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NUCLEAR REGULATORY COMMISSION

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157TH MEETING

ADVISORY COMMITTEE ON NUCLEAR WASTE

(ACNW)

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THURSDAY, FEBRUARY 24, 2005

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike at 8:30 a.m., MICHAEL T. RYAN, Chairman, presiding.

COMMITTEE MEMBERS:

MICHAEL T. RYAN
Chairman

ALLEN G. CROFF Vice Chairman

JAMES H. CLARKE Member

WILLIAM J. HINZE Member

RUTH F. WEINER
Member (Telephonically)

NRC COMMISSIONERS PRESENT:

PETER B. LYONS

JEFFREY S. MERRIFIELD

ACRS/ACNW STAFF PRESENT:

JOHN T. LARKINS, Executive Director, ACRS/ACNW

MICHAEL SCOTT, ACRS/ACNW Technical Support Branch Chief

SHARON STEELE, ACNW Team Leader

THERON H. BROWN

NEIL M. COLEMAN

JOHN H. FLACK

LATIF HAMDAN

MICHELLE KELTON

MICHAEL LEE

RICHARD K. MAJOR

EXPERT PANEL:

BUDHI SAGAR, Technical Director, CNWRA

NRC STAFF:

ANDY CAMPBELL

TIM KOBETZ

PATRICK LaPLANTE

BRET LESLIE

DANIEL ROM

JOHN RUSSELL

RICHARD SAVIO

KING STABLEIN

I-N-D-E-X

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

(8:34 a.m.)

6) OPENING REMARKS BY THE ACNW CHAIRMAN

CHAIRMAN RYAN: Good morning. The meeting will come to order, please. This is the second day of the 157th meeting of the Advisory Committee on Nuclear Waste. My name is Michael Ryan, Chairman of the ACNW.

The other members of the Committee present are Allen Croff, Vice Chair; and Ruth Weiner, who is on the phone or will be shortly; --

MEMBER WEINER: Yes. I'm here.

CHAIRMAN RYAN: Okay. Just wanted to make sure there, Ruth. Good morning.

-- Jim Clarke; and William Hinze.

During today's meeting, the Committee will be briefed by an NRC representative on the status of high-significance agreements between the NRC and DOE concerning the proposed high-level waste repository at Yucca Mountain. We will hear from Commissioner Jeffrey Merrifield on areas of mutual interest in the waste management area. We will discussed proposed ACNW letter reports.

And Mr. Neil Coleman is the designated federal official for today's initial session.

The meeting is being conducted in

accordance with the provisions of the Federal Advisory Committee Act. We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. Should anyone wish to address the Committee, please make your wishes known to one of the Committee staff. It is requested that speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

It is also requested that if you have cell phones or pagers, kindly turn them off or place them in a mute mode.

Thank you very much. Without further ado, we have our first presentation: status of high-significance agreements associated with the proposed high-level waste repository. Good morning.

MR. ROM: Good morning. Thank you. Good morning, ladies and gentlemen.

7) STATUS OF HIGH-SIGNIFICANCE AGREEMENTS ASSOCIATED WITH THE PROPOSED HIGH-LEVEL WASTE REPOSITORY

MR. ROM: This is a brief presentation this morning, which should be fairly straightforward, having to do with the status of the high-significance

agreements for the Yucca Mountain project.

We have done this annually, and we're in a position now where the high-significance agreements are all addressed. And we could almost do this in a single slide. And if you'll go to the next slide for me, please?

If we did it in a single slide, this would be the one. The HML here stand for high, medium, and low-significance risk items, which I'll discuss on another slide for you.

There are 293 agreements total. The other categories of interest: completed agreements, need additional information, and received and in review. Of the 293 agreements total, we have completed and responded to 209. And we have written letters to DOE indicating that we have additional information needs on 15, leaving 69 agreements that are currently in review.

The important agreements we want to talk about today are the high-significance agreements. There are 41 total. And they have all been addressed in letter form to DOE as of about five weeks ago I think the last letter went out on those.

We are not expecting to have any additional comment on those, including the nine

high-significance agreements where additional information is required. So of the agreements, the 41 have all been addressed to DOE.

The ones we're working on now are the mediums and lows. You will see that of the 92 mediums and 160 lows, of those that have been answered or responded to to DOE, 5 of the mediums have additional information needs. And one of the low-significance agreements has an additional information need.

Those that have additional information needs we're considering open. And the total number responded to, then, will include those complete and with additional information needs. So the 224, which is those completed and need additional information, of 293 have been responded to.

Next slide, please. This one you might find helpful with your notes along with the previous slide. This is just a brief description of what we're considering a completed agreement, what falls under additional, need additional information.

And the remainder, of course, is received and in review and considered closed or completed. We have essentially closed the agreement. No additional information is required. The information that DOE has given us has been reviewed and found to sufficiently

address the question.

Those that have additional information needs, the 15 so far, there may be a few more of those in the batch of mediums and lows that needs to go out.

Information has not been sufficient or not all of the information has been available, not all of the references have been available. Again, we will discuss that a little bit more in one of the upcoming slides. So those are the three categories on the agreement status.

Next slide, please. On the risk ranking of the agreements, it was suggested I should spend a little time discussing the difference between the high, medium, and low-risk significance agreements.

In mid 2003, I think the risk ranking was addressed for all of the agreements in an effort to help us economize on our time and address the open agreements as efficiently as possible.

The high-risk significance agreements were information requests that had the potential to alter the risk estimates significantly. Medium-risk information request has some influence on the risk estimates. And, finally, the low-risk category information request is expected to have little effect on the risk estimates.

We were asked to get the high-significance agreements addressed most promptly, particularly when we believed the license application was imminent. And that's why the highs have all been addressed at this point. The mediums and lows are currently in the works and expect to have those all addressed by April 15th.

Let's have the next slide, please.

CHAIRMAN RYAN: Just to clarify, --

MR. ROM: Sure.

CHAIRMAN RYAN: -- that's all the mediums and lows will be addressed by April 15th?

MR. ROM: That's right. Of those remaining, they are all mediums and lows. Sixty-nine of them are currently being reviewed. They're bundled together somewhat. We have approximately 25 letters that are addressing those.

And those numbers are changing daily. Those are being addressed pretty quickly. Most of them will be addressed well before April 15th, but we expect there may be a couple that take us up to April 15th to get out responses to DOE on.

CHAIRMAN RYAN: Just to back you up a slide, the needs additional information category, --

MR. ROM: Right.

CHAIRMAN RYAN: -- you know, you've got two possibilities here. NRC has responded to DOE and has identified information needs. That means you're kind of waiting for something.

The second part is or waiting for supporting documents to be made public. That implies to me that perhaps you understand and have probably seen the information but are waiting for it to come to the public process.

MR. ROM: Right, yes.

CHAIRMAN RYAN: I mean, you're a little bit more advanced in the second part than, say, the first part.

MR. ROM: That's correct, yes. Some of those we have actually seen some documentation. We're just waiting for some of the supporting documentation to be made public.

CHAIRMAN RYAN: Okay. I mean, that's helpful to have an insight that the work has progressed down the road some, rather than just here waiting.

MR. ROM: Yes. In fact, if you want to skip ahead, I'll come back to this slide. If you want to skip ahead about three slides to the one that's titled "Three Categories of Open High-Risk Significant

Agreements," this might be a good time to shed a little more light on your question. Thanks.

Of the 15 so far identified with additional information needs, they actually fall into these three brackets. The information has not yet been made public, in which case we have reviewed non-public information. Those should not be too difficult to complete once the information is made public.

There is a category with models needing clarification. DOE is aware that we are looking for clarification on the modeling. And then the last category is difficult issues, which of the 15 appear to be centered on volcanism and aircraft hazards. So we can lump those 15 with additional information needs under these 3 brackets. Thanks.

Would you back up now to where we were? We have a list of those 15 to fall into these 3 categories. Of the 15, that gives us the first 5 of the 15. This identifies the agreement, indicates what the information need is. These are all high-risk. The subsequent slide will show also the few that are mediums. And that's in the low-risk category.

The information needs are identified in this column. And I think if you'll match them up to

your slide which you do have in your pack, you will see that you can match them up to one of the three categories: information we have made public, a model needing clarification, or if it is a difficult issue.

I will note that there are two agreements that are somewhat different. That would be GEN 1.01 and TSPAI 2.02, which will show up on the next page, which are kind of catch-all agreements and include comments on numerous items. So GEN 1.01 and TSPAI 2.02 are being handled somewhat differently but also in letter form. However, there is quite a lot of meat to GEN 1.01 and TSPAI 2.02 because of the way they were set up.

Unless there are any questions on this slide, let's move to --

MEMBER HINZE: If you wouldn't mind, Dan? Do you ever reopen an agreement? I know you have provision for that. Let me give you an example: the aeromagnetic data review.

MR. ROM: Yes.

MEMBER HINZE: That has led to new information regarding faulting in the Yucca Mountain region. And I'm wondering if that is being incorporated in the seismic analysis and whether you're looking at that to see whether the DOE is

indeed incorporating that new information, not just in the U.S. activity area but also in other areas where it's germane.

MR. ROM: Okay. If my supportive staff will help me out if I'm wrong, that is being --

MR. LESLIE: Bret Leslie, NRC staff.

MR. ROM: Thanks.

MR. LESLIE: Dan mentioned that some of the agreements might go out to April. In fact, the seismic one is one of them where DOE has changed its approach and we're going to do a series of topical reports. I'm trying to come up with a path forward so that they can discuss with the NRC in a public forum their path forward on how to deal with this issue.

One of the issues that you have raised is part of our concerns. And so what we're looking for right now is we're trying to develop that pathway to be able to address it in a public forum so that we know that they are going to be treating.

MEMBER HINZE: Well, would that be considered an open item, then?

MR. LESLIE: It's an agreement that hasn't been responded to.

MEMBER HINZE: I see. So it's --

MR. LESLIE: It's still open.

MEMBER HINZE: Okay. Thank you.

MR. LESLIE: It's one of the medium agreements where we're following it at this point in time.

MEMBER HINZE: But there is the case or you do have provision for reopening if you see that sort of information?

MR. LESLIE: Yes. That is correct as well.

MEMBER HINZE: Okay. Great.

MR. CAMPBELL: And just to add -- this is Andy Campbell, also with the NRC -- none of the closure, completion of agreements, means that the issue can't be raised again in the license review.

We have been saying this for quite a few years, that whatever we review in the license application is material in the LA. So even though we may have completed an agreement, it doesn't mean that that issue can't be raised in the context of the license application review.

MEMBER HINZE: Well, it's so important because a lot of these processes are coupled. We have discussed that ad nauseam, Andy. And that is very important that we don't let something slip through that is coupled to another agreement.

Have any agreements been reopened?

MR. CAMPBELL: None that have been completed so far.

MEMBER HINZE: Okay. Thank you.

CHAIRMAN RYAN: One additional question. Jim Clarke?

MEMBER CLARKE: I just wondered, as you go through these slides, could you clarify some of the acronyms, please?

MR. ROM: Sure will.

MEMBER CLARKE: IFA I could figure out.

MR. ROM: Okay.

MEMBER CLARKE: Are these model abstraction correlations or what is ENFE, for example?

MR. ROM: Okay. These are agreement names. And I originally had a slide on this but culled it out. ENFE: engineering near-field environment. That's one of the groupings of agreements.

MR. HAMDAN: One of the KTI sections.

MR. ROM: Right, yes. Right. These would be the key technical issues. ENFE, engineering near-field environment, is one of them. GEN 1.01 is unique. That's some general comments. As I said, that's one that has comments that apply kind of all

over the board. IA: igneous activity.

MEMBER CLARKE: These do track to model abstractions or a 13?

MR. HAMDAN: Yes, yes.

MR. LESLIE: This is Bret Leslie from the NRC staff.

These agreements reflect the key technical issue teams that the NRC was using several years ago.

MEMBER CLARKE: Okay.

MR. LESLIE: And these agreements were the result of technical exchanges with the Department of Energy.

MEMBER CLARKE: Right. Okay.

MR. LESLIE: So, for instance, ENFE is evolution of the near-field environment, primarily focused on the geochemical environment.

MEMBER CLARKE: Okay. Thanks.

MR. ROM: Thanks. Did I say "engineering"? Evolution. Thanks.

MEMBER HINZE: Have we gone through those all?

MR. ROM: Yes. I'm sorry. Unless there are any other questions on acronyms. TBD: technical basis document.

MEMBER HINZE: Well, I was wondering, on

that slide there, the tephra or remobilization, the ash remobilization, the fourth one there, is that still an open item?

MR. ROM: Yes. All of these that have additional information needs we're considering open right now.

MEMBER HINZE: Is the remobilization part of that one? Tephra dilution rate, does that also mean remobilization?

MR. LESLIE: Bret Leslie from NRC staff. Yes, it does.

MEMBER HINZE: Okay.

MR. ROM: Thanks, Bret.

I don't have all the technical answers for you, but I think we've got the folks here who can if more of these questions come up.

On to the second of that grouping, three is pre-closure, additional reports. This is one of the agreements that requires additional documents be made public.

Three TSPAI items that are of high significance. That's the end of the high significance. So the first nine, then, were high-significance agreements that are open and are considered having additional information needs.

Several mediums, igneous activity, TSPAI.

And if you'll move to the next slide, please, it gives us the rest of the remaining open or need additional information agreements at this point: TSPAI, USFIC, and pre-closure 704. Again, if there are any specific questions, I'll do my best or have staff here answer those for you.

Of those agreements needing additional information, of those 15 -- and there will presumably be a few more after the remaining 69 responded to also -- at this point, we expect that the information needs will be addressed in the license application.

There is an opportunity for more interactions before license application time. So there will be an opportunity to discuss items that may affect the classification currently.

Okay. If you'll move on to the next slide, please? Thanks. The gist of the matter -- and this is what you asked me to speak about today -- the high-risk significance agreements have all been responded to as of January of this year.

Those that remain open because of difficult issues are typically volcanism and aircraft hazards. Those are the two that have caused us to have some open items there.

Of the remaining, which are medium and low significance items, we're on schedule to get them all addressed by April 15th. The schedule is moving along well right now. And of those agreements, the mediums and lows, I suspect there may be a few more that will go into the need additional information category and will be left open.

We're not expecting to see any written DOE response to the open agreements, those that need additional information, prior to the license application. There should be opportunity to discuss those or some of those items with DOE, but there is no new protocol on DOE addressing those items in writing prior to license application.

Any questions on that presentation?

CHAIRMAN RYAN: Questions, Bill?

MEMBER HINZE: Well, I don't know whether it's appropriate to ask, but has any thought been given to the risk significance if, indeed, we start looking beyond 10,000 years?

MR. ROM: Yes. Bret, do you want to?

MR. LESLIE: This is Bret Leslie from the NRC staff.

Again, agreements at this point they're somewhat historical in the sense that most of the

technical exchanges occurred back in 2001. And at this point, it's premature for the NRC staff to speculate what would be in a standard and what would impact how risk is determined in that standard. So the answer to your question is we haven't gone there.

MEMBER HINZE: Thank you.

MR. ROM: Thank you, Bret.

CHAIRMAN RYAN: Anything else, Bill?

MEMBER HINZE: That's it. Thank you.

CHAIRMAN RYAN: Allen? Jim? Ruth?

MEMBER WEINER: Yes, I had a couple of questions, first a general one. Has this process gone approximately as you envisioned it would? Were there any big differences between what you expected the schedule of resolutions for?

MR. ROM: I would say there are always schedule surprises, but we have adjusted pretty well. We continue to adjust. We, of course, originally expected the license application in December. And, as there was such a mass of information to respond to and it appeared that we would not be able to answer all open items before the December '04 deadline, we made the decision to address the high significance agreements.

And it became obvious towards the end of

the year that that license application date was going to slip. And, even knowing that, it still took us until mid January to address all the high significance items. And that was with an awful lot of staff effort.

However, the exercises helped on addressing those remaining items that are mediums and lows. And we're making very good progress on that and getting good cooperation with OGC.

But, to answer your question, I'd say there has been quite a bit of adjustment to schedule and finding that items have not been overlooked, for instance, with the GEN 1.01 and TSPAI, which are fragmented into dozens of comments, actually. It became quite a challenge to address all of the individual comments, some of which could be as time-consuming as a single agreement and some of which are still being worked on.

So yes, there have been schedule changes that need to be with good adjustment on staff's part, I would say.

MEMBER WEINER: Thank you.

MR. ROM: You're welcome.

CHAIRMAN RYAN: If I could maybe turn back to the status chart?

MR. ROM: Okay. That's the first slide after the intro, I think.

CHAIRMAN RYAN: Over the last year or so, my predecessor Dr. Garrick would talk about the bow wave. It looks like the bow wave is a whole lot smaller now than it has been in the past, which is good. And, if I understand you right, you will have zeros across the high, medium, and low and in the received and reviewed column by April 15th?

MR. ROM: That's correct. Those columns will be zero by April 15th.

CHAIRMAN RYAN: Right.

MR. ROM: And not only is there progress, but there is a lot of momentum right now --

CHAIRMAN RYAN: Great.

MR. ROM: -- in the letters, I would say.

CHAIRMAN RYAN: Well, one of the things that strikes me is that at some point after that process kind of comes to a close around the middle of April, you'll have, I think, at least I could envision where you would have in your hand a view of what key issues are going to be as you then think about how you transition into the license application, where the action is, for lack of a better term.

The Committee over the last few months has

focused on the igneous activity as an issue.

MR. ROM: Right.

CHAIRMAN RYAN: In some of these you have here, for example, Professor Hinze is tracking that PBHA review work and so forth and so on.

Could you give us any insight as to what you think we should focus on as we continue to look particularly at that agreement?

MR. ROM: Specific items dealing with volcanism?

CHAIRMAN RYAN: General or specific, what you think would be helpful or useful for us to take a look at.

MR. ROM: Yes. Bret, can you?

MR. LESLIE: I think the positions and the things that are identified are in the letter. And if you don't have a copy of the letter, we will get you a copy of the letter.

CHAIRMAN RYAN: Yes, I'm sure I have it.

MR. LESLIE: I think that's the best answer.

CHAIRMAN RYAN: Okay. That's fine.

MR. ROM: Yes, each of the letters is very specific on those portions of the agreement that we are looking for additional information on.

CHAIRMAN RYAN: Yes. And I think if we could make sure we are as current as you are with everything that you have put back, that will help us as we shape up our agenda for that activity in the next few months.

MEMBER HINZE: I guess if there is any information regarding canisters in the near-field environment, that, too, would be of great interest to us if there's --

MR. ROM: There's quite a large number of agreements dealing with containers. And a lot of the letters dealing with those specific agreements are in process right now. So that's one that you might want to watch.

I'm not aware of any burgeoning problems in that area, but there are quite a few agreements. And they are still being worked on at the moment.

MEMBER HINZE: Are we on track to get copies of those letters?

MR. LEE: Yes, we get any publicly available information that is exchanged between NRC and DOE.

MEMBER HINZE: Well, I think the Committee would be very interested in having those when they do become available.

CHAIRMAN RYAN: Yes. I mean, the obvious progress you have made is helpful to us because that allows us to focus on these key letters and information.

MR. CAMPBELL: This is Andy Campbell.

The letters are all available in Adams. What we can do is we can ensure that if you are not on distribution for any particular -- I think you guys are. I think ACNW does receive them. But if you need a particular letter, then we can get that to you.

CHAIRMAN RYAN: Great. Thanks.

MR. ROM: Right. And I am tracking the Adams, too, and should always be able to pull up an individual item if need be.

CHAIRMAN RYAN: If we can make sure that we're up to date to where you are, that will let us be caught up. And then we can move forward from there. So can we make that happen, Latif or Mike?

MR. LEE: Yes.

CHAIRMAN RYAN: Okay. Thank you.

MR. LESLIE: This is Bret Leslie from the NRC staff. I want to kind of amplify on and respond to Dr. Hinze's question.

You will notice that on Dan's chart, none of the high agreements associated with CSLT are open.

And so from the staff's perspective, waste package agreements, the information DOE has provided is sufficient for us for now to have answered our question.

There was an evolution of the near-field environment agreement in TSPA 3.09, which has to do with how uncertainty is being treated in terms of the geochemistry and the coupling of the models. And so in terms of container issues, it's not container-like in source term. It's more of the coupling of them. And so those are two agreements.

MR. ROM: Yes. Thanks.

And, again, I mentioned that are some CSLT agreements that are still being worked on. Should there be any open items in those agreements, obviously they would not be of high significance. But I'm not aware of any coming up that are going to be in that additional information needs category.

CHAIRMAN RYAN: That's great. Any other questions? Mike?

MR. LEE: Yes. I have a kind of a process-related question. And it's kind of a segue onto some responses we've gotten from the staff previously. As the process is laid out right now, the desire is to make sure that there is sufficient

information at the time of the license application to do a review of the license application. Is that correct?

MR. ROM: I'm sorry? Would you rephrase that?

MR. LEE: Okay. The way the issue resolution process is currently defined, the intent is to ensure that there is sufficient and high-quality information to review at the time the license application is submitted.

And on reviews that you have done, you have no longer any questions or comments, can the Committee assume that that means there won't be any requests for additional information once the application comes in contingent on the information still being the same?

I mean, it's kind of a hypothetical question, but I guess the question is --

MR. LESLIE: This is Bret Leslie, NRC staff.

MR. LEE: Sure.

MR. LESLIE: I'd kind of answer it in a visual way. DOE has presented at last week's management meeting kind of a hierarchy of how their license application and all the supporting documents

would be generated.

And what the staff has been reviewing primarily is down in the middle. So the basis for their license application, we have been reviewing the supporting documents, but we haven't been reviewing their license application.

So you can't necessarily leap and say that we won't have any questions because we will have to review what's in their license applications where their information they provided was according to our regulatory requirements.

MR. LEE: I guess my question is the efficacy of this particular approach. If what you say is true, the expectation is the information that's in the license application is consistent with the technical basis documents and that you're hoping that there is a high success of consistency, if you will, between the two because of the timetable for --

MR. LESLIE: Correct.

MR. LEE: Okay.

MR. CAMPBELL: Okay. One other thing I want to add -- this is Andy Campbell -- is that the fact that some agreements are in an open state when the license application comes in does not mean we cannot review those areas.

The intent of the agreements was to ensure a high-quality license application and that that high-quality license application would facilitate an expeditious review given the timing imposed by the Nuclear Waste Policy Act.

