Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Nuclear Waste and Materials - 181st Meeting

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Tueday, July 17, 2007

Work Order No.: NRC-1676 Pages 1-204

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE

AND MATERIALS (ACNW&M)

181st MEETING

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TUESDAY,

JULY 17, 2007

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VOLUME I

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T-2B3, 11545 Rockville Pike, Rockville, Maryland, at 8:30 a.m., Michael T. Ryan, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

MICHAEL T. RYAN	Chairman
ALLEN G. CROFF	Vice Chairman
JAMES H. CLARKE	Member
WILLIAM J. HINZE	Member
RUTH F. WEINER	Member

NRC STAFF PRESENT:

CHRISTOPHER BROWN

LATIF HAMDAN

DEREK WIDMAYER

NEIL M. COLEMAN

ANTONIO DIAS

FRANK P. GILLESPIE

MICHAEL WEBER

BILL BRACH

ERIC LEEDS

JOE GIITTER

LAWRENCE KOKAJKO

HANS ARLT

CYNTHIA BARR

A. CHRISTIANNE RIDGE

SCOTT FLANDERS

DAVE ESH

GENE PETERS

JIM RUBENSTONE

I-N-D-E-X

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

(8:29 a.m.)

CHAIRMAN RYAN: I would ask the meeting to come to order, please.

This is the first day of the 181st meeting of the Advisory Committee on Nuclear Waste and Materials. During today's meeting, the Committee will consider the following: semiannual briefing by the Office of Nuclear Material Safety and Safeguards, waste incidental to reprocessing monitoring activities at the Idaho National Laboratory and Savannah River sites, DOE reexamination of past U.S. Geological Survey infiltration studies.

Antonio Dias is the Designated Federal Official for today's session.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's session. Should anyone wish to address the Committee, please make your wishes known to one of the Committee staff.

It is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume, so they can be readily heard. It is also requested that if you have cell phones or pagers that you kindly turn them off at

this time. Thank you very much.

Without further ado, I'll introduce Mike Weber, who I think is going to lead us off on our opening session. And welcome, Mike. I'll turn the microphone over to you.

I might mention that I think we have enough time that if the Committee members had questions as we go along, or maybe at a break of each speaker, that we could take them in that way, rather than wait all until the end. Does that work?

MR. WEBER: That's fine.

CHAIRMAN RYAN: Great. Okay.

MR. WEBER: Okay. Good morning. I am Michael Weber. I'm the Director of the Office of Nuclear Material Safety and Safeguards. I appreciate the opportunity to have my management team meet with the Committee this morning.

I began in this position in March of 2007 when Jack Strosnider, the former Director of NMSS, retired. So I am pleased to be back at NMSS where I began my career with the NRC back in 1982.

I have been working with the Advisory Committee since it was formed in June of 1988, so -- not in this capacity, but in many other capacities, and I appreciate the guidance and insight that we have

obtained from the Committee. And I hope to hear some of the same today.

I want to thank the Committee for the opportunity to present this morning and to share a preview of some of the programmatic challenges that we'll be facing as an office over the next six to 12 months. There are opportunities for the Committee to provide advice for the benefit of the NRC, and for the benefit of the American public.

The Committee, in our view, plays a vital role in providing the independent advice to the Commission on a wide range of program activities that are under the purview of my office. Your expert reviews help the agency achieve its strategic goals of safety, of openness, and of effectiveness. And we appreciate the Committee's thoughtful, constructive reviews of the work that we do in the office.

We also appreciate the close coordination of your staff with our staff, and that is vital in scheduling our reviews while maintaining the Committee's independence. But it's important that the advice rendered by the Committee is timely to support the Commission's overall program.

The Committee's charter emphasizes the protection of public health and safety in the disposal

of nuclear waste, and in the handling and processing of nuclear materials. And you're going to see that theme as it's evident in our briefing today, as well as in your agenda that you have over the next several days.

Whether it's infiltration studies at Yucca Mountain, burnup credit for spent fuel casks, transportation and aging and disposal canister system, or spent nuclear fuel recycle facilities, they are all the things that we're about at NMSS. And it's all the things that the Committee is focused on as part of its agenda for this meeting.

I encourage the Committee to apply its attention to the topics where you can add the most value to our national program. Following my presentation, Joe Giitter for the Division of Fuel Cycle Safety and Safeguards, Bill Brach for the Division of Spent Fuel, Transportation, and -- Spent Fuel Storage and Transportation, and Lawrence Kokajko for the Division of High-Level Waste Repository Safety will provide overviews of some of the challenges that their programs are facing, and I wanted to thank you for the part that you play in protecting people and the environment.

Before I turn it over to the Division

Directors, I wanted to introduce my Deputy, Eric Leeds. Eric has served in a wide variety of positions in the agency. He most recently came to the office of NMSS from the Office of Nuclear Security and Incident Response where he was the Director of Preparedness and Response.

Eric?

MR. LEEDS: Well, thank you, Mike. As you know, I replaced Margaret Federline, and I'm really the continuity between the old regime and the new leadership, because I got into my job about six weeks before Mike got his.

(Laughter.)

But as Mike mentioned, I've got a varied background here at the NRC. I spent a lot of time on the reactor side; I'm a mechanical nuclear engineer. When I came to NMSS, I first worked in spent fuel, and I'm very familiar with spent fuel storage and transportation. I spent about four years there when the office was first founded, and then went over to Fuel Cycle and worked with Bob Pearson and Joe Giiter in Fuel Cycle for about four years before I went back to NRR, and then I did emergency preparedness and incident response, as Mike mentioned.

I'm very pleased to be here. I'm looking

forward to getting to know the ACNW and working with you all.

MR. WEBER: And M.

MR. LEEDS: And M. Thank you.

CHAIRMAN RYAN: There's a six-month grace period for getting --

(Laughter.)

MR. LEEDS: You've got to train them.

CHAIRMAN RYAN: We do the same thing.

MR. LEEDS: You've got to train them. But as Mike mentioned, I think the meat of this presentation this morning will come from the Division Directors. And we're following the fuel cycle, and with that let me turn it over to Joe Giitter, so he can get started. Joe?

MR. GIITTER: Thank you. Good morning. We've got a lot of activity still going on in the fuel cycle area, and we've been busy over the last couple of years, as you probably know, with the licensing of the LES and U-site gas centrifuge facilities, the MOX construction authorization review, and a number of other licensing reviews for fuel cycle facilities, as well as ensuring that the operating fuel cycle facilities continue to operate safely and securely.

One of the things that we didn't

necessarily expect a year ago was that we would be getting applications for yet more enrichment facilities. And as it turns out, we do have two applications for full-scale enrichment facilities on the horizon.

We currently, with the General Electric Silex facility, did receive a license amendment request for a test loop at the Wilmington site, the GE Wilmington site. And in this phase of the project, they would test laboratory quantities of material to verify design parameters.

They do plan to submit a full-scale facility application in December of 2007. They have also requested a very ambitious schedule for us to conduct our licensing review, and, of course, we will -- we will try to do what we can, but we are limited in resources, and, of course, we're limited by the length of time it takes to do the review under NEPA.

The second centrifuge facility -- I should add with the Silex facility this is unlike any gas centrifuge facility that we've ever seen before, and the technology is really cutting edge. It does create some unique concerns from a security perspective, and primarily an MC&A perspective.

So this is fundamentally different than

what we've looked at before in the way of enrichment facilities.

The Areva centrifuge facility is essentially the same facility or type of facility as the LES facility. It's a Urenco design. We just learned of this facility fairly recently. In fact, we didn't even include it in our budget process, or budget planning process.

Areva is supposed to make a siting decision by the end of the calendar year, and they hope to come in with an application by mid calendar year '08.

There is some question as to whether France, Germany, The Netherlands, and the UK will support transferring the -- will allow the centrifuge facility to be built in the United States under the Cardiff agreement. So that's one of the policy issues that still needs to be resolved before we get an application for this facility.

Consistent with USEC, the USEC ACP, and the LES national enrichment facility, we don't envision a direct role for the ACNW&M in the review process. However, we would be glad to provide information to the ACNW&M regarding these facilities.

The other area of the fuel cycle facility

where there appears to be a need anyway is the conversion/deconversion area. There is only, as you know, one operating conversion facility in the United States, and that is Honeywell. They have recently expanded.

We did, at our Fuel Cycle Information Exchange, which is kind of our version of the regulatory information conference for fuel cycle, we did have a gentleman from Converdyne talk about their plans with regard to additional conversion facilities, and right now it doesn't appear, at least to Converdyne plans, to do an expansion, and we know of no other plans for a conversion facility in the United States.

Of course, there is plans for deconversion facilities. Specifically, Areva has plans -- has an agreement with LES to fill the deconversion facility in conjunction with the LES project in New Mexico.

We did get some feedback from the Commission that they do support NRC regulation of these facilities, and we're proposing -- right now we're looking at possibly requiring them to meet the 10 CFR 70, Subpart H requirements, which are the requirements for the Part 70 fuel cycle facilities with regard to risk-informed performance-based and the

ISA process.

The other facility is a mixed oxide fuel fabrication facility. There was some political uncertainty with this. It appears that based on the action on the Hill that this project will go forward. It does appear to have sufficient funding on both the House and Senate side.

In the past, the Advisory Committee on Reactor Safeguards, specifically the Fuels Subcommittee, has had the lead on reviewing the Mox facility, and we would expect this to continue in the future.

We have talked to you a number of times about our work regarding the Global Nuclear Energy Partnership. And we very much appreciate the high quality white paper that was developed by the ACNW&M. Right now, that's a project that is also experiencing some political uncertainty. We did send a paper up to the Commission with some options for how we should proceed on developing a regulatory infrastructure for GNEP. The Commission essentially told us to go slow, and they also told us to work with the ACRS.

However, you know, in the future we're going to be -- we're going to look at the way -- we're going to have to look at the waste streams. That's

going to be a huge issue with this facility. And right now, we're in a situation where we don't even know what the design of these facilities are going to be, so it's impossible to tell what the waste streams might be.

But at some point in the future, I would see a role with the ACNW&M in terms of providing us assistance in looking at the various waste streams that are going to be coming out of these facilities, especially the reprocessing facility and --

CHAIRMAN RYAN: While you are on that point, we have thought a little bit about that question, and I think that's probably a critical question in GNEP, because in I think the Committee's view and certainly my personal view, the waste can be the tail wagging the dog.

MR. GIITTER: Yes.

CHAIRMAN RYAN: And I think the real secret to me is the partitioning for key radionuclides, and does it end up in this stream, that stream, all streams. You know, it's very critical to a basic question: does the two-tired system, high and low level waste, cover the landscape? So that's a real fundamental question. Is that in your thinking?

MR. GIITTER: Yes, it is. In fact, that's

one of the things we brought up in our Commission paper.

CHAIRMAN RYAN: And I read the Commission's direction back to you in Option 1, and, you know, proceeding along those lines. But I just want to applaud that focus, because, you know, building a facility is one thing, but actually being able to manage the waste streams and having homes for all of them is -- you know, could be the -- you know, the stop-gap in the whole process, or the -- you know, a path forward, depending on how it works out.

Thanks.

MR. GIITTER: Thank you. I would just like to conclude by telling you that we look forward to working with you over the next year, and we, again, appreciate all of the effort you have provided us in areas such as GNEP and other areas regarding the fuel cycle.

CHAIRMAN RYAN: While we're on a couple of questions, back up on enrichment. Do you see any waste management questions there? I mean, it seems like there's going to be a lot more volume of waste. Are there homes for all of those wastes? And does that all flow inside the wheelhouse or --

MR. GIITTER: Yes. The major waste, if

you will, from centrifuge facilities is that -- is the depleted uranium tails. And we have -- that's an issue that we have certainly dealt with during the licensing process, and there are disposition paths for all the tails of the facilities that we license, and we would certainly expect that to be the case for any additional facilities that we review in the future.

MR. WEBER: Are the wastes similar from Silex?

MR. GIITTER: Yes, as far as I know. I mean, and, again, there is a -- we don't know that much about Silex yet. We're just beginning to look at -- we have the license application, or the license amendment rather, for this small scale test facility. So we may not know completely until we get the -- more into the licensing review of this facility, which is different than -- as I said, than the enrichment facilities.

CHAIRMAN RYAN: Great. And just an update on MOX, we did participate as members of the Subcommittee for ACRS, and we'll probably continue to do that with our focus really being on the waste side of things.

The one question that we did ask in the letter that ACRS wrote was I realize DOE is the waste

processor. But it really raises a question -- if the facility licensed by the NRC is told, "Oh, you can't send any more waste today," for a week or a month or six years, what does that do to the safety case and --

MR. GIITTER: Yes.

CHAIRMAN RYAN: -- safety evaluation for the plant? And I think that's a question that still is a good one to ask.

MR. GIITTER: Agreed.

CHAIRMAN RYAN: That's a hand off that, you know, needs to be managed in terms of a safety question. So I guess we'll continue to participate with ACRS on that or similar questions that might come up.

MR. GIITTER: I would imagine so, yes.

CHAIRMAN RYAN: Okay. Thanks.

MR. GIITTER: Thank you.

CHAIRMAN RYAN: Anybody else? Let's start with Bill on this issue.

MEMBER HINZE: Joe, Bill Hinze. This question comes out of ignorance, but I don't hear much about siting concerns in these new enrichment facilities. How are you addressing concerns with respect to siting in the licensing of these new enrichment facilities?

MR. GIITTER: Well, we do have regulations with regard to siting, and, of course, they have to go through the process of submitting an environmental report and, you know, we conduct a thorough environmental review of the site. And we do -- well, actually, we do that from both an environmental perspective, but also from a safety perspective.

You know, we look, of course, in conducting our environmental impact statement, the impact of the facility on the environment, but we also looked at the effect of the environment, if you will, on the facility. If there is any nearby hazards, for example, of LES, we identified a nearby natural gas pipeline, which is, you know, one of the concerns with the siting that we had to address in the licensing review.

MEMBER HINZE: So there are --

MR. GIITTER: It's really no different than any other facility we regulate.

MEMBER HINZE: There are full guidelines for the applicant, then.

MR. GIITTER: Yes.

MEMBER HINZE: Okay. Thank you.

CHAIRMAN RYAN: Anyone else?

VICE CHAIRMAN CROFF: Let me try one. On

the mixed oxide fab facility, my memory in reading -- I think it's what came out of the House -- was there was some language about transferring the project to another part of DOE and sort of questioning or letting that part of DOE figure out what the facility would be used for I guess, which -- is that still operative? And, if so, doesn't that --

MR. GIITTER: Well, in the House --

VICE CHAIRMAN CROFF: -- change what that plan is about?

MR. GIITTER: Congressman Hobson has never been a big supporter of MOX, and he was the one who put that language in the House Appropriations bill.

The Senate bill did not include similar language, so that would still have to be ironed out in the Conference Committee. And I think he was trying to make a point. I don't want to speak for the Congressman, but his -- you know, originally, the MOX facility was being coupled with a similar proposal on the Russian side.

The Russians were going to build a similar facility using the French technology, and at one point -- the Russians never really wanted to do that, and they really wanted to burn their MOX fuel in their breeder reactor, in the BN-600.

And they -- eventually, there was an agreement that they would decouple the programs, and the United States program would move forward separately, because we still have a need to disposition the surplus plutonium generated in the United States, and the Russians would move in parallel but with a separate path of dispositioning their surplus plutonium in their breeder reactor, in their BN-600, and in their BN-800, which is under construction.

VICE CHAIRMAN CROFF: Okay. So the current belief is that the mixed oxide fab plant is going to do what people have thought it's going to do for a number of years and not be expanded in terms of material or change purpose. That's the current operating assumption.

MR. GIITTER: That's correct.

MR. WEBER: But we will have to wait to see what the Congress decides, and, obviously, through Congress -- the Conference Committee they may come up with a new plan.

MR. GIITTER: They may. On the Senate side, as I said, they didn't have that similar language, and they actually provided more funding for the project than was requested in the President's

budget. So there is a lot more support on the Senate side for MOX than there is on the House side.

VICE CHAIRMAN CROFF: Understand. Okay. I think Mike got the rest of my questions, so I'll pass.

CHAIRMAN RYAN: Okay, great. Ruth?

MEMBER WEINER: I have always been troubled by the designation of the DU tails from LES as waste. And I wondered whether -- this was in the State of New Mexico, a somewhat semi -- let me call it a semi-political decision. It was decided to call these things "waste."

Are you going to carry that over to other enrichment facilities? Are you addressing that in any way? Because DU is not really a waste in the sense that there is a use for the material.

MR. GIITTER: Well, I understand that, and I don't even believe the DOE believes that it's waste. They look at it as a resource. That is a position that the Commission took in the order to LES, and it was also in a position that was carried over to the USEC American Centrifuge Plant. So that is -- that's really a policy decision at this point.

And you can always argue as to whether it's a waste or a resource. It's looking more and

more like a resource given the spot market price of uranium, but, you know, that's a matter of -- a policy matter more than anything else.

MEMBER WEINER: So as far as you are concerned, it's a done deal. It's something that the Commission has made a decision and that's that.

MR. GIITTER: Yes.

CHAIRMAN RYAN: That's a good point, Ruth. It sort of makes the question a little bit more complicated that I asked: when is it waste? Is it going to be waste in 30 years, 100 years? And I think that kind of more forward-looking -- somewhere along the line something is going to be waste, you know, even if it's the plant wears out. So that maybe deserves a little extra thought.

Anything else?

MEMBER WEINER: No, that's it.

CHAIRMAN RYAN: Dr. Clarke?

MEMBER CLARKE: Just a question about the Silex facility. I think you said that you're evaluating at this time an application for a pilot study. And where would that be?

MR. GIITTER: That's being located at the GE Wilmington or the GE Global fuel manufacturing facility in Wilmington, North Carolina.

MEMBER CLARKE: And if that goes forward, would the full-scale facility be there as well, or is that hard to tell?

MR. GIITTER: That's my understanding.

MEMBER CLARKE: Thank you.

CHAIRMAN RYAN: Thanks for the questions, Joe, along the way.

MR. WIDMAYER: Hey, Joe, just a real quick clarification. This full-scale application, did you tell us a date that you're expecting that?

MR. GIITTER: For Silex?

MR. WIDMAYER: Yes. For Silex, yes.

MR. GIITTER: Yes. The Silex is supposed to be mid-calendar year '08, so June of '08 is the current date.

MR. WIDMAYER: For Silex.

MR. GIITTER: Yes.

MR. WIDMAYER: Okay.

MR. WEBER: That's contingent, to some extent, on the success of the test loop and obviously the --

MR. WIDMAYER: Right, okay.

MR. GIITTER: I'm sorry. I gave you the wrong date. That's for the Areva facility. There are actually saying that the application the full-scale

facilities at the end of this calendar year.

MR. WIDMAYER: That's what I thought you said before.

MR. GIITTER: Yes, yes.

MR. WIDMAYER: But like Mike said, it seems to be -- if it seemed like it would be contingent on the success of the pilot scale, that seems real soon.

MR. GIITTER: All I can tell you is GE is very committed to this technology. This was, of course, Australian technology, and I think there was a lot of push for an American company to get the technology, because there was a fear that if it got into the wrong hands it could be a major proliferation concern.

MR. LEEDS: If I may, Joe, I wouldn't be surprised to see the application slip a couple months. I mean, the test loop amendment came in later than they originally planned -- complications. Mike's point is well taken. You want to see how the test loop is going to run.

MR. GIITTER: Yes. I was just going to say that GE does appear to be -- it's kind of a separate issue as to the when. They do appear to be very committed to make this technology work, and so it

may be -- right now, they're saying December 2007. That may very well slip, but they seem to be confident that they can make the technology work.

And that has been one of the problems when -- in the past is getting the technology to work on a larger scale, because it has been verified to be workable on the smaller scale.

MR. WIDMAYER: Well, just as an observation, it looks like you have -- you may have both of these coming in at exactly the same time.

MR. GIITTER: That's possible.

CHAIRMAN RYAN: That's the rule, isn't it?

MR. GIITTER: Yes.

(Laughter.)

