LEVENSON: George, on the water issue, forget the model. From everything you know, what fraction of the incident water on the surface will drip into the drift.

VICE CHAIRMAN HORNBERGER: Right.

MEMBER LEVENSON: And the answer that we got, when you apply it to the extremes of current rainfall turns out to be less than a quarter of an inch per year will enter the drift.

Well, when you go down into the detailed modules that are looking at things, there's many, many times that much water coming into the drift. Seepage models show a hell of a lot of water coming in the drift. So the conservation of mass --

VICE CHAIRMAN HORNBERGER: No, no, no, no. That doesn't violate conservation of mass. That just says that perhaps the model funnels more water into the drift than they really believe go in. But that

doesn't mean that they've created that water out of a whole cloth to put into the drift. They're still keeping track of the critical mass.

MEMBER LEVENSON: Well, okay. I think not.

VICE CHAIRMAN HORNBERGER: You've got an observation there, Brett.

MR. LESLIE: Brett Leslie, the staff, NRC. I was just making a notation that we perhaps can get at this in the gold sim. demonstration.

CHAIRMAN GARRICK: What is important here is if they do anything that is equivalent to it, but you know, they're not doing it rigorously, but if their inputs at these different stages of the model are such that it's representative of conservation of continuity and -- see, what you're really talking about is a very fundamental thing. You'd like to be able to start with the continuity equation, the conservation of energy --

VICE CHAIRMAN HORNBERGER: No, no, no. That's exactly what they do.

So if you look at Bovartson's model, three dimensional model at the mountain scale, unless he's made a blunder, it conserves mass.

MEMBER WYMER: Through the continuity

equation.

VICE CHAIRMAN HORNBERGER: Yes.

CHAIRMAN GARRICK: It seems as though it's something the NRC could probe and be satisfied on.

MEMBER LEVENSON: I am much more concerned about it as it applies to the fission products than to water.

CHAIRMAN GARRICK: But, you know, the 800 pound gorilla is the water, that reaches the waste package. And the end package chemistry that takes place --

MEMBER LEVENSON: But the aluminum fuel had nothing to do with water.

CHAIRMAN GARRICK: That's right.

VICE CHAIRMAN HORNBERGER: Again, my gut feeling is different from yours. I would be really surprised if they weren't keeping track of their inventory, but who knows. Maybe they aren't.

CHAIRMAN GARRICK: Okay. Ray?

MEMBER WYMER: AS you know, Andy and I have been following the chemistry issues fairly assiduously over time here. We did have a working group meeting in February and I'll say a few things and then I'll invite Andy to say a whole bunch more, which I'm sure he will and then --

MEMBER LEVENSON: Excuse me, before you go on, I screwed up. I should ask Rich if he has --

MR. MAJOR: I think you covered it.

MEMBER LEVENSON: Okay, I'm sorry, go ahead.

MEMBER WYMER: So after Andy elaborates on what I say, which he does very well and I'm sure will do -- let me say first that I'll say at the outset what Milt said toward the end of his talk, what the sort of the bottom line is, namely that the staff does appear to be addressing in a comprehensive way all the chemistry issues that are likely to be important to the dose at the site boundary. That's sort of the bottom line of all of this. They are after it, on it and I think doing a good job.

I'll say a few more conclusions before I turn it over to Andy. Andy has written, incidentally, jointly, but Andy has done, as always, the yeoman's work on it, a draft report of this meeting and we have yet to prepare a cover letter for it. And we have yet to polish the draft and rake out any inconsistencies that are in it, but there is a lot of work already been done on a draft.

CHAIRMAN GARRICK: Do we have copies of that?

MEMBER WYMER: Not yet. That's not quite -- it's predecisional. It's prediscussional. The NRC model is by necessity is not as comprehensive as DOE's model for chemistry, but there's a -- the NRC model has to rely very heavily on a DOE data and input since they don't -- NRC doesn't have the resources to pursue all these things.

We looked at three, basically three aspects of the Deerfield chemistry. One is the waste package and drip shield. The second one was the release of radionuclides from the engineered barriers. And then the third one was the delay an dilution of radionuclide concentrations provided by natural barriers. These are the three points we emphasized.

We're still concerned about the way that coupled processes ar handled and we have a little uneasy feeling that because of the complexity of the coupled processes and the fact that it's -- much of the coupling studies have been done on the abstractions of the model that we're a little concerned about and in particular, we think that the changes in the chemical reactivity of the incident water, as the temperature and the concentration and chemical composition of the water changes as it undergoes reactions with the engineered barriers with

the waste package and waste materials that maybe they are not well-enough characterized to give assurance at all that important processes have been identified. We're pretty sure that they haven't. Maybe we've got to qualify the word "important" and not stress it too much, but certainly all the processes have not been identified or dealt with.

That's a point.

A lot of things have been identified that have not been pursued in detail. It would be hard to point to something that at one place or another in the reports that have been written by the Center and by the staff here that it would be hard to point to something that has been left out. The people have fought long and hard about these things and one place or another one thing has been mentioned, but not everything has been studied in the kind of depth that they, as well as we, would like to see.

We're still concerned about the potential catalytic activity of trace impurities as it affects the corrosion of alloy 22, in particular, the welds in alloy 22. Over the very long time period, 10,000 years is such a long time, that it doesn't take a lot of catalytic activity to cause a serious problem in that length of time and it's hard to predict for

10,000 years what will go wrong, even though predictions have been made based on shorter term studies. So that's still a concern.

With respect to transport of radionuclides, that's handled in a fairly simplistic way through the use of KDs. Now KDs do represent what happens, but they don't give you insight and understanding what the mechanisms of what happens really are and we'd like to know more, have a better understanding of what goes on that's included in this very broad blanket summary of all the things that are going on through the use of KDs. That may be an impossible request in light of the time and resources, but still we don't think that the understanding is there as much as it should be.

And we're still a little bit concerned about colloids. One of the things that seems to come out is that most of the emphasis on the study of colloids has to do with what is normally called pseudo-colloids, absorption of materials on the surface of alumina silicates and this sort of thing that form natural colloids. And not much attention is played to colloids themselves, you know, the actinides are notorious for performing colloids all by themselves. They don't need to be carried on some

sort of a natural colloidal material. So that seems to be an area that needs more study.

That's pretty much the summary. Now I'll turn it over to Andy who will tell you what really happened.

VICE CHAIRMAN HORNBERGER: Can I interject before you start, just one thing? Your report strikes me as having a flavor of science that we have to know and understand --

MEMBER WYMER: It does --

VICE CHAIRMAN HORNBERGER: And we have to go down the staff and if we are to follow that uncritically, I'm convinced that we wind up never being able to do any engineering projects.

MEMBER WYMER: I didn't say have to. I just said the word "liked to" or however the desire.

VICE CHAIRMAN HORNBERGER: It's just an observation.

MEMBER WYMER: In fact, as I said in my first statement, the staff is doing what it needs to do in order to go ahead in all of this licensing process. That's the bottom line.

CHAIRMAN GARRICK: And we know with each of these issues when we're done, there's going to be uncertainties associated with that and the question is

what's the impact of that uncertainty.

MEMBER WYMER: Insofar as it is possible in the time and resources to gain a greater understanding that I talked about mostly here, we'd like to see it done.

But I don't think it's essential.

MR. CAMPBELL: I am going to share this. I'll just hit a couple of things and this is an issue that at first blush you might think well this is just a science issue. The issue is how do they calculate the pH waste package which affects a lot of different things in the model so it's not just an academic question; pH is the master variable that determines the speciation of all the radionuclides that are in a dissolved state.