MR. LEE: Right.

MR. CAMPBELL: The lack of closure on all the agreements doesn't mean we can't review it. It may mean that there is more work that might be involved in particular areas than if that area had been completed.

MR. LEE: The second question is related to aircraft hazards. I see that Tim Kobetz is here. Could you summarize briefly what the issue is there or what remains to be done?

MR. KOBETZ: Sure. We had a meeting with them in September of 2003. And the information that they had at that time wasn't that up-to-date. And they told us they would get back to us in about six months after that. Well, it's obviously gone a little farther. They're reassessing, I think, how they are going to evaluate the aircraft crash hazards.

They're writing two reports or finishing up two reports that we're going to review when they're publicly available: one on the identification of the

hazards and the other on the frequency. And hopefully we're going to have a tech exchange on it this summer.

MR. LEE: Okay. So, really, what impact does this have on your ability to close issues at the staff level on the pre-closure safety assessment that DOE will be doing or is working on?

MR. KOBETZ: Say that again.

MR. LEE: It's been identified as a high-significance issue.

MR. KOBETZ: As far as the pre-closure safety analysis, this isn't the only thing that is sticking out.

MR. LEE: Okay.

MR. KOBETZ: And that's a broader question. We have to go through and make sure we understand all of their hazards, not just this one, all of the event sequences, all the consequence analysis, and then determine.

MR. STABLEIN: This is King Stablein from the NRC staff.

Just following up a little bit to remind -- Mike knows this very well and some of the Committee members, too -- that the issue resolution process that we're looking at here, the key technical issues were aimed at the post-closure. And the pre-closure area

is not as far along in this program as the post-closure.

So we did not capture the pre-closure issues in key technical issues or in the agreements with one or two exceptions. The aircraft hazards is touched on in one of the pre-closure agreements.

But there are a lot of pre-closure issues out there which are not deal with by this process. And we are working on those issues now. We will not be setting up a parallel process with agreements at this time.

But Tim heads up our pre-closure team, and he is interacting with DOE on those issues, highlighting which ones are most important. And we may well have a series of interactions on those in the coming months.

CHAIRMAN RYAN: I wonder if it might be useful to think about a briefing to the Committee on the pre-closure review issues and processes and where you are and so forth.

MR. KOBETZ: I can talk to the staff about that and see what it would be in your best interest.

CHAIRMAN RYAN: Thank you.

John?

MR. FLACK: Yes. I just have a question

on the ratings: the high, medium, and low. After the application comes in, do they remain the same? I mean, are you kind of locked into those levels, those bins, those high, medium, low?

MR. ROM: There's no plan on changing that at this point.

MR. FLACK: Now, if, for example, the period of time that's considered later on has an influence on these rankings, how would that change? I mean, is your review based on that? And does like high receive more attention than medium and low and that could get switched around or how would that work?

MR. ROM: Well, hypothetical. Bret, do you want to?

MR. LESLIE: Bret Leslie, NRC staff.

The rankings of the agreements came out in a report in 2003. In 2004, the staff wrote a risk insights baseline report, which describes the staff understanding of those areas that have high significance to waste isolation.

And in that document and in subsequent briefings to the ACNW, we have identified it is not the agreement rankings that control where the risk information comes from to risk-inform our review. But it's the risk insights baseline report that does it.

MR. FLACK: Right, right, right.

MR. LESLIE: So, in essence, the rankings of the agreements don't control where the staff will be focusing on during the licensing review. If you want to understand right now what the staff is thinking about, it's a different report, risk insights baseline report.

MR. CAMPBELL: One additional item to add to that -- this is Andy Campbell, NRC staff -- is that as we review the license application, it is the license application, the material in that, which will drive our understanding of the significance of issues.

We have used the risk insights interactions and activities in the development of the risk insights baseline to help focus our prelicensing program, but ultimately in the review of the license application, it's what DOE gives to us that will really be where we're looking at in trying to understand what's important.

CHAIRMAN RYAN: John?

DR. LARKINS: Yes. Just a quick question. You said you don't anticipate getting or don't expect getting any written responses to those areas that you said need additional information. Are you anticipating any public exchanges, technical

exchanges, with DOE on those?

MR. ROM: It's conceivable. There are a number of potential interactions, some of which may involve some of these, if I'm not taken. I think some of these, if not all, would be included in some likely upcoming interactions. So there will be more opportunity to delve into those issues in the next few months.

CHAIRMAN RYAN: Thank you. Any other questions, comments?

(No response.)

CHAIRMAN RYAN: Thanks very much for your presentation. We appreciate you being here.

MR. ROM: Thanks for the opportunity.

CHAIRMAN RYAN: Thank you all.

DR. LARKINS: I need to make an announcement. I just got a note that because the Commission has had to change its schedule, they were planning a meeting, Commission meeting, this afternoon, they were a little concerned about the weather. So they've switched their Commission meeting until this morning at 10:30 to 12:00.

So Commissioner Merrifield will not be able to get over here until after lunch. And right now it looks like his schedule is to be here at 2:00

o'clock.

CHAIRMAN RYAN: Okay. We adjust.

Yes, Carol?

MS. HANLON: Can I just make a couple of comments if you don't mind following that presentation? There were a couple of mentions on making documents publicly available. And I did want to say that we are aggressively pursuing getting all of the AMRs on the Web. I think that the staff knows that. But I wanted to just say that we're proceeding with getting all of our AMRs on the Web.

And also, as the staff requests specific references that they need to address, specific references that they're looking for, we're also putting them on the Web, thus making them publicly available.

In reference to some of the discussions they had that we've had regarding the additional information items, we're looking into taking action to address some of those additional information needs, what we could do in the interim to address some of those.

I think Bret was out a couple of weeks ago. Unfortunately, I missed that interaction. But we're looking into what we may be able to do in the

interim to address those. So I just wanted to make those comments.

CHAIRMAN RYAN: Thanks, Carol. I appreciate that.

Any other comments or questions?

(No response.)

CHAIRMAN RYAN: Okay. We have two things on the agenda. Looking ahead a bit with Commissioner Merrifield coming this afternoon, we could perhaps do one of two things now: start the presentations from the center and take our letter-writing activity a little later on.

DR. LARKINS: If they can accommodate. I'm not sure. It's about --

CHAIRMAN RYAN: I'm just trying to offer that, offer that up a bit. Budhi, what do you think?

DR. SAGAR: I'm flexible.

MS. KELTON: What about people that may wait until 1:00 o'clock to come? They now miss his presentation.

CHAIRMAN RYAN: Well, I guess what we can do is just take our letter-writing, then.

DR. LARKINS: Yes. Is there supposed to be a link with the center for this presentation? The only thing I'm concerned about is if something happens

and the weather turns bad, you may miss it. What if we try to schedule Budhi's presentation at 11:00 o'clock?

CHAIRMAN RYAN: That would work. That's not a huge change. If that works for you, Budhi?

DR. SAGAR: I'm flexible.

CHAIRMAN RYAN: I mean, I'm just trying to balance the weather, the Commission's schedule, and all of that.

DR. LARKINS: I would hate to have him make this trip and then have to reschedule.

CHAIRMAN RYAN: Yes, right. So we'll proceed with the letter, which we should I think successfully complete in short order, hopefully. And the one letter we have written we can discuss whether we need to write another on the issue resolution presentation we just heard and take a short break and reconvene at 11:00 for the start of the center's presentations.

DR. LARKINS: Sounds good.

8) PREPARATION OF ACNW REPORTS

8.1) AGREEMENT STATE PROGRAM

CHAIRMAN RYAN: Okay. The first item on the letter-writing agenda is the agreement state program. We heard I think an interesting presentation

from Paul Lohaus on the agreement state program and, in particular, on the impact program and how it's used to review agreement state programs and the letter. We'll come out and we'll read that letter into the record and then consider it and go from there.

DR. LARKINS: Yes.

CHAIRMAN RYAN: John?

DR. LARKINS: You don't need this in the transcript right now.

CHAIRMAN RYAN: Oh, we do not?

DR. LARKINS: Pick up the transcript at 11:00 o'clock.

CHAIRMAN RYAN: 11:00 o'clock. Thank you very much.

(Whereupon, the foregoing matter went off the record at 9:16 a.m. and went back on the record at 10:54 a.m.)

CHAIRMAN RYAN: And we're now in the capable hands of Dr. Budhi Sagar, who's going to talk to us for some activities at the center. Again, we appreciate your flexibility on schedule. The weather has upset everybody's schedule apple cart today. So thanks for being with us, Budhi.

DR. SAGAR: Good morning. And thank you, Dr. Ryan, Committee members. I appreciate the

opportunity to make this presentation today.

10) CNWRA REPORT -

ACCOMPLISHMENTS AND FUTURE PROJECTS

DR. SAGAR: As you all know, the Center for Nuclear Waste Regulatory Analysis located in San Antonio provides technical support to NRC, primarily in the repository program area but also in some other areas.

What I plan to do today would be to give you what I call a management-level overview of various activities of certain key technical issues for the past year, try to indicate to you what is planned for this fiscal year, in '05.

And not all of the KTIs will be discussed. The selection was made by your Committee as to what I should talk about. And just I want everybody to know that a subset of the ACNW members would visit the center in April, I think April 14th and 15th, to talk about it in much greater detail on certain aspects of some of these issues.

I don't know what the schedule -- with the change in schedule, whether I continue to speak now and the discussion session would be in the afternoon or I speak for a half an hour, then we talk about, discuss questions in the first half an hour.

CHAIRMAN RYAN: I'd say we'll be interrupted at some point by Commissioner Merrifield's modified schedule due to the weather. So I would suggest stick to your original game plan.

DR. SAGAR: Okay.

CHAIRMAN RYAN: And we'll take a pause for that session and go from there. Is that a workable plan?

DR. SAGAR: That's fine.

MEMBER WEINER: Yes. That's good.

CHAIRMAN RYAN: I know you have other folks standing by and so forth. So, again, I appreciate everybody's help.

DR. SAGAR: Okay. That will be fine.

Okay. The outline essentially lists all of the topics that were selected by the Committee for me to present. The only thing I'd like to point out is that all of the topics except this topic here are related to the high-level waste program or the repository program. And some of these names have become pretty common by now. These are the names of the so-called KTIs, or key technical issues.

This topic here is not related to the repository. This is related to the work that the center is doing on decommissioning. So that's at the

end of my presentation I'll talk about this topic.

The program overview, for some reason I had a slide on funding because I was asked to --

CHAIRMAN RYAN: It's in our package, yes.

DR. SAGAR: What happened here I have no idea.

CHAIRMAN RYAN: I think you skipped over it. It's actually slide 4.

MR. HAMDAN: Keep going back.

DR. SAGAR: Keep going back?

MR. HAMDAN: Before this.

DR. SAGAR: There it is. I'm sorry. Okay. In fiscal 2004, there were $16.4 million on the repository, including Spent Fuel Project Office, which is the contingency which has gone through the hearing process.

This is called charter programs. And in fiscal '05, this was raised to 19 million with the assumption that the license application would be submitted by December 2004. Since that did come in, we are modifying the operations plan now to define a scope of work with the contingency that a license application may come in by December 2005. We don't know exactly when. So, actually, we intend to spend less money than is there for 2005 and keep some for

2006 as a carryover from this year.

The non-charter programs, which have several small components, decommissioning, and environmental impact statement, the fuel cycle safety and safeguards integrated safety analysis on certain facilities, I've given you the thousands of dollars that were for fiscal 2004 and for fiscal 2005.

As you can see, it is a small part of the overall work. The major work is in the high-level waste program.

MEMBER HINZE: Is it possible to ask questions while you're --

DR. SAGAR: I would be happy. It's up to you.

MEMBER HINZE: Well, I realize we all can use more money at all times. But I'm wondering, like that 16.4 there, how close does that come to what you requested or what you budgeted out for the research that you thought was particularly important to the charter programs?

DR. SAGAR: It comes pretty close to what we requested. It's a negotiation process. And we do have a priority list. Not everything can be done, as you said. I agree with you, probably as much money as we could spend if we had it.

I think the high priority, the items that are significant to either waste isolation or pre-closure safety can be done.

MEMBER HINZE: What is the role of the scientists and you as the technical senior in deciding prioritizing where that money should be spent within the program? How much of that comes down from the NRC, and how much comes from suggestions by you? Could you go through the process with us a bit?

DR. SAGAR: Yes. I mean, the President's budget is submitted in February, January, February, and it's always a year ahead. Like the 2007 budget is being discussed now. So you have to kind of think ahead of what you might be doing in 2007, what would be important. And there is some guesswork involved in that.

The center doesn't get involved in the planning process. We do advise the NRC staff as to what we believe are the high-priority items. And then we do discuss it with the NRC staff. Some items after discussion we find are not as important as we thought or vice versa. So there is a significant amount of input from the center, the technical staff in the decisions.

And, as any budgeting process, I mean,

there would be more items of activity or projects suggested than we get funded. And then we have to decide which is more significant than others.

MEMBER HINZE: Are there any critical programs that you believe you should be doing at this time that you're not doing?

DR. SAGAR: Well, the critical programs will be related to -- I think there is a risk here because, as the EPA standard becomes known, there may be something critical which we have to do which we cannot do right now if the EPA standard does become known.

As far as the fundamental processes are concerned, I would be hard-pressed to name something that we are not doing that we need to do. Now --

MEMBER WEINER: I'm sorry to interrupt, but I can't see anybody.

MEMBER HINZE: We can't see you either.

DR. SAGAR: Ruth, could you please repeat your question?

MEMBER WEINER: Okay. What do you envision the role of your research program to be once the license application has been submitted to NRC?

DR. SAGAR: Well, let me first make it clear that when we talk about research programs,

sometimes people think research program is what Office of Regulatory Affairs sponsors at the center, which it used to.

There is no such program anymore at the center, but research in the sense of doing some advanced type of work does go on. And the role would be basically two-faceted, I think. One would be there would be some issues that might come up in the license application that may require scientific examination, either lab work; going to the site itself; or analysis, advanced type of analysis.

An example would be a crash. The DOE design includes a berm, as I understand. Well, the structural stability of that berm to reduce the crash hazard may need to be investigated. I'm not saying it will but may need to be investigated. You might call that research because there would be advanced matters that may be required.

Similarly, in post-closure, there may be certain critical issues, volcanism being one, for example, that might require an independent piece of scientific work. That would be the primary role during the LA review for that kind of work.

I don't know if I answered your question, Ruth, but --

MEMBER WEINER: Okay. Thanks.

MR. HAMDAN: Can I ask a question, Mike?

CHAIRMAN RYAN: Please.

MR. HAMDAN: That's all that the system would do when the license application comes in? He will not review the license application with the staff?

DR. SAGAR: No. I'm not saying that at all. Just give me a minute, and then Andy can speak. There is a whole project plan that has been prepared for the LA review, which has team formations, which are teams jointly between the NRC staff and the center staff who are conducting the review for writing the SER sections and so on and so forth. And those same teams would with discussions between them decide what part needs to be investigated independently, what analysis needs to be done, and so forth.

So there is a whole blend with the source loading, with the schedule, and so on. And the center would participate in almost every aspect of the whole process.

Andy?

VICE CHAIRMAN CROFF: That's a very well-laid-out description of the plan and the team structure and everything that we have in place. I'll

just point out that that will probably be the vast majority of center activities during the license application review, working with staff on individual segments of developing the SER, dealing with a variety of other things associated with the license application review and production of the SER.

MR. HAMDAN: That's what I thought. Thank you.

DR. SAGAR: Yes. In fact, the, quote, "research," unquote, kind of work would probably be much less at the time of license review than has been in the past.

Okay. Any other question?

(No response.)

DR. SAGAR: Moving on, then, let me first kind of summarize the technical accomplishments in the fiscal year 2004. You have already discussed quite a bit this morning about the KTI agreements. There were 293.

The way we worked this one was that the center staff, the technical staff, did their reviews and provided what we call input to the NRC. It's not true that all of that input was provided in fiscal 2004. By the 15th of December this calendar year, the center had completed its review, provided input to the

NRC for them to add onto whatever the center had provided to prepare the letters that would eventually be sent to DOE. So this was a very time-consumptive piece of work.

I mean, whatever is in the letters is actually what is in the public domain. So whatever we could get by a certain date from DOE, that review was completed and the comments written.

DR. LARKINS: Can I interrupt you and go back to a comment that Andy made and follow up on Latif's question? Do you as part of this team that will be reviewing specific parts of the application currently have within your staff and budget those people and things in place to implement this plan upon receipt of the LA or are you going to have to go out and supplement and build up?

DR. SAGAR: Andy could answer the NRC part of this on the staffing issue, but at the center, we have at this point about eight positions open. However, there is, I would say, sufficient staff in most areas, most disciplines that we would need for a later review.

There are certain other areas which are so specialized that neither the NRC nor the center will probably have a full-time staff for those areas. And

we have consultants and subcontractors in place which are free of conflict of interest that would help us in that review.

DR. LARKINS: Okay. That's what I wanted to know. Thank you.

VICE CHAIRMAN CROFF: Let me just add on to that that we have identified areas where we may need technical assistance requests or user need requests to the Office of Research and possibly to Division of Waste Management. Those are included in this plan.

By and large, we have the staffing capability on board. I mean, obviously, you know, people come and go. So we have to replace people. But we're there.

DR. LARKINS: Yes. My question is, do you have the basic constituents to fill those teams?

VICE CHAIRMAN CROFF: Yes. As we sit here right now, we do.

DR. SAGAR: Another big activity last year was the upgrading of the TPA code, which is the total system performance assessment code developed jointly by NRC and CNWRA staff.

By the way, I should say that up front that many of the work or activities I would present

here had been conducted jointly. So I don't want to take all the credit for the center here. NRC staff has contributed to many of them. And I don't want to say it again and again every time I go on an activity. The TPA code is certainly an example where both the staff worked together.

We are at version 5.0. I think the version 1.0 was written in 1993 or '94 time frame. So over the years, as we have learned more and gotten more data and learned more about processes that should be included in the TPA code that has been updated.

We thought version 5.0 is the version we will use for the LA review. Of course, the LA being delayed and the EPA standard may, we don't know which way it will change. It might require some changes. And that could be a schedule risk that we would run depending upon the time difference between when the LA comes in and when the EPA standard is finalized, but that's something we have to watch out.

Here are a few of the factors we have included. I hope Ruth has a copy of my presentation.

MEMBER WEINER: Yes, I have a copy.

DR. SAGAR: I'm not reading every word here.

MEMBER WEINER: Yes.

DR. SAGAR: You will have to --

MEMBER WEINER: That's fine. I'm glad you are. I do have a copy of it.

DR. SAGAR: Okay. Good. The PCSA is a code similar to the TPA code for post-closure PCSAs and for a pre-closure, pre-closure safety analysis tool, which integrates the analysis of the hazards during the operating period. And we started much later in the development of this if you remember the history during 1995-96, when the budget was cut.

The pre-closure safety analysis took the biggest hit, the thinking being that the NRC has been doing this kind of licensing action for many, many years. So even though this is not exactly similar to or the same as others, the components are very similar. So this could be actually a bit later.

I think we started on it about four years ago. We have put an inordinate amount of resources into this. And the tool version 3.0 was supposed to be the tool that would be used again in the later review.

The design being a little bit fluid, the design being a little bit fluid, this might again require some updating in fiscal '05 or fiscal '06 depending on what we finally see.

We did include a worker dose calculation in this code in 2004. And there are two components. There is a database which has the reliability of various engineering systems included based on the industry literature. And it has the calculational part. So it can do probablistic safety analysis if we needed to.

The idea is not to repeat everything DOE does, just like in TPA code, but pick and choose those items that we believe would be most significant to people in safety and analyze those.

DR. LARKINS: And consequences of drift degradation --

MEMBER WEINER: Before you get away from that slide, --

DR. LARKINS: Ruth?

MEMBER WEINER: -- have you done anything with the TPA code that extends past 10,000 years?

DR. SAGAR: We have not. I mean, the TPA code was already capable of doing 100,000 years. And we have not gone beyond that at this point. We have the staff direction basically saying think about what you might need to do but not speculate on what the EPA standard would be, for example, and necessarily spend too much resources modifying it to that speculation.

I think we are doing more work at the lower level than TPA, the process level.

The question being asked is, what if we extend the time of compliance? Does something fundamentally change? So can I ask a spectral geologist that we have at the center and say, "What do you think? Is there some basic process that would change that has to be factored into TPA but not really work on TPA code at this point?"

DR. LARKINS: Consequences of drift degradation, is that from rock fall igneous event or --

DR. SAGAR: Yes. It is from the calculation of all the effects. This could be terminal. This could be hydrological. This could be stretch. Be essentially to try to model this degradation as a function of time and see the effects of the accumulation on various processes that undergo in the near future the dip scale, that inspection is included in TPA.

MEMBER HINZE: Budhi, looking at your bullet there regarding colloidal transport brings to mind the matter of retardation in the performance assessment code. There are some changes that we're seeing in that, as I understand it. How much of those

are included? What kind of detail do we have in the TPA code version 5 regrading retardation?

DR. SAGAR: Right. Well, the colloidal transport is a separate module that does a stochastic modeling depending on the colloid size and whether it is filtered or not filtered and so on and so forth.

The absorption in the TPA code, absorption coefficient, for various radionuclides are now functions of the chemistry, the geochemistry. So the geochemistry appeared this year, too, are described by probability distributions based on field data.

We had field data at various locations on the side. And based on those, you know, not including every observation, but we have ways to filter those, the probability distributions are filtered and are sampled from those distributions. And then correlations are set up between the absorption coefficient and the chemistry.

So the absorption coefficients are not directly given at PDF anymore. There is a link between the site chemistry and absorption.

MEMBER HINZE: Do you and your technical staff feel that you have a sufficient amount of geological data to prescribe the geochemical and lithological variations between the site and the RMEI

or are you taking that spatial uncertainty into account in some stochastic manner?

DR. SAGAR: We are taking the spatial uncertainty to stochastic into a model. I think the staff is still doing some actual lab testing on the alluvium part of the flow path, which was late in determining. It wasn't investigated a whole lot before two years from now, for example.

So if you ask my opinion, that is probably the weakest link in terms of data at this point. But I think there is reasonable confidence that we have the bounds to at least describe the probability distribution that can be factored into the TPA code.

MEMBER HINZE: Perhaps when some of the Committee members are down in April that can be investigated a little more in detail.