It's Murphy's Law.

(Laughter.)

MR. WEBER: Okay?

CHAIRMAN RYAN: Thank you.

MR. WEBER: Our next presenter will be Bill Brach. Bill is going to talk about spent fuel storage and transportation.

CHAIRMAN RYAN: Good morning, Bill.

MR. BRACH: Good morning. On the overview, you'll note a number of topics, some of which we have already had some discussions with the

Committee on, and others that I see coming as candidates in the next, I'll say, one to two years.

Let me go ahead and start first with the topic of moderator exclusion. Clearly, I think the Committee will recall the previous staff briefings earlier this calendar year, industry briefings, roundtable panel discussions. I guess I would offer -- I think -- one, I think we had very positive interactions, and personally I believe the result of -- the interactions resulted in, clearly, a better product, better understanding, on all of our parts.

CHAIRMAN RYAN: Well, as I told you at that meeting, Bill, I couldn't agree with you more, and I said it then and I'll say it again, that we really appreciate your staff's commitment to those days that we spent on the topic, because it helped us. And I think the conversation ended up with us having a more studied and useful view, and hopefully helpful view. So thank you again for all your effort.

MR. BRACH: Thank you. That's a mutual perspective as well.

The next topic -- burnup credit -- we have already as well had some interactions with the Committee on this topic. It, I would note, is closely connected with the first topic with regard to burnup

credit possibly being a resolution path forward with regard to consideration of moderator exclusion.

I would note as well the very first -- all three of the first topics on this list, first, primarily address spent fuel transportation, and as well are closely related.

Now, burnup credit is a topic I anticipate that staff from my division and from the Office of Research will be having future discussions with the Committee. I would note that I anticipate much progress on this particular technical issue, technical topic, to be achieved over the next one to two years.

There's a collaborative effort that NRC, Department of Energy, with industry, with EPRI and others had addressing burnup credit and obtaining data that might help us all advance our knowledge of the profile of burnup credit with regard to -- excuse me, of spent fuel and burnup in the profile of the burnup credit considerations.

I would also note as well that tomorrow morning on the Committee's agenda NEI and EPRI will be meeting and briefing the Committee on industry views and perspectives on burnup credit.

The third topic -- transport of high burnup fuel -- I believe a question here evolves,

really, will or how will high burnup fuel possibly reconfigure under transportation accident conditions? Again, this is related to the earlier topics.

If high burnup fuel were to reconfigure under transportation accident conditions, questions staff have would be with regard to, does the fuel maintain -- or is subcriticality maintained in the possible reconfiguration of the fuel, as well as considerations with regard to thermal -- with regard to potentially slumping the material, what thermal challenges there might be to the canister.

As a note, all three of first three topics are closely related, moderator exclusion. Would consider exclusion of moderator ingress into a canister, a welded canister, such that if there were to be reconfiguration of the fuel, subcriticality would not necessarily be a driving issue. If it's high burnup fuel and it reconfigures moderator exclusion, we'd provide a possible resolution path, technical resolution path forward.

Burnup credit -- again, resolution on further understanding of the profile, the spent fuel assemblies, and if there were to be reconfiguration, or if there were to be moderator ingress, would it take into consideration the change profile, the spent

fuel assemblies take into account burnup credit? Would subcriticality still be maintained?

And then, again, transport of highburn fuel. If, under accident conditions and having a better, improved understanding of the potential hydriding, or the potential for the fuel rod degradation under accident conditions and reconfiguration or non-reconfiguration of the spent fuel under accident conditions, what would be -- those all lead to technical paths that would provide for a conclusion with regard to the ability to maintain subcriticality and overall safety of the transport.

These three topics, some of which we've had discussions noted with the Committee already, some I see coming further on the agenda in the next one or two years, especially in the area of burnup credit and high burnup fuel.

The next topic Mike, in his opening comments, made reference to the transportation of the aging disposal canister design, the TAD canister. I believe the Committee has also had interactions with the Department of Energy with regard to some of the TAD considerations.

CHAIRMAN RYAN: We got the 397-page specification, so --

(Laughter.)

Or whatever it is. It's a huge document.

MR. BRACH: I mentioned the TAD in my presentation. Clearly, I think we all recognize aging and disposal, the A and D of that acronym, pertain to the Part 63 considerations, repository considerations.

The transport under Part 71, I would offer as well the Department of Energy is interested in asking the vendors they're interacting with to design the TAD system for a potential storage configuration at the reactor site or at another storage facility.

That brings us to interactions with my division, Spent Fuel Storage and Transportation, fuel transportation and storage considerations for the TAD design. DOE is currently working with/for vendor organizations with regard to the preliminary specifications you mentioned, Chairman Ryan, to develop a TAD system design.

We are anticipating, based on DOE and vendors' interactions with us, anticipating submittal of Part 71 and Part 72 transportation of storage applications for the TAD on or before June 30th on interactions with the vendors. I am anticipating an earlier date than that with regard to submittals to NRC for our Part 71/72 reviews of those designs.

We are having significant interactions continuing with DOE and vendors on these considerations, so -- to help us better plan and be prepared for review of these applications, as well as I would note we are closely working with Lawrence Kokajko's division -- the High-Level Waste Repository Division -- because clearly there is an interface of Part 71, Part 72, and Part 63 that on the regulator's side of the table we clearly need to maintain. Hopefully, from the folks on the outside looking in, it will be a seamless NRC regulatory review with regard to our consideration of the various three 10 CFR parts in our review of the TAD application.

The next topic is one your Committee may recall previous briefings at the Office of Research, Nuclear Regulatory Research, and our staff had with the Committee on the dry cask storage PRA that was completed roughly a year ago.

And you may recall commitments/comments that we made that we clearly are not only looking at that as being an informative document, but also looking at it from the standpoint of how the insights or general lessons learned from that dry cask storage PRA -- granted, it was a PRA of a particular cask design at a particular site, but looking to see what

general insights there may be that we can learn and gain and apply within our program.

Within our division, we have an effort underway to look at the standard review plan we use for storage cask reviews as well as a site-specific facility reviews to see how we might -- I'll say -- use the phrase "risk inform" our standard review plan based on the insights, lessons learned/gained from the PRA, as well as from our experience over the past few years. And that is an effort that I would see over the next year or so that we'd be engaging with the Committee -- on our considerations with regard to how we can improve and better risk inform our standard review plan for storage activities.

CHAIRMAN RYAN: That's a great step forward. That would be a nice activity for us to take a look at at some point when it's ready.

MR. BRACH: Good. Thank you.

The next topic -- I probably would put the phrase "uncertainty" in front of the national spent fuel management strategy, and let me explain why I'm saying that. I'm sure the Committee will recall from the previous sessions of Congress a number of various legislative proposals that have been introduced that would have various considerations for storage of spent

fuel.

Some considerations were for regional storage facilities, statewide storage facilities, also considerations for storage, a separate storage facility adjacent to the repository. And also, there's considerations in the current Congress with regard to legislative considerations in that regard.

I put this on the agenda because I -- the considerations I've just mentioned, if you step back and think about the division -- the responsibilities of our division with regard to spent fuel storage, clearly the current practices at most power reactors are storing spent fuel at their respective sites. Today, there are 45 storage facilities licensed by NRC under Part 72. Across the U.S., in the next few years, we are anticipating there will be well over 60, 62 storage facilities approximately by the year 2010.

And I mention that in the context of the various legislative proposals, that if there are legislative actions taken by Congress to direct regional, statewide, or other storage -- centralized storage considerations, that clearly would be -- have a significant impact on the workload within our division as well as the industry as well.

So this is an area I mention that from the

standpoint of our maintaining vigilance, monitoring the considerations on the Hill with regard to potential outcomes and ramifications to -- so that we can be better positioned/best positioned to implement any new directions that may be forthcoming. And, clearly, those will be areas I think that, depending on outcomes, the Committee as well may be interested in the preparedness on the agency's part to address those considerations.

The last topic on the overhead -- I would note that it's really -- it's an evolving or continuing review activity on our part to review and study severe transportation accidents. The Committee will clearly I believe recall previous briefings we've had with the Committee on studies we've carried out on the Baltimore Tunnel fire, and also the Caldecott Highway Tunnel fire in the past year.

There was a severe highway accident about two months ago out in Oakland. It's referred to as the MacArthur Maze fire. You may recall that's where there was a severe fire and a collapse of some of the highway structures. Staff -- our staff has been in contact/interaction with the State of California to make arrangements, and we have obtained samples from some of the bridge structures, so that we can analyze

and determine the extent of the temperature, the profile, the severity of the accident conditions, again looking at it from the standpoint of, had there been a spent fuel transportation occurring during the event, what may have been the consequences for that highway cask, if you will, had it been -- had it experienced that severe accident conditions?

We're a little bit early in the process right now, but whether it evolves into a study of the dimensions of the Baltimore Tunnel or the Caldecott Tunnel fire, right now I don't know. We have taken the studies. We have made arrangements to have -- we've taken the samples, we've made arrangements to have the samples analyzed. And as that information -- as we gain more information, we'll keep the Committee apprised as to how -- what direction this study or review will take.

But it's one that I want to stress that we're trying to maintain vigilance on our part with regard to gaining a full understanding or fuller understanding of real-world accident conditions, so that as questions -- as we study the issue, our questions may come to us. How would a spent fuel package, whether it be a rail or a highway transportation be occurring, how would those packages

withstand real-world severe accidents?

We want to be in a position to be able to answer that both from a regulator standpoint but also from a public outreach standpoint with regard to why -- the basis on which we reach conclusions on the safety of transport of spent fuel. So that's one that just in the last two months has been evolving on our part, and we'll keep the Committee apprised as to how outcomes and how that activity and review study proceeds.

CHAIRMAN RYAN: Bill, I think it's noteworthy and commendable that you're looking at hard data. You're actually getting samples and looking at material science questions, you know, in the field, and that's one -- one sample can maybe erase a thousand runs of a model.

(Laughter.)

But I think that approach is commendable, and I guess the ideal would be, is there enough data to then make an abstraction for some analytical purpose? So that's -- three cheers on all of that.

MR. BRACH: Well, thank you. And that's why I say it's a little early in this particular activity, other than to note we have the activity underway and we'll keep you apprised on what we learn

and gain from that -- in that regard.

That's a brief overview of some topics, some of which clearly I think the Committee has been briefed on this year and previous years, but also what I see to be some issues evolving over the next one to two years that I would think the Committee may have interest in engaging with us and/or the industry with regard to technical paths, paths forward.

CHAIRMAN RYAN: Great. Jim?

MEMBER CLARKE: With respect to the dry cask storage standard review plan, you said that review is ongoing, and looking at risk-informing those plans.

MR. BRACH: Yes.

MEMBER CLARKE: Any feeling of when you'll have something that you want to tell us about?

MR. BRACH: It will probably be in the winter timeframe of next year, winter, maybe spring at the latest. So we're in that timeframe. We're engaging with our staff, engaging with contract support, to help get some insight and direction on how best to be proceeding in that regard. But roughly I'll say in the six or nine months timeframe.

MR. WEBER: February/March timeframe.

MR. BRACH: February/March timeframe.

MEMBER CLARKE: Okay, thanks. And with respect to the bullet below that, the national spent fuel management strategy or strategies, or everything that has come out over the last year. So you're just looking at them all. Is that --

MR. BRACH: Well, not --

MEMBER CLARKE: I mean, not them all, but I mean the ones that have been actually proposed.

MR. BRACH: Well, my point is --

MEMBER CLARKE: At some stage of --

MR. BRACH: Yes. My point in mentioning this was that the current regulatory approach and practice with regard to the industry is pretty much onsite storage of spent fuel at the respective power reactors where the spent fuel is generated. I mention that in the context that a number of the legislative proposals in previous years, previous Congress sessions, as well as the current, are looking at various options.

And some of those options may have a very significant impact on our program and our program activities, so I only mention it in the context that we're trying to maintain vigilance, monitoring, so that we -- as to what may be evolving through Congress or coming out through a legislative direction that

we'd be best positioned to address what actions Congress may be directing.

MEMBER CLARKE: And here you're --

MR. BRACH: So fully maintaining awareness and cognizance on our part that the strategies may change over the -- may or may not change over the next few years.

MEMBER CLARKE: And here you're speaking to the regional -- the proposal for regional facilities or --

MR. BRACH: There are -- some of the legislative proposals for consideration for regional storage regionals. Some of the proposals considered statewide storage facilities where all of the fuel in one state would be co-located in a statewide storage facility. Another consideration was for a storage -- a potential storage facility adjacent to the repository.

So we're trying to maintain awareness of those, because of those could have some significant ramifications on many of our programmatic activities with regard to our licensing and certification activities.

So, really, that bullet is there from the standpoint of -- really, to just indicate we are

trying to maintain awareness of what may or may not be congressional actions. This has been a topic considered in the last few congressional sessions, and there are some proposals currently -- in the current session as well.

MR. WEBER: Our objective is to ensure that NRC is not the block in moving forward and making progress. If there is a decision at the national level, this is what we're going to do for the foreseeable future, we need to be ready to act on that. So we need the framework in place.

MEMBER CLARKE: Thank you.

CHAIRMAN RYAN: Ruth?

MEMBER WEINER: First of all, I'd like to commend you for being proactive in the case of the Oakland fire. This is really important. I mean, it would be very nice if the first words that one read in the popular press came from NRC rather than where they usually come from. And I think that study is going to be very, very worthwhile.

Are you giving any consideration to doing a study of how these actual accidents compare with the test conditions of 71 Subpart E?

MR. BRACH: The answer is yes. If you recall, in the Baltimore Tunnel fire, in the Caldecott

Tunnel fire, clearly, we're looking at the severity of the fires, the temperature ranges, and how those compared with the accident condition tests in Part 71, hypothetical accident condition tests in Part 71.

MEMBER WEINER: The sooner that that gets -- becomes public the better. And that leads me to my next question. Do you have -- I know you have a good relationship with all of the public information activities that NRC undertakes. Are you content with how rapidly or how efficiently what you come up with in transportation becomes part of NRC public information? Because it seems to me transportation is very visible. It's probably the most visible thing to the public.

And the sooner that -- the better that relationship is, the more closely you can feed information into a public information mechanism, the better off we all are.

MR. BRACH: I clearly agree with everything you've said. We're trying in that regard. I would mention -- make mention of the MacArthur Oakland -- MacArthur Maze fire. We actually did write with our Public Affairs Office an editorial to the local newspaper with regard to explaining what we were -- that we were monitoring, at that point had already

engaged with the State of California to try to start making the arrangements for obtaining the samples to do the analysis.

So we tried -- we were trying early. Whether we'll be the first, I suspect we'll probably -- well, we'll try to be the first, but that's a significant challenge, but we're trying -- we recognize the high level of public interest, both in storage and transportation, and we're trying in that regard to be out and visible and engaging with local -- with the local governments, local communities, as well as other organizations, to try to explain what we do and the basis on the conclusions we reach with regard to our various activities. But we're trying.

MR. WEBER: In general, we are not satisfied with our communications. We need to do better, and I think you'll find that all of the way up to the Chairman and the Commission. You know, the Chairman often says the agency ought to be the source of information of choice for the public. If something is going on nuclear, you know, go to the NRC website first, or get it from NRC. But there is a lot of challenge associated with doing that.

As an agency, despite our openness for decades, we still are plagued by openness issues.

And, you know, we're trying to get our arms around those and move forward. So every day we make a little bit more progress, and we're trying to avail ourselves of all the resources we can to -- within our budgets to move the ball forward.

MEMBER WEINER: That's very commendable. I encourage you to keep doing that.

Have you -- some years ago, and repeatedly since then, the question comes up on data on spent fuel and radioactive materials transportation accidents. Until 1999, DOE maintained a database of the radioactive material incident reports. Has NRC given any thought to creating or maintaining or picking up a database like this?

It would be of great interest to the public if you could do that, because we get questions all the time about, you know, how many accidents have there been, what's the accident rate per mile, and so on. And in the absence of a data source, it's very difficult to respond. And I'm sure you've recognized that, too.

MR. BRACH: But you may recall Earl Easton, in one of his presentations with the Committee, provided some rather detailed analysis where it -- and this is dealing primarily with rail

transportation, where in working with DOT and the Federal Rail Administration had walked -- had gone through I think about the last 25, maybe 30, years of rail accident history.

And I don't have the numbers memorized, but walked through with regard to the various types of rail accidents, the number of accidents that have been HazMat or hazardous material accidents, and then the subset of those had involved radioactive materials. And I think you're aware that the number of transportation accidents that actually involve spent fuel are very few. I believe the number was four?

MEMBER WEINER: It's zero. Or it's close to.

MR. BRACH: Well, actually, there were four accidents involving radioactive material transportation. That's --

MEMBER WEINER: Yes.

MR. BRACH: But with regard to maintaining that database, let me look into that, Ruth. That's -- I recollect that DOE had sponsored that for a number of years, but I -- to the extent that DOT, through either the FRA or the other motor carrier organization have that information, let me look into that and --

MEMBER WEINER: Thank you.

MR. WEBER: Clearly, incidents involving radioactive material are available in publicly available databases through the event database and the nuclear material event database. So, you know, that's all public. But somebody would have to go and search it and extract the data and analyze it.

MEMBER WEINER: Yes.

MR. WEBER: I hear you asking more broadly about all hazardous material transport incidents.

MEMBER WEINER: Well, the HazMat incidents are -- as you say, they are available on the Bureau of Transportation Statistics database, but it's difficult to work one's way through that. And when you get a specific question on radioactive materials, or even on a certain kind of radioactive materials, how many accidents have there been with NARM, with low-level waste, and so on? It would be very valuable to have a source to go to.

The final question I have deals with the TAD, and this probably is going to extend over into Lawrence's presentation. Various percentages of -- let me back off. In your estimation, how much of the spent fuel and material going to the repository would have to be repackaged, would not be initially in a TAD? How big would that section of the GROA have to

be?

MR. BRACH: I'm not sure there's a real definitive answer. I would offer that currently there are about 850, somewhere right in that range, currently loaded spent fuel casks at storage facilities across the U.S. today. I know the Department of Energy has had discussions and considerations as to receipt of that fuel.

The fuel receipt at the repository in the overall operational period of the repository would allow ability on their part to receive fuel in a non-TAD package. I believe those are -- I'll maybe stop at this point and let Lawrence pick up, but I believe those are considerations the Department of Energy is still looking at with regard to receipt of fuel and I'll call it the standardized TAD design or potential receipt of spent fuel in the non-TAD canisters.

MEMBER WEINER: Thank you. Thank you.

MR. KOKAJKO: I can address that piece of the question anyway now if you would like. DOE does propose some type of phased type of approach, and they would have, at least under their current thinking, some type of design that would allow for repackaging. One of the things that has been proposed is perhaps a small pool where they can repackage spent fuel at the

Yucca Mountain site.

Now, I say "propose," because nothing is definitive yet. They have not submitted a license application. We have had some interactions, public interactions with them. So we have some idea of what they're thinking. But until they come in with their strategy at the license application, we really won't know for sure what they want to invest in. But that's still an open question in our collective minds between SFST and repository safety.

MR. WEBER: Another part of the answer is, of course, the extent to which the utilities use the TAD canister. And one of the things we heard quite clearly down at the recent spent fuel storage forum down in Florida was it's a function of the incentives that the Department provides to the utilities, because many of them have already selected technology and are used to using certain cask designs, and the TAD is smaller than what they have been using. So, you know, all of that has got to play through the process.

CHAIRMAN RYAN: Allen? Bill?

MEMBER HINZE: Briefly. Following up on Mike Ryan's comments and one of Ruth's questions, regarding severe transportation accidents and real analogs, real-world analogs of that, I assume that

there is good monitoring of the international scene in terms of accidents.

And I guess that leads me to the question, how much investigation is there into the transportation in proximity to seismic zones, for example, that might be associated with actual rupturing of the earth or landslides or tsunamis? How does this enter into your investigation of severe transportation accidents?