So the solubility and what I'm showing here, here is this is from a single run from their EQ36 model which I've pulled out of their data set and plotted. Shows the variation of the solubility on the Y axis is in moles per liter because it was done by chemists and the pH scale at the top ranges from 3 to 8. And the pH scale that you see in the calculations that are in input to TSPA range from 4 to 8 and that changes as a function of time. So it's a lot of uncertainty as to what the pH is at any particular

time. And all of that is abstracted into TSPA. So you get this abstraction into TSPA, but if you've not got it right or if the basis of your calculation isn't supported or you can't find how that's supported, then this cascades down the rest of the analysis. It affects the solubilities as you see here of neptunium and plutonium but several orders of magnitude between a pH of 8 and a pH of 4.

MEMBER WYMER: And if you throw eH into that you could change it a whole lot more.

MR. CAMPBELL: What they do in the analysis is they set the amount of oxygen dissolved in the water coming in, equal to an atmospheric value and so that doesn't merit -- if they impose an oxidized environment on the system, they don't actually calculate what this effect of consuming all the waste package materials. There are steels in there that produce acid. And there are aluminum alloys, in the case of glass, glass produced consumes acid, so you have forces driving pH in two different directions and you have a series of reactions with competing reaction rates, that essentially determine the pH at any one point in time.

And so it's not just an academic question. It also impacts the dissolution rate in spent fuel

which pH is a parameter used in that dissolution orate because that's what comes out of the laboratory experiments. It's used in, I believe, the dissolution of glass and the stability of colloids is a function of pH, so if they don't have the pH right, it will cascade all the way down into your various components of your source term, you release radionuclides.

VICE CHAIRMAN HORNBERGER: The reason -- we know they're never going to have quote unquote have the pH right. The real question is whether or not we can represent --

MR. CAMPBELL: They have bounded the uncertainties.

VICE CHAIRMAN HORNBERGER: Not bounded, well, okay, bounded --

MR. CAMPBELL: Had they put bounds on the pH such that they had a realistic adapt and for me, as I dug into the analyses and from TSPA into the AMRs into one of the more recent in-package chemistry AMRs which is a very different pH result than from previous AMR in-package chemistry, I got to a roadblock. I got to a point where I was still asking questions. What are the driving forces for pH? Have they sufficiently characterized this system so these series of a dozen or two or so EQ6 runs truly puts a box around what the

pH could be. Because if they have put a box around what the pH could be, then it's simply a matter of is the abstraction a reasonable thing to do? If they haven't put that box around what the pH could be, then it's anybody question whether it's a conservative or nonconservative approach because you run into this -- so that's an example where the chemistry question on something like as basic as pH or in our looking at all of this, we came across an issue and it's not that they're doing it wrong. It's that at some point you don't know what they're doing. And it's a critical parameter that carries through the entire analysis.

That's basically all I'm going to say about pH at this point. Our conclusion, I think, is going to be that there's going to be a need at least for a much better explanation for what's going on in pH. Keep in mind that this also affects other things because the solubility of radionuclides are determined and this whole reaction vessel is determined by assuming this big waste package is full of water, that's about 4500 liters of void space. So this amount of water with all the materials of the waste package, a smaller volume of water reacting with a smaller amount of material, they acknowledge, could significantly affect the pH, but they figure that's

too complex to deal with. But they at least need to bound it to ensure that the statement that this is a conservative approach really is conservative and it's not clear to me --

VICE CHAIRMAN HORNBERGER: The thing is that when this information goes across from us to whomever and presumably back to DOE, what I think has to be taken into account is what we have said all along and that is we'd like to be as realistic as possible and the fact of the matter is that you can look at this pH and say oh, well, this could affect it by an order of magnitude or something. DOE is already assuming that solubility of two orders of magnitude are probably two orders of magnitude too high. They've got to fix that too.

MR. CAMPBELL: Right.

VICE CHAIRMAN HORNBERGER: Which brings them two orders of magnitude in the other direction. This is the kind of thing that Milt has been harping for a long time and I agree with him. And this isn't a criticism. I think that NRC staff, their job is to go and look for possible difficulties and the possible difficulty that they might not -- they might have lower pHs than they say, but by the same token, it would be nice to say yeah, and also their neptunian

solubilities seem a little weird to us, too high.

MR. CAMPBELL: Right. And it affects the technetium which is simply a fuel degradation issue because it's assumed that technetium comes out.

There's a series of couplings within the system which are essentially the way it's being modeled are decoupled and you don't get the kinds of feedbacks you would need to be able to say what is the right solid phase or what is the reasonable range of pH values over time for the system. A number of other issues that come up in the context of what's going on inside this waste package.

They also have a diffusion model or diffusion through stress corrosion cracks that literally does not need water to move waste. It needs a thin film of water. But when you dig deep enough, what you find is you can't find, or at least I haven't been able to find the actual description of that model. So I'm taking a guess as to what they're doing, but I can't find a specific description of the model which carries the components of spent fuel through the internals of the waste package out and into the invert. I find the detail mathematical model of diffusion through the invert. I find nothing on the release from the spent fuel to the invert. And

yet, it turns out that when they do their sensitivity analyses, the stress corrosion cracking dominates, at least in the first 100,000 years, the sensitivity analyses and the importance analyses and the only way that that can be is that diffusion out of these tiny cracks on this thin film of water is dominating the dose in that period of time. The question is how are they doing it? And frankly, I don't know. It may be conservative. It may be so conservative that it's ridiculous, but you're left with this feeling of we don't know what they're doing.

MS. DEERING: I have a question to make sure I understand the pH. Are you saying that in NRC's IRSRs or in DOE's TSPASR, the issue of pH as an uncertainty and a potential impact on performance has it been identified in either of those places? Maybe you don't know.

MR. CAMPBELL: As far as the chemistry issue which is dealt with in both CLST and near field environment.

MS. DEERING: Because I'm thinking in simple terms like would it be something, I would think you would expect that to see in something DOE's TSPA would say this is an uncertainty, there's a range of impacts. If you have this range of possible pHs,

here's how it would play out somewhere down the way in performance or source term. And here's how we're choosing to model it with the information we have and here's why this is an appropriate and acceptable way to do it. I mean to me that would be transparent and that would be a way to try to deal with uncertainty, but if you saw something like -- you haven't seen that, is that right?

MR. CAMPBELL: What --

MS. DEERING: Or is that even off-base to what you think you'd want to see?

MR. CAMPBELL: What they've done in their analysis is the variability of this limited subset of modeling runs, geochemical modeling runs with this code EQ36 are abstracted into TSPA as several different response surfaces and in what time frame you're dealing with because the pH varies like that with time in their latest effort.

The uncertainty analysis in TSPA is in a sense looking at the variability of this set of modeling runs. That's not necessarily the same thing as the uncertainty in the pH that's important to performance.

I believe the staff is concerned very much about material reactions and the potential for the

different materials reacting with water coming into the system. And so I'm not prepared to say whether or not the staff has completely dealt with this issue. They're certainly aware of this issue, but we only got this in package chemistry AMR, the revised one, just in the last month or so.

MS. DEERING: Was this part of the agreements that DOE and NRC have reached?

MR. CAMPBELL: I believe so. So it's a revised thing. But when you get an AMR that completely changes the story of long time frames. You want to dig a little deeper and when I dug a little deeper what I didn't see was the descriptions of the main reactions driving pH. They tell me it's the material reactions which I believe, but I don't really get a good handle on what are the main drivers for ph and what's perturbing it.

MR. CAMPBELL: Or the impacts of those assumptions they're making in terms of performance.

MR. CAMPBELL: Right.

MEMBER WYMER: I keep coming back to this issue. DOE has in almost all cases taken what they consider to be a conservative stance on all aspects of the TSPA and it does look conservative. And I ask again what's the downside of being overly

conservative? I think we ought to consider whether or not we want to articulate what we think the downside is or what the downsides are.

CHAIRMAN GARRICK: There is certainly no downside to regulating conservatively. You should regulate conservatively, but there is a downside to not knowing if you're regulating conservatively.