DR. SAGAR: Yes. I have --

MEMBER WEINER: Yes. I think that would be a good idea.

DR. SAGAR: I have John Russell back to take these notes so I can take them back.

MR. LEE: If I could just ask two quick questions? One, Budhi, the users' manual for version 5, is that available now or to be delivered later on this year? And I presume that will include some

discussion technically of what you did to the code?

DR. SAGAR: Bret?

MR. LESLIE: This is Bret Leslie, NRC staff.

A couple of things. Developing user manuals are extremely resource-intensive. And we are asking ourselves whether that is really necessary given who actually uses the code.

We have identified that in this fiscal year, we will be taking some activities to ensure that the users of the code understand the changes relative to that and that right now we are focused on, as Budhi suggested, looking at the parameters ranges and making sure that those are bounded.

MR. LEE: Okay. Let me ask the question a little differently. You guys operate under what, TOP 003 or one of those technical operating procedures? How do you document what you have changed in your code as a legacy to future users of the code?

DR. SAGAR: We operate under technical operating procedure 018, which would be QA procedure for software development. And both the NRC staff and center staff operate under that.

There is complete documentation in the QA records. It's not a users' manual per se.

MR. LEE: Right.

DR. SAGAR: But if you wanted to see what did we change on what date an why, it's there. It's a huge file, by the way. So we can go back and reproduce and tell you what changed.

I agree with Bret that it is very time-consumptive to the users' manual. As I understood it, Bret, -- I may be wrong -- there is thinking that we might end up writing a users' manual for TPA 5. I think with this uncertainty now, whether TPA 5.0 will gain change and then "Do I have to modify the users' manual?" all this kind of gives us a pause and says, "Well, maybe we should wait and think before we spend a lot of resources on doing this now."

We may be overtaken by events. The LA comes in, and we say, "Gee, what is more important: the users' manual or doing the review?"

MR. LEE: Right. And my follow-on question is to what Ruth has asked about, I guess the validity of the code. You said you could run it for 100,000 years now. Does that mean that the code in terms of scenario screening or FEP selection is based on 100,000 years?

DR. SAGAR: Well, let me clarify.

MR. LEE: My other questions are, I guess,

presumably, then, the models have been validated and the code verified computationally. Is that --

DR. SAGAR: Well, that's a two-part question, and I will give you a two-part answer.

MR. LEE: Okay.

DR. SAGAR: The 100,000-year calculations we have been doing for some time. And that was primarily based on one assumption. What if the basic processes and even the parameter distributions remain the same as in 10,000 years? What answer do you get in 100,000 years? It's just running the software for a longer period. No changes were made. Okay?

Going beyond 100,000 years or wherever it goes, I may not be able to make that assumption. Serious thought has to be given to that. The FEPs are really based on 10,000 years, --

MR. LEE: Okay.

DR. SAGAR: -- even if I'm making it for 100,000 years. Obviously if you had hardware and you can run it for a million years as such, no big deal.

MR. LEE: Yes, big time steps.

DR. SAGAR: But then you would ask me what confidence I have on the result. I would say none because I haven't really examined the basic processes.

The second part was the?

MR. HAMDAN: Validation.

DR. SAGAR: The validation part. Again, we separate into two parts: model validation and code validation or code verification, whatever terms you want to give. We call it code validation. Code validation is done. It's required in the QA team.

Okay. Model validation is a much more difficult task. We leave it to the DOE. Again, I'm not going to make a safety case. We're not going to make a safety case. Okay?

We are going to ask questions. We are going to make a review, make sure things look similar or the same where there is no big disjoint. And we had no plan to do model validation. We don't intend to for the TPA code or for the PCSA code, for that matter.

MR. LEE: Thank you.

MR. LESLIE: Bret Leslie. I would kind of echo to get back to Mike's original question, which was on documentation. What we did for 5.0 is one of the deliverables that the center provided was the validation report because that to us explains what the new modules are in their attempts to document it.

And so any subsequent type of revision to the 5.0 code also we would expect to see a validation

report. And that again is pretty large. It's not a users' manual, but it says "Here's the algorithm that we're doing to describe this change, and here's the basis for why we believe this is improperly implemented. And here are the results of the entire code. And we believe it works within the ranges that we have provided."

CHAIRMAN RYAN: And just to be clear, that's a code validation exercise, not a model validation?

MR. LESLIE: Yes. It's a code validation.

CHAIRMAN RYAN: Just so we're all confused.

MEMBER HINZE: Its a verification.

CHAIRMAN RYAN: Well, I mean, that's an important point. The code is the mechanics of how things get multiplied and subtracted, added, and divided.

DR. SAGAR: Right.

CHAIRMAN RYAN: And then the model if it's representing some truth somewhere, that's the model validation code. We just need to be clear. That's two different aspects.

DR. SAGAR: The model validation is more onerous in the sense of comparing it to either field

or lab data or making sure you can represent those values.

And we have done that. We don't claim that the models are validated. We will not claim the models are validated, even though some of that work gets obviously done because there has to be a foundation for why the model is what it is in the first place.

MR. LEE: The reason I raise the question is you use your code to vector questions to DOE regarding their programs.

DR. SAGAR: Yes.

MR. LEE: And you compare your results with DOE results and sometimes make recommendations or suggestions for additional analyses or additional information.

DR. SAGAR: Yes. There is a risk.

MR. LEE: It is a risk.

DR. SAGAR: There is a risk there, yes. We recognize that.

CHAIRMAN RYAN: Budhi, I'd like to just probe, if I could, the greater than 10,000-year calculation. I can think about it a couple of ways. I mean, you could help me here get more insight.

You know, if, for example, I am required

-- let me just use X and Y. If I am required to calculate to X, sometimes I want to run up to Y, which is bigger than X so I know something doesn't blow apart here at the point where I need an answer.

That's really a code kind of issue, rather than a model kind of issue. Are we running these larger calculations for more of the code purpose than the insight to any other kind of numerical or model purpose? Is that really what you were saying earlier?

DR. SAGAR: That's correct.

CHAIRMAN RYAN: Again, I want to just make sure from a clarity standpoint that I am getting that right.

DR. SAGAR: You said it better than I did. Yes.

CHAIRMAN RYAN: Okay. Thank you.

DR. SAGAR: Okay. No more questions?

(No response.)

DR. SAGAR: Other parts of the technical accomplishments. I think Bret spoke about the top bullet in the morning. We continue to enhance the risk understanding. As new information comes in, new thinking evolves.

And one of the things done during the fiscal 2004 was the 14 -- there were 14 analyses

selected, discrete analyses, to try to factor them into the risk insights.

MEMBER WEINER: Can you give an example, just a brief example, of one of those?

DR. SAGAR: Bret?

MR. LESLIE: Bret Leslie from the NRC staff.

For instance, one of the things that we wanted to look at, we used these risk insights or risk analyses for risk insights tasks to say, are there places within our TPA code perhaps where we could do something better.

And so one of the things we looked at was, well, what if we changed the near-field chemistry. Right now in a previous version, 4.0, we had a fairly simple way of dealing with chemistry. And we only looked at chloride, which, of course, could be potentially detrimental to the waste package.

So what we did is the near-field folks at the center and at the NRC worked together to get a more realistic assessment and module in there to take into account more information that we had, taking into account, for instance, the nitrate, which is a potential mitigator.

So that was an example of where we did

some process-level modeling to become a little more realistic. And it actually led to changes in 5.0 as 5.0 was being developed.

MEMBER WEINER: But isn't that incorporating uncertainty or, rather, broadening your parameter base, rather than applying enhancing risk insights? I mean, in a larger way, since TA is, in fact, a risk program, yes, you're enhancing risk insights. But what you're doing is, it seems to me, what you do just to expand your TPA to cover all realistic parameters.

DR. SAGAR: Well, Bret, do you want to?

MR. LESLIE: Yes. I'll answer that. I mean, if you look at the risk insights baseline report, which we discussed earlier, it basically says the chemistry of the near-field environment is important, and here are some of the uncertainties associated with that.

So how important and what exactly is it that we should be focusing on? Well, this was an attempt to constrain the chemistry of the near-field as being as important as to what portion of the chemistry of the near-field is important. And if we used our current tool, would we come to a different answer if we had a new abstraction, let's say, of the

near-field chemistry?

So it's really taking a larger topic and focusing on what controls what is important within that thing? And that is why we used our acronym risk analysis for risk insights. In other words, we focused on something that was already high on a risk insights baseline report and tried to constrain the analysis to better understand that insight.

MEMBER WEINER: Thanks. That's very helpful.

DR. SAGAR: Okay. Thank you. You bet.

There are issues -- there were issues, at least, or there are still some on the fabrication processes of the waste package and what effect they might have on the long-term longevity of waste packages. And, actually, we took a sample of C-22, had it welded together in the laboratory, at least, did corrosion studies on that.

This study is still being continued, by the way, but the conclusion that came out of at least the preliminary study was that we didn't see a major effect on the fabrication processes. And I will have another slide later on this.

This is a pre-closure one where the seismic data was analyzed as we received it from the

DOE and what effect, if any, or how to analyze that seismic data to get the motion used for the surface facility design. And again I have a slide later on this.

Again, getting ready for the LA review, we were busy devising the inspection manual, including sections in the chapter 2300 on how the inspection program would be conducted, during the LA review and once construction begins and so on. So quite a bit of time was spent on that.

The public outreach was center stage last year. And we developed a physical model, in a sense a model that shows what the mountain looks like, where the drift is, how the waste package is so when we go to these meetings we could take this with us.

This was a pretty significant item, the integrated issue resolution report was completed, I think sent to DOE in the middle of January this year, which kind of set the technical basis of the NRC staff's and center staff's comments that have been provided to the NRC. Many of the letters in response to the KTI agreements are based on that technical basis. So here in one location, the technical basis of the center and NRC staff was documented.

Now, this is, of course -- there's always

a time lag between a big document being produced and the information that gets factored in. So this is already old news. We had March of 2004 as the cutoff date. Whatever we had up to March of 2004 was factored into this document. And lots of stuff has gone on since then which is not here.

The plan is not to update it. This is revision 1. Revision 0 was two years ago. But we have no plan to update it any further.

MR. HAMDAN: So, Budhi, is this a public document now?

DR. SAGAR: Yes. This is on the NRC Web.

MR. HAMDAN: Thank you.

DR. SAGAR: It has been sent to DOE. It's on the NRC Web.

This is an important item going on where we constructed a one-fifth scale physical model of a heated drift to study the movement of air and moisture within a drift because there are hot spots and there are cold spots within the drift. And the idea is to look at the spatial distribution of moisture and wet spots on the engineered barriers. So an extra physical experiment is being conducted on that.

The experiment is still ongoing, but the physical model was to --

(Whereupon, the foregoing matter went off the record briefly.)

DR. SAGAR: I already talked about the colloidal transport model. That is included now in the TPA code. The xFLO code is a different code we were trying to develop as part of what we call performance confirmation, a new generation flow, transport, and chemical reaction, the reactive transport code, that we hope will be completed at a slow rate. You know, if it takes three or four years, that's okay because we probably will use it once the license application has been reviewed and so on. But it's an object-oriented new generation of code we are developing.

Okay. This is the next topic. That's why it's called a risk-informed or risk insight because it's not entirely based on a single measure in the sense of what is the effect on, like I said, the individual dose.

That's not the only criteria, the only quantitative criteria, that factors into determining those three bins that you saw this morning: the high significance, the medium significance, the low significance bins.

So there are some subjective judgments.

There is some experience factored into deciding what goes where. It's not precise science, although there is support for whatever we have done. So there is explanation of why something is high versus something is only medium significance. But it's not risk-based. That should be clearly understood.

Again, this is a complicated system. If you kind of focus on just one thing, the bottom line end result, you may lose some things. So they were broken into three basic parts. If something affected significantly risk packages, it could be high risk without really looking at what effect ultimately it has on the individual dose. Release that always determines the source terms is important and then transport to geosphere, biosphere.

And there was a huge amount of time spent by both staffs in trying to come to grips with it and trying to get to a consensus based on whatever we knew, whatever analysis we had done, you know, which item goes into which of those three bins.

And we have used this effectively I think to allocate staff effort because now if somebody brings forward an issue which is, let's say, of low significance, that doesn't mean we will totally say, "Forget it. There is no way." We will still discuss

that issue because it's possible that the low risk may change to medium risk and medium risk may change to high risk or vice versa, the other way around depending on what we learn.

But the staff effort can certainly be proportionally allocated to studying of those items which are of high significance. We will obtain supporting information. So when we are talking about KTI agreements, if something is low significance, the standard is lower as to what information would be adequate or sufficient for starting to conduct a detailed review at the NRC. And the effect goes into general priority.

This is usually the first question any time we do an operations plan or we do decide on activities. Well, what is the significance of this? And then we proceed to other steps.

MR. HAMDAN: Budhi, do you feel that process improved your efficiency? And how much? Just a general feeling.

DR. SAGAR: Definitely for what is the basis for making decisions. Essentially key people will sit in a room and decide X is important and then be sent to me or to Bill Reamer and say, "Well, X is important."

I think we have a better explanation now why X is important or not important. I do not want to convey to you that there is complete consensus of all the 130 staff involved in all of this. I mean, there are always pockets of, "Gee, you guys don't understand this. This is really important, but what am I going to do with you?" kind of thing. But there is a general feeling among the staff that we have done a reasonably good job and that one could base one's judgments on these results.

So the efficiency is certainly improved.

DR. LARKINS: You didn't mention uncertainty in that. I mean, I assume when you are talking about the risk, considering the risk, you also are thinking about the uncertainty and what impact reducing the uncertainty might have on your analysis.

DR. SAGAR: Well, uncertainty plays a role in almost all of these considerations, but, I mean, something could be hugely uncertain, but if it doesn't affect any of these three, why bother is the issue. Some things may have small uncertainty, but they affect by a huge amount. Then you say, "Gee, I'm so worried. This is high significance."

But yes, uncertainty plays a role in all of these factors. You know, controversy plays a role

even, subjective. When we say, "Gee, this subject is not really well-understood," you know, many questions are being raised. Even though it's making only a slight effect on something, we had better study this thing to get ready for LA review. Those factors have been --

DR. LARKINS: Is the criteria in your decision analysis as to whether or not --

DR. SAGAR: Yes.

CHAIRMAN RYAN: Budhi, correct me if I'm wrong, but the way to get at the importance of uncertainty is to do a more formal risk assessment, a probablistic risk assessment. I think that is what reflected on at least the groundwater release part on the next graph versus the direct release, which I don't see it.

DR. SAGAR: Right.

DR. LARKINS: Yes. My point is you don't have a clear criteria for your decision analysis, not like you get a vessel or a number like that. So you have to have some criteria for your decision analysis.

CHAIRMAN RYAN: I got your point. I'm sorry. I wasn't listening to your question.

MR. FLACK: Yes. If I could just follow it up? It sounds like you would be using this more in

the context of a sensitivity study. You vary parameters and see how the effect plays out and then decide based on the sensitivity of these whether it's going to be important or not and then if it is, then maybe more formal uncertainty understanding of the certainty. I don't want to put words in your mouth, but --

DR. SAGAR: Well, that's a major input in deciding what is risk significance, the sensitivity analysis. But that's not the only. People can bring in other information from what DOE has done.

Eventually what would matter is what is DOE's strategy in their license application. I mean, I can do all of the sensitivity analysis, but if they don't take credit for something, it is not important.

So in the end, we are trying to learn what the system is. We are trying to understand how the system functions, what makes the system move in this direction versus that direction because as a reviewer, we need to know what is important in the system.

Eventually it is the DOE space that we will have to look at. Actually, they have their own risk ranking, which is not always the same as the NRC's risk ranking. The models are different and thinking is somewhat different. We did it

independently of them. They're very similar but not exactly the same.

So yes, certainly the sensitivity analysis is probably the most important analysis that plays a role, no question about that.

MR. CAMPBELL: This is Andy Campbell. Let's just make sure, though, that everybody is clear that the output of the TPA code does represent parameter uncertainties in the distributions of results that you get. In addition, we do alternative conceptual model type of analyses that help get us at the uncertainties due to different conceptual models.

So that in conjunction with a wide range of sensitivity studies -- we don't just rely on one type of sensitivity study, and that has been documented over the years in a number of center reports for various integrated performance assessments that have been done.

So it's not that we don't consider uncertainty, but we consider it in a number of different ways, both for parameters and for models. And we do a lot of different things for sensitivity.

DR. SAGAR: And as an example, you must have seen this diagram many times before. This is what we call the base case, where all of the release

is in the groundwater and that's how the it would get to those.

It's done in a probablistic manner. Here on the *x*-axis, you see the time, up to 10,000 years, and those in millisievert per year on the *y*-axis.

All the blue lines here are individual realizations, as we call them, in the sense that, as Andy said, in the TPA code, there are about 350 parameters which are sampled, which are uncertain, which are described by probability dissolutions.

Fourteen of those are actually correlated to another. It's important when you do probablistic analysis to make sure you have proper correlations in there.

Depending on how much computer resources you have, you can make many rounds. But we found the 350 runs to be sort of minimum runs, the number of runs that you have to make with that many uncertain parameters.

We use the Latin hypercube sampling scheme. And you see a great amount of spread. I mean, the blue curves are all over the place. Each one is equally likely. As a probablist, any one of those could be the realization of the under 10,000 years.

So there is a tremendous amount of uncertainty in the system, both parameter and model uncertainty. And the standard in the regulation is written in terms of the expected dose, which is the mean, which is this black curve. And it is written in terms of peak dose, which happens to be at 10,000 years.

We know when we did the 100,000-year run for the code, not the model, this still increases further. The dose increases further. That's the issue of the peak dose, whether we're going to do a peak dose or not.

But the other 95th percentile and so on, the important thing to notice is that the expected dose has a high probability. It's not 50th percent. Fiftieth percentile is down here. The expected dose is as much as 87 percent. So there is only a 13 percent probability that the dose would be greater than your need, which is being regulated.

We found that the release here, at least in this base case, is not due to corrosion failure of C-22 waste package out the container. And that leads us, for example, to say that why that doesn't tucker is because its stable passively in an oxide layer on C-22 is formed, which doesn't allow the localized

corrosion to fairly contain it.

So that's how the importance of the risk significance of certain processes leads us to say, "Hey, study this more. Would this really be stable or not? How thick is this layer? What is contained in this layer? How well would it perform in the 10,000-year time frame?"

No strongly -- by "strongly," we mean, the KD, the distribution coefficient, the risk base of one, for example, is pretty strongly the target.

Those radionuclides don't show up. In the base case, it's the technetium, iodine. The absorption they don't solve at all. The neptunium, which is very small, very small absorption coefficient. Those 3 make up 90 percent of the dose out of all the 500 radionuclides. We consider about 30 in the TPA out of those 500.

CHAIRMAN RYAN: When you say, "iodine," Budhi, I assume you mean I-129?

DR. SAGAR: Yes.

CHAIRMAN RYAN: That's an interesting one because if you take a count of its dilution in the iodine pool in the diet, it becomes much less important.

DR. SAGAR: I've read your paper on that.

And I don't know if we have -- and Bret may be able to answer that, if we have any plans to incorporate those kinds of things.

CHAIRMAN RYAN: Whether you incorporate it or not in a formal way, it is conservatism that somehow should be recognized --

DR. SAGAR: Sure.

CHAIRMAN RYAN: -- in treating I-129.

DR. SAGAR: What helps is that I've seen that paper. I was given to read that paper. So I saw that.

MEMBER CLARKE: Budhi, base case and nominal case, are they --

DR. SAGAR: Yes, they're the same.

MEMBER CLARKE: They're synonymous?

DR. SAGAR: Yes. Let me tell you that in the base case, seismicity is included. Seismic change is included. It's the gradual processes that don't --

MEMBER CLARKE: Would that be disruptive of --

DR. SAGAR: Well, yes. But, I mean, some people call climate change as disruptive. So it's a conceptual way you want to do this analysis.

MEMBER CLARKE: And the realization that is shown under "Direct Releases," does that correlate

to anything on the other side.

DR. SAGAR: Well, yes. I was going to come there.

MEMBER CLARKE: Okay.

DR. SAGAR: This is the same black curve as this black curve here. Note that the scale here has changed. So they don't exactly match. This starts from 10^{-8}. This started from 10^{-12}. So they don't exactly look the same.

MEMBER CLARKE: Yes.

DR. SAGAR: On the computer, there is no zero. That's the problem. So you have to.

MEMBER HINZE: Budhi, that local high there on the groundwater releases, is that isotope-driven?

DR. SAGAR: I think this is the -- I don't want to say something wrong here. Do you know that? I thought this was related to the failure, the way we depict the failure of the waste package, where the release occurs.

MR. LESLIE: I would say it's pretty much lost in the noise given the risk level.

MEMBER HINZE: I understand that, but it's interesting to --

DR. SAGAR: Yes, I'll go back and check.

It could be. I mean, it could be that the iodine and technetium are here but not neptunian yet. And then the neptunian shows up, as you are saying. It's possible. Neptunian does have longer travel time. So it's entirely that could be the reason.

But this curve is the direct release. The only disruptive scenario that we considered, in addition to the base case, is the igneous activity, the volcanic eruption through the repository. And that, as you can see, whenever -- and there is an assumption made.

When such an event occurs, the consequence is imaging, more or less, because it's direct expression through the air. And then we will feel the effect very quickly after such an event occurs. Well, you see this peak as soon as the event occurs. And then it decreases. In 10,000 years, it's about the same as the base case.

So this is the only separate event in the peak here. And you can see that the important radionuclides for this are different from the base case because you've got the americium and the plutonium giving you 90 percent of the dose in the direct release case. So those kinds of understandings and how the system behaves kind of helps us in risk

insights.

MEMBER HINZE: Help me here a bit, Budhi. The igneous activity, that's the extrusive event?

DR. SAGAR: Extrusive.

MEMBER HINZE: But the groundwater releases include the effect of destruction of the waste canisters due to volcanic activity through a dike interaction?

DR. SAGAR: No. I think --

MEMBER HINZE: No volcanic activity at all in the left or --

DR. SAGAR: I am not sure again.

MR. CAMPBELL: Let me. This is Andy Campbell. The base case does not include an intrusive event impacts on groundwater. The igneous activity is primarily driven by an extrusive volcanic event, the impact of in our model an intrusive volcanic event has a lower dose. So this is mainly inhalation of americium and plutonium after deposition of volcanic ash.