MR. BRACH: A very good question. With regard to our interactions internationally, the Department of Transportation and the NRC co-represent the U.S. before the IAEA, the International Atomic Energy Agency, in what's referred to as the Transportation Safety Standard Committee. And in that regard, there is a close working relationship between us, DOT, and our international counterparts with regard to transportation of radioactive materials, clearly which includes spent fuel as a subset.

So from the standpoint of our coordination engagement internationally as a very close, good working relationship in that regard.

MEMBER HINZE: Do you get a chance -- excuse me, Bill, but do you get a chance to investigate accidents like you have with the

California fire or the Baltimore Tunnel fire? Because you have a very small sample to deal with here, and what you need is, as was said, you need these real-world analogs.

MR. BRACH: On the one hand, fortunately, there are not that many real severe accidents, which is good, a good outcome. There are not that many accidents.

Perhaps the -- on the international scale, maybe what we have been -- we, the U.S., have been engaged in looking to Baltimore, the Caldecott, and now looking at the MacArthur Maze, may be a little bit more than what has been done internationally. But on the more positive side, there are very few international accidents of transportation, so that the population -- the numbers are very small, which is a positive -- that's a positive reflection not only on the transporters and the safety of transport, but also as well as package robustness also.

On your latter point with regard to seismic, I guess I would have to step back and talk to some of my technical staff, but with regard to the hypothetical accident condition tests, we have certain drop tests, puncture-type tests that could simulate potentially some of the challenges that might result

from an earthquake where maybe there is some separation of the road or ridge or other physical challenges that might result as a -- in response -- might result to the transportation package as a result of a seismic event.

MEMBER HINZE: Well, actually, that kind to mind just here in the last 24 hours or so. If there had been transportation of some of the waste associated with the recent Japanese earthquake, what would be the effect? I mean, is there -- is there really a nexus here, connection, between the problems of landslides, between the problems of tsunamis, and the parameters that you're investigating with your tests and drop tests.

And some of those drop tests might not be totally inclusive of some of the problems that you might encounter. And that's my question I guess.

MR. BRACH: Well, let me have that as a question I'll discuss with my staff. My initial thoughts were that some of the physical challenges from a drop consideration that are part of our current, if you will, fleet of accident conditions that must be analyzed, I think may resemble in significant part some of the physical challenges that might result from an earthquake where a bridge or a

highway or some other physical challenge would impact the cask and challenge its robustness or challenge its containment.

MEMBER HINZE: I guess I was thinking more in terms of landslides and actually tearing out of railroad, tearing out of the roadway, and carrying it out or carrying it into the sea, or whatever. There are a lot of -- you know, a lot of scenarios that you can envision. I'm just wondering how all-inclusive your tests are in terms of that, and I'll leave it at that.

MR. BRACH: Well, I would just offer, for example, that there are submersion tests required for a spent fuel package. So if it were a landslide near the sea, I believe some of the depth considerations would be somewhat similar to the accident condition tests that we have looked at.

But your point is one I'll discuss with the staff to see if there is additional insights that might --

MEMBER HINZE: Thank you.

MR. BRACH: -- we might gain from that.

CHAIRMAN RYAN: You know, it's interesting. That's a good conversation, Bill. I mean, it strikes me -- and I think I gathered from all

of the things we've talked about in this session and others, Bill, is that you're really seeking to understand, are the parameters of your analyses risk-informed? And if we're at the 50th percentile and assumption of a 99.9 percentile.

And I think every one of these kind of cases like the one Bill mentions, and others, and the ones you've looked at and will continue to look at, I agree with you. I'm glad they're few in number. I'm glad your statistics stink.

(Laughter.)

That's good, and it's good for the worldwide system, too. But, you know, it's -- and I think it's a good discipline to look at them all and see if there's anything new to be gained in terms of where are we on the risk-informed scale. Are we in the middle, are we on the top end, are we bracketed properly, and so forth, in our analyses?

So I -- what I take away from the conversations, that that's really your goal is to understand how -- you know, where you are and to continue to risk-inform as new information becomes available. And, again, I second the idea; that's commendable. So that's great.

MR. WEBER: All right. And our last

presentation will be made by Lawrence Kokajko on the high-level waste repository safety and security program.

MR. KOKAJKO: Good morning, Dr. Ryan, and Committee members and staff. I am --

CHAIRMAN RYAN: Good morning.

MR. KOKAJKO: This is a great opportunity for me, because I get a chance to say that we're in the final year --

(Laughter.)

-- before DOE submits the license application for Yucca Mountain. How many times have you heard that before? Well, we've faced many of the same challenges we have faced in the past in terms of staff attrition and preparation, developing and improving our tools to review the license application, and, of course, our continued interactions with DOE pre-licensing.

I want to cover a few things today with you. One is the schedule for the license application, the 63 revisions that are based upon the EPA standard, the NRC/DOE interactions, and, of course, our current staff preparatory activities, and provide a few other comments.

First, DOE has publicly maintained its --

and has submitted an affidavit to this effect, that they will submit a license application no later than June 30, 2008. And this was provided to the pre-application presiding officer, the PAPO award, just -- not long ago. And they even implied they could be even earlier.

As you know, they have to certify their licensing support network at least six months prior, and that means they would submit a certification for their LSN no later than December 21, 2007, and, again, alluding to the fact that they may even bring it in earlier than that. This would, of course, if they brought it in earlier, give DOE more options as to what they wanted to do with the license application.

Certification of the LSN is a big trigger for us. We begin to go into a very different mind-set once that happens, and a lot of things start taking a whole different air than they did before, including with the LSN-certified -- the State of Nevada. It will be -- and any other group that would like to raise contingents may start doing so, or not start doing so, but their preparatory activities will increase, because they know that these documents that are in LSN are going to be somewhat final documents that will be used as the license application support.

In terms of Part 63 revisions, I cannot say a whole lot about it. EPA, as you know, has not yet finalized its standards. Some discussions are still going on downtown, and I'm not privy to those discussions. We would implement -- issue implementing regulations to Part 63 upon issuance of the new standard, the revised standard. And until that happens, we are sort of waiting to hear what comes from downtown.

CHAIRMAN RYAN: Lawrence, just quickly, do you have any idea on schedule?

MR. KOKAJKO: Yes, I was about to mention that. We expect that we -- we -- sometime this summer is probably the best way to describe it. We would have thought that it might have been done before now, but it has, in fact, not happened. But -- so I assume sometime this summer.

MR. WEBER: We're told that you would address, if there isn't a standard in place, what effect that has on the LA.

MR. KOKAJKO: Actually, I wasn't going to address that.

MR. WEBER: Okay.

(Laughter.)

But it has come up in interaction with the

Department.

MR. KOKAJKO: It has. It has.

CHAIRMAN RYAN: Good question for later.

(Laughter.)

MR. KOKAJKO: Good question for later. Well, I might as well address it now. DOE has stated -- in fact, Ward Sproat stated at the regulatory information conference last March that he believes he could submit a license application without the standard in place.

We -- you know, it would be based upon some presumption that they have that they know what that standard is going to be, and that value is what they would then prepare all their regulatory documentation on, whatever that standard is.

The staff would take it and review it. However, it's -- we are still discussing with OGC as to what conclusions we could reach with the standard not being implemented.

CHAIRMAN RYAN: I guess I could envision where some parts, whether it's the facilities or other things, would be workable. But, you know, the ultimate question of long-term performance, it's tough to do that in the absence of a standard.

MR. KOKAJKO: And, again, that's another

question with General Counsel is that, you know, for example, I think you're alluding to this.

Could you prepare all of the pre-closure facilities at their geologic repository operations area, and have that being reviewed and somehow approved? Well, that's not what the construction authorization allows, I think is my understanding of it. That it would have to be the entire site gets construction authorization approval, not just the pre-closure facility.

CHAIRMAN RYAN: And I think, from the Committee's perspective, it's important to us that you -- and I think you mentioned it a couple of times, this is really an OGC question, not one necessarily to the Committee, but we'll be mindful that it does impact the schedule of your activities and ours in turn, so --

MR. KOKAJKO: That is the million dollar question, rather -- meaning your question. Well, I'm glad we exhausted that topic.

(Laughter.)

CHAIRMAN RYAN: Thank you.

MR. KOKAJKO: Interactions with DOE and NRC staff -- and, again, I say NRC staff, but I'd also like to make sure that you understand it's also our

Center colleagues as well as our Region IV colleagues and our onsite representatives in Las Vegas.

We are still in a pre-licensing phase, as you know, and we are still looking at a number of documents that DOE has and is using in preparing its license application, primarily analysis and modeling reports that will support the license application.

As you know, we do not conduct formal reviews here that reach regulatory conclusions in this pre-licensing phase. This is meant for study only. However, we do have a lot of interactions with the Department to try to understand their thinking, and as it evolves -- and it is evolving, and has done so over the past few years.

A question that -- I'm about to get to this, but, again, under the leadership of Ward Sproat at the Office of Civilian Radioactive Waste Management, I do think he has invigorated the interactional process with the NRC, as well as, you know, being very clearly focused on civilian license application no later than June 30, 2008.

However, that also means he had to make some decisions, and one of the big ones is we are pretty much a KTI process that we had started with the -- nine KTIs with the 293 agreements. It's pretty

much quiescent for right now. We are no longer engaging on specific attributes of that. Most of those 293 -- I think about 260 have been addressed to some extent. There are some open that we have required additional information on.

However, DOE is not going to provide documentation on those. They said that they would deal with it in the license application itself, and which makes a lot of sense. If you have only limited resources, why would you want to do something that has less of a regulatory aspect than, instead, put -- focus your energy on developing the regulatory product you need to submit.

And so those things that are still open should be addressed in the license application, and that will -- we'll be looking for that.

We have recently decided to ensure that all of our Appendix 7s, which were primarily information-gathering needs, are now open to the members of the public. And they have started -- the information sessions that we have had recently have been on near-field environment, colloids, multi-scale thermal hydraulic modeling, pre-closure criticality, and, Ruth, also canister receipt and closure facility layout and structures, as well as human reliability

analysis.

Two future information-gathering meetings are also on unsaturated zone field tests, which is later in August, as well as drift degradation, which is in September. These typically will precede a technical exchange, and, again, this is a public meeting as well where we get a little -- much more -- instead of information-gathering, we are much more probing. We are asking questions about what they're doing.

Recently, we have had some on pre-closure facility layout and design operations group, security, quality assurance, and we have a number of them that are being scheduled now. One is pre-closure criticality, which is scheduled for August 30th. We are also looking at event sequences and development categorization, identification of hazards, source terms and consequences, and, of course, the pre-closure safety analysis development, as well as, in post-closure infiltration.

These technical exchanges are, as I said, open to the public, and Committee members and staff are certainly welcome to observe when they happen.

I know you have worked considerably on probabilistic volcanic hazards analysis of late, and

I won't address those at this time. We did see the report that the Committee developed, and we appreciate the opportunity to review it. And we look forward to having further discussions, if need be, on that topic.

One of the other things that we do with DOE is we do interact with DOE on internal QA audits. We observe them, and we provide feedback to them as we need to. We have had some QA audits recently. One is we look at their infiltration audit. Gene Peters will provide more information on this I think later this afternoon. He is a very capable individual, and I think you will find that presentation very interesting.

We have also had some discussions with them on technical -- rather, their audit of technical data management system, design interface and change control, which is going to become an issue as well, which is under 63.44, and, of course, waste package emplacement vehicle design. These are things that are ongoing now that we have observed, and we have commented on.

One thing I'd like to mention before I go into the last topic on staff preparation is, although these are interaction with DOE, we have also had interactions with stakeholders out there. We recently

held last month a two-day meeting with the affected units of local government, with all the stakeholders, primarily state and county representatives, and others, to inform them of their opportunities under Part 63 and Part 2 to participate as an affected unit. And it was a very well-received meeting, and we are looking forward to continuing to interact with the state and counties in that area out there.

The final thing I'd like to cover before I close, and open for questions on staff preparation -- again, we are basing all our work on the schedule that DOE has provided. And as you know, we have committed to doing an 18- to 24-month technical review, and we recognize we have to maintain some flexibility in order to accommodate whatever DOE submits to us.

We are also continuing to staff. We do -- have identified some critical skill areas, such as materials engineering, hydrogeology, and criticality analysis, which we are looking to -- we have open positions that we're looking to fill. Recently, one of the big steps, we have completed deployment of our TPA, our view of the code we use to assess the performance in the post-closure period.

TPA Version 5.1 has now been accepted by

us, including its users' guide. Now, I understand Dr. Brett Leslie will be submitting or having a presentation with you in September on this update, and I think you will find it very fascinating.

We have developed our interim staff guidance documents, which help to supplement guidance to the Yucca Mountain Review Plan, which provides guidance to the staff. Three are now out. We are -- we have one that is pending, right now pending a public meeting with the Nuclear Energy Institute later this month.

We continue to refine our risk insights and their approaches on facility design, pre-closure operations and analysis. And while they are changing some of their approaches even now, our Appendix 7s help us gather that information so that we are better prepared to understand where they are moving toward the LA. So that has been a positive step.

In terms of future interactions, I understand the State of Nevada has sent in a letter recently that has expressed some concerns about the ACNW role after LA submittal. And, you know, we look forward to seeing the response to that, as I know you do.

In terms of future interactions with the

ACNW, we hope that they remain fruitful until the LA is submitted, and we -- there are four areas that I'd like to mention to you that we would perhaps like to address with you at some point. One is drift degradation, performance assessment, the TAD canister specifications and technical review from the disposal site.

But I would -- even before I did that, I would want to coordinate, and in fact have, with Bill Brach and his staff available to support to the 71/72 attributes, because it is an integrated strategy. And, of course, the ever-ubiquitous risk-informed decision-making. And since I can't help it, I'm going to say it again. I've said it many times. I still think I have the best job in the house, and I enjoy my work, and I thank you for the opportunity to be here.

CHAIRMAN RYAN: Thank you, Lawrence.

I think that there's two on your list that are probably related -- the performance assessment and the TPA 5.1 and the risk-informing. That goes hand in hand without saying so, but it would be good to hear.

Bill Hinze?

MEMBER HINZE: Well, we are very much looking forward to learning about TPA and the modules that are involved in it. Lawrence, you mentioned the

interaction with the stakeholders and the state. Is this -- any of this on a technical level? Are there any major concerns that we're hearing about or that you're hearing about from the state on the technical level regarding the site?

MR. KOKAJKO: Well, the meeting that I alluded to was all -- would be better characterized as a process meeting. We are trying to inform them about the process -- the processes that are identified in 10 CFR 63.63 which allow ALUP participation, and of course if they want to provide -- you know, want to participate in the hearing as an intervenor.

And that was the scope of that. It was more meant to sort of keep them informed of that.

MEMBER HINZE: I see.

MR. KOKAJKO: Now, as you know, I think you probably do, you know, Nye County has its own well drilling program. And Inyo County has a drilling program as well, and they do participate at a technical level and have expressed interest in participating in some fashion with the information that they have, and it's primarily due to the transfer of radionuclides in water from the repository to some receptor location either in Nye or in Inyo County, California.

MEMBER HINZE: Last December when you met with us, you mentioned one of the things that could be -- that the ACNW&M could be involved with would be the problem of drift degradation and the related seepage. And you mentioned that, again, we're trying to get a handle on that and trying to work with your staff and trying to develop a working group meeting of -- a short working group meeting that will attack some of those problems.

I gather that the problems related to the static load on the drip shields, the problems or the differences between you and DOE have not been resolved as part of the interactions over the past six months.

MR. KOKAJKO: Well, no -- well, I can't say that there has been a lot of interactions with DOE on that. You know, we did submit a letter on that. The real issue is we haven't seen the LA yet. And until DOE sort of comes off the dime and makes a decision one way or the other, we don't have -- you know, we couldn't really study any one position.

So what we do is we have to study a variety of thinking -- I mean, you mentioned the scenarios on the transportation piece. We have to do the same thing. We have to sort of look at a variety of things that are out there that could come into

play, and so that's what we're doing. And some of the studies have been to look at, you know, a gamut of things that could affect the static loading.

Now, we have not reached any regulatory conclusion. We did not --

MEMBER HINZE: Sure.

MR. KOKAJKO: -- discuss any specific type of finding with anyone, because we just don't have enough information yet. But we know that there are some issues associated with it, and we have to be prepared to address them.

MEMBER HINZE: Thank you.

CHAIRMAN RYAN: And I think it's important that, you know, our exploration -- you know, we're the -- and our own independent review of it is really to identify risk-significant kinds of issues. And I know that's helpful to you and us, and that's our goal. So we're not in a decisionmaking business here, just to clarify.

Anything else, Bill?

MEMBER HINZE: That's it.

CHAIRMAN RYAN: Okay. Allen?

VICE CHAIRMAN CROFF: Early in your presentation you piqued a thought. What is the role of Region IV in this whole exercise, now and maybe

into the foreseeable future? What -- how do they fit in?

MR. KOKAJKO: Region IV is our -- essentially a big component of our inspection arm. They provide the onsite assistance -- assistance to our onsite representatives. They go out there, they'll do field inspections, they'll do records inspections, just as they would do at a commercial powerplant during construction. And so they are going to be our eyes and ears.

Now, we do have right now one, but they will be stacking up to a second, onsite rep here soon. And those people are there daily, like this -- the resident inspectors at a powerplant. Region IV people will be going -- be tasked to go into the field to look at documents or activities, pouring concrete, whatever, during the construction phase. And they are an instrumental -- integral component to our efforts.

Now, we have people who are qualified inspectors back here as well, and they will also work collegially, in tandem, to do what we need to do. Now, during the license review, we may see stuff that doesn't quite look right. We might dispatch our inspectors to go take a look at something in the field or in the records area, to try to understand what is

going on a little bit better. So they have become our eyes and ears.

CHAIRMAN RYAN: Thank you. Jim?

MEMBER CLARKE: Just a question about the schedule, to clarify my understanding of what will happen. If the license support network is certified by December 21st, as you said -- and I understand there are no outstanding issues, because the key technical issues that are still open, you've come to an agreement about how that will be handled. That will be handled through the license application itself.

So you receive the application on June 30th, or before, 2008. Is there then a process that you go through to go back and forth about needs for additional information? Or does the clock start then?

MR. KOKAJKO: Well, the clock starts when I accept the review -- the application for review, which I will hope to have accepted for review within six months from the date of the application. That's the goal.

Recognizing that we have KTIs that were never fully addressed, as we would have liked them to be, if one can make an assumption that we will have

requests for additional information, we have planned in our schedule to have a request for additional -- at least one, maybe more, request for additional information. And it will be a pretty significant document, because it is going to cover many attributes of the repository. It is going to be a large application, so there are going to be a lot of questions potentially.

Again, not fully knowing where DOE is deciding on, say, a particular point or not, may raise other questions that we had not anticipated when we were -- during the KTI process. So we expect a large number of -- you know, potentially a large number of requests for additional information, and we have factored it into our schedule.

MEMBER CLARKE: Okay.

MR. WEBER: But those would be issued if we accept the application under review.

MR. KOKAJKO: Only if we accept the application.

MEMBER CLARKE: Right. Okay. First, you accept the application, and then you go through the information exchange where you -- you would be asking perhaps for additional information. And then, did I hear you say that you have committed to a period

during which you'd perform that review?

MR. KOKAJKO: The statutory requirement says that you'll do it in three years, maybe four if you, you know, tell Congress -- ask Congress. And so we, the technical staff, has taken liberties to say half of that time will be devoted to technical review, which is 18 to 24 months.

MEMBER CLARKE: Okay. That --

MR. KOKAJKO: The rest of it will be the hearing.

MEMBER CLARKE: Understand.

MR. KOKAJKO: Hearing support.

MEMBER CLARKE: Thank you.

CHAIRMAN RYAN: Ruth?

MEMBER WEINER: You mentioned the EPA -- that EPA is still working on the standard, and this is just for my information. Isn't there an existing standard, and don't you go by that with regulation until there is a new standard?

MR. KOKAJKO: The standard was vacated by the courts.

MR. WEBER: The one aspect.

MR. KOKAJKO: Yes, that's --

MEMBER WEINER: Yes, the one -- that one aspect.