MEMBER LEVENSON: Ray, let me give you one specific example. If you are ultra-conservative and then force yourself say to go to a coal repository design which might triple or quadruple the amount of fuel handling you have to do on the front end, you in fact, have generated a new risk arising from something you called conservative because you may expose many, many more man rems of people on the front end to avoid something on the back end. It very seldom is over estimating the consequences really conservative because it always forces you to do something else which has its own risk.

MEMBER WYMER: I guess I would like to see something written that spells out why we think DOE's ultra-conservative, I could call it that, that position is a bad thing.

CHAIRMAN GARRICK: It's a bad thing because they're not doing risk assessment and they're

supposed to be doing risk assessment. And you don't do risk assessments conservatively. You do risk assessments to represent the truth. You give the issue the best shot you can possibly give it in terms of what you think will really happen.

It seems to me if you don't have that as a baseline, you don't know where the heck you are. But it says nothing about how we want to regulate it. It only says this is what the experts have indicated as their best shot at what they think will happen and we'll use that and we will consider the evidence supporting that in making a decision as to how we want to regulate it.

MEMBER LEVENSON: Ray, there's also financial aspects. Suppose -- I'm not saying this is true, but as an example, by being ultra-conservative on solution and dispersion, you force the C-22 container in being, when in fact, you could have buried it in plastic bags and tin cans and it would have been safe, you're spending some billions of dollars of taxpayers' money for no improvement in safety.

MEMBER WYMER: But that's not our concern. That's John's point. Regulation is different.

MEMBER LEVENSON: You were asking is there

a downside risk to DOE's being overly conservative and I'm saying there's lots --

MEMBER WYMER: I should have said in the context of what we're supposed to be doing.

MEMBER LEVENSON: Regulation is a different story. But there's an inadvertent thing that we tend to do. It's kind of a follow-on to George's questions. We and the staff have to be very careful of, and that is if DOE comes in and this is clearly conservative, we don't say anything about it. It's acceptable. They come in with something else that's less conservative, we say gee, you could be more conservative. We inadvertently push them farther away from real risk-base thing into arbitrary increased conservatism and that would be an unfortunate thing.

If you talk to people on the other side, at Yucca Mountain and other licensing things, why did you do such an incredibly stupid thing and they say well, it was pretty clear that that's where the NRC staff wanted us to go. You talk to the NRC staff, they didn't necessarily want the people to go there. They asked a question. So I think this being nonsymmetrical about not commenting on being overly conservative, we do some things --

CHAIRMAN GARRICK: I think there's a high order of responsibility here too that actually goes beyond what we're supposed to be doing, but one of the words that appears in the NRC strategic language, at least it used to appear, I don't know, is the word "enable."

Society -- to enable society to use this technology to their betterment --

MS. DEERING: In other words, safe.

CHAIRMAN GARRICK: Yes. And if we present this technology in the context of an ultra-conservative model, we may be denying society something that's very important.

MEMBER WYMER: That is a higher goal than we are commissioned to pursue.

CHAIRMAN GARRICK: Well, I don't know how much higher it is given that's in the basic documents that govern our behavior, but I don't know.

MEMBER WYMER: I'd like to see something written, that spells out why this being too conservative is a bad idea. I hear what you're saying, but it would be nice to have some --

CHAIRMAN GARRICK: I will only tell you -- I'll answer that in one word. We want the truth. There's nothing more basic than the truth and if we

don't put those kind of rules on it, we won't get the truth.

MEMBER WYMER: You're waxing philosophical on me.

CHAIRMAN GARRICK: No, to me, it's very explicit.

MEMBER WYMER: I don't know what the truth is in anything.

MS. DEERING: Take the pH issue. Say that you don't know the truth in terms of how it's going to vary over time and how that would affect solubility because you don't know what's going to make it vary over time, modeling it at say a constant value, that might lead to some conservatism in some cases because you don't have a basis to say how it's going to vary. Is that being what you would call too conservative or is that even -- I mean is that okay to do? Is that your only way to go or would you still attempt to look at variable pHs that would allow the solubility to be --

MEMBER LEVENSON: You've got to include in that discussion, Lynn, probability. If the probability is 99.99 percent that it ranges between 5 and 7, then you probably shouldn't use 8 or 3.

CHAIRMAN GARRICK: By the way I think we

really need to keep to our schedule. This is something that --

MS. DEERING: We have an hour after lunch to continue.

CHAIRMAN GARRICK: We've got to finish the chemical one up or if we're not finished.

MEMBER WYMER: I think we're done.

CHAIRMAN GARRICK: Then we need to say a few things about the TSPA one. I notice we still have some time for doing that.

MR. CAMPBELL: Let me just add one thing, John. What I was talking about was commercial spent nuclear fuel.

CHAIRMAN GARRICK: Right.

MR. CAMPBELL: High level waste, glass, the glass buffers, the pH, it's much more constrained and that's the key there. It constrains the uncertainty because there's a pH buffer in there which is the glass that dissolves. So my comments were focused on what happens in the commercial spent nuclear fuel waste packages.

CHAIRMAN GARRICK: Okay.

MEMBER LEVENSON: Is that at all, Andy, a function of what the glass is or -- it's now going to be a big range of glasses with significantly different

titanium contents, for instance. Is that pretty much --

MR. CAMPBELL: Glass drives pH.

CHAIRMAN GARRICK: Okay, let's adjourn for lunch.

(Whereupon, at 11:35 a.m., the meeting was recessed, to reconvene at 1:33 p.m., Tuesday, May 15, 2001.)

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

(1:33 p.m.)

CHAIRMAN GARRICK: Okay, let's come to order. I guess the question is were we through with the chemistry?

MR. CAMPBELL: I think so. I sure was.

(Laughter.)

MEMBER WYMER: We haven't drafted our discussion of conservatism yet.

(Laughter.)

CHAIRMAN GARRICK: We'll take care of that. That's probably a good idea.

Okay, the final item on our KTI list here is Total System Performance Assessment Investigation and of course this one overlaps with all of them and especially the chemistry so it only stands to reason that we involve Andy in both of them, maybe.

I think what I'll do is I'll just highlight a little bit what our approach is. As you know, we have not had our technical exchange meeting, but it is now scheduled and it will be next month and that will preclude us from having any further excuses, but we do have an approach and we want to share that approach. It's discussed in Tab 3.1, page 5. I'll highlight it and then Andy will give some backup.

Generally, what we are talking about doing is taking a top down slice of the TSPA and related activities and what we mean by that is starting with the dose to the critical group we want to work ourselves backwards to the contributing factors of that dose and hopefully we will be able to focus on just a couple of radionuclides such as technetium 99 and neptunium 237 and when we talk about working backwards to the contributing factors, we mean not only the contributions to the dose that come as a result of physical processes, but we mean the assumptions, the models and of course, the specific radionuclides that are involved.

In this process, we're going to be attempting to answer a couple of questions. One is at least with respect to our vertical slice, what is the evidence supporting the results of DOE's TSPA and by that we mean the nature of the models, the most important assumptions and other relevant input information.

The second question has to do with the adequacy of the NRC staff's approach of using their TPA, their Total Performance Assessment, and the review plan to review the TSPA. The thought here is that in order to assess the adequacy of NRC's review

process, we need to know something about what it is they're going to be reviewing.

So we will try to in the vertical slice, identify the factors and satisfy ourselves that the factors controlling the release from the engineered barrier system are understood by which we mean the failure of the waste package, the water access and composition, the mobilization of the key radionuclides within the waste package such as technetium and neptunium and the release rates and mobilization.

Now there's two subissues that we are wishing to slice through and evaluate in some detail and one of those is the degradation of the engineered barriers and the other is the radionuclide release rates insolubility limits. As far as the engineered barrier degradation issue is concerned, we will be looking at the NRC review process and activities. We will at least to the extent that we can try to develop that first order understanding of DOE's modeling approach, and we will certainly lean on the chemistry vertical slice to develop an understanding in the context of the performance assessment of the impact of in-package water chemistry on radionuclide mobilization.