MR. HAMDAN: I'll add to what Andy said that I have been told that the component of the dose through an event is small it doesn't feel the effect.

MEMBER HINZE: So it is not included in the base case, but it would be lost in the width of

the line?

MR. HAMDAN: Right.

DR. SAGAR: Okay. If there are no questions on this, I'll move forward. So here I list the items of high significance. I think this morning you saw that out of the 293 agreements, there was something like 41 agreements that were listed as high significance. But those are related to these items here.

As I said, passive film on waste package is very significant risk because it is not stable. Then we know that we will have much larger consequence than we calculate, assuming that this is stable.

Seepage rate is the driver, of course, for all of the base case. So if this changes by a significant amount, we have a significant amount of uncertainty in it. And it will drive the mean dose that we calculate in the end.

And all of these things -- I don't need to read all of these things. But, you know, these are activities or processed right sometimes. Just the home visit remains. I could get her to stop jumping on window, significance to waste isolation.

So the waste code, for example, in these items would be the high priority compared to the next

item which I'm presenting, the medium significance. This is obviously a larger number than the high significance, as it should be. The items of low significance are even a larger list, which I am not presenting here. You can see that in the baseline report if you are interested.

Let's look at, for example, climate changes. The climate change we know affects the --

MEMBER WEINER: Hello.

MEMBER HINZE: Okay, Ruth.

DR. SAGAR: And --

MEMBER WEINER: What slide are you on?

CHAIRMAN RYAN: Twelve Ruth.

MEMBER WEINER: Twelve. Okay.

DR. SAGAR: We have, you know, in the baseline report brief explanations of why we believe these are of medium significance; whereas, the previous list was of the high significance. This is all based on 10,000 years.

CHAIRMAN RYAN: Budhi, just a timing issue. We're now at 12:00. And we're expecting Commissioner Merrifield at 2:00. So we'll probably go to 1:00 o'clock with your presentation.

DR. SAGAR: Okay.

CHAIRMAN RYAN: Okay.

MEMBER WEINER: Budhi, this is a comment for our meeting when we come down to the center. A number of these items you were working on had ongoing services the last time we visited the center. And I think it would be a good idea if we were basically updated what has happened since we were down there.

DR. SAGAR: Okay. On the same items that we discussed last year?

MEMBER WEINER: Yes. I mean on those items, not that there's nothing new. I'm more interested in an update. Let me put it this way. I think we're more interested in updates than we are in a review of the entire program. Of course, we're very interested in anything new that you're doing.

DR. SAGAR: Okay. Okay. And, by the way, we are on slide number 12, Ruth, if you didn't know that.

MEMBER WEINER: Yes.

DR. SAGAR: Okay. Any question on this?

(No response.)

DR. SAGAR: Okay. Total system performance assessment and integration key technical issue. The results I just showed you were based on TPA version 4.1j, not 5.0. And it was prepared for inclusion in the license support network that NRC was

supposed to do within 30 days of DOE certifying their LSN.

The TPA version 5.0 code is still being prepared. It will be tested. Code validation will be done. We have included a preprocessor to this code to make it easier.

The expectation is that a very large number of NRC center staff should be able to use this code, execute this code, on their PCs. So most people will have access to it. And if some question arises, they can use it.

The basic info file would be fixed. So they would have access to all of the 900-some parameters that are in code. If somebody wants to change one, they can do it and run it to see what effect, if any, on the 5.0 code.

The parameter values actually -- I mean, most people talk about model validation or code validation, but to me, the most important is the data that goes into the so-called validated models because the huge number of input parameters and the data model is even more complex, has an even greater number of parameters than we have. And the data on which those things are based and the way those parameter values are derived, the way the probability distributions are

fixed for them affects to a very large extent what the end result is.

So whatever the best knowledge at any given time is whatever information is there or lab information, and so on, has to be included in that. In fact, to me that is really the most important part of the whole analysis, rather than what the code looks like or the models look like.

MEMBER WEINER: Budhi, when someone uses this preprocessor, does the code actually run or do you have precalculated solutions?

DR. SAGAR: No. The code would run. With the preprocessor, it's just to help set up the run for the user.

MEMBER WEINER: Okay. Thank you.

DR. SAGAR: Yes. And there may be a possible consideration. We don't know which direction that would go for the code changes. A simple example in the number slide, number 15.

The sensitivity analysis, as has already been said, probably the most important use of this code, is in doing sensitivity analysis. The most important thing to know about sensitivity analysis is that there are many methods of doing sensitivity analysis. There is sensitivity analysis of

parameters, sensitivity analysis with respect to components of a system, subsystems of a system.

And there is not a single method. At least we have used up to six or seven different methods. And each method gives you a slightly different answer based on what the basis of that method is.

One of the conclusions we drew is that you shouldn't just depend on a single, applying a single, method and saying, "Okay. This is your sensitivity. This is it" and that you should try different methods to see how your sensitivity results weight.

This is just one example on the component sensitivity analysis, the unsaturated zone, drip shield. We are calling these components of the system.

And sensitivity analysis is not always realistic, by the way. I mean, we all talk about in terms of sensitivity bounding realistic. The sensitivity analysis can be done in many factors, again to learn how the system behaves.

So sometimes you learn more about the system if you do something unrealistic to the system and say, "This component doesn't work. What happens? Does the whole system fail or not?" and so on.

So this is one of those examples where we would say, "Well, the unsaturated zone doesn't do its function. What happens? What's the effect on this system?" and so on.

And this is not unique. Every analyst could think up other components or fewer components and so on and so forth. This is, again, a repetitive process and what we call one-off, one-on. If only one of these components was on in the sense of solving its functions and one off, not doing its functions, assigned functions, in the system, what would happen?

And if so, I want to say that nowhere in Part 63 we say, "You have got to do this kind of analysis." This is, again, up to the analyst as to what helps people to understand the behavior of the system.

MEMBER HINZE: While you have that up there, Budhi, may I ask you a question? Going back to your page 11, you had seepage rate as one of the critical items to the isolation of the waste. I'm wondering, in treating that in the unsaturated zone, do you treat that temporally and spatially or is this just a flux we're looking at a tube blind, if you will, or a tube through the critical group?

DR. SAGAR: What we do, the temporal part

is only the climate change. You have the one climate, and then it changes to the blue hill climate. That's the temporal change, extent of temporal change. We don't do hourly or daily.

MEMBER HINZE: Sure.

DR. SAGAR: The spatial, I think we divide the -- Bret is the expert here; he will help me -- seven or eight space zones, each one having a different infiltration rate.

So the stratigraph he also changes on those seven. So if you think of seven one-dimensional columns, the particulars of each one of these stratigraphs is different in each column. The inflow at the top is different. That's the heterogeneity part.

MEMBER HINZE: So the realizations may take into account the uncertainty of your information on the seepage rate in each one of those seven, eight zones?

DR. SAGAR: That's correct, yes.

MR. LESLIE: That's correct.

MEMBER HINZE: Okay.

DR. SAGAR: For instance, it's that way -- I mean, why 7? Why not 47? But that's based on what best we can do.

MR. FLACK: If I could raise a question? Getting back to the sensitivity studies that you do, some parameters are known a lot better than others.

DR. SAGAR: Yes.

MR. FLACK: And some have much larger uncertainties than others. And when you do your sensitivity studies, I guess you vary them depending on how much uncertainty is associated with one versus the other. So you could end up with, say, something of large uncertainty. You could have a large range of impact.

How do you reconcile that with things that are all well-known where the sensitivity shows very narrow spread? Are you just using expert judgment in there, in that area of reconciling the differences?

For example, in reactors, we have external events and internal events. External events are somewhat treated differently than internal events the way that that information is used because the uncertainties are much larger.

Is there something like that that you do here or do you kind of mix them all together or --

DR. SAGAR: Well, they are mixed together. The only external, to take your example here, would be the volcanic. That would be considered separately and

is treated differently from all of the other processes.

But you are correct that there are some parameters where the probability band is very wide compared to some others where they are better known and the probability is narrow. Those are factored in and mixed in.

Now, if there is a parameter whose probability base is very broad and we see a great effect of that -- I mean, we have done sensitivity analysis where we say, "Well, how would the gradience of this parameter effect remain of" -- statistical sensitivity.

And that helps us to discriminate between those two different types of parameters with different kinds of uncertainties. But certainly the expert judgment, another part of the question, plays a role everywhere here.

Okay. Here is the result of that one-on and one-off analysis. And DS means drip shield. WP means waste package, waste formed inward, saturation zone. And what this means is that in the one-off analysis, you have the whole system functioning. You have the whole everything functioning as normal functions. And here the blackened box indicates that

the drip sheet is off. Its functions are removed from the cold.

And, again, the questions usually in this kind of analysis is "How can you do that? If this doesn't work, something else shouldn't work" and so forth.

This is done one at a time. This function is off. Everything else is on. There are correlations we understand. So this is not, as I said, realistic in that sense. It's not necessarily something that will happen in extra life.

But what happens is that the dose is 34 percent higher if this one is not functioning. That's the meaning of all of these numbers here. If the waste package, only one item at a time, is not functioning, we get a dose which is 62,200 percent higher.

Well, obviously this is a complement of the system, which is more significant than this complement and so on. And you can repeat it the other way, where you have one-on analysis, where the basic thing is where none of the components are functioning and now the drip sheet only is functioning and the dose is 63 percent less. And here the dose is 99.9 percent less.

MEMBER CLARKE: Budhi, on the left-hand side of your second highest impact is when the unsaturated zone is off. Is my understanding right?

DR. SAGAR: This one? Drip shield is off here.

MEMBER CLARKE: Oh, no. Go --

CHAIRMAN RYAN: Look at the 1980.

MEMBER CLARKE: Go over to 1980.

DR. SAGAR: Here?

MEMBER CLARKE: Yes.

DR. SAGAR: Yes. The unsaturated zone below the repository. There are two unsaturated zones: one above the controls the seepage.

MEMBER CLARKE: I understand. I understand.

DR. SAGAR: Yes. Right.

MR. FLACK: So this is equivalent to a risk achievement worth?

DR. SAGAR: That's exactly right, yes. It's very common to the reactor analysis, as a matter of fact, your important specters.

MR. FLACK: Right. It also tells you how much credit you're taking for things when you get a big number.

DR. SAGAR: Well, in the actual nominal

case, this is not the credit we take necessarily. It's much less credit taken in the nominal case because in the nominal case, this thing is functioning.

So, again, this does not mean to imply that the waste package is the most important part compared to something else. So the natural systems don't do anything. Why do I need natural systems? Risk can do the whole thing.

We don't want to go there. The idea is if needed, if other things failed, this is what this component would do, could do. That is not necessarily what the credit is taken for in the nominal case.

MEMBER CLARKE: Budhi, if I could follow up on the question that I just asked? In the unsaturated zone, you are or are not including matrix diffusion?

DR. SAGAR: The NRC code does not include matrix diffusion. The DOE code does. Bret has --

MR. LESLIE: Actually, it does it based upon travel time. So we have a switch that says if -- so it depends on which subarea you are in. You might have matrix diffusion in a particular unit all the time.

But in general, we have a switch that for

computational efficiency -- and this leads back to kind of several of the questions about the long time frame simulations.

We need to have a code that can conduct routinely longer-time simulations than 10,000 years.

MEMBER CLARKE: The other thing, I think the reason I am a little confused is my understanding was that, to use the jargon, you are not taking much credit for the unsaturated zone. This shows a high impact.

MR. LESLIE: There is one layer, the non-welded vitric Calico Hills, that provides a lot of retardation where it's present.

MEMBER CLARKE: Two thousand percent.

MR. LESLIE: From four subareas where retardation occurs.

MEMBER CLARKE: Okay. I'm with you.

DR. SAGAR: This is the unfractured, non-matrix --

DR. LARKINS: How do you reconcile in your one-on analysis? You've got three, possibly four components that are of equal sensitivity; whereas, in your one-off analysis, it's essentially dominated by one component.

DR. SAGAR: That's the way the percentages

are calculated. I mean, notice that this is the basic normalizing factor here. If nothing was working, you've got the huge goals. And everything you've got is --

DR. LARKINS: No, no. I understand that. How do you use that information in your assessment?

DR. SAGAR: Well, I mean, if I were going to risk-rank, I would risk both from this analysis and this analysis that waste package is ranked high. So the stability of the passive layer is definitely a high risk-significant or high significant --

DR. LARKINS: So you try to combine the insights from both of these types of analysis in terms --

DR. SAGAR: Yes. Well, not --

DR. LARKINS: -- of your risk significance?

DR. SAGAR: As I said, these two are just an example. We have six other sensitivities analyses we did trying to figure out --

DR. LARKINS: I was just trying to see how you reconcile the information that you're getting from these six different types of ways of doing a sensitivity analysis in terms of risk ranking.

DR. SAGAR: Well, one thing we did, we

looked at results from all six of them. This one appears high in all six of them, must be higher. This one appears on number 5 here but number 15 here. Then we try to understand why, why is this so, and then decide where that item should go. But it's not --

CHAIRMAN RYAN: And I guess I'm getting the idea that Bret's answer of what particular unit in the unsaturated zone was so important is the endpoint of what you just described. And, again, I think it's one-off, one-on, two off.

You could look at all different perturbations of this to get combination insights. And I think I have an understanding.

DR. LARKINS: Yes. I think it goes back to what Bill said about using expert judgment, in addition to this information.

CHAIRMAN RYAN: Exactly, sure.

DR. SAGAR: You're in a hurry?

MR. LESLIE: They want you to finish in 45 minutes, and you have 35 slides left.

CHAIRMAN RYAN: You can certainly --

DR. SAGAR: I'll stop at one, wherever I am.

CHAIRMAN RYAN: You can stop there and pick up after we --

DR. SAGAR: I see the sign there. So I'm wondering what's going on.

CHAIRMAN RYAN: You can take as much time as you like. We have the rest of the day. We just have to interrupt you.

DR. SAGAR: No. I don't want to take any more time than is necessary, but I have a speed of speaking, and I can't pick it up, --

CHAIRMAN RYAN: That's fine.

DR. SAGAR: -- unfortunately. If I do that, I'll mess it up.

CHAIRMAN RYAN: The good news is we're asking all the questions now, Budhi.

DR. SAGAR: Yes. Well, that's good.

Well, this is another summary of the same results, as you said, two on, two off, or all on, all off, and so on, so forth. So sometimes the question is whether the natural system does worse than the engineered value system. So all drip shields and all waste packages, if we assume, which is not realistic, they all fail, what would the dose curve as a function of time look like? What if only the drip shields failed but the waste packages kept functioning? What would the dose look like? This is the base case for comparison.

So, again, you can play these or you can do this kind of analysis to try to answer different questions and try to understand the system behavior.

MEMBER HINZE: Let me see. Part of the reason for those values is a wide range of uncertainty, for example --

DR. SAGAR: Yes.

MEMBER HINZE: -- in the waste package failure. And if I'm correct, you're doing further analyses on the waste package failure. And so that could well decrease that uncertainty and, thus, move that line down, move those results down.

DR. SAGAR: It could.

MEMBER HINZE: Is that the purpose? Is that right?

DR. SAGAR: I mean, I would expect if the uncertainties decrease, I would expect this line to move down, reduce the dose. That could be one of the purposes of studying this, sure.

MEMBER HINZE: Do we have any feel for how much that might move down?

DR. SAGAR: Yes. We have done this more than once in the sense of what if, what this, and looked at different curves.

MEMBER HINZE: Okay.

DR. SAGAR: You can get a sense. I mean, you can do a sensitivity analysis to try to find out at what rate things will move up and down.

MEMBER HINZE: Well, you're working in waste package failure. How often do you update the values so that you can get a more realistic curve here?

DR. SAGAR: We update that internally. I mean, we haven't published anything after this if that is what you are saying. Staff keeps doing these analysis plugging different curves and understand what things are going on. But publishing these things is another matter which takes months to get things out.

Bret?

MR. LESLIE: For instance, there are a couple of papers that are coming out at NACE where the PDF for localized corrosion on the base metal and on welds is provided. Okay? And so some of this reflects. You know, what he is presenting here are results from the 4.1j code, which was a couple of years ago. The 5.0 code has enhanced some things. And the bases for those parameters are being published in the peer literature.

MEMBER HINZE: Are you getting regular updates from the research that is being conducted by

the DOE? Are these synched?

MR. LESLIE: For the waste package example, DOE and NRC have different approaches, in the past have had different approaches, in terms of how corrosion is modeled in their performance assessment. So primarily the way we have incorporated corrosion of the waste package and a drip shield is primarily based upon the center's laboratory work, where it is a much more mechanistic model. And those results are the basis for the parameters that we're providing.

So, for instance, the paper that I'm talking about on what is the PDF, probability distribution function, for localized corrosion, it's a function of all the laboratory experiments that the NRC and the center have been conducting over the years.

MEMBER HINZE: And you can't realistically feed in the results from DOE because you're approaching it differently. Okay.

MR. LESLIE: That is correct.

MEMBER HINZE: I'd like to learn more.

DR. SAGAR: Okay. The next topic is the evolution of the near-field environment, or ENFE, as we call it lovingly, key technical issue.

There were two main items that I wanted to

present on this topic. One is the chemistry of the brines that we studied during thermodynamic simulations. The idea here is that the near-field environment that affects the engineered barriers' life depends upon the chemistry of the aqueous phase that they come into contact with.

One of the things that might happen is that the seepage water, which is a pretty dilute solution to begin with, when it comes into contact with the heated engineered barriers will evaporate, specifically the salts on the surface. And this cycle echoes many times as the seepage continues. So there can be brine formed on the surface, a concentrated solution found on the surface, that could affect the corrosion of the engineered barriers.

And the chloride-type ion is important. It's deleterious for what is enhanced as corrosion of C-22. The fluoride does that to the titanium, which is the material of the shield. The nitrate, sulfate, and bicarbonates are inhibiting species. That is, the greater the amount of these three, the lower is the rate.

In this diagram here, which is kind of complicated, all of the red or pink, whatever that color is, crosses of the Yucca Mountain actual major

full water chemistry on the diagram. And the diamonds here, the blue diamonds, I think there are 11 bins that DOE has created in their model, representing the variation in chemistry on the site.

What we have done is that we have collapsed those 11 bins that DOE has into basically 3, that there are three major types of chemistry that cannot: the alkaline, the neutral, and the calcium chloride brine. We wanted to see which of these different kinds of brines that can form due to evaporation/condensation can most affect the waste package corrosion.

Here are some results here. This is the key on the *x*-axis. And when the brine dies, they'll climb. All of the three brine types are on the *y*-axis here that I showed you in the previous diagram. And the box here represents the range that we calculated with thermodynamic modeling or, for example, pH here. The line here is the median in the middle of the box. And you see the same thing for chloride, fluoride.

And this is the ratio. This is the important part because the susceptibility of the engineered barriers to corrosion depends on this ratio of the corroding ion to the inhibiting ions, mainly nitrate in this case. So the greater this ratio is,

the corroding to the inhibiting, the more potential there is for corrosion to occur. So that was the main idea of doing this kind of analysis.

The second part of this study was the deliquescence of salts that are present in the dust or could potentially be present in the dust at Yucca Mountain, the idea being that many of these salts are hydroscopic in nature. So they would absorb water, even at lower humidity. And there could be a formation of a liquid or aqueous phase layer on the surface of the engineered barriers.

We did actual lab experiments using different salts. And you see here the part between the temperature going up to 100 degrees C and the relative humidity at which the liquid phase appeared.

And, as you can see, this is thought to be the major types of salts that would be present in Yucca Mountain: the sodium/potassium chloride, nitrate salts.

But we tried with something else. The magnesium chloride probably actually gives it and the calcium chloride actually give it much lower relative humidity at which a liquid layer would appear.

So depending on the different salts and the temperatures, the onset of corrosion in the sense

-- you know, the aqueous corrosion would only be onset when there is a liquid water. When there is a certain chemistry; localized corrosion, for example, it could be earlier if the magnesium chloride or calcium chloride were present. We also did the chromium here because chromium is a corrosion product to see what effect that has on the deliquescence.

So the idea is, again, to feed into a performance assessment-type corrode as to at what humidity should we consider the aqueous phase to begin on the surface, even though it's heated.

So what we are saying is not true that at a temperature above boiling, this is going to be dry, the engineered barriers would be dry. There would be an aqueous phase that might exist because of the presence of salts on the surface.

So in that sense, it would affect the possibility of performance because the life of the waste packages, for example, could be affected. Now, what is actually positive is that the dust from Yucca Mountain vicinity which has been analyzed -- and we looked mainly at nitrate data on this -- also not only included chloride, for example, which is not so good, but also include nitrate and sulfate.

So one has to look at the ratio of these

two to determine the susceptibility of the engineered barriers to corrosion. And we are trying to get some atmospheric dust samples from the Geological Survey, who is collecting this, to actually look at the composition of the dust at Yucca Mountain.

In this figure, for example, here we show the nitrate and sulfate which are inhibiting the chloride ion from the actual dust here. And you can see the spread of these in the median. In a later picture, I will show you where the susceptibility window is with respect to this ratio, so where, at what ratio there is potential for corrosion.

I will show you in this slide the container life and key technical issue. As we said, the stability of the test simulator, the oxide layer that forms on the C-22 ultra container is a major factor in determining the life of the waste package.

The uniform corrosion rate is low for C-22. It's only the localized corrosion or corrosion that could shorten the life of the waste package. So the idea is to see how thick such a layer would be, oxide layer, passive layer, would be.

And we wanted to see what is in that passive layer and how could we -- what could we say about the stability with region II is the passive

layer in this figure. This is experimentally determined.

And you see the different compositions. This one is the nickel. This one is the molybidnum, moly, and chromium. Those are the three main components of the passive layer.

It's about 54 angstrom thick, measured actually in the lab and, as I said, chromium, nickel, and moly oxides is the main composition of the passive layers.

We still are trying to look at the stability because it's a time-dependent phenomenon, what good, for example, rock fall destroy this if it all falls on the waste package. Would it penetrate this passive layer and start the corrosion process again?

MR. HAMDAN: But, Budhi, where are you in this process? I mean, are you near the end of the beginning?

DR. SAGAR: Well, we know quite a bit about this. Let me say that. Whether we are the end, there will always be something to investigate. But I think if they submitted tomorrow, I would say we can review it.