MR. KOKAJKO: What you're suggesting is there's a -- somehow negate the 15 millirem per year whole body for the first 10,000 years --

MEMBER WEINER: Yes.

MR. KOKAJKO: -- in groundwater, and the answer is no. That was held in place. That's still valid. However, the license application addresses an application for the repository, which goes for -- to the period of geologic stability, which is assumed to be a million years. And that piece is missing still, and it -- that was what EPA is struggling with.

MEMBER WEINER: Thanks for that clarification. That means that for that piece there really is no existing standard at the present time.

MR. KOKAJKO: That's right.

MEMBER WEINER: Thank you.

My other question is a follow-on to what Dr. Hinze asked. You mentioned that your meetings with stakeholders, your Appendix 7 meeting with stakeholders, dealt mostly with the process of intervention and participating in the license procedure.

Do you anticipate meetings with stakeholders that deal not just with technical issues but with more substantive issues? And how do you see

the NRC's relationship to the state and local governments?

MR. KOKAJKO: Well, 63.63 outlines our interactions with affected units of local government. And as you know, Part 2 has our hearing requirements in there. We will attempt to continue our outreach activities within the confines of what we can do, and this will of course require a lot of advice from General Counsel.

But things change if intervention occurs. Once a party decides to intervene, there are restrictions placed. I cannot give you the entire scope of that at this moment, but that is something that we're going to follow. But our goal is -- and like you said about, you know, it would be nice to have NRC be out front on some things, our goal is to be a wealth of information that we can talk about that gives confidence to them that the NRC is doing its job.

MEMBER WEINER: Thank you.

CHAIRMAN RYAN: Thanks, Ruth.

Gentlemen, I really appreciate all of the briefings we have had this morning. I don't have any further particular questions, but I thought, since we are in a public forum, if there are any questions,

we'll start with Frank, and then maybe take questions from the audience.

MR. GILLESPIE: One general one, because we've got think both I think for NMSS and FSME, and Mike and I asked this morning. Research proposed updating all of the reg guides past the Phase 1s, which was kind of the big push for new reactors. So now it looks like Phase 2 and 3 really do affect the kind of facility that kind of covers everything else.

Mike, how does that affect NMSS and your scheduling? And does -- is it factored in --

MR. WEBER: We are not ready for any of those reviews, so --

MR. GILLESPIE: Okay. So it will be a while before we see kind of a proposed schedule on which ones -- you guys are working with Research on --

MR. GIITTER: Yes.

MR. GILLESPIE: -- on that one. It was a difficult question, because it seemed to -- it was an endpoint agreed upon, but no individual schedules for different guides. And fuel facilities has to have a wealth of guides that are a bit dated now.

MR. WEBER: I recall back in the late '90s we had over 60 guides that dealt with plutonium and uranium processing in one shape or another. Many of

them dated back to the 1970s.

MR. GIITTER: So all of those --

MR. WEBER: Almost all actually.

MR. GIITTER: They were all in that Phase 2 and 3 --

MR. WEBER: Yes.

MR. GIITTER: We looked at, you know, if GNEP comes to fruition, the timing would be more likely Phase 3.

MR. GILLESPIE: Okay.

MR. GIITTER: Unless, you know, there is wealth of resources that suddenly come to us and, you know, we're looking probably more at Phase 3 than anything else.

CHAIRMAN RYAN: We are actually taking a little bit -- a harder look and some study of the reg guides, and, you know, I had the fun exercise of going through all 10 revisions of them and trying to catalog dates and look at, you know, age brackets and groups, and so forth. And a couple of things sort of come out at me.

One is current risk-informed thinking is probably not as widely reflected in the reg guides as it would be today. So that's one. Two, when you pull the string on what's the technical document that

supports the reg guide, is it a NUREG, is it something else? You know, you ask the question, well, those are probably bounding analyses and, you know, old styles of calculations. And then, strings like dosimetry, the basis for dosimetry, runs the gamut from ICRP-2, 1959, to ICRP-68, modern era.

And, you know -- and I've heard Ralph Anderson tell us many times that they have to retrain their HP so they can use ICRP-2, because academic programs don't teach it anymore for those calculations. So there's a -- that's an interesting problem that we're wrestling a bit with.

And, frankly, the question we've got is: where is the real opportunity for the Committee to add some value to things that are current and on the plate rather than just say, well, let's look at them all. That's, you know, not a fruitful way to go at it. So we're thinking about that, so any insights you have would be helpful. If you've got some, you can say, "Well, boy, we'd really like to have these updated, or understand the history of this group. And are they risk-informed? Are they current? Do they still make sense?"

And, you know, the GALE code, which we have sort of picked on in the reactor area, uses a

FORTRAN 4 computer code with fixed values for, you know, partitioning fractions and all the rest for reactor designs that are 30 years, you know, old. Wow. Is that all good? Well, we don't know that. We're pulling that string a little bit.

Thanks for bringing that up, Frank.

MR. GILLESPIE: Would you anticipate probably later, maybe in the fall or the spring, having worked out something where we can interchange on what your schedule is for looking at them? Or is there Phase 3, and literally to you again in another year.

MR. GIITTER: That might be a better idea.

MR. GILLESPIE: Okay. Good. No, that's a perspective that is good to have.

CHAIRMAN RYAN: It helps us, because it kind of helps us in thinking about our study schedule and things that we might find and pass your way as we begin to poke around on it, so that's great.

I wanted to offer the opportunity, for any members of the public that might be here that wanted to ask questions of this panel this morning, if there are any, we'd be happy to have them now.

(No response.)

Hearing none, Chris, I --

MR. BROWN: Thank you, Mike.

For Bill -- Bill, back in February, your staff members gave a presentation on moderate exclusion. And it was based on the development of a Commission paper. I was just interested in knowing what's the status of that paper.

MR. BRACH: Okay. Chris, the Commission paper has been revised by the staff based on the briefings/interactions we've had with the ACNW&M and the panel/industry discussions as well. Also, there has been an exchange of correspondence between the Committee and EDO and that -- we are right now in the process of revising/finalizing that Commission paper. It should be -- I'll use Lawrence's earlier comment -- out in the summer timeframe. It should be finalized a little bit later this summer.

MR. BROWN: Thank you. And one last comment or question. Transportation of high burnup fuel -- we know that there is guidance out there on storage. And there is a program that you are -- you had with Argonne National Laboratory. Do you foresee any data coming out of that program any time soon that kind of help you -- and that data is probably mechanical properties of the cladding -- to help you with this issue on transport of high burnup fuel?

MR. BRACH: My glass is always half full, so the immediate answer is yes. But I think you are well aware of some of the difficulties -- had a hot cell in Oregon and looking at other facilities and arrangements for some of the testing. That's still being looked at right now.

So on the one hand, I -- yes, I look for data to be coming out, although, quite frankly, right now I don't think it's going to be in the near term. But that technical data will be developed and available to us, yes.

MR. BROWN: Thank you.

CHAIRMAN RYAN: Okay. Any other questions or comments?

MR. COLEMAN: Neil Coleman, ACNW staff.

CHAIRMAN RYAN: ACNW&M.

MR. COLEMAN: I didn't --

(Laughter.)

Lawrence, how is it looking for the release date on TPA 5.1?

MR. KOKAJKO: Well, I mentioned it's believed now that we are going to be given a presentation on that in September. I think it will be conducted --

MR. COLEMAN: Okay. So it is publicly

released right now.

MR. KOKAJKO: I believe it is. I will go back and check. But -- and we also have the users' guide, but I can get that information for you, if you would like to see it.

MR. COLEMAN: Fantastic. Thank you.

MR. WEBER: As you can see, this is an exciting time for NMSS. We've got proposed new facilities, we've got proposed new technologies, we've got new safety and security challenges. We're excited, because we're consolidated together as an office for the first time in over a decade and a half at the Executive Boulevard Building.

So we are looking forward to great things and more cooperation with the ACNW&M. And that completes the presentation.

CHAIRMAN RYAN: A couple of things in closing. One is thank you so much for a very informative morning here so far. I think at some point the Committee ought to come and visit you in your offices and not make that a far-away place, but, you know, part of the -- maybe a little distance is okay sometimes, but it's -- it would be good for us to understand your work environment as well.

And I want to recognize Sam Jones, who

continues to coordinate with our staff and it makes our briefing scheduling work better for all of us, and, you know, we can recognize your priorities and needs and we can fit that into our own scheduling. So that contact and interaction is very productive for us. It helps us stay productive, so we really appreciate that.

And, again, thanks to all of you for your presentations and insights this morning. We appreciate it.

Thank you.

MR. WEBER: Thanks.

CHAIRMAN RYAN: With that, we are scheduled for a recess from 10:00 until 2:00, and we will recess the record and reconvene at 2:00.

Thank you.

(Whereupon, at 9:57 a.m., the proceedings in the foregoing matter were recessed.)

VICE CHAIRMAN CROFF: I would like to bring the session to order. Chairman Ryan is upstairs in a meeting at this point that is maybe running just a tad long. I think he will be back shortly, but we've got a busy afternoon left. So I want to get going.

At this point we are going to have a

presentation on the NRC approach to monitoring sites containing waste incidental to reprocessing, I guess, as I'll phrase it. As you know, I believe there are still draft monitoring plans out for the Savannah River saltstone vaults and for the tank farm at Idaho. We got those some time ago and have gone through them. And they are going to give us a presentation on those plans and their monitoring approach pursuant to those plans.

Our speakers are Hans Arlt, Cynthia Barr, and Christianne Ridge. And Hans I think is going to take the lead and take it away.

NRC STAFF REPRESENTATIVE FROM THE DWMEP, OFFICE OF FSME BRIEFING ON WIR MONITORING ACTIVITIES AT THE DOE'S INL AND SR SITES

MR. ARLT: All right. My name is Hans Arlt. And I am with the Division of Waste Management Environmental Protection from the NRC. I will be talking for the next 20 minutes about NRC's approach to the NDAA monitoring.

I will be presenting a monitoring overview and a background of the NDAA. Cynthia Barr will be talking about specific monitoring activities and technical issues associated with the tank farm disposal system at INL. And Christianne Ridge will do

the same for the salt waste disposal system at SRS.

First, a little bit of background and introduction. The National Defense Authorization Act, or NDAA, requires NRC to monitor disposal actions taken by DOE for the purpose of assessing compliance with the performance objectives of 10 CFR 61 Subpart C. The NDAA also requires that NRC report any noncompliance to Congress, the state, and DOE as soon as practicable after discovery of non-compliant conditions.

Under the NDAA, NRC will monitor DOE's disposal actions in the States of Idaho and South Carolina in coordination with the covered states. NRC does not have an NDAA monitoring role at the Hanford site nor at the West Valley demonstration project because neither Washington nor New York State is included under the NDAA.

NRC does not have regulatory or enforcement authority over DOE under the NDAA. NRC's monitoring plans for the tank farm disposal system at the Idaho National Laboratory site and the salt waste disposal system at the Savannah River site do not prescribe activities to the DOE. All NRC is allowed to do is issue non-compliant notification letters if the performance objectives from Part 61 are not met.

Technical evaluation reports have stated that NRC has reasonable assurance that the disposal actions associated with the INL tank farm disposal system and the SRS salt waste disposal system can meet the performance objectives of 10 CFR 61.40 through 44. NRC has issued compliance-monitoring plans for both disposal systems this year.

The draft version of the NRC staff guidance for activities related to DOE waste determinations was published in 2006. Public comments are being addressed in the revised version, including comments on monitoring.

This staff guidance will be issued as NUREG-1854 sometime in the very near future. The section on monitoring in the staff guidance has been extensively revised. Main features of the monitoring section are included in this presentation.

NRC's general monitoring approach is based on a risk-informed, performance-based philosophy. During the technical evaluations, NRC staff typically derives reasonable assurance that the performance objectives will be met in the future through the use of performance assessment.

Monitoring to assess compliance with the performance objectives is expected to include

activities necessary to maintain confidence in DOE's prediction of long-term site performance.

Environmental monitoring will be part of NRC's monitoring approach. However, DOE typically relies on a number of engineered features to close their facilities. There may be several decades or centuries before any radioactive materials are expected to be released from the disposal facilities. Building confidence in DOE's selection of parameters and models will be a critical monitoring activity.

NRC staff will monitor key aspects of waste disposal systems. Assumptions, parameters, and features that have a large influence on the performance demonstration and/or have a relatively large uncertainty will be considered key factors of the waste disposal system.

Key factors of the SRS salt waste disposal system and key monitoring areas of the INL tank farm disposal system were identified in NRC's TERs using risk insights. Both are synonyms of "key aspects."

NRC's technical evaluations have determined that the salt waste disposal system at SRS has more uncertainty associated with it than the INL tank farm disposal system. Although both existing monitoring plants are similar in nature as to maintain

consistency, the quantity and character of the activities in the monitoring plant for the salt waste disposal system reflect this uncertainty and are more rigorous.

Although the NRC is required to monitor DOE's disposal actions under the NDAA, regardless of the amount of uncertainty associated with the waste disposal system, monitoring is a good mechanism to manage uncertainties and to evaluate new information.

When there is a large uncertainty associated with waste disposal system, monitoring can maintain confidence in the performance demonstration. Monitoring is not to be used as a substitute for inadequate information but, rather, to support previous determination of adequacy considering uncertainty. Additional information gained through various sources is expected to reduce uncertainties and support previous predictive modeling.

NRC's monitoring plan consists of two major components: technical reviews and on-site observations. Components of technical reviews including reviewing data associated with DOE's disposal actions and reviewing DOE's performance assessment.

During the technical review, staff should

remain aware of developments of waste management approach and challenges to the sport of key aspects of the waste disposal system.

Key aspects identified during the technical evaluation will need to be assessed through review of data, studies, experiments, and analyses. In the review of data, staff will need to ensure that there is reasonable competence in the quality of the data in terms of traceability, reproducibility, and representativeness.

The level of detail of the performance assessment review will depend on if and how extensively DOE revises its performance assessment and how these changes and their effects are documented and referenced.

Along with reviewing DOE's performance assessment, NRC staff will review studies and analyses that support performance assessment. Model results should have adequate model support or appropriate conservative assumptions and parameter values.

The on-site observation approach is the second component of NRC monitoring plans. The staff will visit the waste disposal facility sites, observe and review waste disposal actions, and discuss the results of observations with DOE immediately

afterwards.

Observation activities may include direct observation of work activities, past demonstrations, facility constructions, interviews with the workers, or a review of selected documents and records.

This frequency of periodic observation of DOE's waste disposal activities may be dependent on DOE plans and should be selected based on the stage of waste disposal. On-site observation reports developed after each site visit will include a description of monitoring activities conducted, results of on-site observation, and follow-up activities.

This table is not legible but hopefully in the slides or in your handout. This table has been taken out of the draft NRC staff guidance and shows some of the primary monitoring activities that might be performed for each of the performance objectives with which the disposal actions need to comply. So it's just a listing of different types of activities. And we can look through that later.

Slide 12, coordinating with the covered state. The key part of NRC's monitoring responsibilities under the NDAA is to coordinate monitoring activities with the covered state.

NRC anticipates keeping the covered state

informed of its monitoring activities and notified of plant on-site observations. NRC provides the covered state with draft copies of monitoring plants for the state's comments prior to finalizing the plans.

In some cases, NRC may be able to rely upon information obtained by the covered state. For example, the covered state may have specific requirements related to well construction and sampling that may help NRC ensure that the wells are properly installed and reliable, samples are collected and analyzed. This is just an example, a hypothetical example which I present.

Next slide, 13. Staff will document its assessment of the various technical reviews and on-site observations in a periodic compliance monitoring report, which will include monitoring activities covered, preliminary assessments and recommended actions, and current status of each monitoring activities and basis for each status, ratification of potential disposal design changes, and subsequent revisions of a compliance monitoring plan, and future planned activities and potential problems.

In the periodic compliance monitoring report, the technical review activities and the on-site observation activities will be given the

status of either closed, open, or open non-compliant. This is the tracking mechanism that allows NRC staff to quickly see which activities have been concluded and which activities need special attention.

Staff will only monitor activities that are categorized as open or open non-compliant. The distinction between the last two categories is made finally to distinguish between monitoring activities that are merely ongoing and monitoring activities that are ongoing and about which the NRC has issued a notification letter of non-compliance.

Each monitoring activity, whether technical review or on-site observation, is associated with a disposal action and should so be identified in the relevant compliance-monitoring plan. A simplified example is given below.

If an NRC staff member participates in an on-site observation, one of his or her activities may include observing the construction of an engineered surface cover. This monitoring activity is associated with the stabilization disposal action. Site stabilization has a direct bearing on whether performance objectives of 10 CFR 61.44 can be met or not; again, just an example.

Coordinating with DOE. NRC has interacted

with DOE at both technical and managerial levels to discuss NRC's monitoring plans. These interactions have been positive. As a result, DOE had minimal comments on the monitoring plans issued for SRS and INL facilities.

NRC is working with DOE to address specific and generic technical topics that have the most uncertainty. NRC anticipates meeting with DOE in the covered states to discuss the status of the monitoring programs.

If preliminary assessments indicate there is no longer reasonable assurance that the performance objectives can be met, NRC staff will document its findings so that it can be conveyed to the DOE.

DOE will be afforded an opportunity to provide additional information, analyses, and on sites that could help the staff reach a final conclusion.

Non-compliance notification letters. Under the NDAA, NRC is required to issue a notification of non-compliance as soon as practicable after discovery of non-compliant conditions.

Disposal actions taken by DOE could be found non-compliant if there are sufficient indications of the current requirements of 10 CFR 61.41 through 44 are currently not being met or there

are sufficient indications that there is no longer reasonable assurance that the performance objectives will be met in the future or there is a lack of supporting information.

For example, key aspects relied upon to demonstrate compliance with the performance objectives are no longer supported or there is insufficient basis in DOE's final waste determination document to determine that there is a reasonable assurance that the performance objectives will be met; that is, if NRC staff is unable to conclude that there is reasonable assurance in its technical evaluation report and has not received additional information to provide reasonable assurance.

Key aspects that are no longer supported can occur if new information is obtained which contradicts or conflicts with the technical bases providing reasonable assurance or if information that was predicted and expected to support key assumptions, key aspects is not obtained or documented.

This table has been taken out of the draft NRC staff guidance and shows the types of notification letters. Given the three types of non-compliance, NRC anticipates using three different types of notification letters, as seen in the table.

Prior to sending out a type I through III letter, NRC will review its concerns in a type IV letter to DOE and the state. If the staff determines that based on the information provided by DOE there is sufficient basis to conclude that DOE is in compliance, NRC will send out a type V resolution letter.

And that is the last slide except for the backup slides. Cindy Barr will continue with the presentation with monitoring activities at INL.

MS. BARR: Hello, all. This is my last official meeting before I go off on maternity leave.

(Laughter.)

MS. BARR: So as long as your questions --

(Laughter.)

MS. BARR: My name, again, is Cynthia Barr. I wanted to thank you for attending this afternoon's session and providing me the opportunity to present the second of three NRC presentations on the work that we perform in reviewing or monitoring DOE disposal actions at NDAA facilities. Hans provided a nice overview of the overall monitoring philosophy. I will provide a specific example for the Idaho tank farm facility.

Okay. NRC uses a variety of tools to

risk-inform its review, which carries over into the monitoring phase. We use simple models in calculations, independent probabilistic analysis, and independent information, including the use of monitoring data, to determine key parameters and processes that are most important to DOE's compliance demonstration.

Armed with all of this information, NRC was able to conclude with reasonable assurance that DOE could meet the performance objectives in 10 CFR Part 61, Subpart C. The basis for this conclusion is documented in the staff's technical evaluation report, which was completed in October of 2006.

Nonetheless, NRC is still required to monitor under the NDAA. NRC staff used the information it gained during the review of the draft waste determination in order to focus on those key aspects of facilities' performance most important to the compliance demonstration.

NRC provided the draft monitoring plan to the Idaho Department of Environmental Quality. In early 2007, we received no significant technical comments on that draft monitoring plan, but Idaho DEQ did request that we have a public meeting with the Snake River Alliance prior to initiating on-site

observation activities. So NRC conducted a public meeting in Idaho Falls, Idaho with Snake River Alliance and other interested members of the public.