Now we know that from the point of view of

the NRC's key technical issue approach, that the emphasis is now on this integration of subissues and in this case there are four sub-issues of primary interest: system description and demonstration of multiple barriers, the analysis, the selection and analysis of scenarios, model abstraction and the demonstration of the performance.

A primary area, a primary area focus is the abstraction process associated with the models. That is to say the transition from the subsurface models to the probabilistic analysis and there are, of course, three key subsystems involved in this, the engineered system, the geosphere and the biosphere.

So that's what we're going to do. We're going to start with the dose and work backwards, but keep very focused on what seems to be driving the risk in order to keep it within a reasonable bounds of complexity and beyond that, there's a lot of technical issues.

Andy, you may want to elaborate on some of them.

MEMBER WYMER: Can we react to that a little?

CHAIRMAN GARRICK: Yes.

MEMBER WYMER: It seems to me that much of

what you've discussed in the beginning, what you said, is what's covered in the chemistry vertical slice.

CHAIRMAN GARRICK: That's right.

MEMBER WYMER: I don't know why you want to repeat that.

CHAIRMAN GARRICK: Well, we wont. We won't.

MEMBER WYMER: It seems like what you talked about last four issues you outlined, that's really the guts of what you want to do. That's the substance of a review of a TSPA.

CHAIRMAN GARRICK: Yes.

MEMBER WYMER: It seems to me that's what I -- what's about what I would do. That's about all I would do. That's a big job in itself. We're sort of rehashing all the chemistry stuff.

CHAIRMAN GARRICK: Well, we won't rehash it, but we will try to put it in the context of the onion peeling process of working back from the dose to the --

VICE CHAIRMAN HORNBERGER: My guess is that you'll be looking at the model abstraction process and how it carries into the TSPA.

CHAIRMAN GARRICK: Right.

VICE CHAIRMAN HORNBERGER: Whereas you're

going to be looking at processes and chemistry.

MR. CAMPBELL: Let me try and put this in context. What we want to look at is abstraction of models in the TSPA and how that abstraction process carries through the uncertainty into the final result. So really the focus, the reason I referred to chemistry was probably one that that's the lamppost phenomena, that's what I thought would be a good proxy for looking at -- I mean we could look at water flow, we would look at any number of things to trace through the TSPA, how abstraction is done and how uncertainty is dealt with in this process. That just happened to be a useful thing which we had a lot of background information.

MEMBER WYMER: The emphasis is on the abstraction process, not only the specifics.

MR. CAMPBELL: Right and then how they analyzed the uncertainties and sensitivities and so on, how that's all carried through. At least that's the concept that I'm coming from.

CHAIRMAN GARRICK: I think there is a desire to understand the physical processes enough to appreciate that the abstraction makes sense.

VICE CHAIRMAN HORNBERGER: Actually, I think that's why it sort of makes sense to have this

plan because Ray and Andy are looking at the very detailed physical stuff and then you and Andy are looking at the abstraction, so you'll have a direct connect there.

MR. CAMPBELL: That was the intent, was not to reinvent the wheel or redo that which has already been done, but rather okay, now that we have this large base, if you will, of information about what's going on in the process level and maybe even some concerns on that, start at the top, work your way down and then come back up, looking as to how did they abstract a particular set of information into the model and how is that treated within the model and then how are they dealing with the uncertainties and do their uncertainty and sensitivity results make sense in the context of all of this. That's the idea here.

MEMBER WYMER: That's not the flavor that I got, but that sounds very sensible.

CHAIRMAN GARRICK: As far as the flavor that you got, I guess the way I'm presenting this is that the performance assessment is to take the relevant chemical models, the relevant geotechnical models and structure them in order to be able to abstract from them a probabilistic treatment.

MEMBER WYMER: Fine.

CHAIRMAN GARRICK: And if you start with the dose and work backwards, you work your way into what's going on inside the waste package because the source term is where most of the action is, the development of the source term.

And that's all water access and corrosion model and mobilization of --

MEMBER WYMER: Chemistry.

MR. CAMPBELL: He cringes.

MEMBER WYMER: Sorry.

CHAIRMAN GARRICK: Anyway, that's where we are and I think that we'll be able to in about a month get some real momentum.

VICE CHAIRMAN HORNBERGER: Is the technical exchange in Las Vegas? I didn't know.

CHAIRMAN GARRICK: Yes.

MR. CAMPBELL: It's June 25 through 28.

CHAIRMAN GARRICK: And also the one that's going on now is very relevant.

VICE CHAIRMAN HORNBERGER: FEPs?

CHAIRMAN GARRICK: Yeah, Features, Events and Processes. It's too bad that one of us is not there, but I'm sure Jim Clark will give us a full report.

MEMBER WYMER: John, I would hope that there's a sentence that I raised a question about some time ago by e-mail because it appears dozens and dozens of places in DOE documents and since it's the identical wording in each case, I assume it isn't accidental and that's a statement that no confirmation of this is required. When Rich and I asked about it, nobody seemed to know what that meant. Does that really mean that any programmer, anybody can attach that sentence to something and nobody else checks it or reviews it? None of the people, in fact, none of the people that we talked to, either staff or in the Center, were sensitive to the fact that this was a standard statement that appeared in many, many places in the DOE documentation. I'd suggest that you put that on your list of things to ask about if you're looking at the total TSPA.

CHAIRMAN GARRICK: I hope not. I hope that's not the case, that interpretation.

MEMBER WYMER: Well, I don't know. What bothered me is that nobody else seemed to have -- except for Ray, nobody else had raised the question of what does this mean.

But since it's the exact wording that appears many places in many documents, I think you

have to ask about it.

CHAIRMAN GARRICK: Yes.

MR. CAMPBELL: One of the concerns that we have is how do some of the conservatisms that are built into these various models carry through into the final analysis and what are the impacts of those conservatisms on your interpretation of the uncertainty and even the sensitivities?

And there may be issues along the way that we come across that we haven't and certainly there will be issues that we haven't anticipated that will possibly change our focus a bit. There has to be a vehicle for where do you start and we thought, okay, let's start with this because this is something we know and then work from there and I recognize that that's a bit of a lamppost philosophy there, but it's a starting point.

CHAIRMAN GARRICK: One of the things that we'll certainly be looking for is consistency of modeling. The worry here is and maybe it's been done in such a way that it does not present a problem, but the worry is that you have in the same track periods of extreme conservatism and periods of nonconservatism and periods of totally probabilistic approach and periods of totally deterministic, sometimes. And

that's inevitable to a certain extent. You can't really make the probabilistic approach completely pervasive or you'd never get done. So just need to understand where it is and where it isn't and what the basis of the way it is, how it's presented.

I don't know if it's a feasible approach, but we'll know soon when we get into it a little more.

MR. LESLIE: Brett Leslie, here, NRC staff. Just one of the things you may have heard, John, is that DOE has just issued a corrective action request and I think you'll like this one because it had to do with model validation and in effect, they found a problem in that the DOE appeared to be saying the staff believes that this model is conservative and therefore it is validated and so it was as large portion of the models that they evaluated in these AMRs that had this specific problem. And so the Office of Quality Assurance has brought this up as something as a high priority issue.

CHAIRMAN GARRICK: I'm glad they did. Do you want to add any more to it, Andy, or are we okay for now?

MR. CAMPBELL: I think we're okay for now.

CHAIRMAN GARRICK: Okay, I guess this is a good time to hear from Lynn, isn't it?

MS. DEERING: I just wanted to talk about schedules and deliverables. If we could think about that a little bit.

I think, as we understand it, staff is looking to kind of get their sufficiency comments wrapped up by August to the Commission in mid-August and that means that we could have that meeting, our August meeting, we could also take that time we need to start wrapping this up.