This explains the study on what is the

effect of the ratio. What is the effect of the ratio? As I said, nitrate is the inhibiting ion to chloride on the vulnerability to corrosion.

We use, as Bret had aptly explained, the mechanistic model, which is based on looking at the repassivation potential. This is the electro potential. The corrosion potential is the potential at which the metal would corrode. The repassivation potential is the electro potential at which the metal will repassivate and stop corroding.

And we assume the repassivation potential to be the threshold value that the actual potential would have to be higher than this for the metal to corrode. So higher would be repassivation potential. Less is the potential for the metal to corrode.

Higher repassivation potentials are good. Low repassivation potentials are not so good. That's how to understand this figure. And we have done experiments with minimal need and terminally in need samples at eight degrees C., ten degrees C.

The basic idea is to see that at about .1 ratio, if nitrate is one-tenth off the concentration of chloride, the repassivation potential goes up considerably. If it is .2, you can say, well, the potential for localized corrosion is very low, will

not occur. So that's the importance of the inhibiting ion.

Here we show at the higher temperature 870 degrees C in a sodium chloride solution with a crevice contained in the sample so that we can start the localized corrosion, crevice corrosion.

And, again, we see that at the higher temperature, you would need a larger ratio of inhibitors to chloride ions for the repassivation potential to be as high as here. But, again, here is a .2, here probably .4, you cover most of the points. So if there is a 40 percent nitrate, 60 percent chloride, the potential for localized corrosion of C-22 would be very low.

MR. HAMDAN: Is there something that DOE can do in the design of C-22 to introduce? Maybe this isn't a question but inhibitors or --

MEMBER HINZE: Lower the temperature.

MR. HAMDAN: Yes, lower.

DR. SAGAR: Since you called it DOE, I'll have DOE answer that.

MEMBER HINZE: That's very simple.

DR. SAGAR: I don't know.

Another question that was being investigated was the stress corrosion cracking. I

think it was in two or three years ago that Lawrence Livermore had done some tests with the conclusion that C-22 could be vulnerable to stress corrosion cracking.

We did a test using slow strain rates. This shows you the samples as they dragged. And we found that the bicarbonate, which is an inhibitor of localized corrosion, actually is an ion that causes a greater rate of stress corrosion cracking.

So we have a solution that contained chloride and added CO_3. And we got stress corrosion cracking. If you removed the bicarbonate ion, no stress corrosion cracking occurred. So that's kind of an interesting result.

And the morphology of this surface is such that we think that even if the corrosion cracking is initiated, the crack may not propagate. It's so rough that a propagation of such a crack would be hindered.

We haven't done that, actually, at a very slow, a dynamic type of loading test. But that's something we might end up doing.

MEMBER HINZE: Isn't that a function of the strain pattern, though?

DR. SAGAR: It's a strain rate, yes. And I think in the actual case, perhaps the strain would happen because of a -- well, there are two kinds. One

is initially when they manufacture the waste packages, they would heat treat and so on, which would leave some stresses and strain there. And second would be during the functioning of the operation of the repository, you know, things falling on it.

MEMBER WEINER: As the endpoint that you will observe corrosion experiments, when is enough enough? Where are you heading just generally?

DR. SAGAR: As I think I had replied earlier, I mean, we are at a stage where we are confident in saying we have adequate information to do a review.

MEMBER WEINER: Thank you.

DR. SAGAR: So, I mean, this is enhancement of whatever understanding we already have. Add to that.

MEMBER WEINER: Well, I apologize for having you repeat.

DR. SAGAR: That's okay. I used to be a teacher. I repeated many, many times. I have the patience.

But, anyway, spent fuel dissolution. That's some topic we discussed last time.

MEMBER WEINER: Yes.

DR. SAGAR: The ACNW members visited. I

think Ruth is very interested in this topic. But there was a suggestion from you that we look at the data from spent fuels. We made an initial step in that direction by talking to the NRC Interoffice Technical Advisory Group to collect appropriate data.

The preliminary thinking is that the data is probably not going to give us a whole lot because the pools get cleaned periodically and it's mostly cobalt 60 that leaks in. The concentration of all others is very, very low, and so on, so forth. So we're still looking at that.

Basically what we are doing is to monitor whatever DOE experiments are going on on this and the data in this area from other countries also. There's quite a bit of work being done in Europe and so on.

We at this time have no experimental work planned at the center.

MEMBER WEINER: I might say I read the earlier report that you put out on the spent fuels solution. And I found it very informative, a very good resource.

DR. SAGAR: Thank you.

MR. FLACK: Can I just ask one question, please? On the expectation of containment life, dependent on the fuel contained within, cask, in other

words, have you looked at the chemistry of the fuel itself?

DR. SAGAR: There has been a look or study done on the chemistry in the sense the corrosion of the container can start from inside and outside.

MR. FLACK: Right.

DR. SAGAR: Yes. That has been looked at. And I can't also remember whether that has been factored into TPA. I know it has been looked at at a process level, what effect that might have. Do you know?

MR. LESLIE: The casks are sealed under an inert environment and dewatered. And so basically the idea is that in terms of a performance assessment, that has been screened out because they will have the controls to ensure that there is an inert environment in there prior to placement into the repository.

MR. FLACK: So essentially you could take any kinds of fuels with respect to advance reactor fuels and this sort of thing coming down the pike, I said?

DR. SAGAR: No. I think the high-burnup fuel is still being looked at, what effect that might have. Now, your question is whether the fuel type has an effect on the container life itself. And, you

know, that is correct. But once imperfection occurs or a hole buckles, then the water goes in. And the corrosion can start both from inside and outside. So for intents and purposes, we assume that once the penetration occurs, the container has failed. Okay.

And then what we were looking more at is not at the container life as much as what would be the effect on dissolution rate, the fuel dissolution rate, because of the corrosion products, plus also what the internal --

MR. FLACK: Which can then have an effect.

DR. SAGAR: Yes, which can then have an effect. But I think it's not factored into the TPA at this time.

MR. LESLIE: The only other aspect of that -- this is Bret Leslie from the NRC staff again -- as we did look at the effect of gamma radiolysis, the radiation effects on the surface chemistry outside the waste package. So we have investigated this.

DR. LARKINS: Is DOE doing any work on fuel dissolution?

DR. SAGAR: Oh, yes.

DR. LARKINS: Okay.

DR. SAGAR: They're doing the major part of the work.

The igneous key technical issue is the next topic. This is one of the problem torrential subjects that most people believe would be difficult in an LA review, but both the probability as well as the consequence of igneous activity have some open issues at this time, as was said this morning.

Here is a picture, for example, where the -- this would be the repository here. And these are the known volcanic centers. These are some of the geophysical data that tells us with high confidence that they are probably basaltic volcanism that had been buried underground. There are other geophysical data that may or may not be volcanic centers, as shown in blue.

The probability so far still remains in that range according to the best estimate we have of 10^{-8} to 10^{-7} per year. But there is some new geophysical data that we have recently received.

I think DOE did some geomeg studies that we have also received the raw data. And we are looking at that to try to find out if this probability would be affected in any significant way.

The existence of these possible volcanoes, of course, adds to the uncertainty in the spatial and temporal repository because most of that is based on

the past data that we know.

There are other alternate hypotheses that we know that they are put into clusters. They are not totally randomly distributed, but there could be alternate hypotheses for modeling the clustering process.

At most, we think the probability can be a factor of ten or less, even if all of these turned out to be volcanoes that should be considered in the probability distribution. Of course, the age of these volcanoes affects how they factor into the probability model and so on, so forth. I understand the DOE might even drill at some places.

Yes, sir?

MR. COLEMAN: Budhi, from my experience with exercising the NRC's center model on probability for volcanism, your last point there, where it says you could get up to a 10X increase depending on alternative hypotheses, I find that you cannot do that with the spatial clustering alone.

And if you do it with temporal clustering, as has been applied in presentations to the Committee, the more that you focus on narrow pieces of time, that means the more you are neglecting the long spans of time over which no volcanism has occurred in this

region, which means you are moving away from a risk-informed approach.

I was wondering why in volcanism, you are taking that approach.

DR. SAGAR: I think some of the other staff would have to answer that detailed question. I'm not a volcanologist. I mean, the clustering, both in space and time, does mean that you pick an appropriate interval of space or time in which you would consider clustering.

Whether those are too narrow versus too wide is something that needs to be done by appropriate experts. I mean, I can't answer what that interval is.

MR. COLEMAN: I mean this in a generic way. I mean, you've been a hydrologist much of your career. One of your slides --

DR. SAGAR: Ask me a hydrology question, and I will answer it.

MR. COLEMAN: Okay. Okay. I'll do that. Your slide 11 showed that percolation is one of the high-significance items, along with the volcanism probability. Of course, percolation comes from precipitation and infiltration.

I've been at the Nevada test site when an

inch of rain fell in an hour. But it never occurred to me to think I should somehow extrapolate that to a yearly rate of over 8,000 inches per year.

In a sense, you can get very high cluster probabilities with volcanism in the same way, but they have no meaning and are inconsistent with the geometric record.

DR. SAGAR: I would be hesitant in going to your conclusion of no meaning because there is a tremendous difference between your example and hydrology, which is once the seepage occurs, there is a whole 300 meters of ground that makes it uniform. It's a very low pass filter.

That's not true in volcanism. There is an event that occurs at a particular event of time. It's very focused, which is not true with seepage. Seepage I would never go this route. Okay? And there's a very good reason for that.

So in my mind, the two are very different processes. Seepage is not a low-probability, high-consequence thing. It's a continuous process. And the 300 meters of unsaturated zone, even if there are pauses at the top, are all uniform, become uniform, as you know. You're a hydrologist, too, right?

MR. COLEMAN: I agree with everything you said. However, you cannot ignore the long spans of time over which no activity has taken place.

DR. SAGAR: I'm not. I definitely am not advocating ignoring. All I'm saying is, being not an expert, I don't know what interval of time is appropriate for considering clustering. You may have one opinion. Other guys may have other opinions. I don't know.

MR. COLEMAN: I'll leave it just to say that you would want a consistent approach throughout the program with how you treat clustering events.

DR. LARKINS: Maybe you can pursue that at the center and in paper.

CHAIRMAN RYAN: I was just going to say I think you're not going to answer the question here and come to a final conclusion, but it would be helpful to explore, I think, --

DR. SAGAR: Sure.

CHAIRMAN RYAN: -- with the experts, Budhi, when the team get out to the center. It would be great.

DR. SAGAR: Sure.

MEMBER WEINER: Yes, I think this is a very important question.

CHAIRMAN RYAN: Thank you.

DR. SAGAR: Okay. Yes. I wish I could answer, but I can't.

But consistency I agree, and I don't see this to be inconsistent, by the way. So raise it again in April when experts are there.

In the consequence part, we have a contract in the U.K. and in the Netherlands to calculate actual physics of the exsolution of gas as the magma moves up, the turbulence flow modeling of that and trying to see what the pressure distribution would be behind the magma flow, whether it can create secondary parts or not, whether the magma would enter the -- once it hits the open dearths of the repository and how many of the waste packages would be impacted.

This is not something people model normally. I mean, this is not something that is done every day at many universities. So that is one reason why this is a more difficult topic, because it's not like hydrology, which thousands of people are doing every day. So you can have different understandings.

But here it is kind of a heartbreaking analysis that is being done. It's a high number of flow. I won't even try to explain this because there's more behind this than this curve.

The basic idea is that if you could understand the physics of the flow as it comes from depth up, how does the pressure change? How does the velocity change? What is the mixture of gas vapor versus solids that are moving up, et cetera? So we need to get some sense of that. And if you have to depend on an expert opinion, it's based on some things that you have done, some analysis that you have done.

The value distribution is part of the calculation of consequence for igneous activity. This is the repository here. This is the 14-mile wash basin. Any ash that's deposited in this area kind of flows like this into this area here, which is a depression and deposits here.

The drain is in this area. So the idea is that for many years after such an event occurs, the ash can be redistributed, can be accumulated, which is widespread here initially but eventually can flow through this area.

So this can be a source, radionuclide source, there for many years to come. The idea would be to somehow try to consider this in the calculation of the dose.

CHAIRMAN RYAN: Budhi, I think this needs to be on the list as well --

MEMBER WEINER: Yes.

CHAIRMAN RYAN: -- as a critical issue because the ultimate inhaled quantity by whoever you're calculating for is dramatically dependent, by orders of magnitude, on some of the assumptions you can make.

For example, a simple one -- and you're showing them on the next slide. Thank you. You know, the idea that 100-micron particles are inhalable is at least 80 percent outside of the range that 10 CFR 20 relies on. So I really want to explore that I think in some detail to understand the insights that people feel are appropriate.

You know, we had a working group session in Las Vegas last September and had a diverging set of views on how long material is available for resuspension, what fraction is resuspended and what particle size range.

I think there are important questions about the distribution of the radioactive material on or in airborne material and so on. And all of that again I think sums up to have a very important impact on the calculated dose.

So I think the Committee is certainly focused on this and will really appreciate some depth

of discussion on these issues at the center visit.

DR. SAGAR: Okay.

MEMBER WEINER: One question that I hope to explore when we are there is specifically -- it's probably too long to answer it now -- how you model resuspension, what model you use, what assumptions you make, and so on. It's just a head's up.

DR. SAGAR: Okay.

MEMBER WEINER: Thank you.

CHAIRMAN RYAN: Bret, you had a comment?

MR. LESLIE: Yes. This is Bret Leslie from the NRC staff.

Previously you had asked, well, what kind of risk analyses did you do? In fact, 3 of the 14 analyses were on this topic or aspects of this topic; for instance, wind fields, redistribution, what are appropriate sizes for inhalation. So a lot of that work was occurring this last year with the thought of updating what is in the TPA code. So we did these things.

And so what I want the Committee to understand is it's not just isolated analyses, but there is a thread here that we are trying to use our risk insights to identify where areas are that we need additional information. Those analyses are being

done. And you should get an integrated picture of the topic and not focus just on, is this --

CHAIRMAN RYAN: Oh, no. I don't think we're focused on any one parameter. We actually want to do exactly what you say, which is explore the entire picture.

MEMBER HINZE: Yes, exactly.

CHAIRMAN RYAN: You know, again going back to September, we didn't have a lot of the updated information then. We wrote a letter. The EDO's response really didn't give us a lot of the detail that you're now describing and we hope to get at the center.

(Whereupon, the foregoing matter went off the record briefly.)

CHAIRMAN RYAN: Again, I'm aiming ahead a bit, but where I think the Committee wants to be is to explore this with the idea that we could write a follow-up letter that would provide the Commission with our further understanding and insights from the visit on these details. That's really where we're heading, and I just wanted everybody to have an appreciation for that up front.

MEMBER WEINER: Yes.

DR. SAGAR: Any help we can get from the

Committee would be great on this topic. This is one of the controversial ones.

CHAIRMAN RYAN: Yes. That's great. And we'll look forward to it.

MEMBER WEINER: Yes. I think this has been great.

MR. HAMDAN: I just wanted to say on this topic, if you go back to your list of items of high significance and those that are medium, you see already that igneous activity is one of the high items. And then two items on the medium are the volume of ash and the remobilization of ash. I think that is where the question is going to be, that these two should also be in the high-significance item list.

MEMBER HINZE: I think three of the six are volcanic-related. Right. They're on that page 11, I think it is.

DR. SAGAR: Yes, yes. I think the resuspension is an important one depending on the activity of the RMEI. So yes. That needs to be considered.

Structure deformation and seismic key technical issue. One of the main work that I am showing you as an example is the calculation or estimation of the ground motion for design of surface

facilities, which is a function of mainly three things: resources, what we have for the excitation to moves, and what the correct sticks on the side are.

The primary thing we are investigating is the effect of the alluvium on the shallow stratigraph just below foundations of the surface structures; what effect; what amplification, if any; how the ground motion changes as it goes through the shall stratigraph.

MEMBER HINZE: You are still using the California measurements on ground motion?

DR. SAGAR: We have -- and I don't know where these are. Two of the earthquakes are from Europe. Again, I'm not a seismologist. And two are from California. So they are doing four analog earthquake motions to try to study this.

MEMBER HINZE: I think we would like to hear more about this at the center as well.

DR. SAGAR: Sure. Okay. We'll make a note of that.

MEMBER WEINER: Yes. L already have.

MR. LEE: Before we leave this, though, staff are in the queue to come in and talk to the members about seismic design issues just to remind folks. I think that's on our count.

CHAIRMAN RYAN: Before or after the center visit?

MR. LEE: After, after.

CHAIRMAN RYAN: We want to hear about it at the center.

MEMBER WEINER: Yes.

DR. SAGAR: This earthquake, Kozani, I think this is a European earthquake somewhere in 1995 with a magnitude of 6.5, 17-kilometer epicenter. This is the input exsolution. The red line here in this curve is the same as this one. This is the input at the rock surface and the depth.

And then all of the other lines are assuming a one-dimensional stratigraphic column under the surface structures. And there is variation in the shallow stratigraph here at the site where the thicknesses of each type of stratigraph changes as we move about the site. And the velocity propagation rate depends upon the geologic nature of that and how thick that stratigraph is.

So we took 25 such columns, one-dimensional columns. And these are 25 curves as to how the motion, one motion of the depth, would amplify as it moves up to the surface. So the design basis would then depend upon these ground motions, one

of these ground motions.

The only difference I see between what DOE is doing here is that they are doing this more on a randomized fashion in the sense that they have a base case stratigraph. And then they put uncertainties around it to try to calculate the design basis.

We didn't put uncertainties. We just had 25 samples taken. The idea was to try to see how good that uncertainty bound that DOE is doing does bound the adequate motion of the surface.

MEMBER HINZE: Do you have access to all of the information you need from DOE to perform these analyses?

DR. SAGAR: As far as I know because these 25 one-dimensional columns were derived from the 3D site model that both DOE has and we have.

MEMBER HINZE: They have been doing some more work, as I understand it. I don't have any of the details on it, but I am wondering whether you're getting that information on a continuing basis.

DR. SAGAR: Well, that's another question we should ask when you come to the center because, again, those people who are doing this hands on would be best to answer that. I mean, I haven't heard anything going up and saying, "Oh, we're not getting

this. What is this?"

Then the effect of the thermal falls that the repository would create on the potential for slipping on falls, this is mainly related to the rock fall, potential rock fall, in the drifts.

On the left side here is an analysis that indicates the slip tendency with *in situ* stresses, the red being where the slip tendency is high, -- it's a dimensionless number -- and the other colors being less potential for slip. As you factor the temperature, the heat generated the picture changes somewhere in the sense that you see more color here, which means more there is a potential for activation of fractures because of the heat generated.

In my next slide, I think I would show you the thermo-mechanical effects key technical issue. There are two parts here. One is once the degradation occurs, the rock fall occurs. It accumulates around the waste package for the engineered barriers, drip shield included. It acts as insulating material. And the temperature is calculated without assuming the accumulation of this debris material works as the temperature calculated without it is different.

So we have a higher temperature. I think the black line is the one you should pay attention to,

which includes both convection and conduction processes in the calculations.

It's about 150 degrees C. higher. But when we factor this into the calculation of the dose, again look at the black curve. This is the blue curve here, which is no backfill at all.

Assuming no degradation occurs, the difference is not that large. Look at the scale here. The first dose calculation is not large with the conclusion that perhaps it wouldn't matter.

Now, this has some assumptions about whether the drip shield fails or not, whether the waste package mechanically fails or not, and so on and so forth. But on the next one, you would see a connection.

Did I miss something? Is that right? I've got another slide in which the DOE's strategy is that they will design the drip shield to accommodate all the load from a degradation. If that's the case and we agree that design can be done, then it's really not that big an issue.

CHAIRMAN RYAN: That's not a bad break point. Bill's got 2005, and then there are some other topics. I'm going to suggest that we wrap up with perhaps Bill's question and perhaps a couple of others

and then take our lunch break so that we're all back and seated for the commissioners' arrival at 2:00 o'clock, rather than go long.

DR. SAGAR: Okay.

MEMBER HINZE: I'll ask him after the break.

CHAIRMAN RYAN: It will wait until afterwards?

MEMBER HINZE: Yes.

CHAIRMAN RYAN: Okay. If now is right, go. That's fine.

MEMBER HINZE: No.

CHAIRMAN RYAN: Ruth, we'll sign off with you.

MEMBER WEINER: Yes. Can you patch me in again when Commissioner Merrifield comes in? I think I've got the local electronics under control.

CHAIRMAN RYAN: Well, it's going to be 2:00 o'clock.

MEMBER WEINER: Yes. That's fine. And if nobody answers, it means I'm in surgery at the same time.

CHAIRMAN RYAN: Okay.

MEMBER WEINER: Thank you, guys, for your forbearance.

DR. SAGAR: Thank you very much.

CHAIRMAN RYAN: Bye.

(Whereupon, at 12:57 p.m., the foregoing matter was recessed for lunch, to reconvene at 1:52 p.m. the same day.)

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

(1:52 p.m.)

CHAIRMAN RYAN: We can go ahead and begin our session this afternoon. We want to welcome Commissioner Merrifield and Commissioner Lyons to the Advisory Committee on Nuclear Waste. And we're looking forward to your discussions this afternoon now with areas of mutual interest in waste management.

So, without further ado, let me turn the meeting over to you.

COMMISSIONER MERRIFIELD: Great.

CHAIRMAN RYAN: Welcome.

COMMISSIONER MERRIFIELD: Well, thank you very much. And, again, Mr. Chairman, thank you for making this time available to do this. I have the opportunity to meet some of the members of ACNW whom I have not yet had the pleasure of meeting.

9) DISCUSSION WITH COMMISSIONER MERRIFIELD

COMMISSIONER MERRIFIELD: As John Larkins would recognize, this is something that I have done previously with ACRS and not previously had an opportunity to sit down with the ACNW as a whole and to talk about some of the issues that I think are important for you to be focusing on. So it's a good opportunity today I think to do that.

When he first came on board, Commissioner Lyons had expressed a desire to come as well and to meet with some of the members of the board and see what a commissioner interaction with ACNW would look like. It was certainly my pleasure to do that.

There are a few things that I want to try to cover today. I guess as a predicate, I would say that the best way of adjudging what it is ACNW should be doing is following the Commission SRMs.

And so I don't get too far away from that, certainly I would reference the most recent SRM from the Commission under Com. SECY 04-0077 that we issued on January 19th of 2005 giving the Committee the notion of where the Commission was coming from relative to the action plan that you had sent us for fiscal year 2005 in 2006.