NRC received very favorable feedback from meeting attendees,including the Snake River Alliance, DOE Idaho operations management, government officials, and Idaho DEQ, among other stakeholders.

NRC issued its final monitoring plan in May 2007 after providing an advance copy to the Department of Energy, who also had no significant technical comments on our monitoring plan.

And now I will walk through an example of how NRC used risk insights made during the review of the waste determination to develop its monitoring plan.

As I have already stated, NRC identified key credits in DOE's performance assessment to focus on during monitoring. This table summarizes those key credits.

The first row indicates the amount of risk reduction needed in order to meet the performance objective in 10 CFR 61.41, "Protection of the General Population from Releases of Radioactivity." This is for three highly radioactive radionuclides for the groundwater all pathways test, Tc-99, strontium-90 and

iodine-129.

While the risks posed in this first row is relatively impossible to achieve, this gives you a relative indication of the starting risk prior to any credit being given for chemical, physical, or biological processes incurred in a system.

The next two rows provide the relative credits for engineered and natural system barriers in reducing the risk for these three groundwater constituents.

For Tc-99 and iodine-129, we have risk reduction associated with reducing grout. So this presents a range from oxidizing to reducing conditions at the tank grout.

For strontium-90, we have absorption and decay during transport through the engineered barrier. At natural system, we have credits for dilution from Big Lost River seepage. And the Big Lost River is a losing ephemeral stream that's located in close proximity to the tank farm facility. And it also had natural attenuation through the transport through the vadose zone for strontium-90, so decay absorption.

Basically the key credits of DOE's compliance demonstration in the simplified example is the post-cleaning inventory, which has the ability to

reduce the risk of all key radionuclides for the groundwater pathway; reducing tank grout, especially for Tc-99, which is redox-sensitive; the ability of the vault to retain strontium-90 and other short-lived radionuclides in the sand pads.

And I should say the sand pads are located outside of the tank in the concrete vaults that house the tanks. And they were contained as a result of a back-siphoning event of first cycle extraction waste into the vaults from the tanks.

Leachate dilution from Big Lost River seepage is also a key credit in DOE's performance demonstration and natural system attenuation. And decay for strontium-90 is an important barrier for strontium-90 release.

So if you subtract the total barrier performance provided in row 4 from one, you see that you have greater than one to two orders of magnitude safety barrier, safety margin for each of these key radionuclides.

While there are a number of uncertainties associated with these key barriers or key credits, there were also several pessimistic assumptions that were made in DOE's performance assessment model. I am going to discuss that in more detail under each key

monitoring area.

Therefore, NRC's monitoring plan is not prescriptive and provides flexibility to DOE in addressing key monitoring areas. Recognizing that total system performance is dependent on interactions of multiple barriers and that no one key monitoring area can be considered in isolation, we need to look at overall system performance.

Next slide. So based on the information provided in the previous slide, we identified four key monitoring areas, one, two, three, and four, related to the 61.41 performance objective and then key monitoring area 4 specific to 61.43, which is protection of individuals during operations.

Now, key monitoring area 1 also addresses 61.42, "Protection of Individuals Against Inadvertent Intrusion." And key monitoring area 2 is also important for flexibility under 61.44.

The KMA 1 addresses residual waste sampling for currently uncleaned tanks. And those tanks are WM-187 through 190. There are four tanks out of 11 that have not been cleaned yet. Technical review areas include reviewing sampling and analysis plans and data quality assessments for those tanks.

We want to compare the post-cleaning tank

vault inventory to the assumptions made in the waste determination performance assessment for those unclean tanks. It's just something that's prudent for us to do. Now, they haven't finished cleaning the tanks yet. So we want to focus on that after they clean the tanks.

On-site observation activities include observing sampling of the tanks after cleaning and the methods to estimate residual waste volume, basically they use reference points on the tanks, what we call rockets and welds, in order to estimate the depth of contamination, to use an excreting analysis to estimate the total volume of waste remaining in the tanks.

We have already discussed key monitoring area 1 is significant to the demonstration of compliance of 61.41 and 61.42. For example, cesium concentrations are expected to be higher in uncleaned tank WM-188. So it's important for us to monitor those particular concentrations in that tank.

There is uncertainty associated with the final inventory due to the variability in concentrations between tanks, difficulties in sampling the salt residuals. For Idaho, their cleaning activities were very effective.

Just as an example, there is less than two-tenths of an inch of salt residuals remaining in the bottom of the tank. So that poses some sampling difficulties, but it is a good problem to have. But that is one of the sources of uncertainty. And also they weren't able to directly sample the sand pads that were contaminated in the vaults, WM-185 and 187. And so those uncertainties will be addressed in this key monitoring area.

KMA 2 is about formulation and performance. Technical review areas include evaluating where there's sulfur content in the slag. And it's added to the grout. It's sufficient to maintain reducing conditions and assessing the short-term performance of the vaults. Again, the risks, short-term risks, are being driven by the short-lived radionuclides strontium-90 and cesium-137 present in significant activities in that sand pad. And so that is one area we wanted to make sure was addressed.

On-site observation activities included evaluating the final grout formulation for consistency with design specifications, evaluating the quality assurance program for the grout materials, and observing the conditions of grout placement in terms

of temperature and humidity for curing.

KMA 2 is important to the 61.41 compliance demonstration. It is also important to the stability of disposal facilities, 61.44. The uncertainties, again, are related to the reducing conditions in the tank waste, by the tank waste, and the ability of the grouted vault to serve as an effective barrier to release short-lived radionuclides.

It is important to note that DOE's conceptual model for radionuclide release transport in the compliance case did not consider some things that it could have taken credit for.

DOE performed an independent process or not an independent but a separate process model, cementitious material degradation, and just abstracted information from that model in a more simplified model.

They used the worst case scenario times to failure of 100 years post-closure for the vault to fail. And so after 100 years, the short-lived radionuclides could be released from the sand pad. And for the tank grout, they assumed that. At least they concur after 500 years.

So they took these abstracted initial times to failure, put it in a simplified dose MS

release model, and basically assumed that the hydraulic properties of six inches of the grouted waste form, six inches of sand pad, and two and a half feet of the concrete base mats were the transport length for radionuclide releases assuming that the hydraulic properties were similar to the surrounding alluvium. So that's a pretty conservative assumption.

So basically -- and then for the short-lived radionuclides, you just have transport through the sand pad involved before. But basically you're just getting a chemical barrier after those initial times to failure. Had DOE taken credit for a more slowly degrading, more slowly oxidizing waste form, the peak concentrations could have been lower.

Okay. The next slide is KMA 3. Hydrological uncertainties identified during NRC staff's review are addressed by this key monitoring area. Technical review areas include evaluating new and significant information regarding natural attenuation processes off and below the subsurface at the tank farm facility. This is obviously significant to the demonstration compliance of 61.41. The uncertainties are related to Big Lost River seepage infiltration rates and flow paths and directions.

The next slide presents DOE's conceptual

model for the hydrological model. They basically assumed a 2-D slice pointed in the direction of saturated zone flow from north to south. They had a cross-section of two tanks illustrated in this particular model.

They simulated Big Lost River seepage with two grid nodes at the northernmost point at a combined seepage rate of seven meters per day.

The hotter stratigraphy that's presented in this figure contains 20 separate sub-horizontal zones, assigned the hydraulic connectivity different, and adjacent vertical layer.

The major hydrostratigraphic layers include the alluvium at the top of the model domain, and then we have the salt flow groups with interspersed subentry inter-bed layers. It says inter-bed layers that provide a lot of the attenuation capacity for strontium-90.

This figure presents the results of DOE's model, that 2-D slice from north to south. As you can see in this figure, there is lateral spread of the Tc-99 plume away from the tank farm facility. That is caused by the Big Lost River seepage.

So, again, that was the very important credit that DOE took in its performance assessment

model. It resulted in 600 meters of lateral spread, other plume away from the tank farm facility. And then we have vertical transport through a break in the sedimentary inter-beds. Point of maximum exposure is this point where the receptor for 61.41 is assumed to reside and obviously draw water from a well.

The particular results presented in this model are potentially inconsistent with recent characterization data that was collected under the CERCLA program, the Comprehensive Environmental Response Compensation and Liabilities Act.

There was monitoring conducted to address historical contamination from the 1972 inadvertent release of sodium-bearing waste directly into the site surface at the tank farm facility.

This characterization data revealed that Tc-99 was found in significant concentrations north of the facility. And, again, this is 600 meters south of the facility and significant concentrations of strontium-90 in close proximity to the tank farm facility to the southeast.

Therefore, NRC included this particular key monitoring area to address hydrological uncertainties in DOE's performance assessment model. However, NRC was able to conclude using the same

characterization data studies and monitoring reports related to that historical contamination event to support its conclusions that sufficient natural attenuation processes were occurring in the subsurface to mitigate the release of radioactivity from the tank farm facility.

Maximum concentrations of some important contributors to the groundwater contamination of intact TFF are provided in this figure. Analytical data provides valuable information regarding the variability in transport rates for different radionuclides, key information about flow paths, directions, distances, and transport times for the unsaturated zone. So we used this information in order to evaluation DOE's assumptions regarding the attenuation capacity at the Idaho site.

For example, strontium-90 is present in concentrations of 200,000 picocuries per liter currently in perched water just southeast of the tank farm facility. And this has been detected since the early 1990s. The release, again, was in 1972, but they didn't monitor before that. So we don't know exactly when it started to occur.

Significant attenuation of strontium-90 appears to be occurring with maximum concentrations in

groundwater of only 35 picocuries per liter.

Transport of less mobile cesium-137 is evident because we just recently saw cesium-137 in detections in groundwater wells at 600 picocuries per liter.

On the other hand, Tc-99 is not present in the vadose zone anymore. It appears to have had a quicker release into the saturated zone. And it is present north of the facility at 3,000 picocuries per liter. So this information provides us a basis for assumptions regarding the natural attenuation processes for these different radionuclides.

We were, again, able to use the information from this release in order to conclude more confidently that DOE can meet its performance objectives for 61.41, event though there were some apparent inconsistencies between the groundwater model and the monitoring data. And that is because, even with this direct release into the environment, the concentrations in saturated groundwater are not much higher than they would be at the performance objective for 61.41, not even considering that we have an engineered barrier system that is going to mitigate further the release of that radioactivity into the environment.

But, again, it's prudent for us to include this particular key monitoring area so that we can continue to assess new information if it's significant that comes in to make sure that our initial conclusions are not invalidated.

KMA 4 is protection of individuals during operations. Obviously that addresses the 61.43 performance objectives, but basically you are going to review worker radiation protection program and the pilot program pathway analysis on-site observations include observations of risk-significant closure activities and the environmental surveillance program.

Engineered surface barriers are addressed by KMA 5. Technical review areas include evaluating design of performance of engineered surface barriers against PA assumptions regarding infiltration. The engineered surface barrier is going to be constructed as part of the CERCLA program.

On-site observation activities include observing construction and maintenance of the engineered surface barrier. It's significant to the compliance demonstration for 61.41. And interim infiltration controls under the CERCLA program apparently like to increase the infiltration rates. So we just want to make sure that construction of this

engineered surface barrier, whatever it is, under the CERCLA program doesn't lead to artificially high infiltration rates.

Okay. The next portion of my presentation, I am just going to briefly go through the very first monitoring activity that occurred under the NDAA, which was at the Idaho National Laboratory.

But before I do that, just again, I quickly went through 15 technical review areas, again focusing on key attributes of the disposal facility and DOE's compliance demonstration. I've listed 11 on-site observation activities.

I was active. Was I not active? They thought I was sleeping.

(Pause.)

MS. BARR: The on-site observations focused on key disposal actions and showing consistency between the waste determination and actual implementation of the plans and to evaluate the data collected to support DOE's compliance demonstration.

Our activities officially began in November 2006, when DOE began grounding small tanks at the tank farm facility. We expect to have increased monitoring activity during 2007 to 2012, which is the date that the tanks all have to be closed under the

RCRA program. And we consider our monitoring plan dynamic and interchanging. And we are going to update it on a periodic basis to close out monitoring areas that we have sufficient information on and to address any areas that we identify.

I just wanted to mention that, again, we have reasonable assurance and generally less uncertainty for the Idaho review. And our technical review areas are almost half those identified for the saltstone plant, which had 29 technical review areas.

And the next slide, 40, during our first on-site observation, which was conducted in April 2007, we looked at KMA 2 and KMA 4, grout formulation performance during grouting operations and then protection of individuals during those grouting operations.

It was reported by the Idaho Department of Environmental Quality. We met with them prior to the on-site observation. They actually supported it while we were out there. We issued a monitoring or observation report in June 2007. I provide that number there.

We had no significant findings of non-compliance of that on-site observation. We did have several recommendations which were communicated

to DOE in the exit meeting and in the observation report. DOE is currently following up on its recommendations.

Slide 41. I'm not going to spend too much time on 41 and 42 because I've kind of already gone over what we were intending to do in our on-site observations under KMA 2. Basically quality assurance, making sure they did what they said they were going to do in the waste determination.

KMA 4, on-site observation, just reviewing DOE's radiation protection program as it's implemented during closure operations from those operations.

Slide number 43, results of the KMA 2 observation. We conclude that DOE has an adequate quality assurance program for ensuring grout and component quality. Our monitoring activities included interviews with DOE and contractor staff for the batch plant facility and the control room, where they execute those grouting operations. We reviewed operating procedures and select quality assurance documents while we were out there.

Slide 44. Our follow-up activities for DOE include the following information on their approved vendor list. They are relying on their vendor for chemical test reports for the grout

components. And so we just wanted to follow up on their procurement program.

DOE is also providing updating engineering evaluations for the necessary hold times between control load strength materials, pours in the tanks.

We also recommend that DOE document any deviations from or significant deviations from their planned closure activities. While we were out there, they did experience some operational problems during the grouting. And they had to halt operations while they were correcting those things. But anything that is going to affect the assumptions that remain the waste determination, we have asked DOE to think about how they were going to document those deviations.

There were also issues with some of the small tanks. They used higher water-to-cement ratios in some of the small tanks that would lead to higher hydraulic connectivities than were assumed in the performance assessment.

Now, the inventory in the small tanks is very small. So we don't anticipate that that is a major issue, but, again, they need to document any deviations from the assumptions made.

And the next one, we are going to return back outside in the fall to follow up on some of these

activities. With respect to KMA 4, I noticed they concluded that DOE has an adequate broker radiation protection program. That was based on interviews with DOE and contractor employees involved in radiation protection. We reviewed radiological control documents associated with closure operations and reviewed worker radiation topics.

We need to go back out during actual grouting operations to observe the radiological controls as they are performing the work. We also need to look at the public radiation protection program under KMA 4.

And my final slide. Follow-up activities include that next observation activity in the Fall of 2007 observing the actual grouting operations, the cleaning and sampling activities for the unclean tanks, WM-187 through 190, which are planned for the 2008 to 2012 time frame. And we are going to continue to review monitoring reports and data as it's collected to address some of those key monitoring areas.

And we are planning on having an annual meeting at the end of the calendar year 2007 to look at our monitoring plan again to see if we need to make any modifications to it.

That's about it. Thank you for your attention.

VICE CHAIRMAN CROFF: Thank you.

MS. BARR: I made it. Christianne is up.

MS. RIDGE: Well, thank you very much for the invitation to speak to you this afternoon about monitoring activities at the Savannah River site for salt waste disposal. As Cynthia mentioned, my name is Christianne Ridge.

I know many of you are familiar with DOE's plans for salt waste disposal, but I am going to just go over a few background points because it has been a long time since the last time we talked about this.

NRC did issue a technical evaluation report on our review of salt waste disposal at SRS in December of 2005. And in that technical evaluation report, we concluded that we had reasonable assurance that the performance objectives would be met.

As you might recall, there are 51 tanks at the Savannah River site. Two of them are operationally closed. And most of the waste by volume is salt waste. And that includes either salt cake or the supernate. Now, by radioactivity, that only accounts for about half of the radioactivity in the tanks. By volume, it's most of the waste.

And so the idea essentially is to remove the salt waste, liquefy it, and mix it with grout so that it becomes a solid called saltstone. This is a picture of one of the saltstone vaults. This is vault 4. It's a completed vault. It's 200 feet by 600 feet. And DOE plans to dispose of approximately five million cubic meters of saltstone at the site. So what that would mean would be about 14 or 15 of these at the site.

Now, subsequently DOE has changed their vault design, but this is the original design. So you can get an idea of how much waste that means.

One of the fundamental aspects of monitoring, of course, is environmental monitoring. And I wanted to just show you a map. This is from DOE's groundwater monitoring plan for saltstone. And this map shows here in the bottom right-hand corner vault 4, which is complete; and vault 1, which is about half the size of vault 4. Those are in your bottom right-hand corner.

Vault 2. If you see in the upper left here, these have not been complete, but they reflect the new design that DOE is considering or planning on for vault 2.

This map also shows existing and proposed

groundwater monitoring wells. I wanted to point out that this map does have a line called a point of compliance. And that reflects the relationship between DOE and the State of South Carolina.

The saltstone disposal facility is licensed with a solid waste permit from the State of South Carolina. And the operations to create saltstone are actually licensed with a wastewater permit, a wastewater treatment permit.

The solid waste permit requires this groundwater monitoring. And there are three monitoring wells if you can see downgradient of vault 4. These are 25 feet downgradient of vault 4.

There are proposed wells downgradient of vault 1 because vault 1 is so far upgradient of vault 4. So it's proposed to have separate groundwater monitoring wells downgradient of vault 1. There is also an upgradient well that will be used, in part, for determining background conditions.

And the proposal that the state has agreed to, as far as I understand, is that there will be groundwater monitoring wells 25 feet downgradient of the furthest downgradient vaults essentially. And so if other vaults are placed downgradient of vault 2 and vault 4, then additional wells would be placed there.

In addition, if vaults are placed significantly upgradient, they would get their own groundwater monitoring wells. But that is the plan.

Now, in addition to environmental monitoring, we also plan to monitor several technical areas that were described in the technical evaluation report.

These areas are based on aspects of the disposal system that NRC staff expected to have the most significant effect on risk. And in general they also reflected assumptions that DOE made in its performance assessment.

Now, we use the word "assumptions" here because that is the word we used in the technical evaluation report, but I did want to emphasize that there was information to support these assumptions.

And we expect the assumptions to, in fact, be true, which is why we have reasonable assurance that the facility will meet the performance objectives. These were, however, areas that we wanted to keep an eye on during monitoring to essentially build confidence, to make sure nothing changed, to make sure we didn't get any contradictory data, but we do expect that these assumptions are valid and sound.

So in this slide and the next slide, I am

going to briefly describe the eight key factors that staff considered to be most significant to risk.

And you will see that I have noted which performance objectives they pertain to. Now, of course, many of these factors pertain to more than one performance objective. For example, on the next slide, I believe, is the erosion barrier. And that is very important to the intruder calculations 61.42, but, of course, it is also important for site stability. What I have tried to list here is the performance objective we think is most affected by this key factor.

You will note as I go through that I have listed 61.41 for essentially all of these factors. And that's consistent with the conclusion of the TER, which indicated that the demonstration that the facility will meet 61.41 was the area with the most uncertainty and that we had much less uncertainty about the other performance objectives. And so that's essentially why most of these factors relate primarily to 61.41.

The first of these is oxidation of saltstone, which was important because of the possibility of technetium release. And, like the plan for Idaho, we have planned both technical review areas

and on-site observation activities for all of these monitoring factors.

And I am not going to go through all the planned activities. As Cynthia pointed out, there are more of them for Savannah River than there are for Idaho. But I will just give you an example.

For example, for oxidation of saltstone, technical evaluation activity might be evaluating more detailed process modeling that DOE has done to model the oxidation of saltstone and the resulting technetium release.

On-site observation might be observing any cracks in saltstone that would relate to the oxidation of the saltstone as a whole or perhaps observing any field studies that DOE did. They have lysimeters at the site that are made of similar material. And if they did any experiments with those, we might include that, observing those activities in an on-site observation.