One of the things to think about is what products we want and George and I are accountable to get out at least one of these on the overall sufficiency review. And one idea we've talked about is having funneling some of our insights to the extent there's commonalities or nuggets we could share in this report into that single report.

We're also able to have, depending on the outcome of some of these vertical slices, we may decide we want to issue a separate report to the Commission on just that very vertical slice. So George and I were talking. We probably -- it's probably easier for the Commission if we try to limit the number of reports we're going to give them and try to package our insights into a single document or maybe, Ray, if you really want to give a chemistry

report -- I think you do.

MEMBER WYMER: We have about half committed ourselves to present four independent vertical slices, I felt.

MS. DEERING: No, I don't believe so. We're committed to do them, but then how we report the results, I think we have flexibility.

MEMBER LEVENSON: Don't forget the objective was a single thing. WE divided it up.

MS. DEERING: We did.

MEMBER LEVENSON: For implementation, but I would think that putting it back together for presentation to the Commission would make a more coherent story.

MEMBER WYMER: Not really in a way because if you put it back together, then they can expect all the pieces to be covered and there's only four pieces covered.

MEMBER LEVENSON: No, no, no. More importantly --

MS. DEERING: We would discuss our method.

MEMBER LEVENSON: There's going to be a significant difference in degree of detail, so I'd suggest we put them together into a brief report as several appendices where you might include, for

instance, a lot more detail on chemistry or a lot more on this or that to make the report itself.

The question we're addressing is a very narrow one, that is, is the staff doing its job. The details are not really relevant to evaluating that point from a Commission standpoint. they just want to know should they worry about what the staff is doing or not. And I think we can best respond to that by a single report. But maybe appendices for detail.

MEMBER WYMER: It seems to me it would be a little illogical.

MS. DEERING: I don't think -- it depends on the outcome of your review. You may find that you have something to say beyond what the sufficiency report wants to say, which is fine. I don't think we have to shut down on that now. I think we're assuming, Ray, that you will go down that path, the loan bath of a chemistry --

MEMBER WYMER: We're always alone in that, but I think that's right. Again, I don't know how you can pretend to write a sufficiency review which covers everything when you haven't covered everything.

VICE CHAIRMAN HORNBERGER: First of all, of course, we wouldn't write a sufficiency review that covered everything because we didn't cover everything.

We would simply have to outline what we did and what we did was an audit, but Lynn and I chatted briefly and again, not looking at it from our point of view because I think from our point of view it would probably be easiest to write four separate reports, but trying to look at it from the Commission's standpoint and what we could do to benefit the Commission and it's pretty clear at least to me and I think to Lynn as well, that it will be harder for us to do, but it would really benefit the Commission most if we wrote a single report.

MEMBER WYMER: Properly qualified.

CHAIRMAN GARRICK: Properly qualified. A summary report that deals with the question of sufficiency. And then appendices --

MEMBER WYMER: That's part of the question that we've audited.

CHAIRMAN GARRICK: Yes. And then appendices as appropriate.

MEMBER WYMER: Absolutely.

CHAIRMAN GARRICK: So we don't lose the detail and we don't lose what Ray wants to communicate. He wants to convince the Commission that the only thing that's important is chemistry, well, let him do that.

MEMBER WYMER: That seems to be the way it's turning out.

(Laughter.)

VICE CHAIRMAN HORNBERGER: Actually, though to go a little farther, I also agree with exactly what Lynn said, that if, in fact, as you delve into chemistry or if we look into groundwater flow and dilution and what not that if there are issues that really aside from sufficiency, issues that really deserve a letter, then we should by all means follow those up.

MS. DEERING: And it could even mean we save those issues until we do our research report.

CHAIRMAN GARRICK: And I think it fits in nicely --

MS. DEERING: Depending on how we use the information we gather.

CHAIRMAN GARRICK: I think it fits in nicely with our briefing to the Commission where we indicated what our approach was going to be and we can make reference to that and show continuity.

MEMBER WYMER: And indicate the limitations of what we've done.

CHAIRMAN GARRICK: Right.

MEMBER WYMER: We can do that whether we

have four reports or one.

MS. DEERING: We have June and July and then August, we're really under the gun, and then we're going to get the staff briefing on sufficiency in August. I think we've accepted that. We've agreed to that.

And we want to hear from DOE also, be it July -- hopefully, July, August, somewhere in there. No later than August. So we still have some pieces that we won't get to later, but we need to start thinking about bringing -- we've isolated our areas, now recombining and the staff can do that, help do that here on our own, help you do that and we also do it -- when we're all together. But the templates, I don't know how useful those are. It's probably worth revisiting, if those will guide us to where we want to go.

I tried to tweak it a little bit for this notebook. It's revised slightly, just based on some of our experience, but it still probably needs, as you're finding, filling this thing out, you may find some of it just doesn't have relevancy and there might be areas that are missing, but originally I was thinking we would use something like this to start a letter and I might take a stab at that with George to

just get -- even if we don't have the answers, but just see if I could structure the thing in a way that would -- I mean it's time to start thinking about that.

VICE CHAIRMAN HORNBERGER: Sure is.

MS. DEERING: Is that what you've been trying to tell me?

VICE CHAIRMAN HORNBERGER: No. I live in a glass house. I'm not throwing any stones.

MEMBER LEVENSON: I think we have a template in our current book?

MS. DEERING: Yes, we do.

MEMBER LEVENSON: Page 13 under Tab 3.1.

MS. DEERING: How comfortable is everybody on where we stand on this? Is this about as clear as mud or do we feel we have a path forward as the staff would say?

CHAIRMAN GARRICK: I am sure that each one is going to be a little different in the final analysis because we're going to tailor it to the specifics, to the specific vertical slice, but I think for now, it's plenty of guidance and we just need to --

MS. DEERING: I think we're going to come up with a number of interesting, even if they don't

make it in the report, observations that will be very useful as we pursue issue resolution beyond sufficiency.

My assumption, tell me what you think, just as a staff -- sufficiency is sort of a snapshot with where they are with issue resolution and ultimately if they get to licensing. Same with our vertical slice.

CHAIRMAN GARRICK: Right.

MS. DEERING: I think this is a snapshot. This concept, if it works for us, we can continue using it.

CHAIRMAN GARRICK: Yes, that's right, as issues pop up.

MEMBER WYMER: I like your Part 2 questions and I think we need to work a little harder. Andy and I are writing to respond more directly to those questions in our report. We haven't really sort of pulled them out, highlighted them yet.

MS. DEERING: Now those are the kinds of questions I would envision in the total report. Say if you and -- to the extent if we individually can answer those, all the better, but this is the kind of thing I'm picturing as things we tried to get at in that one big --

MEMBER WYMER: If we don't do it individually you'll have a hard time doing it in total.

MS. DEERING: I know.

MEMBER LEVENSON: Are you accepting nitpicking?

MS. DEERING: No.

MEMBER LEVENSON: On your second question in Part 2, I'm not sure that any of the sub-issues have a risk. It's really the contribution to risk of the subject, rather than the risk of the sub-issue.

MS. DEERING: How should that be worded? How is the relative --

MR. CAMPBELL: Contribution to risk of the sub-issue.

MS. DEERING: Contribution --

VICE CHAIRMAN HORNBERGER: On the other hand, if Lynn picks up that sub-issue, it might be a risk to you.

MS. DEERING: No.

MEMBER LEVENSON: But it's only NRC or DOE --

CHAIRMAN GARRICK: But just simply is the contribution to risk of the sub-issue known or understood.

MS. DEERING: This gets at what I was kind of trying to get at earlier. Does the staff have a good feel for risk insights, their own that they found with their TPA code and their own perspective and/or has DOE provided that in repository safety strategy?

Does it hit that top ten list that you kind of referred to earlier, Milt, that top ten, are there top ten issues?

I'm not sure how well we'll ever get to this, but I think it's pretty important.