Before I get into some of the details on that, I think I regret that it has taken me six and a half years to actually come and have this type of meeting.

When I worked on the Senate Environment Committee and when I finished that effort in 1998, I frequently talk about the subcommittee of which I was the staff director, and that was the Subcommittee on Superfund Waste Control and Risk Assessment. So the

issue of waste, as you can well-imagine, is something that is near and dear to my particular heart.

I spent a number of years up in the Senate interacting with the Senate Environment Committee. And that involvement focused not only on the issues of Superfund and the Resource Conservation and Recovery Act, which were under the principal jurisdiction of that subcommittee, but in the role that I played for the member of Congress for whom I then worked. I was also substantially involved in activities associated with the cleanup at a variety of DOE and DOD facilities, which included both radiological as well as hazardous waste contamination.

And so under that aegis, certainly the notion of sensitivity of those issues has been one that I have been concerned with for a long period of time.

And I'm going to go into that in a few minutes. Today I think the principal focus of my discussion in the dialogue I want to engender does relate to the issue of decommissioning and where I think we need to be focused.

A few predicate things I think are important. I think any meeting with ACNW on the issue of priorities would not be complete without at least

referencing the issue of the role of this group as it relates to Yucca Mountain. That clearly has been the focus of the substantial interaction between the Commission and you, Mr. Chairman, and your predecessors in the past few years and obviously given the current status will be one of continuing interaction and concern.

This is clearly a case where it is in I think my best interest and that of the Committee to focus merely on the words that are contained in the SRM of the Commission. And I think I may not read the entirety of that text. You can do that on your own. But I have no better summation of the expectation of the Commission than what is engendered in that particular document.

That brings us to a couple of other issues that are listed on the SRM that I would like to just briefly touch on before I get to decommissioning. The first one is the issue of waste incidental to reprocessing.

In the context of the SRM, the Commission noted the importance that it believed should be placed on this particular issue and should be included as a Tier I topic of the Committee. I think that was principally underscored by recent congressional

action, which has enhanced to a great degree the NRC's role in this program in the interaction that we will be having with the Department of Energy.

This is an issue which has significant interest on the part of a few congressional delegations. Some members of Congress, understandably, are very concerned. "Concerned" perhaps isn't the right word, but they are very interested in knowing where we are going to go and the level of involvement that we will be having.

So I think the Commission, as the SRM indicates, would be well-served by the Committee taking a look at this matter in a thoughtful way and as a tier one priority in the context of the next year. There's going to be a lot of work on the part of our staff and certainly I think to the extent that we can engender the significant expertise of the Committee in assisting in good quality outcomes I think is the right way to go.

The second predicate issue I think I would want to mention is the transportation of radioactive materials. As is noted again in the SRM, this was listed as a second tier topic of the ACNW and one which the Commission has considered should be thought of as either a first tier topic or, at worst, given a

high priority among the second tier projects.

I think this is an area where the Commission does have, albeit it a limited role in the issue of transportation, an important one. And as the time gets closer to potential consideration of where DOE is going in that regard, I think it's very important that the Commission have the benefit of the knowledge and expertise of ACNW to make sure that we're getting what we need to get going forward.

This is clearly an area which engenders significant interest on the part of our stakeholders, those who live in communities that may be affected by transportation issues, those in Congress who represent those and other individuals, and other interested parties.

It is an area which has received increasing attention on the part of the Commission. We did engender to understand with greater specificity the impacts of the Baltimore tunnel fire and how that may play out on spent fuel transportation.

We are at a point where we are having consideration very actively of spent fuel storage transportation of a canister and monies that we may put toward conducting a full-scale test, so a lot of areas that have had an increasing level of interest,

but, again, as I said before, which certainly justify having increased activities on the part of this Committee into looking into those particular concerns.

All right. That brings me to the last topic that I want to lay out before I open it up. And that is really the issue of decommissioning.

I think there is a variety of important issues that are going on with decommissioning right now. Part of what I am going to talk about today is not any different than similar discussions that I've had with our licensees, with other outside stakeholder groups, or have had in our public veins.

As it relates to reactors that are under decommissioning, we are in, I believe, somewhat of a unique opportunity right now to really gauge in understanding some lessons learned in how one might go about decommissioning a former power reactor.

We have right now more former reactors under decommissioning than we have had at any time in the history of this Commission, whether it is Big Rock Point. Whether it is Maine Yankee, Rancho Seco, Trojan, or many of the other facilities that are either under decommissioning or nearing completion, like Saxon, I think it is quite important for our staff and for our licensees, both collectively and

individually, to take a real assessment of how this process of decommissioning has gone.

What were the successes of that decommissioning process? What were the potential down sides of some of the activities, be it from a regulatory and safety standpoint or from a cost and efficiency and effectiveness standpoint, to really capture to the extent that we can these lessons in a methodological way so that a commission of the future or a licensee of the future when confronted with the inevitable requirement to decommission these reactors will have the understanding and appreciation of what went through before?

These, as you all know, are very expensive undertakings. Mistakes made early on can have impacts in the tens to potentially hundreds of millions of dollars. And so understanding what those potential pitfalls are and translating that I think is quite, quite important.

Now, the reason why the timing on this I think is somewhat critical results from the fact that looking back at the period of the mid '90s, the Energy Information Agency at that point felt that we were really on the bridge of having a significant number of reactors shut down.

The shutdown of Maine Yankee I think was probably the penultimate of that particular action. What has subsequently happened, as all of you well-know, is that we haven't had that wave of reactor decommissionings.

And, indeed, given our license renewal program and the trajectory that it is on right now, which I think will result in virtually all of our reactors being relicensed for an additional 20 years of power operations, the next wave of decommissions on the power reactor site may be many years away.

And so I think it is for this reason that having the focus today and now is important for capturing that information for its future use. As it relates -- and I think it is important to always focus not merely on licensees who are part of this process, but I think it is also important to think about these issues, decommissioning issues, in the context of the people who live around these sites.

When the early days of the building of the current program and this I would date back to the 1950s and early 1960s, individuals, be they utilities or be they associated with the Atomic Energy Commission, went to communities that were to be the future host of these sites. They went on with a

promise that at the end of the day, after these reactors were utilized for their purpose, that the site upon which they were located would be put back in a way that would be responsive to the needs of the community, sort of the "We'll use it, but we'll put it back right."

I think the efforts underway right now, be they at Saxon, be they at Big Rock Point or elsewhere, is the closing of that circle. The fulfilling of the promise to the host community is that, in fact, when the useful life of the reactor is completed, the site will have some useful future purpose.

Now, this, again, dates to an issue that goes back to the time I spent on Capitol Hill. One of the things I dealt with quite significantly was the base closure process by the Department of Defense. How do you take former military facilities, some of which have significant environmental contamination, and reutilize them in a way in which they can provide enhancement and value to a community?

In some cases, that meant that portions of these facilities were put toward environmental purposes, be it the Fish and Wildlife Service, the Park Service, or otherwise.

Some of them were for like reutilization.

For example, many of the Air Force facilities were reutilized as airports or other types of economic redevelopment, whether it is for the purposes of residential, commercial, or otherwise.

Well, Congress I think recognized that one of the significant impediments to making that process work, not just merely at the Department of Defense sites but, for example, at Superfund sites and Brownfield facilities, which fall typically under the aegis of the Resource Conservation and Recovery Act, was that the mechanism used to require the ultimate cleanup of those facilities created a liability regime in which it made it very difficult to attract individuals to come in and to provide that beneficial reuse.

Keeping that focus in mind, coming to the Commission, it was my desire -- and I think the Commission has gone far in accomplishing this goal -- to try to move us in a way that would provide for greater sensitivity of meeting the needs of the local communities in providing those beneficial reuses.

Changes to the license termination rule, recognition that, for example, in some cases, institutional controls with a balance of cost versus benefits made sense in a way that would allow enhanced

and expedited reuse of these facilities by the people and by the individuals who were living in those sites.

That obviously brings with it a lot of complexities. It brings with it some obligation on the part of its agency to be a steward of those efforts. But I think moving away from a focus which typically always looked at a default farmer scenario and, instead, looked to more realistic scenarios I think makes a lot of sense.

As ACNW moves forward on this, I think it would be instructive and useful as part of our overall mandate to protect public health and safety to have an opportunity for ACNW to look at these issues in a holistic way, to make sure that, in addition to meeting our overall requirement for public health and safety, that we are mindful of the local communities and mindful of ways in which we can innovatively put these sites back into a beneficial reuse in a way that makes sense in a way that is timely. That I think -- and I have been going on for a while. That is really the heart I think of much of what I wanted to say today.

I guess one additional issue that is worth mentioning, I have been focused principally on the issue of the decommissioning of reactors. It would be

a gross oversight on my part to say that I don't have similar concerns with decommissioning of other facilities that fall under our regulatory authority.

One of the things that I think I have asked the staff to focus on quite a bit since I came here as a commissioner was to get a better grapple on what is the totality of the sites that we have under our responsibility for decommissioning and in a holistic kind of way try to have the staff create documentation that would give the Commission a better understanding of those sites, what the complexities and costs of cleaning up those sites are, and what is the timetable for us to ultimately get to an appropriate disposition of those sites.

Part of the driving force for that I think for me was a recognition that, unlike EPA, which can tap into the Superfund to clean up some of these facilities, we generally do not have a pool of funds that we can use to clean up these sites.

Working with our staff and working with our licensees to identify the areas that we have of concern, where appropriate and if we can, identifying streams of our licensees to resolve those in a way which is meeting our health and safety mission I think is critically important.

The staff I think has achieved a significant amount in the course of the last few years in that regard. I think we now have documentation that more clearly articulates the universe of sites that we have before us.

I think today the staff if called in front of you could give a better explanation of where they think the program is, what the requirements are for it, and where they think it is going. I think we have somewhat of a better throughput in terms of addressing some of these sites.

Now, I wouldn't be so sanguine as to say everything is hunky-dory. Obviously with any environmental program and legacy issues that they back well over 50 years, there are and will continue to be sites already identified as we go along with contamination that we otherwise may not have been aware of. That is just a given I think for where we are.

In this regard, having an understanding of the methodology we should be using to most appropriately and quickly identify those sites and resolve them with the methodologies and capabilities we have would well-benefit from again I think an introspective look at this process by ACNW.

At the end of the day, the American people want these sites to be resolved. They want them to be resolved in a way that is protective of public health and the environment. And they want them to be resolved in a way that hopefully can contribute to the community.

Those contributions may be in a more natural state. It may be in a more commercial or residential state. But hopefully given the tools that we have and perhaps some tools we can come up with, we can do it in a way that makes sense that is timely, efficient, and effective in accordance with our overall strategic plan.

So that I think is encompassing of the major things I wanted to talk to you about today and certainly would be welcome to engage in questions or dialogue on those issues.

Before I do, I don't know if you had anything, Commissioner Lyons, you wanted to add.

COMMISSIONER LYONS: I mainly wanted to join you today just from the standpoint of an initial meeting and to see how you conduct these kinds of meetings.

Certainly all of the areas that Commissioner Merrifield are of great interest to me as

well. And on some of them I bring perspectives from my past job. I'm still very much learning this current job.

As we proceed in the discussion, I may jump in if it seems appropriate, but I didn't have any particular comments. Thank you.

CHAIRMAN RYAN: I would certainly welcome participation from both Commissioner Merrifield and Commissioner Lyons in any and all of our activities. And we certainly appreciate you taking the time today to be with us.

By way of introduction, if I may, mainly for Commissioner Lyons' benefit, introduce the members a little bit more formally in their technical areas of interest, that might give you some additional insights.

To my right in the green jacket is Professor Bill Hinze. Bill is a geoscientist of great note. He's a returning member of the Committee after a gap. He's been back. And he is our continuity to the past geosciences effort, particularly related to Yucca Mountain. We're pleased that Bill is back to join us just recently for a new term.

I'd like to also add that, particularly Commissioner Merrifield, I know that you and the other

commissioners helped us fill two slots that were vacated very quickly to members that went to the NWTRB. And we appreciate now being a full complement again to do our work and share the load.

COMMISSIONER MERRIFIELD: Well, I have to say, speaking on behalf of the Commission, which I do rarely, we appreciate being a full complement as well.

(Laughter.)

CHAIRMAN RYAN: We all work well together.

Next is Allen Croff. Allen is retired from Oak Ridge National Laboratory and a chemical engineer, has a particular interest in WIR and will probably be our lead person on the WIR effort. It is, as you know, on our action plan and one that is under current discussion.

Again, by way of introduction, I am a health physicist by training and have been a member of the Committee for several years now and took on the chairmanship as John Garrick departed along with Professor Hornberger to the NWTRB.

Jim Clarke, to my left, is also one of our new members. Jim is an environmental scientist and has a unique background that bridges your own experience in RCRA and our waste management as well as radioactive waste management and environmental issues

related to many of the questions you raise.

So Jim has been in good conversation with Robert Johnson and the staff in the decommissioning area. And that is an important part of our planning for our work ahead as well.

One member is not with us today. She is probably having surgery at this moment. She broke her leg. And, unfortunately, Dr. Ruth Weiner from Sandia just could not be with us due to that injury. So I'm sure she would want to say hello.

Ruth is a chemist by training and has quite a good background in actinide chemistry. So that's by way of introduction.

We have been working hard in the last few months, again, with Dr. Larkins and other members of the staff preparing our action plan. We are pleased and very satisfied with the advice and clarifications that you have given us and the direction, the Com. SECY memo.

In fact, we finished incorporating those revisions to better orient our plan to align with your goals and objectives and hopefully will be transmitting that back to you shortly. So we found that to be a very effective tool and information for us to redirect our priorities. It was helpful to us

to get your insights.

As you know and, again, for Commissioner Lyons' benefit, about a year ago, as we were previously directed, expecting an LA for Yucca Mountain to come in, we have refocused our activities to better balance our work on Yucca Mountain with other activities of interest.

We have been in routine communication with the staff of NMSS. And we view that ACNW can serve NMSS in the same way that the ACRS serves NRR. So we are looking at those broad spectra of issues in waste management and radioactive materials management that span a spectrum of interests.

We have the rulemaking activity on disposition of solid materials. We have the license termination rule and its application. You know, we have low-level waste questions that continue to arise. And we see popular press developments on areas in that industry segment.

So there is a broad spectrum of issues. What we have tried to do is recognize the common technical threads, much along the lines, Commissioner Merrifield, that you just identified.

And there is I think benefit of seriously and thoughtfully studying these areas to gain the

lessons learned and to bring forward the information that will help us do a better job in advising you and, in turn, a better job of meeting our health and safety mission as an agency.

So your words I think sit very well probably with all of the Committee members, certainly with me, and are very much in line with our action plan and our plan for the year's work ahead.

I would invite other members to make any comments or open it up for questions.

MEMBER HINZE: Well, let me ask you, Commissioner Merrifield, does your interest in the lessons learned go to the actual decommissioning process itself in terms of the physical decommissioning and exposures, radiation problems associated with the workers? That's a very critical time for the public as well during the decommissioning process.

COMMISSIONER MERRIFIELD: Yes. I have no problem with looking at those issues. I wouldn't say that that was the specific focus I was looking for. I think what I was looking for was sort of a more encompassing look at a variety of different areas. That would be clearly one that could well be considered by our staff and by our licensees.

Really, what I was trying to engender here was a notion that you have a unique opportunity right now. A lot of these decommissionings that are coming either very close to fruition, like Saxon, are well along their way. And we ought to really take the opportunity now to look at a number of slices of how that process has worked and are there better ways that they can be done.

Now, I say the very same thing to our licensees because I think that they ought to be doing the same thing as well. It really does in some ways benefit them as much, if not more, than it does us as a regulatory agency.

I think from a regulatory perspective, licensees have been accomplishing those decommissioning activities in accordance with our requirements. But, like anything else, I think there are ways you can do it smarter.

And I think there are ways you can do it more effectively and efficiently in identifying that either through our staff on a parallel track. The licensees themselves I think make sense.

Now I don't want to talk too much to this, but I think in terms of the conversations I have had, I think the folks at NEI, Nuclear Energy Institute,

recognize this. There is some effort. It may well perhaps be inclusive of some efforts at EPRI to try to capture some of those lessons learned.

What I think is important to try to do on their part and, similarly, I think if we were to engage in this on our part is to make sure it's not stovepiped; i.e., here are the lessons learned from Maine Yankee, here are the lessons learned from Saxon, here are the lessons learned from Big Rock Point. I think we ought to have that, as they say, in a more holistic sort of way.

One I think which is useful for us to consider -- and this has an application as it relates to low-level waste -- is the activities undertaken at Big Rock Point in terms of disposing of very low levels of radioactive material.

As you may well know, much of the rubble from Big Rock Point is being deposited in a RCRA subtitle D landfill, sanitary waste landfill, in the central part of Michigan. This is one of the largest landfills, I believe, in the Midwest.

There was a significant amount of negotiation between the community of Big Rock Point, the host community in which that landfill rests, the landfill operator at Big Rock Point, and others in

Michigan and other staff, who are interested in how all that might come together.

In order to accommodate that, some of the things that consumers, energy was willing to do was to pay for monitoring equipment, both at Big Rock Point when the material was being shipped out as well as monitoring equipment when it was being received at the landfill to provide some level of assurance that it was not going to trigger in the areas it shouldn't have.

Another thing that occurred was there was an effort on the part of the utility to volunteer to pay for an individual not under the employ of the utility but under the employ of the community to assess that, to make sure that the licensee and any contractors that they had were doing the right thing.

The cost of that is relatively modest. The amount of savings that Big Rock Point is achieving in comparison to the cost that would have been associated with shipping it to a Class A facility is extraordinary. I mean, it's a huge savings.

Now, in terms of the mass of material, one of the things that they're doing at Big Rock Point at this particular landfill, is, rather than putting it in one single area, they're actually doing some

spreading around the site because, after all, most of this is concrete material. And if you know anything about landfills, you want to have an appropriate balance. You don't sort of squish the liquids out too much.

Well, the total volumetric amount of this material, although it's very large if you look at it from the perspective of Big Rock Point, in comparison with the total volume of material in that landfill is very, very small. I think it's something two percent or less.

So you have a real win-win in that respect. It will have in the end almost no measurable impact on the total radionuclide content at this landfill.

And, indeed, the claim is made -- I haven't verified this independently, but the radiological content of what is being disposed of by Big Rock Point is actually less than the material that would be preexisting in the landfill. It sort of would cause you to step back a bit and say, "Are there more places that this could be done?"

So it's that type of lesson learned that I think would be valuable for us to capture for the benefit of the American people as a whole.

MEMBER HINZE: You know, a lot of goodwill with the local people in the State of Michigan.

COMMISSIONER MERRIFIELD: Right.

MEMBER HINZE: And that's important.

CHAIRMAN RYAN: Commissioner, your comments suggest a different view than the typical kinds of stovepiping looking at reactor by reactor. And if you extend your thought, say, from bulk concrete waste with a very small amount of radioactive material contained in, you could look at the reactor decommissioning in a segmented way based on those kind of work activity breakdowns.

You could go all the way up to the other end and look at irradiated hardware, stainless steel.

COMMISSIONER MERRIFIELD: Right.

CHAIRMAN RYAN: It's got a lot of cobalt and a little bit of nickel. And by classification, it may be Class C, but by risk-informed assessment, is it the same? So there is a challenge I think at every level of radioactive material concentration and content to evaluate those same and similar questions where you keep things risk-informed.

On the worker side, it could be, well, was the work activity to take something apart into 1,000 pieces, rather than grouted in one container, worth

the extra worker exposure?

COMMISSIONER MERRIFIELD: Right.

CHAIRMAN RYAN: So there are probably operational issues and so forth. So that kind of topical view across the industry, rather than reactor by reactor, I fully understand what you are suggesting. And that is something we will certainly take up.

COMMISSIONER MERRIFIELD: Well, I think along those lines, I think that was one of the trade-offs that they made up at Maine Yankee. Now, in the case of Maine Yankee -- and I don't know the nature. You know, a lot of disposal issues relate to very sensitive contractual relationships between the licensee and the ultimate host of the facility that the material would be disposed of. But I think Maine Yankee probably made a lot of those very same trade-offs.

You know, if they could more quickly get it into a car where it could be shipped off and they had a price at which they thought they could meet, you know, perhaps they didn't do the same level of decontamination or something. I would just say, "Okay. Well, it's going to go to a Class A. Let's just ship it out."

So those trade-offs are very important in understanding why those choices are made. I think it would be helpful for us and for the licensees.

CHAIRMAN RYAN: Often that is referred to as the process of optimization for waste management.

COMMISSIONER MERRIFIELD: Right.

CHAIRMAN RYAN: I think that's a guiding principle we will certainly hold.

Comments or questions? John?

DR. LARKINS: Yes?

COMMISSIONER MERRIFIELD: I want to go home. It's snowing, and I live in Alexandria. So, you know, it's okay.

(Laughter.)

DR. LARKINS: No. I was just going to follow up on a comment that Mike Ryan. We have been meeting with the staff and are developing a plan to move forward with the WIR issue.

One of the questions that came up as we tried to revise the action plan was transportation of radioactive waste. The Committee has been looking at the proposed full-scale testing of shipping casks. And we'll propose to continue to look at that.

The other issue involves the NRC has a limited role in looking at transportation issues

except maybe through adoption of DOE's environmental impact statement.

And that was an area that we have been discussing and thinking about. Any views you had on that would be helpful.

COMMISSIONER MERRIFIELD: Well, I don't know how much more I want to add on transportation. I think the previous Commission has committed to having a full-scale test.

Right now I think what we're trying to balance is what would be a test that would make sense, what would be a useful effort that would provide us some results that are going to engender a greater degree of confidence and hopefully a greater degree of public confidence on what we do.

I think that is sort of the general theme that the Commission has used and would likely use to determine what is the best way to go in that regard.

Now, you know, obviously this is not all passive activity. You know, as a result of international obligations that we have made, many of the transportation casks currently in use will no longer be allowable after the 2007-2008 time period. That brings with it complications and possibilities that the transport of materials may be affected.

I think the Commission has asked the staff, we have already asked the staff, -- and certainly I think it would be useful for all of you to track it -- what does that really mean? You know, what are the outcomes? And so that's one I think is important just to be mindful of.

COMMISSIONER LYONS: If I could just add a comment that the general area of full-scale testing of casks is one of the few things I've had a chance to speak out on in the limited time I've been here.