So there are both types of activities for each of these. And if you have any questions about what specifically we might do for each of these factors, I would be happy to talk about that in the question and answer session.

One other thing I also did want to point

out -- and oxidation is a good example of that -- is that because of the uncertainties that Cynthia talked about, there is a bit of a difference in the types of activities we have talked about for Idaho and that we hope to do or plan to do for Savannah River.

And one of the main differences is that the monitoring plan for Savannah River includes a section on observing experiments and doing a technical review of the results of experiments. And that would include experiments such as any accelerated aging that might be done to look at saltstone aging or experiments that might be done to look at oxidation of saltstone. And so that is one of the differences in the characteristics of the two monitoring plans.

So the key factors, I've talked a lot about oxidation of saltstone. We also found that hydraulic isolation of saltstone would be very important. And that includes factors like the extent of cracking or the hydraulic conductivity of the bulk waste and its deteriorates.

There is a third key factor for model support because that was identified as an area that affected a few different parts of DOE's performance demonstration. And that included model support for moisture flow through fractures, waste oxidation,

extent and frequency of fractures, lower drainage layer plugging rate, and the infiltration barrier long-term performance. Notice, again, I will essentially come to the idea of the hydraulic isolation of saltstone being very important.

Erosion control design I mentioned. And that is very important to the intruder calculation because it is used as the basis for eliminating an agricultural scenario for the intruder because essentially the waste is believed to remain below the depth that an intruder could either construct a house and exhume any waste and then would be exposed to that waste by growing plants on the site.

The long-term performance of the infiltration barrier, feed tank sampling is somewhat self-explanatory as it relates to inventory.

Tank 48 waste form. As you mighty recall, tank 48 was a waste that had organic materials left in it from the in-tank precipitation process that DOE had previously attempted to use. And one of the areas that we wanted to look at was the long-term properties of the saltstone that was made from tank 48 waste to make sure that wasn't any different than the bulk saltstone that we had information about.

And waste removal efficiencies. I wanted

to say a couple of words about waste removal efficiencies because they relate to 61.41 in 2 different ways. One is that the waste removal efficiencies relate directly to the inventory, which is important to risk both for the intruder and for the member of the public.

And, of course, efficiency here -- let me just remind you -- is used a little differently than it is with the tank waste because we are not talking about how much waste was taken out of a tank but, rather, once the waste is liquefied, how much of the radionuclide, what fraction of each radionuclide, is chemically removed from the waste or physically removed through filtration.

But essentially if you liquefy the waste and then can chemically remove 99 percent of the cesium, then that is what we would be referring to as a removal efficiency.

So, as I noted, the efficiency is important because it relates to the inventory and the concentration in saltstone, also because it relates to the ALARA requirement of 61.41, of course, requires that the dose be reduced as much as reasonably achievable.

And so an example for when we might look

at that would be if, say, for instance, DOE plans to remove during its first step in the process the deliquefication, dissolution, and adjustment, they plan to remove cesium or plan to remove the supernate by draining the waste. Well, they think they can remove about half of it. But removing half of it takes time. It takes pumping time. And they don't know exactly how much they are going to be able to remove.

The removal of that liquid is very important to the cesium dose because most of the cesium that ends up in saltstone is going to come from this NDAA process because other later treatments that they plan to use are so effective at removing cesium that essentially most -- I believe it was something like 90 percent -- of the cesium that is going to end up in the final saltstone happens during this very first interim process.

While they said they could remove about half of it if they decide to run the pumps for less time, say it starts to take too long and they can only deliquefy the waste to, the salt cake to, get 25 percent of the supernate out, well, we will ask why.

And that is essentially how that ties into the ALARA requirement, that if we saw that there was

a substantially lower removal efficiency in one of these steps of the process, we would want to ask why and how that decision was made as it relates to the ALARA requirement of 61.41.

I wanted to tell you briefly about the status of these activities. This presentation has been a little less detailed than the INL presentation, in part because we have not started any on-site observations at SRS. And we haven't started any on-site observations because DOE currently is not processing salt waste for disposal in the saltstone disposal facility.

As I mentioned earlier, DOE disposes of the waste in the facility pursuant to a permit that they get from the State of South Carolina. And that permit is currently the subject of a legal challenge. And disposal has been stopped while that legal challenge is going on. We are coordinating with the State of South Carolina and DOE and will begin our observations when salt disposal begins.

Meanwhile, there is technical information that is already coming in and will be used as part of our technical review.

Part of that comes from ongoing DOE activities. NRC and DOE meet regulatory to discuss

incidental waste. Right now that is primarily in the context of potential tank closures at SRS, but we do meet regularly. And many of the activities that DOE is performing top facilitate tank closure will generate information that will limit uncertainty in key monitoring factors.

In addition, DOE is pursuing research that relates directly to saltstone. For example, they have done more enhanced process modeling that relates to the oxidation of saltstone, which is one of our key factors for modeling. And DOE has proceeded to do more work on that and, as I understand, is continuing to do more work in that arena.

In addition, independently of DOE, NRC is working with the Center for Nuclear Waste Regulatory Analyses and also leveraging work that the National Institute of Standards and Technology is performing to improve our predictions of long-term performance estimaticious barriers in waste forms, which, of course, related to many of our key factors that relate to the hydraulic oscillation of saltstone. And so these are two ways in which we are generating information that is going to be used in the technical review for saltstone.

And that is all that I had on saltstone.

So we are happy to answer your questions.

VICE CHAIRMAN CROFF: Thank you very much. Bill?

MEMBER HINZE: A few general questions. First, do I understand that NRC will not do any physical environmental modeling but only establishing guidelines for the monitoring schemes and the protocols? Is that correct? And is that also true of the states or are the states doing monitoring, environmental monitoring, on site?

MS. RIDGE: Well, the states are doing environmental monitoring, and we are cooperating with them. So I can let Cynthia speak specifically to what we are doing at Idaho because that has progressed a little further, but I'll just mention briefly that at saltstone at SRS, the state required DOE to put these monitoring laws in. And they have a monitoring schedule. And we are planning to essentially use that data.

MEMBER HINZE: So you are auditing the monitoring that is being conducted by DOE. I just want to make certain I am on the same page.

MS. BARR: Yes. We don't have any regulatory authority over --

MEMBER HINZE: I understand that.

MS. BARR: -- DOE. So we can't require them to put in specific monitoring wells at specific locations.

MEMBER HINZE: But what about putting them in yourself?

MS. BARR: Or samples, yes.

MEMBER HINZE: Yes.

MS. BARR: We don't have unfettered access to the site or authority, regulatory authority, to even require them to put in wells based on our recommendation.

For the Idaho site, the state actually does perform their own monitoring, which I think is different. I think South Carolina just approves the monitoring plan. They don't actually sample themselves.

But Idaho DEQ actually has their own environmental surveillance program. And there is actually a figure in the Idaho monitoring plan that shows the location of those wells.

And then under the CERCLA program, because of that existing contamination from the 1972 release, they have an existing monitoring well network that includes both perched water and saturated zone wells at the Idaho intact TFF that is pretty comprehensive.

And we are going to use that information and the data that is collected under the CERCLA program. And it is part of the record of decision that they will continue to monitor that particular release. And we are going to use that information to supplement the information that we --

MEMBER HINZE: So you will be on the auditing of the monitoring to do analyses on the results of the monitoring? Is that correct?

MS. BARR: Do we go beyond the monitoring?

MEMBER HINZE: Of simply auditing and doing analyses on the results of the environmental monitoring or --

MS. BARR: Well, just like we did during the consultation phase, we actually used that information from the monitoring program under the CERCLA program in order to assist us with our review, DOE's draft waste determination. So yes, we did do independent analysis.

And also we might rely on the State of Idaho because they are also trying to verify or validate DOE's monitoring program. We are actually having conversations with the State of Idaho regarding how we can leverage their skills in order to also analyze that information to reduce the scope of effort

that we might have to have in the future.

MEMBER HINZE: I read statements like "long-term performance" and "long-term monitoring." What do you mean by "long-term"?

MS. BARR: Okay. I'll let Hans answer that one. He's all for that section.

MR. ARLT: "Long-term" would be beyond the fate of the institutional control. So say, for example, with the engineered surface barrier --

MEMBER HINZE: A hundred years is what you've got for the --

MR. ARLT: Yes.

MEMBER HINZE: I don't exactly understand where that 100 years comes from. But also you referred to the 10,000-year compliance period. Is that correct?

MR. ARLT: Right.

MEMBER HINZE: Where does that number come from?

MS. RIDGE: The explanation for where that number comes from is in one of our guidance documents for low-level waste, NUREG-1573, but the basis for that number is twofold, essentially. One is that the authors of the guidance were looking for a number that was long enough so that we would understand the

performance that was attributable to the natural environment, the natural system, and not something that relies solely on engineered barriers.

And 10,000 years was also believed to be long enough so that we would see releases, at least from the more mobile radionuclides, and understand that we would capture those and that we would be able to see them. It was long enough so that we would see those releases.

MEMBER HINZE: So the long-term monitoring, how long will NRC be monitoring INL facilities?

MR. FLANDERS: Can I add to that comment? Right now at the present --

MEMBER HINZE: Introduce yourself.

MR. FLANDERS: My name is Scott Flanders, Deputy Director, Division of Waste Management, Environmental Protection. Right now the current process, as we mentioned earlier, is that the monitoring plan is dynamic and tends to be ongoing as part of our activities.

So at the present time we would say we intend to continue monitoring activity for some time in the future. Can I say it's going to be for 10,000 years, 1,000 years, or 100 years? Who knows?

But what we would say today is that we're going to continue our monitoring program as constructed. And as we gain more information and insights, we reexamine what we need to do and make appropriate changes to the overall plan. So that is the current strategy that we intend to implement at this point in time.

MEMBER HINZE: Scott, does that mean that you have criteria for termination of the monitoring?

MR. FLANDERS: At this point in time, as I said before, we are looking at whether or not we have reasonable assurance the performance objectives are being met. So one of the things we are going to examine as we move forward is the DOE's actions in terms of what they are actually doing and then some ongoing monitoring.

So a point at which we turn up the monitoring is something that we will continue to assess over time.

MS. RIDGE: If I could add a little more detail?

MR. FLANDERS: The criteria really is wrapped in terms of demonstration of the --

MEMBER HINZE: Thank you, Scott.

MS. RIDGE: If I could add a little more

detail to what Scott just said?

MEMBER HINZE: Sure, please.

MS. RIDGE: As you saw, we have separate monitoring activities planned. And each of those monitoring activities might have a separate ending. For instance, the inventory, monitoring activities that relate to inventory, will be closed when the inventory is known for saltstone. There will be a time when that is known, and that monitoring activity will be closed.

That is a simple example, but essentially --

MEMBER HINZE: Well, there are criteria, --

MS. RIDGE: Yes. Essentially there are --

MEMBER HINZE: -- although they may not be stated.

MS. RIDGE: Right. And we have attempted to state in the monitoring plans for each at least the general idea of what we expect for when each activity will be closed.

Some of those will need to be developed in more detail as the plans, as DOE's plans, in fact, develop. For instance, we can't say exactly when the monitoring activities on the closure cap will be

closed because DOE hasn't finished designing the closure cap for saltstone, but as we evaluate those plans, we will develop more detailed criteria on when that specific activity will be closed.

MS. BARR: And I just want to reiterate that the monitoring plans are a living document. So periodically we are going to go back and look and see where we stand when we are trying to collect the information to fill the data gaps that we currently have.

And, you know, periodically we are going to go back and evaluate do we have sufficient information so that we feel comfortable closing this particular monitoring area. And so it's not something that's set in stone, but it's something that will continue to progress as we collect more information.

MR. ARLT: And the anticipation is that the level of effort for the monitoring will be greatest at the beginning and then as time goes on will start leavening off.

I was talking before about --

MEMBER HINZE: I was trying to see that in your document.

MR. ARLT: Yes.

MEMBER HINZE: But I didn't. I didn't see

that.

MR. ARLT: As I was talking before, there would be like a status of either closed, open, open non-compliant. And as time goes on, we are going to hopefully see more closed activity than --

MEMBER HINZE: That's time-sensitive.

MR. ARLT: Right. And then there are a few items that would --

MEMBER HINZE: Let me go on. My time is very limited here. My colleagues are about to put out the hook. One of the things we see, for example, at Hanford is that we have leakage from our tanks. And it would have been wonderful if we would have known that there might be leakage in planning those tanks so that we could do adequate monitoring.

And I guess that leads me to the question, how, in what way -- and maybe this is DOE's and not your question, but if you're guiding this monitoring, one of the questions is, how have you used the lessons learned from leakage and from some of the tanks at Hanford or other places to develop protocols for adequate monitoring, establishment of conductivity sensors, and the subsurface, et cetera, et cetera? Any way in which lessons learned have been incorporated into this?

MR. ARLT: Well, the CMWRA is working on various projects. For example, if we have -- there is a report on the sorption coefficients. They're using all literature, all information that they can find that deal with the various radionuclides to try to get this kind of expertise through past leaks, either from Savannah, West Valley, from Hanford, anything that they can obtain. So that information is being incorporated.

MEMBER HINZE: Is there time for that, Hans? Is there still time to modify?

MR. ARLT: Well, it's like Cynthia was saying. It is a living document.

MEMBER HINZE: Okay.

MR. ARLT: It's an iterative time step. And we hope that as time goes on, there will be less and less uncertainty and that we get more information on that type of material. We are trying to incorporate as much as we can from those examples.

MS. BARR: I just want to point out that Research is, as you know, sponsoring a lot of work in this area for the reactor facilities in order to look at how they can have additional requirements perhaps, to require reactors to monitor. And they are considering all of the leakage and historical events

that have occurred at the reactor facility.

So I would point to them as a good example, but as far as lessons learned from -- you know, we just got involved in this recently. You know, we were asked to review these drafts.

Waste determinations of all of these leaks actually occurred prior to our involvement under WIR, but we are cognizant of the other work that is going on in the agency.

But, just as an example, at Idaho, you know, you learn that the system is very, very complex. You have this fractured basalt system. And you don't always know where to put the monitoring wells.

And so a lesson learned for Idaho is that you really have to consider the uncertainties associated with that very complex system in designing your monitoring plan.

You also have to use iterative process in order to collect monitoring information, update your performance assessment, and get better predictions in the future to consider those uncertainties and to calibrate your model better. So I would say that is a lesson learned, not necessarily for us obviously but in any monitoring program.

CHAIRMAN RYAN: My sub-chairman exhausted

his --

MEMBER HINZE: It says that I have one more question.

VICE CHAIRMAN CROFF: No, no. We will come back to you if we have time.

MEMBER HINZE: No. That's right.

VICE CHAIRMAN CROFF: Good luck.

MEMBER HINZE: I was going to ask a site-specific question, but that's all right.

CHAIRMAN RYAN: First let me apologize for being late. I had a meeting up on the top floor. So I had to go there first.

I want to compliment you on your slides, particularly at 56 and '7, which really sort of sum up a few things. One is you're looking at what requirements you try to meet. And you are matching your measurements and requirements. That's a touchdown.

And you're looking at, as you have outlined, kind of a temporal version of what do we know today, what do we need to build confidence based on what we know today.

And I really like the idea that we are not going to try and make a decision as to when to stop, but we know we are going to continue to evaluate and

update. I think that is the smartest plan we could come up with.

That's just terrific because it's something the Committee has been poking at in one arena or another, which is modeling and monitoring. You know, you can monitor for compliance, but if you don't monitor for performance and then feed that into your performance assessment, you are missing a real opportunity. It looks like you are really taking advantage of that. So I applaud you for doing that.

I guess I was trying to think of a what smart thing could I add to that. And the answer is nothing. I mean, you really covered all the bases. So I applaud your effort. It's really topnotch work. So thanks.

MS. RIDGE: Thank you.

CHAIRMAN RYAN: Ruth?

MEMBER WEINER: I have a couple of specific questions because all the big general ones have been asked. If you go to your slides 35 and 36, Cynthia, I don't know if you can get those up on the screen or not, but --

CHAIRMAN RYAN: Which one is harder, the arid environment or the humid environment to develop the plans?

MS. BARR: Well, it depends on what aspect you are talking about.

CHAIRMAN RYAN: The answer is both.

MEMBER WEINER: You make the point, Cynthia, that the model, which is in the slide that's up now, is very different from what they found in the monitoring.

How did you get them to -- what methods did you suggest for reconciling that? I mean, it seems to me if the model doesn't look like the results, you change the model. You can't very well change the --

MS. BARR: Yes. That would be a part of the iterative process if DOE elects to go forward with maintaining their performance assessment and updating it with new monitoring information. Then under DOE order 435.1, they're required to constantly update that performance assessment.

But as far as we were concerned, although DOE was trying to come up with a realistic representation of what was occurring in the subsurface, there was so much uncertainty and so much difficulty in modeling the system that they actually tried to be conservative in the way they modeled it.

And so although you don't necessarily get

consistency between the monitoring data and the results, we feel overall that the results were on the conservative side for overall system performance.

As far as where they were getting their credit score versus what we saw in the national system and how much credit they could get in the national system, we felt like it was justified in how much credit they were taking.

So basically they were trying to be realistic, but under the constraints of doing this very, very complex modeling, they had to make certain conservative assumptions to go forward with their performance assessment. But, again, it's up to DOE if they want to go back and revise their performance assessment to update it with respect to the recent monitoring data that was collected.

MEMBER WEINER: Yes. I understand the constraints that you're under, which you just addressed, but it seemed to me in this case from your presentation that they had the plume going in completely the wrong direction in their model.

MS. BARR: Well, there are a lot of different sources of contamination at the site that confound the results. And so it's very difficult to say, you know, 100 percent your model is completely

inaccurate. I mean, it is very, very complex. We have multiple sources. So we used the best information that we could find that was provided under the CERCLA program.

We asked a lot of additional information or asked for a lot of additional information so that we could understand exactly what their model was doing and what credits they were taking so that we could feel comfortable in saying with reasonable assurance that they could meet the performance objectives.

Had we not received that additional information and didn't understand what exactly was occurring in their model, we might not have had that confidence.

But, again, reviewing the monitoring data, that actually was a blessing for us, even though it's not a good thing for DOE, obviously, to have contaminant releases like that, but it made us or me personally feel a lot more confident in this decision because, you know, this was a release where you were getting absolutely no credit for the engineered barriers.

And they could almost meet the performance objectives just for the natural attenuation processes occurring alone. And so that was a big plus for the

review. And it's documented in our technical evaluation report, the basis for our conclusion that they could meet the performance objectives using that information.

MEMBER WEINER: That's a very valuable explanation. I am always confused by the fact that you do not have enforcement authority and you cannot prescribe activities to DOE. What can you do? You just make suggestions and say --

MS. BARR: Right.

MEMBER WEINER: -- this is what would make it better or something?

MS. RIDGE: And if we don't believe that performance objectives are going to be met, we are writing our compliance letter to Congress and the effective state and DOE. And those parties do have valid --

MEMBER WEINER: I see. That --

MR. ARLT: That assumes the recommendations. I mean, if the concern gets very big, there's a concern letter that's a type IV letter. So DOE gets informed about what is going on, what are the problems. There's plenty of opportunity for consultation and additional discussion. That is the extent of it.

MEMBER WEINER: Christianne, you were talking about the saltstone vaults. What do they estimate the lifetime of the saltstone vaults as barriers to the leakage to be? Is there an estimate?

MS. RIDGE: Well, the primary hydraulic isolation from saltstone comes from the waste form itself. And there are assumptions about the degree of degradation and the degree of cracking.

And I can't give you a specific answer on what credit. There wasn't credit taken in the model for the vaults eliminating any infiltration for a certain amount of time. So if that's what you're asking, --

MEMBER WEINER: Yes.

MS. RIDGE: -- the answer is in the model, there wasn't credit for the vaults stopping infiltration for a certain amount of time.

MEMBER WEINER: So they took no credit for the vaults and just said that the barrier is the waste form.