VICE CHAIRMAN HORNBERGER: Actually, Lynn, it strikes me that for you to move forward, as you said, to try to structure a letter, it would be extraordinarily helpful if each of the four of us took these questions and answered them, as Ray said, as best we could.

MS. DEERING: That was the idea.

VICE CHAIRMAN HORNBERGER: And then you could compile them and see (a) if there are commonalities, what they are; (b) what is specific to the individual things, so we would have to call out specifics. It might really help us structure the letter.

MS. DEERING: And it might even help us structure that working group that we have six months

from now. If we really can't get to the answer of this, it may be that that helps us structure it differently -- we just keep on the path to try to get at this.

I like that.

MEMBER WYMER: The one problem with answering some of these, some of them are very appropriate generic question, that is, for instance, are they focused on the most risk significant issues. Well, we picked sort of four arbitrary slices and we're not in a position to say whether the four that we picked are or are not among the most significant. We didn't pick them for that reason. We did a random sample. I think that the questions are good ones, but we won't necessarily directly answer them in a letter. In fact, maybe one like number 4, the letter ends up saying we did a slice and we sampled. There's no assurance that the four we picked are the most significant. I think it's the right question to ask. We don't necessarily need to answer it --

MS. DEERING: That's a good point. That's very reasonable.

CHAIRMAN GARRICK: There's another point that may be worth just mentioning and that is none of the questions have anything to do with DOE except

Question 2. Is the contribution to risk of the sub-issue known or understood by NRC or DOE? Is it a principal factor? Well, that's just slipped in there. That's a mouthful. And a big one. See, the way I characterize it in our general approach was the two questions were the first one is what is the evidence supporting the results of DOE's TSPA in the context of the vertical slice as background. And the second one has to do with the adequacy of the NRC staff's approach of using their TPA and review plan to review the TSPA.

MS. DEERING: John, what is that you have? Is that something you wrote a while back, right, and we all had it?

CHAIRMAN GARRICK: I might have.

MS. DEERING: I thought I adopted those.

CHAIRMAN GARRICK: Yeah, well I think you did. And I'm just trying to correlate the two and --

MS. DEERING: I don't know where they are. I'm going to have to relook at your list and make sure.

VICE CHAIRMAN HORNBERGER: He only has two.

CHAIRMAN GARRICK: I split mine into two basic questions and then there's a lot of

sub-questions and yours are -- many of yours are the right sub-questions. But two basic questions that we want to get out of the vertical slice. One has to do with developing a warm, fuzzy feeling about what DOE has done. And having done that, and having that as background, you're in a position to evaluate the adequacy of the NRC approach to review.

MS. DEERING: That makes sense. That's good.

CHAIRMAN GARRICK: It's on page 5 if you want to check it. It's the second paragraph on page 5.

MS. DEERING: Page 5. That's probably good. That's probably something I need to start building into the overall template and I don't know why --

CHAIRMAN GARRICK: You can steal it.

MS. DEERING: May I?

CHAIRMAN GARRICK: Yes.

MR. CAMPBELL: Let me add that the advantage of having four different perspectives and four different, somewhat different ways of doing these vertical slices is to pull together common observations and common trends.

To me, in a sense that then becomes

abstracted into our letter, the overall letter to the Commission or what are the commonalities in our four different vertical slices, from widely different perspectives, did we come across. I think both in terms of the DOE approach and how the staff is handling that, I think those -- that's really going to be key. Not a bunch of details, necessarily in the overall letter.

On the other hand, as Ray and I have talked about, there are a whole series of issues at, if you will, the process model level and how those are carried into TSPA that at least we think in terms of the chemistry warrant a separate report, but what we will pull forward, I think, I'm getting in a vision how we can put together the cover letter, is pull out of this issues that address these questions and then that's backed up by this report. And then ultimately from the other three Members of the Committee, the other three processes we pull out of that and then sit down and basically look, do we see common issues.

CHAIRMAN GARRICK: I think what you're kind of saying is that let's see what kind of product we develop or generate and then it will be much easier for us to decide how to aggregate that into a single package or multiple packages, whatever seems to do the

best job.

MS. DEERING: Do you want to talk about when?

CHAIRMAN GARRICK: Yeah, we should.

MEMBER WYMER: Nag, nag, nag.

CHAIRMAN GARRICK: We should. Chemistry next week --

(Laughter.)

MEMBER WYMER: Why wait so long on that? You don't ever get where you're going unless you have a nag --

CHAIRMAN GARRICK: Well, I guess we could look at this schedule and be guided.

MS. DEERING: No, probably not. Would you like to defer and talk about that for a minute while you talk about DOE's schedules and then we can align ourselves.

VICE CHAIRMAN HORNBERGER: If we work backwards, we know that we want to have this finished in August. We really do. We need to come into the August meeting with a draft, a good solid draft and we can then add to modify in response to the staff's presentation, but we should have our act together coming in.

CHAIRMAN GARRICK: Are you talking about

the vertical slices?

VICE CHAIRMAN HORNBERGER: Yes. That means that --

MS. DEERING: That would be the final letter.

VICE CHAIRMAN HORNBERGER: That's what I mean.

MS. DEERING: We need those even sooner.

VICE CHAIRMAN HORNBERGER: Well, to have -- to get to a final, good final letter in August, that means that we have to be in a position to discuss everything in July. Okay? And if we're going to discuss everything in July, that means that by our June meeting, we're going to, at the very least, have to have this information. So we know that we need it at least by the June meeting and the only question then is whether we push it to get it ahead of time on the June meeting to have a first pass at trying to pull it together.

So it's bounded.

CHAIRMAN GARRICK: So we need a draft of our individual vertical slices for the June meeting?

VICE CHAIRMAN HORNBERGER: For the June meeting or ahead of the June meeting, one or the other.

CHAIRMAN GARRICK: How can we do that?

MS. DEERING: Do we make an exception for John?

VICE CHAIRMAN HORNBERGER: Yes, we have to make an exception for John.

(Laughter.)

CHAIRMAN GARRICK: When is the June meeting again?

VICE CHAIRMAN HORNBERGER: So we need yours two weeks after that tech exchange.

CHAIRMAN GARRICK: Okay. 19, 20, and 21.

VICE CHAIRMAN HORNBERGER: And if you want to put the same pressure on the rest of us, then we should get ours probably a week ahead of the next ACNW meeting which is going to be impossible for me.

CHAIRMAN GARRICK: So three of the four vertical slices, we'll see a draft at the next meeting. Is that what we're saying?

VICE CHAIRMAN HORNBERGER: At least the template version.

MS. DEERING: To answer these kinds of questions and any other insights beyond these questions you want to share. We'll start to really have some results.

Sound good?

VICE CHAIRMAN HORNBERGER: Have to. We have to do it.

MS. DEERING: Okay. The staff seems open to continue on with informal information exchanges, if you have the need for that. Let's schedule those. Let's continue to schedule those.

MEMBER WYMER: What did you just say? I heard the words, but what does it mean?

(Laughter.)

MS. DEERING: I have that effect on people.

(Laughter.)

MEMBER WYMER: I saw your lips moving, but --

(Laughter.)

MS. DEERING: These information exchanges we've been having with the staff, we just had one at lunch. It was pretty useful. The staff indicated they would be willing to continue doing that between now and August and beyond, but if you need them, make that known and let's --

MEMBER WYMER: You mean at the time of the regular scheduled meetings.

MS. DEERING: Any time.

MR. LYONS: Or conference calls, if you

need, we can set something up like that or if you're in the area, we can come in and talk.

MEMBER LEVENSON: The one that Rich and I had, we just came here for a day and did it.

MS. DEERING: Don't be constrained by our meetings. George and I had a conference call once between meetings.

MEMBER WYMER: They work pretty good, conference calls.

MS. DEERING: Yes. Would you like me to give some highlights? We heard a few of them at lunch, but for the benefit of everybody about DOE, how DOE plans to get this site recommendation process under way.