And primarily from my perspective of just leaving the Hill, where I feel very, very strongly that having a very credible full-scale test is absolutely essential from the standpoint of public confidence. I am very complimentary of my more senior colleagues on the Commission for having provided the guidance to proceed with that test.

Having said that, I don't have a preconceived notion of what that test should be. I would agree with the way Commissioner Merrifield stated it. It should be a carefully thought through, sensible, realistic test, hopefully one that can provide some data for code verification and additional confidence in other accident scenarios because you're certainly not going to test every accident scenario

with one or two tests.

DR. LARKINS: That's good because if you're conducting the test to verify codes or things that have one type of design, for demonstration it might have another type of test.

COMMISSIONER LYONS: I imagine it would be best to balance both. I'm sure that there is at least useful data or code verification that comes out of it along with providing an advance level of confidence.

CHAIRMAN RYAN: Other questions, comments?

(No response.)

CHAIRMAN RYAN: I'd like to pick up on another aspect, Mr. Merrifield, on decommissioning. You mentioned the non-reactors. That's a world that I have a lot of interaction with in my background.

You know, we think about 17,000 licensees and agreement states. Perhaps they're not spending the dollars that a Maine Yankee would spend, but sometimes they face critical decommissioning questions that are similar at a much lower budget level, but with the number of licensees out there, I think that is an important question and certainly one that we have addressed.

We have interacted with the agreement states program and learned how they're involved in

those activities. We have talked to NMSS and have looked again across the spectrum of facilities, both licensed by the Commission and by the agreement states. And we're mindful of those activities as well.

So I just want you to know that is on our radar screen.

COMMISSIONER MERRIFIELD: You know, I think that is appropriate. One of the reasons I think that I have really laid on the staff to get a better handle around that part of the program is a recognition that at the end of the day, there may be a group of sites. I don't have a crystal ball as to whether that is one, 2, 20, or more.

There is going to be some group of sites for which there is not a viable party with the wherewithal to clean it up and that there are no other avenues within the regulatory authority of this agency to get the money necessary to effectuate that cleanup.

And so if we can identify that, as in the case of safety license up in Pennsylvania, where we recognize that that is ultimately going to become a Superfund site, and work with EPA to get it there, identifying those and working that mechanism through either to tailor that in and seek tailoring that into

the EPA program through Superfund or, alternatively, if there was a notion that if we knew we had a core universe of sites that we had a good handle on were going to be the number of sites that we really thought were going to need some federal intervention from the federal fisk, then perhaps we would be able to go to Congress and say, "You know, we've got these five sites. And we think we're going to need somewhere in the neighborhood of -- pick a number -- to clean them up. That would at least give us the data necessary to go ahead and make that appeal as appropriate."

I think it's important for us to continue to develop and follow through on that program so that we can close the chapter on some of these sites and get to the finality, which I think people who live around them deserve and certainly desire.

So I think following through, continuing through, keeping on top of our staff in terms of bringing these to finality I think for me is an important criterion.

CHAIRMAN RYAN: I think if we could serve the function of bringing the technical experience to date across those sites that have been taken care of and what costs look like and what problems occurred and what successes they've had and those kinds of

things, that may better inform these estimates that will be important to you in addressing these larger potential problem sites.

COMMISSIONER MERRIFIELD: Right.

CHAIRMAN RYAN: Okay. Thank you.

Other comments or questions?

(No response.)

CHAIRMAN RYAN: Commissioners, again I thank you very much for joining us. We would welcome you to stay. We recognize you have other responsibilities. And with the snow pounding down the streets, it's going to be a tough travel afternoon for some. We really appreciate you being with us today. Thank you very much for your insight. It will help us in our work and in our continued planning and efforts on behalf of the Commission and the staff.

COMMISSIONER MERRIFIELD: I appreciate that. And I would say, having been on the Commission now six and a half years obviously I know full well the degree to which the Commission relies on the important involvement and interaction with ACNW.

Although you are new to your tenure, I know that you certainly have and will take the opportunity to come and meet with the commissioners individually --

CHAIRMAN RYAN: Yes.

COMMISSIONER MERRIFIELD: -- to make sure we have the appropriate level of communication in terms of the direction you're going and keeping us informed of where you think you need to go. So I appreciate that.

It was an excellent relationship I had with your two previous chairmen, both of whom have left. Certainly I expect good things to continue, as they have over the years.

CHAIRMAN RYAN: I look forward to it.

I'd be remiss if I didn't recognize the staff, John Larkins, who is our director of the staff, and the other members who support the ACNW. They all do a fabulous job. They're very highly skilled professional people. And everybody around the table and many who are not in this room, we get the support we need to do the work that you asked us to do. And I want to recognize their contributions to the Committee's efforts. So thank you.

COMMISSIONER MERRIFIELD: I always tell folks up on Capitol Hill that we always hire smart people, and it shows. Thank you.

CHAIRMAN RYAN: Thank you.

(Whereupon, the foregoing matter went off

the record at 2:36 p.m. and went back on the record at 2:59 p.m.)

CHAIRMAN RYAN: Again, I mentioned to Dr. Sagar that we appreciated his flexibility in letting us interrupt his presentation, but we'll get back on track. I think we had left off with a thorough and informative review and lots of good questions and answers on work in 2004. Now Budhi is going to give us a view of the work plans for 2005 and beyond.

DR. SAGAR: Right.

CHAIRMAN RYAN: Thank you.

DR. SAGAR: Thank you. The 2005, just to brief you on what we do in planning for a fiscal year, we do prepare what we call operations plans at every center, which are approved by the NRC before we start expending money.

For 2005, we did prepare a plan while the budget was not yet approved by the Congress as an interim plan with the assumption that the license application would come in December 2004. There would be a three-month period in which we would do acceptances, et cetera, et cetera, et cetera.

And that, of course, all has to be revised now that the license application has been delayed. That revision is ongoing now. By the 23rd of March,

the revised license application will be sent to the NRC.

There is a discussion going on on the scope of work. As I said, the expectation this fiscal year is to not spend all the money that is in the budget for the fiscal year because it's expected that more funds would be needed next year. So some things can be carried over. It's between the contracts because there is some issue upon how much you can carry over and so on, so forth, but that is ongoing.

In a sense, then, I think one of the things you perhaps want to note is that the key technical issue agreement work is, quote, unquote, "complete." We do not expect, as was said this morning, even on the agreements that are not complete, which we have responded to the DOE indicating that there is some information for the NRC staff to proceed to do a detailed review, a response, a written response, from DOE is not necessarily expected. We may get something. We would continue to review. Any new information DOE would produce we'll bring out in public.

Again, we have no plan to update the ISR, for example. So the key technical issue work we may say finished. And, really, we are proceeding to look

at how to implement the plan that is being developed for the license application review. What is it that we need to do in the interim that the LA is not here? That is what is reflected here.

Once the new EPA standard or the revised EPA standard with respect to the compliance period is known, even in draft form, I think we would be concentrating on doing whatever work is needed to be able to review the license application with respect to that standard, which would, of course, require, you know, similar revision of Part 63 or looking at any changes that we may need to make, either in the TPA codes or in the PCSA code and so on, so forth.

What I've listed here is sort of a summary of what we think are the important items that we would continue working on until the license application actually is submitted.

The risk insight is an important item of work. And any new things that we learn, as I said, the risk insight report, the baseline report, is now 18 months old. And as new information factors in, you know, factor that into calculations and update any information, any results that we can.

Update the EPA codes as needed. I say "as needed" because we don't know what the EPA standard

would look like. Sensitivity studies are ongoing most of the time. And these go on the total system level as well as at the process level.

So, again, you know, faulting, for example, we had a slightly different method to look at the probability of faulting, fault slip in the future and so on. Perhaps we'll continue to look at that.

The reactive transport, we have made a tremendous amount of progress in simulating the reactive transport. Rather, you know, we were in the preliminary stage, I would say, five years ago. And this is still an active area of research in many places all over the world.

So to absorb this new knowledge and continue to do a more realistic simulation of the active transport remains an objective. My own personal guess is that this is the kind of area which will probably continue in the performance conformation phase.

MEMBER CLARKE: Budhi, your reactive transport simulator seems to be dealing with seepage water chemistry. Is it dealing with stuff potentially coming out of the repository as well?

DR. SAGAR: The primary objective of the simulator is the seepage water. As it travels

downward, it interacts with the rock.

MEMBER CLARKE: What is its chemistry? Is it --

DR. SAGAR: What is its chemistry? How does it change and so on? We have a multi-flow that couples the unsaturated chemistry heat and flow.

MEMBER CLARKE: If I could follow up, I was going to say when you finished, Dr. Hinze this morning asked about retardation studies and KD as a function of water chemistry. Is there any more going on in that area? I don't see it on this.

DR. SAGAR: Well, let me see. Do I have one more slide or this is it?

MEMBER CLARKE: Oh, you have another slide?

DR. SAGAR: Okay. No, no.

MEMBER CLARKE: All right.

DR. SAGAR: Well, maybe I missed it, but the investigation of the retardation in the alluvium is ongoing.

MEMBER CLARKE: We are interested in that when we come to the center.

MEMBER HINZE: Yes. I think that is a critical item.

DR. SAGAR: Yes. And we will be happy to

talk much more about it. That is the Nye County is drilling wells. And we have taken both water samples and rock samples, sediment samples from there.

We have brought those into the lab. And we are doing the characterization of the sediments, the water chemistry, absorption, studies on the actual sediment.

MEMBER CLARKE: Thank you. I didn't mean to distract you.

DR. SAGAR: No, no. That's fine. But yes, that is ongoing and will continue.

I wasn't totally sure what to put on this list. As I said, revision is going on. Discussions are going on. The work scope is still being defined for fiscal 2005. So, you know, I may have missed something.

The relative humidity of the deliquescence of salt mixtures in Yucca Mountain, those experiments are continuing. And we expect to encounter the actual Yucca Mountain dust in some of these experiments.

The fabrication -- and I am not a material scientist, but the welding of a TIC C-22 plate is an issue I think the DOE is in the process of making a prototype. Perhaps more will be known at that point, the temperatures and so on, or whether or not there

are any potential effects, we would continue to look at that.

The igneous activities remain a topic on which we have not closed all of the agreements in the KTI space. And those investigations would continue. I had indicated this morning that we have received some new geomagnetic data from DOE last week. And we intend to do an analysis ourselves to try to see what, if any, effect there might be on the estimate of the probability.

Some new seismotectonic models have recently been proposed at DOE, which I just heard last week. And the tectonic people told me they need to spend some time to try to understand what those models are indicating. I, frankly, don't exactly know what these new models are, but certainly some time would be spent doing that.

In the pre-closure one, the DOE design, there are some new -- well, not entirely new, I was told, but some concepts in which the safety margins are being evaluated or will be evaluated using a method called high probability or high confidence, low probability of failure. This is apparently a method that has been used previously in evaluating structural design. But for this program, this is I think

somewhat new. It is being introduced now. So we at the center, together with NRC staff, will try to look deeper into that method for the design part.

Unless you have questions, this would close the presentations on the repository program.

MR. FLACK: This is all related to your infrastructure that you have now to support the licensing application. If the standard should change, would you have to adjust the infrastructure or do you feel comfortable that the infrastructure you have now in place can be used even after that or whatever?

DR. SAGAR: Right. The infrastructure in the sense of staffing we are very confident is sufficient to support whatever change is out there. The infrastructure that is back to tools, like computer codes we are not so confident that depending on what the changes are in the standard, there may be things that have to be done to those tools.

But I think as far as do we have enough staff in each of the main disciplines that will be needed to implement whatever that standard happens to be, I think we are pretty confident we can do it.

MEMBER HINZE: Budhi, can we understand from that list or can we gather from that list that you will be completed with your studies of the tephra,

the remobilization and the suspension problems and so forth?

DR. SAGAR: No.

MEMBER HINZE: That's not on there.

DR. SAGAR: Yes.

MEMBER HINZE: I think that that is something that is of interest, considerable interest, to us.

DR. SAGAR: Well, I was afraid that this list would not be complete when I was writing it also.

MEMBER HINZE: That's the danger of it.

DR. SAGAR: But no. Those studies are ongoing. And there is some data from analog volcanic sites that is being analyzed for the remobilization part also, how many years does it take to erode certain parts of the deposit and how far it can go and so on, so forth, and an I will call mechanistic model because that is far more difficult than a field mechanics-type model, but more often empirical model based on data is being developed. It has been developed, but I think that they will probably enhance it.

MEMBER HINZE: Your sixth bullet there regarding dust, there might be quite a difference in the dust that you encounter outside of Yucca Mountain

and that which you encounter within the drifts. I think we would be interested in how you are focusing in on that dust and its attributes. Dust is not as simple as the housewife makes it, I think.

DR. SAGAR: You are exactly right. And I think the dust they are collecting is from the ESF, from the underground repository. And through ventilation and those kinds of processes. But you are correct that the one that would actually be in emplacement drifts is not necessarily the dust I would collect today.

MEMBER HINZE: Yes.

DR. SAGAR: It might give us some idea, though, a threshold baseline understanding, but yes, the same --

MEMBER HINZE: Well, that is really a container issue. And so I am quite certain that the group going down, if I can speak for Jim here and Ruth that we would be interested in that aspect as well.

DR. SAGAR: On that issue, though, I am expecting -- and I was talking to Dr. Ryan in the break -- that, as we did in your last year's visit, that we probably would have a chance to talk to you before you come so that we are aware of what are the main questions that we need to talk about.

CHAIRMAN RYAN: I think we would take the action that based on today's briefing, particularly from the members who are participating. We will do the same thing again, --

DR. SAGAR: Right.

CHAIRMAN RYAN: -- have some formal back and forth in writing, so that you can prepare as best you can for the questions that are of interest.

DR. SAGAR: That's correct.

MEMBER HINZE: These will obviously not be all-inclusive because the presentation --

CHAIRMAN RYAN: Well, it will be a good start --

MEMBER HINZE: It will be a good start.

CHAIRMAN RYAN: -- and allow Budhi and his staff to --

MEMBER HINZE: Exactly.

CHAIRMAN RYAN: -- prepare I think as effectively as they can.

MEMBER HINZE: Right.

CHAIRMAN RYAN: I'm sure they'll take one or two calls. We can continue to have a dialogue.

DR. SAGAR: Right, right. And if we can provide, like we did last year, any written reports on what the work is based on for you to prepare so that

in the day and a half, we can complete whatever the objective is. I think we will be very happy to give you those things.

MS. HANLON: This is Carol Hanlon.

Regarding deliquescence in the salts, the dust samples, I think the dust samples that you are working with are the ones that I worked with Zell Peterman to obtain for you. So if you are looking for the background on those dust samples, if it would be helpful to you, I can get in contact with Zell and perhaps get some background on those.

I don't know if that's what you're looking for, but I think those are the ones that we sent down to you around Thanksgiving time. And if those are the ones that are in question, it might be helpful to get the background. So if that is, just let me know, and I'll get the background for you.

MEMBER HINZE: Excuse me, Carol. Could you give us any information or any hard copy on what Zell is doing with the dust samples?

MS. HANLON: I can ask Zell for that as well.

MEMBER HINZE: Yes. That would be helpful.

DR. SAGAR: Thank you, Carol.

Okay. Any other questions on the repository program?

(No response.)

DR. SAGAR: Hearing none, I would proceed on to my last topic, which is evaluating and testing multimedia environment to models for complex decommissioning sites. This is a relatively very small task that we are doing for the Decommissioning and Environmental Branch.

I suppose you might get a briefing from the NRC staff from that branch to get a more broad perspective of why this is being done, et cetera, et cetera, but I will try to provide you a very brief overview again of the work that we are doing at the center.

In background, this is primarily for determination of potential doses for complex decommissioning at low-level waste sites. I would stress complex here because there are some decommissioning sites which are at a screening-level basis, which are simple enough that you could screen them and say, you know, based on risk whether something needs to get done or they can be released.

But complex could be because they are geologies-complex. Complex could be because the

sostrum is complex. Complex could be because the contamination is already widespread or some parts could be, other parts not, and so on, so forth. So that estimate requires somewhat sophisticated application of sophisticated software to do those estimates.

Well, there are quite a few advanced modeling tools that one could use for decommissioning analysis, but all of them are in various stages of development, various not a standard tool that you can say, "Well, use this, and you will be okay."

Again, being a hydrology, for example, monfloys they're called in hydrology, which has become industry standard. If somebody has nothing else, you pick up that, and you get an answer. And most people will shake their head and say, "Okay. These."

There is nothing yet of that variety. Whether we will get there I don't know because you, of course, again need to test these models. And the site characteristics can be quite different from site to site. And some have these boundary conditions or this kind of contamination versus some other sites. So perhaps even the objective of having a standard tool may not be reasonable here.

MEMBER CLARKE: Budhi, are you looking at

interfaces as well?

DR. SAGAR: Interfaces?

MEMBER CLARKE: For sample models that you might use to evaluate transport across, a groundwater-surface water interface, something of that nature.

DR. SAGAR: Pat, do you have an answer to that question? Pat LaPlante is at the center. He's the principal investigator for this project.

MR. LaPLANTE: Yes. Just to answer the question in general, I would say the testing we are doing is considering a variety of pathways in the environment, surface water, groundwater, betos transport, the whole, you know, just about anything you could think of that could be going on at a decommissioning site.

So when we evaluate the codes, we would obviously be looking at how the models allow you to model interfaces or not between the different pathways in the environment.

MEMBER CLARKE: Is it your intent to provide a framework of how these different models could be used in combination for something like that or --

MR. LaPLANTE: I think that --

MEMBER CLARKE: -- you're evaluating them separately?

MR. LaPLANTE: We're evaluating them separately, but with the understanding that we can if we see opportunities for using tools together to achieve a certain end, we can provide that information in our final report or to the NRC. And that's part of what we have looked at as we're continuing the work.

We have identified some areas where you can combine tools to achieve a certain level of complexity that you don't have with --

MEMBER CLARKE: I just raise that example because for a lot of these sites, I would think the groundwater-surface water interface could be important.

MR. LaPLANTE: Yes.

MEMBER CLARKE: It seems it's a hot topic in other areas.

MR. LaPLANTE: That's true.

CHAIRMAN RYAN: Maybe one other final question before you get away. You know, we hear a lot about waste modeling and how it's risk-informed. Are you approaching these modeling activities in the same way of using probablistic risk assessment techniques or how are you addressing the risk-informing aspect?

MR. LaPLANTE: Well, I would say it would be risk-informed from the standpoint of we are focusing on those parts of the models that contribute most to risk. Obviously we wouldn't spend a whole lot of effort trying to dig into a part of a code that might not contribute to risk --

CHAIRMAN RYAN: That's why I would steer you in the other direction because if it didn't use the same rigor to look at all aspects of the code, you might miss something. I mean, that's the one-off, one-on, and those kinds of things.

I guess just as a general matter, as you take approaches toward these other modeling areas, I would at least start out with the same rigor that you have on the high-level waste program because it might serve you well in the long run, just something to think about.

MR. LaPLANTE: Yes. I wouldn't say we're ignoring anything, but we're certainly, for example, focusing attention on the hydrologic models because the license termination rule requires off-site dose calculations. And that is a newer aspect of what they need to do now, as opposed to the compliance with previous clean-up criteria of the past.

And so hydrologic modeling, coupling the

hydrologic models to exist decommissioning site modeling tools is a new area that there's more interest in that. So our vision might be focused on some of those types of areas that we know that the Decommissioning Branch is particularly interested in.

CHAIRMAN RYAN: Yes. I think that is good thinking. Another tack might be to think about it from the licensee's perspective. It's a tough problem when you say that the limit is X. Pick a number, 25, 15, whatever number you happen to be thinking about and in whatever context.

We're talking about doing a calculation that we all recognize is not single valued. So how do you instruct the licensee to do something that is risk-informed; that is, that has some character of while the mean value is this and the thousand realizations, 300 realizations give you this kind of spread? And how do you then translate that into you're done, you've done enough, that's okay --

MR. LaPLANTE: Right.

CHAIRMAN RYAN: -- when, in fact, there is some spread of how that result can be measured against what, in essence, is a single valued standard?

So thinking ahead to how you would instruct the licensee to the endpoint of when you're

done, --

MR. LaPLANTE: Right.

CHAIRMAN RYAN: -- that's an interesting way to -- that's the way I kind of think about how to risk-inform the tool because you've got to put --

MR. LaPLANTE: Right. And some of these tools, if they prove to be useful for modeling decommissioning sites, that may translate into making a licensee's job easier because now they have to do the work themselves to find --

CHAIRMAN RYAN: Most of it, you tell them when they're done.

MR. LaPLANTE: Yes. That's a --

DR. SAGAR: I agree with you, Dr. Ryan. I think that would be the way to go. Some of the tools I'll project on my next slide do have the capability of doing probablistic simulations. But this is my personal comment, that I think the decommissioning is thought to be a simpler -- even though the commissioner, we just heard from him, for example, high-level waste repository program.

And probably the probablistic grounding or foundation is not as strong there as it has become in the repository program, where the regulation itself is written in terms of probability. It's not that

explicit there in the site, rule of site domination rule, or even in the low-level waste, I think, Part 61.

CHAIRMAN RYAN: But I will tell you there are ten dead corpses out there for low-level waste siting that failed because we couldn't get from a geohydrologic model for a surface system to any kind of an assessment that "I'm done."

So I would challenge. You know, it's a great dialogue, but I would challenge you to rethink the idea that, oh, this is a simpler case than high-level waste. It is in terms of the time frames, perhaps in terms of the complexity, the geohydrology, but in terms of where the bar is set to demonstrate a compliance, I am not too sure it is all that different.

So, again, I'm not criticizing anything you've said, and it's a good thing, but I just thought I'd offer some comment for us to stimulate the new work. I think that's the challenge. If it gets off on the right foot that can address this range of issues, it will be a lot more powerful.

DR. SAGAR: Okay. But the scope of work for the center is rather well-defined in the sense that we have four goals, which I will show you in my

next slide, that we are supposed to evaluate based on certain criteria, which we have defined, whether the strengths and weaknesses of each goal, what it can or cannot do. Can it do interfaces between groundwater and surface water? Can it do whatever processes we have to consider?

And, therefore, can we come out with in the end recommendations with respect to those four goals where they would be most useful? And can we, then, therefore, say -- and this is the kind of site -- we have used this tool, and if this is another kind, use that other tool.