MS. RIDGE: Dr. Esh, would you like to elaborate on this? I'm not sure. I know they didn't take credit for a certain amount of time, but did they model it as a hydraulic barrier?

DR. ESH: This is Dave Esh. They did take

credit for some hydraulic properties of the barrier, but for the fault, it was more of the diffusive properties as a barrier.

And originally when we first got the performance assessment, there was a lot of pretty much indefinite performance of the waste form and the vault, hydraulically and as a diffusive barrier or a barrier to diffusive releases.

In the sensitivity analysis and then the review, then they looked at a variety of other cases' levels of performance for hydraulic performance and diffusive performance of those barriers.

But there wasn't a fixed number like in the Idaho case, 100 years. Then it goes from infinite performance to zero performance. That wasn't the case in the saltstone review.

MEMBER WEINER: Okay. Thank you. In the interest of time, I will stop there.

VICE CHAIRMAN CROFF: Jim?

MEMBER CLARKE: While we're there, can we go to the next slide? I think it's -- yes, that's it. By the way, as you guys know, the geology there is inter-bedded sediments and rock.

There has been a lot of work on the subsurface disposal area, which is very similar

geology. You have got an extensive vadose zone. And you have also got evidence that if a release occurs, you can find it in the purged water at that sediment interfaces. So that leads me to the question, is there any proposed vadose zone monitoring associated with the Idaho?

MS. BARR: Yes. Under the current record decision for that tank farm facility release that I spoke about, they are required to monitor the purge zone. They are actually trying to dewater that zone to further mitigate the release of that strontium-90 that is currently being held up in that particular purge zone. And so they will continue under the CERCLA program to monitor.

MEMBER CLARKE: You know, it's complicated in that we have already got stuff there. But still it tells you if there is a release. That's a likely place to be.

MS. BARR: Right. It's located 110 feet below grade. And the bottom of the tank is around 50-foot. So it's a real good source of information for any kind of releases that you might get from the tank farm facility.

And so we are going to continue to evaluate that data as it's collected under the CERCLA

program until this key monitoring area is closed.

MEMBER CLARKE: The question that Dr. Hinze asked about how long are you going is the $64,000 question. And I guess one of the ways -- and, of course, what exacerbates all of this is that the likelihood of a failure increases with time. And it's human nature to say, "I haven't seen anything. So let's reduce the frequency in the monitoring." So how do you handle that trade-off?

I think one of the -- and I was pleased to see in your slide 11, which I thought was a real good description of the different roles, what the DOE would -- that's, unfortunately, one of the illegible ones, but it was a real good description of what the DOE will do and what the NRC will do. And it sounds like the NRC's role is to monitor the monitoring.

This iterative process that we talked about a great deal in a working group meeting we had back in September, I guess one answer is when you build sufficient confidence in your assessment, that that might be a place where you could certainly cut back on the monitoring or maybe even stop monitoring. Those are, I think, really difficult questions virtually everyone who has every kind of contaminant isolation going on is struggling with.

And let's see. Oh, just to pick up on one thing that was said, I think one of you -- and it might have been in the very beginning -- said that there is more uncertainty associated with the Savannah River site than the Idaho site. Is that?

MR. ARLT: Yes, that's correct.

MEMBER CLARKE: And you can give us a quick reason for that or maybe you did and I missed it?

MS. BARR: I guess DOE didn't really have to take as much credit for Idaho. I mean, it had a very limited inventory and for those key groundwater radionuclides for the 61.41 compliance demonstration.

So they ended up using a lot less sophisticated modeling that they tried to demonstrate was very conservative for their compliance demonstration because there is less difficulty in demonstrating that they could meet that 25 millirem per year until effective dose equivalent from the groundwater all pathways dose.

And so they basically had a much simpler job to do in demonstrating compliance; whereas, for saltstone, I think the inventory was sufficiently higher or more significant that they had to take more credit in their various process models or submodels in

evaluating the potential impacts associated with parameter assumptions actually led to much higher potential doses than it did for Idaho, again very simple and you could pretty much constrain exactly how high it would be; whereas, for saltstone, they had to take credit for a lot of different things that led to these additional uncertainties and whether they could meet the 25 millirem per year standard.

MS. RIDGE: I agree. I agree with everything Cynthia just said. Essentially for saltstone, there was credit taken for more parts of the system where they had to do complex modeling for instance, the characteristics of the waste itself to be a diffusive barrier and a hydraulic barrier.

So that just required a more complex level of modeling that requires more support than a simpler conservative model.

MEMBER CLARKE: And I guess one just last comment on slide 11. Under the "Site Stability" category, you have "Observed construction of engineering features and their maintenance." And that's good.

If an engineered barrier is going to fail, experience has shown that the construction phase could be one of the reasons; in other words, either you have

a poor design or it just isn't implemented properly.

And I'm sure you're going to do this, but before you even get to the constructive phase, I would encourage you to take a real hard look at the quality assurance plans for that engineered barrier construction, monitor that as well, but I think you have got a really good program here.

The only thing I didn't see -- and I know why I didn't see it and you don't see it anywhere, really, except a few isolated cases -- is that apart from physical inspections, the only real sampling and data analysis is environmental.

And one of the things that we recommended is the closer you get to the source, the better off you are. Ideally we would monitor things that indicate that the system could fail, not that it did fail. That's easy to say and hard to do.

So I wondered if there were any thought being given to -- and, unfortunately, they're invasive -- but any thought being given to whatever calling system monitoring, monitoring during itself, monitoring the waste form. I'm sure that's been discussed.

MS. BARR: We don't, again, have any regulatory authority over DOE. We would --

MEMBER CLARKE: I understand. I understand.

MS. BARR: We would love to make suggestions on what we would like them to do, but we can't really be prescriptive in these monitoring plans because that puts us at risk of not getting that information.

So basically we just try to say what kind of information needs we had. And we were laving it up to DOE to decide how they were going to address those data gaps or information needs that we were requesting.

Our hands are kind of tied because of the odd role we're in under the NDAA to monitor DOE disposal actions to assess compliance but then not having any regulatory enforcement authority to execute.

MR. ARLT: I think, again, an iterative process comes in here again, too. There's going to be a lot of waste determination. I think a lot of people have the same thoughts that you have. I think people are going to be thinking about that. And, you know, with the future waste determination, we're actually doing that, but, like Cynthia was saying, we can't prescribe anything that would be --

MEMBER CLARKE: I find myself thinking about that. You know, it has a lot of appeal thinking in kind of an abstract sense, but when I find myself thinking about it, given all the difficulties of doing it, I really come to the conclusion that, as you know well, better than anyone, the monitoring ought to be risk-informed.

And that means it's not only the likelihood that something will happen. It's the consequences as well.

MS. BARR: Well, certainly in our discussion with DOE, we will try to make recommendations. And we do communicate quite frequently with DOE under this enhanced consultation process. So that will afford us opportunities in the future to work together collaboratively to address key areas where we could monitor performance and talk about these issues.

MEMBER CLARKE: Thank you very much.

VICE CHAIRMAN CROFF: So many questions, so little time. I would like to come back to this point that you and Jim were just discussing where a second ago.

Accepting for the second that you don't have the ability to go in and obtain additional

monitoring data, will you have adequate information from the state monitoring and DOE's monitoring to do what you have to do to resolve these issues to continue to make determinations as to whether the performance objectives will be complied with?

MS. BARR: I can speak for Idaho. In the case of Idaho, we think that the monitoring program is pretty robust and that because of that historical contamination event, we were the benefactor of all of that information that's being collected under the CERCLA program. So we think that that information is going to be sufficient to meet our needs.

Now, you know, monitoring of the CERCLA program is finite, too, and that monitoring plan may change over time. So we would have to evaluate if and when it changes if we are at the point where we can close that key monitoring area if we need to obtain additional information.

At this point in time we feel pretty confident that there is enough information being obtained through the CERCLA program to address our needs.

MS. RIDGE: To answer your question with respect to SRS, the short answer is I think we believe we will. And certainly our confidence is enhanced by

processes that we see going on, such as DOE doing more work to model the oxidation of the saltstone and the resulting radionuclide release.

That was something that we had identified. And our confidence that we will have enough information is certainly enhanced when we see DOE continuing with these activities.

CHAIRMAN RYAN: Just a point here. I think I am struggling with just one thought that you don't have direct regulatory authority, but you sure have a hammer.

I mean, I don't really see that you're in the kind of decision-making, though, because you make the determination and you can also say, "We don't think they're going to meet the requirements." So I think that's a pretty big hammer myself. If I were on the receiving end of that message, it wouldn't be a good day.

I mean, you said that several times. I just wanted to point out from a perspective of somebody who is trying to demonstrate performance, that your authority to say, "No. I don't think you're going to do it," that's a pretty big stick.

VICE CHAIRMAN CROFF: I agree with what Mike says. And, in addition, I am not a lawyer, but

as I read the law, the law says that the NRC in cooperation with the state will monitor. And it doesn't say that you can't get your own results. Okay? Just a thought.

MR. FLANDERS: Excuse me, Allen, before you go on with that point.

VICE CHAIRMAN CROFF: Go ahead.

MR. FLANDERS: This is Scott Flanders. I think we recognize, you know, the way the law is constructed and how that can be interpreted. Certainly we understand that.

And if you look at our monitoring plan, you look at the way we have it constructed, one of the things that we do identify is that if we feel that we don't have sufficient information to make a call, then we start the process of potentially going down the road and writing them out a compliance letter.

So we recognize that role. We hope that we are able to get sufficient information. We think that the way we have the plans constructed now, as Christianne and Cynthia both said, we think that we are going to get the right information that we need to be able to adequately make an assessment as to whether or not we believe they are in compliance with the performance objectives.

But if it comes to that, the way we construct our overall program is when we get to that point where we feel as if we are not able to obtain the information that we need, then we start that process. And, as you said, I think it would be a bad day for anyone if we have to go down the path --

VICE CHAIRMAN CROFF: Right.

MR. FLANDERS: -- of writing non-compliance letters.

PARTICIPANT: That's the hammer he mentioned.

CHAIRMAN RYAN: I think, as you said earlier, I mean, you have worked collaboratively to show here is the path to success without having to worry about, you know, "Oh, by the way, there's a big stick over here." So it's to your credit that you're on a path to do what you need to do to continue to build confidence as time goes on. And that is clearly the right way to do it.

VICE CHAIRMAN CROFF: I am going to allow myself one specific question here. In one of the SRS slides, you mentioned a key issue or factor. I can't remember which one it is. It concerned feed tank sampling.

I am a little bit puzzled. If you've got

to put your feed tank full of liquid with a mixer pump in it, it's presumably pretty homogeneous. What is the sampling issue?

MS. RIDGE: Well, the DOE intends to sample the waste as the state requires them to. And the state in their most recent permit does not require them to sample every batch.

In our monitoring plan, we indicate that that is our preference, that the data that we would really like to have is sampling of every batch. And that we say clearly would be the best way to do it.

Now, DOE also has -- and I am glad you brought this up so I can clarify it a little. When we talked about in the monitoring plan the possibility that DOE would not sample every batch and what they might do instead, I think we might have used the term "process knowledge." I wanted to clarify a little because that is used differently in different parts of the waste treatment process.

For instance, in the tanks, sometimes they base inventories on process knowledge. And that can mean something as simple as we know what extraction process we used. And we think that the waste that comes out of this is such and such.

In this context, it is actually a lot less

uncertain than that because I think what our understanding of what DOE might do is to say, "Well, we know that in the feed tank, we have put waste from this tank in this tank and this tank. And we have information on what is in this tank and this tank."

So it might be a simple process of saying, "Well, these are the volumes, and these are the concentrations. And we are going to do a weighted average" and then say what is in the feed tank.

We agree with you sampling every batch would make us most comfortable.

VICE CHAIRMAN CROFF: Okay. Understand. Well, thank you very much. It's a very interesting -- I'm sorry?

MR. ARLT: Just one more thing.

VICE CHAIRMAN CROFF: Mr. Arlt?

MR. ARLT: For those of you who are more visually orientated, slides 22 and 23 kind of work through the process in a flow chart if some of this is still a little unclear. So I think maybe that might help.

VICE CHAIRMAN CROFF: Very interesting presentation. As Mike said, they are good plans. And congratulations on that.

With that, I'm done. Fifteen-minute

break? Fifteen-minute break it is.

CHAIRMAN RYAN: Fifteen-minute break until five of.

(Whereupon, the foregoing matter went off the record at 3:39 p.m. and went back on the record at 3:55 p.m.)

CHAIRMAN RYAN: Okay, I guess if I could ask everybody to take their seats and come to order, please, we'll reconvene. And this session is going to be led by Professor Hinze.

DR. HINZE: Thank you very much, Dr. Ryan. It is my pleasure to introduce Gene Peters from the Nuclear Regulatory Commission Staff who will be presenting some material on nuclear infiltration studies for Yucca Mountain.

This is in the aftermath of the concerns regarding the U.S. Geological Survey's emails pertaining to infiltration studies. And we understand, Gene, that you have been involved in observing a DOE audit, or someone within your group has, of the Sandia work on the infiltration studies, and we'll be covering some of that.

We welcome you. We are anxious to hear what you have to say.

DOE REEXAMINATION OF PAST U.S. GEOLOGICAL SURVEY

(USGS) INFILTRATION STUDIES

MR. PETERS: Thank you very much.

What I'd like to do is bring the committee up to date on recent activities conducted by the Department of Energy in simulating infiltration at Yucca Mountain.

As Professor Hinze indicated, much work has been done by the Department of Energy on this topic since the daylighting of some potential quality assurance issues that have received much media attention.

What I will be speaking of is a recitation of material presented by DOE in various forums. This does not represent original work on the part of the NRC.

Recognizing that several important meetings have taken place at which we, as staff, observed the Department of Energy's work product, I wanted to use this opportunity to bring this material to the committee's attention. So it is very timely, and it is very important in the context of the other work that you might be hearing about with respect to performance assessment in the post closure period.

I'll touch briefly on some of the background facts. I trust that most of us are well

acquainted with what has transpired, and what brought us to this point.

I'd like to spend more time on DOE's response, describing our understanding of what DOE has done and will do to support infiltration studies for Yucca Mountain performance assessment.

We have as I mentioned received several briefings on the new DOE infiltration models. I will share with you what I know of those models. Again, this is my interpretation of what DOE has told me and my colleagues.

I am able to provide some preliminary results from those DOE models because they presented these results in public forums, since I thought it was acceptable those with you since you might not have had the opportunity to hear some of those presentations firsthand.

And finally I will place all this material in the context of our review plan, the Yucca Mountain review plan, and how we plan to use the information that we have, the work that we have done, to evaluate DOE simulation of infiltration.

This all started, as Dr. Hinze alluded, because US Geological Survey was responsible for modeling infiltration at Yucca Mountain. They used a

model code that they developed that was ultimately called INFIL 2.0. And the intent of this product was to simulate infiltration over the post-closure period representing 10,000 years of performance after the closure.

Some of the scientists who were involved in the development of this code, and in the development and collection of data that were used as input to this model offered emails that implied a disregard for the Q/A procedures that DOE imposed on the project.

I'm sure we've all read the reports and seen those emails, so they warrant no reiteration here.

ODE did take an aggressive response strategy, investigating the root cause and the extent of the conditions associated with these issues.

The response took several forms. The first was to assess the technical impact of the INFIL based infiltration model results. And you will see throughout my presentations several superscripts, numbers one and two here on this first bullet. And these relate to some of the presentation materials that I understand Neal Coleman made available to the committee in advance of this meeting.

We probably all have read the 2006 report, evaluation of technical impact on the Yucca Mountain project. That was the instrument with which DOE attempted to affirm the president's 2002 site recommendation decision.

The principal concern at the time was, were the concerns associated with the quality assurance implications of these emails, did those compromise the 2002 site recommendation decision in any way?

That 2006 report took a look at the results of those INFIL models and compared those results to other studies in similar environments - typically arid environments, mountainous, Western U.S. terrain - and found that because there was a fair degree of similarity between the INFIL results and the results of other investigators in other studies, that there was no indication that the technical validity of a site recommendation decision was compromised.

The Department of Energy did undertake an investigation of emails very broadly. Gene Runkle from the Department of Energy spoke on this at a March TRB meeting. His presentation materials are available online if Neal hasn't provided them already, and they describe the process that the Department of Energy

went through in trying to determine the extent of that problem. And that is clearly outside the scope of my presentation here today.

More important is the Department of Energy's efforts to qualify the input data. This infiltration model, as with that of NRC's, requires data about soil properties, soil thickness, meteorological data. These are key input parameters that any infiltration model requires.

Because the authors of those email messages were responsible for collecting, manipulating, reducing or in general supervising the collection of those input data, the Department of Energy did undertake an effort to quality those data so that they would be available to the new infiltration model that I will speak to in a moment, and to verify that they were appropriate for their intended use.

They produced a series of nine reports that are not yet publicly available. I have had an opportunity to review those along with several of my colleagues through the course of the audit that Dr. Hinze mentioned, and I will discuss that momentarily.

The penultimate manifestation of DOE's response was to develop a new model -

(Off-the-record exchange)

The Department of Energy charged the lead lab, led by Sandia, supported by other labs, Las Alamos and others, to develop from first principles a new infiltration model that would completely replace the old USGS infiltration model.

The Department of Energy plans to document the results of that modeling effort, and the new infiltration results in an AMR Analysis of Modeling Report that will be available later this summer or early this fall.

DR. HINZE: Gene, could I interrupt you for just one second while you're on this topic?

MR. PETERS: Of course.

DR. HINZE: Has the US Geological Survey done any technical review of their work?

MR. PETERS: They have, and I'll speak to this momentarily, but yes, they have continued work on INFIL in a new version, and I will address that specifically.

So you will see number three superscript footnoted at the bottom there. Much of this material was presented to the NRC staff for the first time during Q/A audit observation in June of this year, just a few weeks ago.

Consequently, neither me nor my staff have read this new infiltration AMR in detail. So I can't speak to it with authority, but I can relay to you some of the input from that model, and some of the context for it. But we have not reviewed this in detail.

The new model - the old one was INFIL; the new one is MASSIF, Mass Accounting System for Soil Infiltration and Flow, produced by the DOE's lead lab, primarily Sandia.

The same conceptual and physical bases as INFIL from a physical process standpoint were used in this new model. It's a mass-balance approach plotting grid cell basis.

The equation - I've rearranged DOE's equation slightly to show that infiltration is what is left over essentially when one looks at these grid-cell based model. One looks at all the inputs to a unit square area. P is precipitation, so we're summing all the inputs to that grid cell.

Precipitation, run on, snow melt, and then subtracting away where the water leaves the system - sublimation directly from snow to atmospheric water vapor; changes in water storage capacity in the subsurface; evapotranspiration from ground surface;

and finally, runoff.

Therefore infiltration in this mass-balance or water balance approach is the sum of the change in the hydrological cycle, what is left over from these other components of the hydrologic cycle is assumed to infiltration into the subsurface.

INFIL 2.0 and MASSIF both use this same fundamental equation. Where they differ is some of the submodules that make up individual components of the hydrologic cycle.

Another key difference as it's been conveyed to us is the direct incorporation of uncertainty. Those of you familiar with the earlier DOE work products, you know there was a simulation report and then an uncertainty report that was applied ex post facto.

In this particular case, the MASSIF model stochastically simulates several of the most important parameters that affect infiltration - things like soil thickness, precipitation, that are hydraulic properties, and in doing so, attempt to capture the natural variability of the system.

The final major component difference is an expanded treatment of evapotranspiration. As you can imagine, in the Nevada desert, evapotranspiration

dominates the water budget. You will see some statistics to that effect.

Sandia has used an expanded model relative to the earlier work product that is based on a UN Food and Agriculture Organization methodology, FAO 56, developed by a researcher at the University of Idaho.

This provides them they feel with a more robust treatment of evapotranspiration systems.

Simply a cartoon diagram of the hydrologic cycle; should come as no surprise to anyone here.

I mentioned earlier, I put the plural of models in parentheses, because there are several models.