CHAIRMAN GARRICK: I think that would be useful, unless we're breaking any rules.

MS. DEERING: This won't take more than 10 minutes.

CHAIRMAN GARRICK: Okay.

MS. DEERING: And we have about 15 left.

CHAIRMAN GARRICK: Go ahead.

MS. DEERING: Sure.

CHAIRMAN GARRICK: We got the clock running.

MS. DEERING: Okay. Some of these

highlights come from this colorful package that you have. This is pretty neat. It's very pretty.

Some of these highlights -- this is like a report from the TRB meeting. I'm just going to give you orally some highlights that came out of it. Okay?

And I'm using this point paper, if you want to follow along.

Let's talk about the revised SR approach. That's what DOE is calling it. Their LA is expected, I think we've all heard this by now, it's going to be now late 2003. They're looking to issue the LA in late 2003.

MEMBER LEVENSON: Why are we worrying about it? It's after my term on the committee.

MS. DEERING: That is no excuse to slack. I don't know whether I have whether that's FY or calendar. Calendar. Thank you.

All right, the SR decision, I think we also know and it's expected in early 2002, FY 2002. I'm sorry, that's FY 2002. So November-December time frame. That's when DOE is planning to make an SR decision, unless there's delays in getting 963 out, etcetera, delays in the EPA standard.

What they're calling the revised SR approach includes a series of documents. It's no

longer what we once refer to as SRCR. The first -- the SR process was initiated on May 4th. That was the official beginning of the process and the public -- it was announced in the Science and Engineering Report, this big thick thing that you'll have an Executive Summary of in your mailbox with the disk, started that process. And the draft DEIS is also considered part of this process supplement to the DEIS.

In those documents, there's a summary. Those tend to summarize, as I understand it, there's two things. It complies with what's required in NEPA part 114. There's some very specific information DOE has to address. That document does that, in their opinion and it also attempts to summarize the PMRs and the AMRs.

As I understand it, it also tries to focus more on this range of temperature modes, operating modes as does the DEIS.

So next after -- I guess in the June time frame, DOE's, the next series is what they're calling the Supplemental Science and Performance Analysis Report and it has Volume 1 and Volume 2. Now let me tell you about what this is. Volume 1, they call Scientific Basis and Analysis. Volume 2 is a Performance Analysis. The idea here is that new

information has come in since the TSPASR. They've altered some of their conceptual models. They consider them to be less conservative. They also have done some work on uncertainty, trying to deal with quantified uncertainties. And they also now want to evaluate this cooler range. They're talking about a single design that would operate from cool to warm and they're not willing to lock in to either of those just as of yet, so they're going to carry along both ideas and this, the emphasis now, so since TSPASR, this is how they're going to factor in this new information are in these documents that are coming out this summer. There will not be a TSPASR rev. 1 in other words. The new information for SR decision making will be captured in the supplementary documents to be issued this summer, which is interesting, really.

And as I understand it, they're also -- even though the TSPASR focused on the warmer temperature, they're going to now with their updated information and new conceptual models, reevaluate the warmer temperature also and compare it to the cooler temperature in these supplementary documents, so they're going to revise what they did for warmer and compare it to cooler with the same information. Is that clear?

Now a third document in the series to be issued, this may be July, I believe, is what they call their Preliminary Site Suitability Evaluation and this is something they will actually do against Part 963, okay. And apparently, they're going to look over a range of thermal operating modes and at that point when they issue this document, they're going to announce some public hearings, the dates of those public hearings and specify a formal public comment period for whole SR process.

So they believe they're doing this partly -- partly they're doing this because (1) the SRCR they needed more time to get updates from this technical information and I guess the IG report that was pending also played into why they've changed their whole -- revised their SR process. And they think that this will give people more time to review each piece.

The Board seemed concerned at the meeting last week that there's no one integrating document and it does seem a little unruly, but that was some comments from last week.

On page 2, I'm going to talk a little bit about the design. I may have already covered some of this, but I mentioned that it's a single design, flexible, capable of operating over a range of

temperatures. They're looking at tradeoffs between the two, the cooler and the warmer. I think the original objective was does a cooler reduce uncertainties and enhance performance? And I think the NWTRB has been convinced that it does. I think there's -- I know Charles Fairhurst has been working with TASCA and they're doing some analyses that suggest there might, you know, there might be more seepage. There might be more concerns, more uncertainty. But DOE, as we understand, is going to carry forward both and continue to quantify in terms of performance, both ideas.

I mentioned that there will not be a rev. 1 to this TSPASR. All the new information will be quantified in what they call the Supplementary Science Performance Analysis.

CHAIRMAN GARRICK: This is a Supplementary Science and Performance Analysis, is just an aggregation of other things including the TSPASR and the System Description documents and the Site Description --

VICE CHAIRMAN HORNBERGER: Just the cold depository.

MS. DEERING: It's what?

VICE CHAIRMAN HORNBERGER: It's just the

cold depository.

MS. DEERING: Well, but it also will include the warmer repository design quantified also. Yeah, it's a way to bring the new information they've collected in some of their less conservative conceptual models and some of the way they're dealing with uncertainties, they've been doing a comprehensive and systematic study on uncertainty.

They're going to try to bring all that in as I understand it, to these documents.

CHAIRMAN GARRICK: Is this -- I'm trying really to understand if this is real or just cosmetic. Is this DOE's attempt to respond to the TRB's frequently asked questions having to do with what other evidence are you going to present beyond the TSPA?

MS. DEERING: Oh, I don't -- you know what, these documents will also deal with the multiple lines of evidence, but that -- a lot of this is an attempt to address TRB's concerns about a number of things. Low temperature operating modes, the Board has beat up on them on that. This is a way to bring that into -- on to the table. Multiple lines of evidence, use of natural analogs in a way to help quantify some of this information. They're going to

try to bring that in to the extent they can for the SR.

The Board also has beat up them and John on uncertainty, dealing with unquantifiable uncertainties. So again, they're trying to bring that in. It is a way to structure, yes, to answer to the Board.

CHAIRMAN GARRICK: Okay.

MS. DEERING: But I don't think it's cosmetic. I do think that there's concern that this cooler repository and them wanting a single, flexible design that operates at different modes is a way to not -- to resist the Board's demands for a cooler repository. I could be wrong with this, but I'm just talking here.

CHAIRMAN GARRICK: Right.

MS. DEERING: That seems like the Board quizzed them pretty heavily, like why would you go with this flexible design? Would this be the optimal design if you were just designing a cooler repository? Would you do this flexible design and what are your criteria? What is it that -- what do you want the flexibility for? And they very heavily quizzed them on what is the need for the flexibility? You have to meet a certain dose at 20 kilometers. Where does the

need for flexibility come in. What drives you toward that?

And so they encourage the DOE to articulate that in writing and get that -- clarify that so that the Board can live with it, okay?

Just a couple other highlights, DOE, the waste package peer review we're aware of that was announced last week, that's on May 23rd.

There's an international TSPA peer review that's on-going, but there's a report, an interim report due in October and the final report due in February 2002. So the interim results of that will probably be -- support the SR decision, hopefully, if they come out in October.

I'm on page 3 now. There a biosphere peer review report that was issued last week. Howard announced that. The revised repository safety strategy, I think should be rev. 5, comes out this fall.

Unless there's questions, I can talk a little bit about the fluid inclusions, that was a big highlight of the meeting.

(Pause.)

It should be on the top of the pile, because I just handed it out right after lunch.

CHAIRMAN GARRICK: Thank you. I'm sorry.

MS. DEERING: All this is is an interim report, there will be a bigger report on the CRB meeting. This is just designed to give you the latest, what I heard last week and what DOE is saying.

CHAIRMAN GARRICK: Right.

MS. DEERING: Just my best attempt at keeping us as informed as possible.