So this is primarily looking at the characteristics of the four different goals. And to be able to compare them, we will pick a fictitious site, which is based on a real site, but we will make up data because a real site doesn't have all the different complexities that we want to look at.

So even though it's based on some site that we have already dealt with, we would make up the test case and then have various models' goals run on that test case to kind of try to draw some conclusions as to their effectiveness.

So these are the four. The GENII was in 2.0, which is still a test portion of codes using the

frames. I assume some of you are familiar with this, but frames is a general framework written I think at the Pacific Northwest Lab. To be able to have an object-oriented goal, you can create an environment of assessment goals picking various modules and combining them together to solve a problem.

The GENII is a wide disruption of a coal that's again produced at the PNL, P&NL now, National Lab. That calculates the dose to receptors by various pathways. It's probably one of the better known dose simulators.

What is included in here is air transport and exposure pathway models, such as farming. I was interested in the comment that was made that perhaps the subsistence farming is not always the appropriate scenario to try to look at the safety of a site.

CHAIRMAN RYAN: There are not many subsistence farmers in some of the industrial sites downtown in big cities.

DR. SAGAR: Well, you said bounding. It's a bounding thing.

CHAIRMAN RYAN: But that tells you nothing about the risk?

DR. SAGAR: That doesn't tell you anything about the risk, right.

CHAIRMAN RYAN: Having a calculation that is unrealistic conveys nothing about the risk.

DR. SAGAR: Right. I think it's okay for screening purposes, but if you get into where is it done or is it complete, then you have to go for --

CHAIRMAN RYAN: Yes. This is kind of my point, Budhi. It's on what we talked about a minute ago, that the subsistence farmer can inform a practitioner. If you and I look at subsistence farming scenario output, we can decide it's okay or it's not, but that doesn't help either of us if we're demonstrating compliance --

DR. SAGAR: Right.

CHAIRMAN RYAN: -- from a point of view of a regulator or the public because it's not realistic. And it doesn't communicate anything about risk. I think, frankly, that's kind of what Commissioner Merrifield's comments are aimed at, thinking about it in that way.

DR. SAGAR: MEPAS again used in FRAMES. So this is the -- what is it called, Pat, the multi-environmental pathway assessment?

MR. LaPLANTE: Yes, that's pretty close.

DR. SAGAR: But this is, again, in the sense that the earlier question you asked, whether the

surface water/groundwater coupled here is through the soil, through the groundwater, through surface water, through air, all kind of pathways are included.

Now, of necessity, these models are generally compartment-type models, where you mix things up and then it moves into another compartment. That's all about the transport process.

There have been some models now that are being developed where the groundwater pathway has a more physics-oriented transport, rather than just a mixing cell type of model. So eventually you are going to where you have more realistic modeling of the various processes.

The RESRAD-OFFSITE, which is, again, a beta version, which means a test version, which is now left to do only the on-site, those calculations. They have a new version now, which is off-site, which is what we need for the site determination kind of analysis for decommissioning. That's the third.

CHAIRMAN RYAN: Budhi, those are kind of one-dimensional transport models that are certainly useful but are limited perhaps. And some of the kinetic models; for example, the pathway stuff, is also for kinetics and linked compartments with single value rate constants and those kinds of things.

Do you see anything that is getting a little more powerful in the other areas besides, say, groundwater? Are they becoming more sophisticated in the other aspects of the modeling?

DR. SAGAR: Again I would ask Pat to comment because what I have seen, I have seen the groundwater getting more physics-based, but I don't have knowledge about other parts.

MR. LaPLANTE: This is Pat, Pat LaPlante again from the center. Well, the RESRAD-OFFSITE code, for example, pays it to the groundwater transport model. And we're just starting to get into that one. We're waiting for some more documentation on the actual mathematical equations and the model --

CHAIRMAN RYAN: That's fairly new, right?

MR. LaPLANTE: -- because the documentation hasn't been developed yet, but I think some papers have been published or something like that.

I think early on, they might have put a three-dimensional groundwater model in to RESRAD, and it ran so slowly that they had to make some adjustments.

So I think that these tools that we're looking at are I would say generally consistent with

the types of tools that are used for decommissioning analyses, the level of modeling that is being done.

Now, we understand that technically the models are fairly simplistic. And they may not be considered state-of-the-art, but there's that balance between how do you get a tool that's essentially good enough technically to satisfy the technical requirements of the analysis but will also enable staff to do these analyses efficiently because staff don't have the time or resources to do cutting-edge, state-of-the-art analyses for each of these decommissioning sites?

And so there are some very detailed models out there that I think the Decommissioning Branch is looking at and NRC Office of Research is looking at for the Decommissioning Branch.

One that comes to mind is like the groundwater modeling system software GMS, but in this case, these are the ones, these are the models that we selected based on interactions with the staff. They're comfortable I think with the list.

As we get more into the details of them, I will provide the details for each source term, release, betos, transport, saturated zone, what types of models are there, what are their limitations, what

are their strengths, that kind of thing.

CHAIRMAN RYAN: Yes. That will be a great start. Well, for example, the RESRAD on-site, the documentation always impresses me because in many places, it says, "Use site-specific data. Here's the reference code. Use site-specific data." It shows up -- I don't know -- a half a dozen times.

MR. LaPLANTE: Right.

CHAIRMAN RYAN: And I think sometimes that aspect of how models are used and how you advise on their use is as important as perhaps a level of sophistication and the mathematics.

MR. LaPLANTE: Sure.

CHAIRMAN RYAN: I mean, very often one site-specific parameter erases a whole lot of conversation.

DR. SAGAR: Well, that was my comment this morning on the repository program. And that aspect of the data part is even in my mind more important than the model itself.

CHAIRMAN RYAN: Sure.

MEMBER HINZE: Is there any thought of using this type of program for determining where you should be doing the monitoring?

DR. SAGAR: Certainly you can do that. I

mean, that's a question that has been studied, I'm sure you know, in various fields, the monitoring aspects and where it should be done, when it should be done, what intervals of time and et cetera are.

I'm sure. I'm sure that you can use these models for that purpose. I don't know examples where they have actually been used that way, but we certainly wouldn't be having this program. We are suggesting that even the all-site review or the -- what's it called? -- the inspections, you know, what to inspect, when to inspect, where to inspect, could be part of the simulation. I mean, it could tell you what is the high-priority item that you should go look at. So definitely I think this is an area which should be looked at.

The GOLDSIM model, DOE uses this for the repository program. It is not really a model itself. It is language in which you can write your models. But it is pretty flexible. It's expensive. But I think it is much easier to create a model using GOLDSIM.

This you can make as complex as you want. I mean, here is a possibility where you can create a cutting-edge model if you wanted to. But, for example, the GOLDSIM at least we have doesn't have

those calculation capabilities, but you can bring GENII and make it a part of GOLDSIM.

And GENII is a pretty detailed pathway model for those calculations. So you can have all sorts of models. So it's just another question of what are the hardware you need.

We at the center don't have the hardware to make many simulations using GOLDSIM as DOE does using DOE's complexity of the model. It takes a lot of hardware.

So, as Pat said, there may be some balance you have to reach as to what the end objective is and what kind of complexity would be sufficient.

The last mark here, this is part of the experience we had using these models, bringing them in, putting them on a computer system, trying to run them. And we discovered bugs.

So not all of these models have taken a long time to develop. Not all of them are through the same rigor of quality assurance, QA/QC. And it's sometimes bothersome when you get a cold and it has been in use for ten years. You want to run it. And, well, it doesn't.

I think when the tools become so important to your work that that is an important input to the

decision-making, I think it is perhaps time to pay some attention to make sure that you have confidence in the tools that you have.

We added a very preliminary stage in this task. So I can't present you a whole lot of results. The FRAMES would be the framework for -- in general, I think it's a good idea to have this kind of -- unless we are into GOLDSIM, which is a mix of the frame and so on so you don't have to go into FRAMES.

The GENII is now upgraded to version 2.0. And that can be worked in FRAMES 1.4. The capabilities we believe are consistent with decommissioning model needs.

We have completed the integration of GENII into FRAMES version 1.4, but the FRAMES is being updated to version 1.5. And we would like to look at the latest version of FRAMES and have GENII included in that.

So, as you can see, it's still at a stage where we are bringing these codes in-house, putting it on our computer systems, and making sure that they are strong.

Again, MEPAS, again, the path would have to be used in FRAMES 1.5, I suppose, eventually, even though we only talk about FRAMES 1.4 here.

MR. LaPLANTE: Yes. We just got the version that is in 1.5.

DR. SAGAR: 1.5, right.

MR. LaPLANTE: Both GENII and MEPAS now run in FRAMES 1.5.

DR. SAGAR: Right. But there were some problems with version 1.4 with the stochastic version of MEPAS they found, which is apparently now fixed. And it runs in version 1.5.

And basically what we call the center according to the QA procedure, the installation tests of these codes is proceeding. Once we are sure that they are properly functioning as advertised by the developer, then we will start testing them.

The RESRAD-OFFSITE we got in December 2004. We had completed installation testing. It was running fine. And we wrote a cumulative report, which was published in August 2004, where we indicated the various criteria which would be used to evaluate these four goals, you know, all of the functional requirements against which we would judge the utility of these codes. So that is published there.

It would depend both on modeling and coding, how easy it is to use. There are some criteria like that. And the model capability, whether

it does kinetics or other complexity and so on and so forth.

And we are scheduled to have a code comparison initial report in March 2005. And I assume we are going to meet that date, Pat.

MR. LaPLANTE: Yes. That report is actually an interim status report. So we will summarize what we have done to date in that report.

DR. SAGAR: And the final report is in August 2005. On the GOLDSIM, we actually took the GOLDSIM language, and we included in it certain modules to make the code do what is needed in a complex decommissioning site. It's kind of unique in that sense that you can adapt it to do various things.

We think this is probably the most flexible code that can be used for decommissioning. And it can be flexible in the sense that it can be modified very easily to include a variety of processes. And we think that we don't have to reach the end state immediately. We can do modest complexity first and then perhaps look at what else is needed. So theoretically we can develop the code to a stage where it is useful.

And since I said earlier that it did not have the capability or did not have a module that came

with it to calculate the goal, we incorporated the GENII as part of the GOLDSIM to do the dose calculation. And we are testing the model at this stage.

MR. HAMDAN: Yes. Budhi, can I can you a question? You have two of the codes in there. You are evaluating the codes from the center. I did not hear you say anything as to how you are doing that. I mean, are you taking sites and outlaying them or how do you go about doing that?

DR. SAGAR: Two things. One, we did develop criteria for comparison which look at both what the model's capabilities are and the code. And then we have, as I said, one example site, which is based on a real site but not exactly. We can add data to it just to make it more complex or add processes to it and so on, so forth.

MR. HAMDAN: Can you apply all models to that one?

DR. SAGAR: And we will apply all models to that one. We would see how each model does on that site. I mean, you can do many sites, but that is the extent of the scope of work at this point.

MR. HAMDAN: Yes. Thanks.

DR. SAGAR: Okay. So the initial insight

is this is the very beginning stage of the testing. We note that the four tools that I described are in various stages of development. And we believe that perhaps we don't need to develop an entirely new model for decommissioning or new code for decommissioning. The existing codes together can meet the need.

Incorporation of NRC models is an important aspect in FRAMES. I think this is a multi-agency initiative, and EPA is included. Department of Agriculture is included. There are quite a few federal agencies that work together to develop the FRAMES code.

The quality of software, I've already noticed that it varies depending upon who has developed the codes and how strictly QA was applied. And, of course, the testing of codes and actual use of it, there's no code I know -- I'm a modeler. I'm a code developer. I used to be in my previous life. There is no perfect code. And there's no code without any bugs. I mean, that doesn't exist.

So unless you test it thoroughly and unless you use the codes, that's the only way to figure out if these codes work okay or not.

I think that's the --

MEMBER HINZE: Budhi, are these codes and

this whole process for the purposes of evaluation by NRC or will the sequence of codes be made available to units that are doing the actual decommissioning? And how will all of that come about?

DR. SAGAR: My sense is that these codes would be provided to be made available to the licensees.

MEMBER HINZE: So they will be available, then, to people to do the analysis. And they could do this up front before they start some work up front.

DR. SAGAR: Right. That's right.

MEMBER HINZE: And are there any restrictions on the use of these codes? Will they have to buy GOLDSIM, for example, and --

DR. SAGAR: GOLDSIM I'm sure they will have to buy. This is a for-profit company that does nothing but sell GOLDSIM. So they are in it to make money. So yes, they will have to buy that.

The other three I think are developed by federal agencies. So they should be available to the public. I mean, NRC has a long history of developing codes in NRR which are used by all licensees for all sorts of things.

MEMBER HINZE: Will this test case that you talked about in response to Latif's question be

made available as an example or as --

DR. SAGAR: It would be published. And it should be available to anybody who needs it, yes.

MEMBER HINZE: Great. Thank you.

DR. SAGAR: Well, this is a summary of the entire presentation. I think there's nothing I'm saying here that you already don't know. We do support NRC through the charter program, which is primarily to the repository and the Spent Fuel Project Office in transitory projects and non-charter, such as decommissioning I presented to you today but some other programs also.

Risk insights has become the main method by which resource allocation and prioritization is done. As I said before, I think we had developed sufficient expertise that the expertise and the tools that are needed for review of license application, we do have that that goes in hand except for the caveat that the tools have to be modified because of standard changing. Well, there may be a schedule issue there, but I think we are capable of doing it.

This was a big task. As I said earlier, the KTI agreements have been hanging there for three to four years. I think the completion of those agreements with very few left incomplete is an

accomplishment.

This is a question often asked. I think it was asked this morning, too. What would we do once the LA is in-house? Would we stop doing all laboratory field work?

The best guess I can give you is that no, that's not really true. The amount of work we do -- you called it research this morning. The amount of this work may be reduced, but some of this work would continue to be done, even when we are reviewing the license application.

The decommissioning work I explained to you is to provide an assessment of evaluation of the various tools that NRC already has in their hands to try to give them a comparison of the utility.

Those are the prepared comments. I will be happy to answer any questions.

VICE CHAIRMAN CROFF: Okay. Thank you. I think you've already answered many questions, but are there any further questions now that we're at an end? Latif?

MR. HAMDAN: Yes. Budhi, on decommissioning, I know what you are doing in 2005 on these codes, in evaluating these codes, which is ongoing work and needs to be competed. But has the

center done any other work on decommissioning for NRC?

DR. SAGAR: Yes. The site I was referring to, the real site, we did work on that and John Russell, who is our manager on decommissioning projects.

John, could you answer that more clearly?

MR. RUSSELL: Yes. John Russell. I manage the Decommissioning Project.

We have actually had two decommissioning projects that go back to 1997. I believe at this point, they have been task order contracts. We have done probably 15 different task orders. Those have been a mixture of generic task orders, non-site-specific but would generically support all of the decommissioning actions and then others that are site-specific, like a performance assessment for particular decommissioning sites.

These run the gamut from support for the looking at certain aspects of a resuspension, indoor resuspension, slag leeching, all of these types of things.

MR. HAMDAN: Actually, the next question is from this work that has been committed at the center, are there any lessons learned that could be shared, not necessarily now but in time to come.

DR. SAGAR: There are always lessons learned. We will be happy to share them with you.

VICE CHAIRMAN CROFF: Okay. Do we have any other questions? Jim?

MEMBER CLARKE: I just have one. I'll try to frame this as a question, Budhi. If the objective is to do risk analysis for risk insight, what I've seen people do more than once is use -- and Pat brought his up earlier -- a very complex three-dimensional model with a lot of parameters in a very deterministic way and not permit, really, risk insights. And I wondered what your feelings were about, rather than doing that, using a more simple model in a probablistic way.

DR. SAGAR: Well, in fact, that's a very good question. And I didn't show it to you, but people usually represent it with a pyramid where the node to take three-dimensional process-level models are at the base. And then you have simplified models at the top. Most of the time the more complicated the model is, the likelihood it's going to run in a deterministic manner because there's no way --

MEMBER CLARKE: Because of the resources, the time it takes?

DR. SAGAR: Yes. I mean, if you are doing

a hydrologic model and there are one million nodes and you make them all sample, well, you will be here for 10,000 years before you get an answer. So yes, most of the risk insights, as a matter of fact, are from the quantitative risk information, is from simpler models.

Now, that doesn't mean that the more detailed models are in a deterministic framework doesn't give you some idea and understanding of what is going on. So I don't think we have to do either/or, either do this or that. I mean, these things have to proceed in parallel. What you learn from detailed process models, you factor into your simpler models before you do probablistic simulations.

So it's a mixture of several things. We do both.

MEMBER CLARKE: Will you be providing guidance as well as critical review of these models and the extent to which the codes are valid and the models are appropriate?

DR. SAGAR: The scope of work does not include commenting upon, model --

MEMBER CLARKE: How would it be used?

DR. SAGAR: I think we are going to look at the capabilities, what are they designed for. And

given that, we will run them with certain data and say, "Yes. This capability function is fine. This particular one doesn't do as well" and so on.

Now, if we learn something about the models themselves, the process not being included, we would certainly comment upon that to the NRC. But that's not necessarily the main focus.

MEMBER CLARKE: Thank you.

VICE CHAIRMAN CROFF: Okay. Anything further?

MR. SAVIO: It would help if they could identify the activities that they want to focus on at the center. I've heard some of the members' conversations. I came up with igneous activity, near-field corrosion. I believe Jim might have an interest in talking about the decommissioning.

MEMBER CLARKE: Absolutely, if there's time. I mean, one of the things I think you did is take what we've learned to go already and cycle through that again.

VICE CHAIRMAN CROFF: Yes. There was I think some discussion earlier about getting you the discussion topics from the Committee by mid March.

MR. SAVIO: Actually, those were detailed questions. The last time we did it the list ran

several pages.

VICE CHAIRMAN CROFF: well, i think let's try and --

MR. SAVIO: This is just the general area so that Budhi would have some indication and also so that --

VICE CHAIRMAN CROFF: Let's try and do both at the same time, get those in.

MR. SAVIO: Okay.

VICE CHAIRMAN CROFF: And then you can get the list down to the center by no later than the end of March. Is that okay with you or is that too late?

DR. SAGAR: Well, my perspective would be the sooner we get it, the more prepared we will be for your visit.

MR. SAVIO: We talked about trying very hard to get it out by March 15th.

VICE CHAIRMAN CROFF: Get it to the center?

MR. SAVIO: Getting it to Budhi.

VICE CHAIRMAN CROFF: Okay.

MR. SAVIO: What we have done in the past, which I think works pretty well. Once you have the list of questions, we sit down with you and whatever ones you --

VICE CHAIRMAN CROFF: Okay. Is it --

MR. SAVIO: -- and your staff want to involve and talk to you over the phone.

VICE CHAIRMAN CROFF: Jim, Bill, does it give you any problems giving your input in the next couple of weeks?

MEMBER HINZE: Well, the question is, how much time is it going to take them to turn that around? I can see us getting it to Dick by, say, the 10th of March or something like that. If you could get it to them shortly thereafter, then we would be on track. I think that --

VICE CHAIRMAN CROFF: Would that work for you, Dick?

MR. SAVIO: That would.

VICE CHAIRMAN CROFF: Okay. Let's say our input to you by the 10th of March. And you'll get it down within the next few days, which is mid March down at the center.

MEMBER CLARKE: You have to tell us, Budhi, if these are realistic requests in the time we have available.

DR. SAGAR: Well, I'm sure we would. If we can't address something, we will definitely let you know why we can't address it or something. But, I

mean, sometimes the questions are asked, and we have some balances under these reports.

My intention at that point is to point to that report and say, you know, "Look at this." And if there is still something we need to discuss, we shall discuss it.

To the extent we can point you to some published material, I think it would be helpful for you to take a look at that before you come.

MEMBER CLARKE: Absolutely.

DR. SAGAR: But definitely I think whatever questions --

MEMBER HINZE: Well, I'm the culprit behind climate change. And I would like to find out where the center ended up their work and where they were at that position. But I really don't see that as taking much more than three-quarters of an hour at the center at the most, but I think we would like to learn that from the center and from their people that were actually involved. But igneous activity might go for much longer than that.

MEMBER CLARKE: We've heard a great deal of interest in even some of the transfer work which is still going on, which may become more important if the time of compliance goes out further and further,

whatever. So that's --

DR. SAGAR: I mean, I don't think we would be able to discuss issues related to time of compliance because --

MEMBER CLARKE: I mean discussing what you're doing on KDs and water chemistry absorption.

DR. SAGAR: Sure. Yes.

VICE CHAIRMAN CROFF: Okay.

MR. FLACK: There was another objective to that, preparing another viewgraph for the Commission to let them know ahead of time the areas where that would be explored on this trip. So if there was a way of coming up with some very high-level four or five bullets on a viewgraph for them because I think the other piece --

MR. SAVIO: The answer I heard was that we would be doing it later and not in-depth.

MR. FLACK: Yes. We wanted to get those viewgraphs prepared and completed at the end of this session.

VICE CHAIRMAN CROFF: Yes. Well, my memory was Mike was going to work a little bit on that with --

MR. FLACK: I worked with him. That's why I'm bringing it up.

(Laughter.)

VICE CHAIRMAN CROFF: What does that mean?

MR. FLACK: The four or five bullets were to be filled out. And we figured this would be the final viewgraph that would enter into that package. We can discuss that offline, actually.

VICE CHAIRMAN CROFF: Well, offline all right. I think, well, first let me do some business in order here. I'd like to thank the representatives from the center for a very interesting talk under somewhat difficult circumstances. So thank you very much.

To everybody, i think it's been somewhat of a chaotic day, but it's been a very productive day. Mike has gone off to a conference call he had to take, but at this point we're going to call the session to a close. And I expect some people may want to find their way home. We will reconvene tomorrow morning at 8:30.

Tomorrow's business basically we've got a number of odds and ends to pick up. I think this can be one of the odds or ends as you choose to pose it. I think we've already got probably enough general items already on just the short list from this discussion to do the viewgraph at least, but we'll

work our way through that. We've got a few other things we'll need to do tomorrow. And so that will be our morning session.

Is there anything else we need to do here today?

(No response.)

VICE CHAIRMAN CROFF: Seeing nothing, we're adjourned. Thank you very much.

(Whereupon, at 4:00 p.m., the foregoing matter was recessed, to reconvene at 8:30 a.m. on Friday, February 25, 2005.)