And I wanted to mention this fluid inclusion because we had had our own session on that less than a year ago, was it? Less than a year ago.

CHAIRMAN GARRICK: Back in October.

MS. DEERING: It was Yuri Dublionsky and Jerry Shamansky and Jean Klein and this study that DOE funded for the ULNV to take a hard look at this whole fluid inclusion issue and whether or could be hot water coming from up and based on evidence in the mountain and fluid inclusions plays into it in that sense. And the study is over and she reported very definitely on her results, feels with high confidence that there are no other interpretations other than the ones she's putting forth and the USGS backs her up and some other independent advisors also who -- a man named Bob Bodner, I believe, who facilitated these quarterly meetings that they had. Everyone praised

the study in terms of its openness, involving the public, the quality of the data, the quantity of the data. And in the end, she basically is saying these two phase inclusions which contain the record of the heated water, hot water is throughout Yucca Mountain is evident. However, these two phase fluid inclusions are only found in rocks or calcites older than at least 2 million years old. So this -- and she used uranium, lead dating of the opal to come up with this finding. And she took all kinds of samples and basically that's her ultimate conclusion that they are at least 2 million years old which puts in her mind and others the concerns raised by Dublionsky and Shamansky about seismic upwelling potentially occurring into Yucca Mountain, based on the past. It has not happened any time in recent geologic history and Bodner went on in pretty great detail about the fact that the evidence you would expect to see if you did have this type of episodic, heated invasion of fluids and it just isn't there.

Yuri Dublionsky had his change to also counter this. The Board was very, very fair and allowed him opportunity to show his data and his information. He's now kind of saying well, he thinks that there could have been this episodic upwelling

only along the faults which there really, we didn't focus on those in the study. And anyway, the Board was great because they made him address each and every point. It was uncomfortable, I think, probably, forcing him to address, but they did. And I think to everyone's -- most people's satisfaction it looks pretty good, that that's a safe conclusion.

Anyway, that just puts -- since we had opened that up at our own meeting, so I thought I would share that. It was pretty exciting because then Jean would stand up and then Yuri would stand up and Jean would get back up to stand up and then the USGS would stand up and there was a lot of opportunity and very fair, I thought, forum for this discussion.

VICE CHAIRMAN HORNBERGER: It's interesting how science can be politicized. Jean, I think, first reported those results at GSA in Reno, if I'm not mistaken.

MS. DEERING: Probably.

VICE CHAIRMAN HORNBERGER: And boy, she got lambasted publicly in the Reno press and basically had to defend herself in a public forum. It's just very interesting and yet Shamansky and Yuri, this goes on. It's a never-ending sage.

MS. DEERING: Because they're still

missing, I guess a hypothesis of exactly why there are these -- evidence of elevated temperature water.

VICE CHAIRMAN HORNBERGER: Three million years ago, you could still have some heat from vulcanism, I think.

MR. LESLIE: I hesitate to butt in. This is Brett Leslie from the staff. As you may know, we do have an agreement in the near field in which there are some observations that weren't even talked about at the NWTRB meeting that the Center has made and still remained to be addressed, where clearly there were saturated fluids at high temperatures. They have no dates.

Second, we believe that currently the DOE as Lynn suggested, doesn't have a very robust hypothesis for how you can maintain temperatures, elevated above ambient for millions of years after we know that vulcanism occurred. So to kind of further this, I actually got something today from Yuri Dublionsky going through the hypothesis saying that their model which is basically a conductively cooled model is seriously flawed.

So even though publicly the NWTRB thinks things are resolved, there are still on-going information by State-supported people who are going to

follow this and this is one of the reasons why we had that agreement is that we would have the necessary information to address this issue.

VICE CHAIRMAN HORNBERGER: It's clear that the State is going to follow this. In something that Howard gave us this morning, they're saying that Shamansky and Dublionsky have been commissioned to write a Nevada Paper on this aimed at a court case.

MS. DEERING: Yes. Any questions you have about some of this design, what not? I have all these handouts from the meeting, if you require information right away, until I do my report and send the handouts to you.

So this DOE SR process, you got the basic idea?

And you know, NRC will be needing to take into account that new information they receive in terms of these supplementary performance analysis documents, some of which may affect, impact their sufficiency review and so they need to deal with that and factor that into their schedule somehow.

DOE wants their comments, sufficiency comments by October. I think the staff thinks they can meet that, as long as this new information doesn't -- first of all, they don't have exact deliverable

dates. NRC needs to have a better idea of when exactly these documents are going to be coming out. I think a lot of people want to know that, but DOE is pretty nebulous on that.

MEMBER WYMER: Is it really new data or is it just a reformulation of the old information that they're coming up with? In all these new reports that they write, things that are coming up, it seems to me that there's not been enough time to really dig into new information. They must just be recasting --

MS. DEERING: You know, even at TRB meeting in January, they had a lot of new analysis beyond the TSPA --

MEMBER WYMER: So there really is new scientific information?

VICE CHAIRMAN HORNBERGER: Things like this, this fluid inclusion --

MEMBER WYMER: Yeah, that's new.

MS. DEERING: And a lot of these assumptions in some of these conceptual models have changed to be less conservative and they believe they have the evidence to support this. I know in saturated zone that's true. They've got a lot more information.

VICE CHAIRMAN HORNBERGER: I mean there's

still an awful lot of lab work going on at the labs at Livermore and Argonne and what not.

MS. DEERING: It's that time lag problem. They had to lock into that TSPASR quite a while ago and here as the SR decision wants to be -- need to do something this summer, there was a whole year's worth or more of information, somehow needs to be quantified that DOE thinks helps their case for the SR finding.

VICE CHAIRMAN HORNBERGER: It's a little disquieting if it made any major differences, wouldn't it?

MS. DEERING: Yeah. Well, maybe this cooler repository will open up a new can of worms in terms of -- who knows? Maybe there will be some interesting things.

So is the ACNW going to review the S&ER, the Science and Engineering Report and the -- I mean, how do we factor that into our vertical slices? If they're due in June, I guess we're not.

I don't know that we need to. I don't know if it's relevant to our purpose.

VICE CHAIRMAN HORNBERGER: What's due in June?

MS. DEERING: Our vertical slice.

CHAIRMAN GARRICK: What information is in

it that's safety related that we don't have?

MS. DEERING: In the S&ER, I don't know anything other than just a look or consideration of the core repository. I'm only going by hearsay on that one.

MR. LESLIE: I thought it was a consolidation of the AMRs, PMRs and they all get more compact --

VICE CHAIRMAN HORNBERGER: Until they get to something this thick.

(Laughter.)

That's my question. I thought there was more of a matter of consolidation, integration and unification than it was novelty.

MS. DEERING: And as I mentioned this cooler design, in some ways is considered in the S&ER.

CHAIRMAN GARRICK: But if we're expected to use them, we better have the full report and I guess that's on the CD.

We're getting copies of that?

MS. DEERING: We have one hard copy.

VICE CHAIRMAN HORNBERGER: But are the graphs in it using different colored lines, and whenever you make a copy of it those all disappear into a single color and sometimes it's difficult to

sort it out. DOE likes to use these --

CHAIRMAN GARRICK: You said we have copies on the way.

MS. DEERING: CDs.

CHAIRMAN GARRICK: Now the CDs, I assume are colored?

MS. DEERING: Yes. We also are expecting the hard copy to come in for everybody too.

VICE CHAIRMAN HORNBERGER: That's useful.

CHAIRMAN GARRICK: Okay.

MS. DEERING: Thank you.

CHAIRMAN GARRICK: Anything else along these lines because we're going to move from what we're doing now into reports, preparation and what have you and for that part of our meeting we'll go off the record.

(Whereupon, at 2:35 p.m., the meeting was concluded.)

CERTIFICATE

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

Name of Proceeding: ACNW 126th Meeting

Docket Number: (Not Applicable)

Location: Rockville, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

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