The license application, as DOE has indicated to the NRC staff, is going to be based on MASSIF, as developed by the lead lab. As Dr. Hinze pointed out, USGS has been continuing to work, and DOE has sponsored work on the legacy code INFIL.

DOE charged Idaho National Lab with examining INFIL 2.0, figuring out why various people have problems running the code - simply a code management perspective; it was very difficult to get all the routines to run effectively and to link up properly. So Idaho National Lab took it apart; made sure that all the procedures flowed internally; and

this was another topic of presentation at the March TRB meeting.

Finally USGS on its own has continued to refine the INFIL model. They are now working on it as version 3.0. And Dave Pollack from USGS made a presentation on this at TRB as well.

This is - the intent there is to bring INFIL as a code up to the same level of documentation and peer review as the other codes that you are no doubt familiar with like MODFIL (phonetic). They want to have it available as a generally available code that any researcher can download and use that would be well pedigreed.

It is significant that it receives that treatment because when we move to the saturated zone system, the boundary conditions for the Yucca Mountain flow system models in the saturated zone are generated by the USGS Death Valley regional flow model which uses INFIL 3.0 as its boundary conditions.

So it is important to us that we continue to examine INFIL 3.0 as a code that has a small input to the Yucca Mountain water balance, but an important one nonetheless.

Finally the other model that is available to us is NRC's own code. We have named it

Infiltration Tabulator for Yucca Mountain, ITYM. This was developed by the Center for Nuclear Waste Regulatory Analyses. It is a pre-code to the TPA code that you will be hearing about in September. And it is our tool to simulate infiltration in the subsurface. We use that to provide some comparative analysis.

So what are the preliminary results? These are DOE's from DOE's presentations. So I'd like to acknowledge Josh Stein and his entire team at Sandia and Las Alamos for providing this information.

This was presented at the March TRB meeting.

What we have in the upper left are the results of the simulations generated by MASSIF. We have infiltration under our three climate states: present day; monsoon; and glacial transition.

In the context of our 10,000 year performance period, present day conditions are assumed by the Department of Energy to occur for the next 600 years following closure; monsoonal conditions from year 600 to 2,000; glacial transition from 2,000 to 10,000. So we see three distinct phases temporally.

Because it is a stochastically represented system, we have a family of curves, just like we do in

dose assessment. So we have a distribution of results of infiltration.

Portrayed in this table are the 10th percentile, 50th and 90th percentile values for infiltration. So in this family of simulations, the 10th percentile is 3.9 millimeters per year; 50 th percentile, 13; and 90th, about 27 millimeters per year. That is the net flux of water passing the rooting zone into the subsurface environment where it becomes available to the unsaturated flow system and ultimately could reach the depository horizons.

By way of comparison, this table in the upper right represents USGS work product using the INFIL 2.0 model. So you can see that although this is portrayed as a mean rather than a median, the measure of central tendency here is that MASSIF produces somewhat more water than INFIL does for a given climate state, an increase of three to four times water moving into the subsurface.

The bottom table here, as I mentioned earlier, shows the relative proportion of water in each of those components of the water balance. So when we look at what falls on top of Yucca Mountain, it's precipitation, roughly 8 to 10 percent infiltrates. You can see here, evapotranspiration

dominates the hydrologic cycle as one would expect.

And the other components - runoff, storage, sublimation - are very small in comparison to the other components.

Which leads to a question I'm sure in most of your minds, why is MASSIF producing more infiltration, a greater infiltration estimate than INFIL? It doesn't have anything to do with the code; they used the same equation as I mentioned earlier.

It has to do with the data, the input data that were used, and how they were represented. The researchers at Sandia assumed thinner soils across the repository footprint. Thinner soils equate to greater infiltration because you have increased the reservoir, the storage capacity, in the subsurface in which water can be trapped.

You think about the soil surface above the bedrock is a sponge. Clearly you have to saturate to some extent those pore spaces before the water can move through that prism into the next layer down.

Because the soils are thinner in Sandia's conceptualization, the reservoir is smaller, and therefore, there is less storage capacity.

Other changes relate to the bedrock hydraulic conductivity. When Sandia I believe lab

examined the fracture data, they felt that a greater percentage fo those fractures were open and transmissive, compared to the assumptions made by the USGS researchers. Clearly you have more cracks in the subsurface, more water is going to be able to get into and through those.

The other major component is, relates to the evapotranspiration. Through their use of the FAO 56 methodology and their understanding of the system, they limited rooting zone depth to a shallower horizon than did the original USGS work. The USGS had rooting depth down to six meters; Sandia lead lab constrained it to two meters. Clearly, smaller roots equals less evapotranspiration, which puts more water into the subsurface.

Those are the major differences in how the results differ. There are other contributing factors, but those contribute the most to variance.

How we at the NRC, our staff, review this, number one, we have observed these presentations as DOE has given them. In some cases we were able to ask questions and seek clarification. In other cases we have listened a bit more passively, such as at the TRB.

The Q/A audit Dr. Hinze spoke of was a

great opportunity for my staff, my team, the climate infiltration team, to interact with DOE's quality assurance specialists, and their external observers. This Q/A audit did bring in three independent experts from Colorado School of Mines, University of Arizona, and Golder Associates, to independently evaluate the defensibility of the infiltration work.

They were able to work with us in a very collegial manner, and we were able to share some of our institutional knowledge about the systems at Yucca Mountain, and the historic work, and work together to make sure that DOE had the full benefit of their experience.

I must reiterate, of course, that we have not reached any conclusions, nor taken any positions, on either the approach to simulating infiltration, or these preliminary results that I have shared with you. Those are DOE's; they carry with it no endorsement by NRC.

We do have an independent model as I mentioned earlier, ITYM, that represents infiltration in the subsurface. And for certain key physical data such as soil thickness, we have collected some corroborative data - we and the Center for Nuclear Regulatory Analysis in San Antonio have gone out and

taken our own measurements of soil thickness; evaluated fracture and infilling; and observed some of the same conditions that the DOE researchers have. And we will use that to inform our review of the license application.

What is particular noteworthy, I mentioned that the INFIL and MASSIF models rely on water balance approach, in which you quantify as many components of the hydrologic system as you can, and estimate the difference.

The ITYM model, for those of a hydrologic nature, is a soil physics based model, using Richard's equation, in which - it's a little hard to see on the screen here - you are directly simulating that front of infiltration water at the subsurface, solving a partial differential equation for the change in moisture capacity, theta here, for time.

So rather than looking at as a mass balance approach where we are quantifying the sizes of the different reservoirs and the fluxes through them, here we are simulating a phenomenological approach of infiltrating water, that front as it migrates downward through the soil system.

As with the water balance approach, we do rely on key data about soil conductivity and

thickness; pressure head distributions; many of the same key input data that DOE requires for its model.

Consequently we use some of that same DOE data and USGS data as well as our own corroborative data.

But what this provides is an alternative conceptual model, a different way of looking at the same problem. When we see multiple systems use multiple approaches to evaluate a problem like this, and when we start to converge on similar values, that allows us to have a much more confidence in the results. Because as I mentioned to Chairman Ryan at the beginning, this infiltration is the first domino of the chain of water flow through the Yucca Mountain repository. So when infiltration changes, unsaturated flow, unsaturated transport, saturated flow, saturated transport, all have to change accordingly.

Put in three times or four times the amount of water into the subsurface, that will have some effect downstream as that water moves through the system.

So it's important that we have multiple lines of evidence to support the infiltration estimate. An alternative conceptual model and DOE's approach.

Another advantage to DOE's MASSIF model is done not in FORTRAN but mathCAD which is an open source type spreadsheet, similar to an Excel spreadsheet, that allows you to simulate, change things, do sensitivity analyses much more readily.

You have probably all seen the state of Nevada's concerns about the computational challenges of running TSPA. In this case the Department of Energy has chosen a much less computationally intensive platform in mathCAD if we are able to obtain those wide mathCAD files.

We will be able to run the model ourselves on standalone workstations and PCs, so we can do our own sensitivity analyses, and assess the effects of changing parameters.

Finally we are going to look at some of our key technical issue agreements. As you probably heard from Lawrence Kokajko earlier speaking about the KGIAs, we had several that directly relate to infiltration. They are closed. That does not mean that we are not going to look at those issues any more. We will revisit those technical issues, and make sure that what the Department of Energy had agreed to do, usually in the form of providing information, was adhered to.

An example, one TSPAI 3.18 is an agreement in which DOE committed to using a Richard's-based equation to show that their mass balance equation was consistent - produced consistent results.

And in some of the materials that we've seen that DOE has presented to date, we are confident that the Department of Energy is going to provide us with that information satisfying that agreement.

Finally, final slide, these are the acceptance criteria that we use in the Yucca Mountain review plan to affirm that this license application, or this particular component of it, is adequate to support our regulatory findings.

So the things that we will be looking at - adequacy in system description and model integration - we are going to be looking specifically at how well the Department of Energy represents the physical processes in the subsurface. Do they capture all the components of the hydrologic cycle that need to be accounted for? Do they have sufficient data with which to support their claims, adequate technical bases?

One of the concerns we articulated at this Q/A audit is that they provide a discussion of the representativeness of the data that they are using.

For example I mentioned specifically that soil thicknesses was amongst the most important parameters. Well, in the DOE's representation, 78 percent of the repository footprint falls into one soil depth class that is represented by 35 data points. There is some spatial bias in these data points. At the time these data were collected by USGS the conceptual models were that the watershed drainage channels dominated infiltration. So that was where the focus of data collection was.

When you simply look at the map of where these data were collected, and a repository footprint, and the model domain, it's clear they are not randomly distributed. So we would like to see some discussion of how representative these data are in characterizing and representing the medium of interest.

So there's an example of the types of things we might look at for data sufficiency.

Given the stochastic nature of the model, it will allow for better incorporation of uncertainty in both the data and the model.

Some of the other things that Sandia has presented are the results of their sensitivity studies, and their extended sensitivity studies, where they parsed out systematic uncertainties, knowledge of

the natural system, from alleatory uncertainty, things like future precipitation.

So they treated those separately in order to assess the relative effects. They found that precipitation dominates alleatory uncertainty related to future climate change, and that soil thickness dominates epistemic uncertainties, the uncertainty about the natural system; not surprising there.

And then finally we are going to be looking for objective comparisons, how well can we approach this problem from different perspectives. We see with some of the DOE work where they have compared to INFIL, HYDRIS, a Richard's-based equation, and our own ITYM simulations. So that we see these multiple lines of converging evidence on an infiltration number that is supportable and defensible, that then gets used as input for the next model down the road.

So that's the end of my formal presentation. I'm happy to answer what questions I can, recognizing that this is DOE's work, and I may not be able to speak to it as authoritatively as they would.

DR. HINZE: Thank you very much, Gene, excellent presentations.

Let's have the committee ask questions if

they have any. Dr. Clark?

DR. CLARKE: Could you put slide eight up again please?

I just want to clarify a few things. These two models, the MASSIF is the one that is currently being used by Sandia, and INFIL is the model that the USGS -

MR. PETERS: That's correct.

DR. CLARKE: - used, and I think you told us that two major differences in those models, in the input to these models - the models were basically the same - the differences derived from the input, soil thickness and root zone penetration.

By the way net infiltration is what's also called depercolation is why it reaches the repository horizon.

MR. PETERS: Just to elaborate on that potentially important difference, that infiltration is what leaves this two meter thick upper surface, depercolation is a separate and distinct term that is, as you say, the flux of water that reaches the repository horizon.

That is important, because in the potential revisions to Part 63, NRC staff uses the term, depercolation, to represent the values of water

flux reaching a repository horizon. And that becomes important in the 10,000 to one million year compliance period when the regulations are finalized.

DR. CLARKE: I think I heard you say that there is a process going on now to try to explain these differences, rather, look at the technical bases if you will for the assumptions that were made in both of these cases.

The NRC is doing its own analysis as well?

MR. PETERS: Yes.

DR. CLARKE: And is it fair to ask you how your analysis compare's with DOE's?

MR. PETERS: It would be premature. Tim McCartin and I will be presenting later this year, once we have finalized that work, because we are undertaking that work to support the depercolation values for the Part 63 revisions.

Because we are not done with that work, Because EPA hasn't finalized their standard yet.

DR. CLARKE: Very nice. Is the DOE taking a probabilistic approach to net infiltration or use distributions for each of these scenarios?

MR. PETERS: Yes. They vary what they produce - for each run, they perform 40 realizations, and they varied about 20 individual parameters like

soil thickness, some of the values in the Markov chain prediction for precipitation; bedrock hydraulic conductivity; some of the vegetation values for the FAO 56 methodology.

They did an extended sensitivity analysis that told them which were the most important values, similar to a principal component analysis type approach.

And they found for example that soil thickness accounts for 70 to 90 percent of the variability in results.

DR. CLARKE: And you are taking a probabilistic approach as well?

MR. PETERS: Yes.

DR. CLARKE: Okay, thank you.

DR. HINZE: Dr. Weiner.

DR. WEINER: You said they used, they did 40 realizations?

MR. PETERS: Yes.

DR. WEINER: Is that enough to sample the entire input distribution? Did they use some kind of stratify sample?

MR. PETERS: They used Latin hypercube, so that - and their extended sensitivity analysis, which was 200 realizations, allowed them to confirm that 40

realizations they felt were sufficient to capture the variability in the system.

DR. WEINER: Did both Sandia and USGS use Latin hypercube sampling?

MR. PETERS: No. The USGS work, and I've not studied the USGS work. I've been with the NRC about two years now, so I came in just as that work was going out, so I haven't spent as much time studying that work as I have the current work that is going on.

But the work that Sandia and the lead lab has done produces 40 values, which then become available to the unsaturated flow model and community for incorporation as starting conditions, initial conditions for that model.

The USGS work had three values, a low, medium and high, for each climate state. So there I think a more robust distribution, because now we have 40 values to choose from, with a defined statistical distribution, compared to three values for each climate state that represented the starting conditions under the USGS modeling approach.

DR. WEINER: It's just a question, but why did they only give you three values? Did they just some kind of random sampling that they only did three

runs or something?

MR. PETERS: Well, they felt that captured the variability in the system based on their approach. And Dr. Hinze asked me earlier if I could wrap this up in a couple of hours. And I could certainly go into much greater detail.

But the USGS approach calibrated their model to certain components of the hydrologic system that allowed them, I believe, to conclude that these values were bounding values, and therefore sufficient.

When one looks at the Sandia approach, and they were asked this directly at TRB in other forums, why did you not calibrate to those same parameters, like runoff, USGS calibrated two runoff by varying evapotranspiration parameters.

Well, Sandia's response is, why would we want to calibrate to such a small component of the system? That didn't make sense to the researchers at Sandia, so they did not adopt that approach, so therefore you are not calibrating and assuming that your model is fully calibrated and correct, then clearly you have to assume a wide distribution of variables and family of results.

DR. WEINER: What I am trying to get to is what created the differences. And of course you

commented on some of that. You said Sandia used a different soil thickness.

In your opinion which is more realistic, or can you explain why?

MR. PETERS: Because I haven't read this report in detail it would certainly be premature in any case. But also since we are in prelicensing interactions it would also be inappropriate for me to comment on the validity of DOE's approach at this point.

DR. WEINER: Well, let me ask it a different way, then. Are there actual measurements of soil thickness -

MR. PETERS: Yes.

DR. WEINER: - that you can compare this to?

MR. PETERS: We find the distribution of soil thicknesses, the values themselves used by Sandia, to be consistent with those measured by the center and our staff.

DR. WEINER: I see. Thank you. That explains - that settles that question.

Let me ask you another question about this. If the U.S. had calibrated to evapotranspiration - this may be an unfair question -

would you have more confidence in their three values than calibrating to something like -

MR. PETERS: I think if any party preparing a model calibrated to the dominant component of their water balance, I would say yes, that would lead to more confidence. I mean we need not even personalize to this situation.

I think calibrating any model to any system to its single largest component is probably the best thing to do.

The problem is, it's very difficult to calibrate to evapotranspiration. Some of the things that Sandia has done with the MASSIF code, has looked at other sites, some of the weighing lysimeter from the test site, in various other places, where they had the information to do that. And their results were pretty favorable in the sene that they were able to match things like evapotranspiration pretty well.

And if you look at some of the presentation materials from the TRV meeting, you will see some of the specific graphs that show those objective comparisons.

DR. WEINER: Do you yet have any NRC results to compare to this?

MR. PETERS: No. We have a work product

from the Center for Nuclear Waste Regulatory Analysis that represents our simulations over a million year period that will be available later this year.

DR. WEINER: I see. And those are the ones - then you will make the comparison when you feed these into the TPA and the TSPA.

MR. PETERS: That's correct.

DR. WEINER: And we can see what kind of differences there are.

Just one final comment: I note that the differences between MASSIF and INFIL, if you just take present day data, it's pretty consistent. It's right around 30 percent difference.

And if you look at the monsoon section, it's not hardly consistent at all with the glacial transitions; it's a little bit more. That is just something I noted and queried with better data for the present day than we do for any of the others.

And that is reflected in these consistent differences.

MR. PETERS: And the water balance changes a bit when you move - if you were to compare present day to glacial transition. It's still not a lot in any one component. But the timing of this - remember, these are year-long averages. But when you assume for

example in the monsoon era you have larger storms, more frequent participation events. That puts more water into runoff and makes it less available to the other components of the system.

DR. WEINER: That's a very good point.

MR. PETERS: One of the graphs that DOE presents in some of their other materials is a comparison between MASSIF and INFIL. I don't have it. I can hold it up. Sorry, I didn't have an electronic version to include in the presentation.

But it was an attempt to include MASSIF and INFIL one for one with the same input parameters, and they got very close agreement between those when they tried to make the input data exactly similar.

DR. WEINER: Which is a good calibration of the models against each other.

Thank you. That's all.

DR. HINZE: Dr. Ryan.

CHAIRMAN RYAN: I'm trying to recall - first of all, thanks for a nice job. I'm looking at the changes in a different percentile. There is not a wide really range in some of the distributions. It's a factor of maybe 10 in the worst case in the glacial transition on INFIl and a small effect - well, maybe a little more for monsoon over MASSIF. But it's

not a huge range.

What is the influence of this change on those? That's where the rubber meets the road. I mean we are trying to understand the risk significance of these results.

Now I appreciate the fact that you are examining it on its own merit, but is this a big driver of those?

MR. PETERS: We don't know yet. DOE has not put this amount of water through the full system and seen it come out the other end and presented that to us.

CHAIRMAN RYAN: Fair enough. Okay, you are going to be accessing that from a TPA standpoint as well, and looking at that. That is really I think where the rubber meets the road on how important this can be.

MR. PETERS: And you will see some presentations on that in September, when our TPA work product is fully released.

CHAIRMAN RYAN: And just for my own calibration, are you okay with the number of significant digits on some of those? Is it 1.2 and 1.6?

MR. PETERS: One of my personal

idiosyncrasies, in that there are way too many significant digits in here.

CHAIRMAN RYAN: Okay. Again, I appreciate why, so it's really not a criticism. I just don't want people to take away that we can deal with upper and lower bounds of net infiltration to that level of precision.

Thanks. That's all. We will look forward to the PA implications.

MR. PETERS: And one of the things that we will be tracking very closely is, the output of the INFIL model is the input for the unsaturated flow model, and we will be tracking that very carefully to make sure that that handoff, if you will, is done appropriately and correctly.

CHAIRMAN RYAN: Okay, excellent. Thank you.

VICE CHAIRMAN CROFF: I shall try. Is there not any data on net infiltration? In other words has somebody not tried to measure it, maybe at the site or something, in support of the program?

MR. PETERS: That is correct. There are no direct measurements of that infiltration. One would do that with a weighing lysimeter. There are several - there are two at least at the test site in Area 12.

That is a different climatic region. It's a lower elevation, different soil thicknesses. The Department of Energy has not put in one at Yucca Mountain itself.

VICE CHAIRMAN CROFF: I'm assuming from our discussion that net infiltration is a fairly important parameter in the whole performance assessment?

MR. PETERS: In the NRC's TPA it becomes medium risk significance in the first 10,000 years, largely because the waste packages don't fail.

VICE CHAIRMAN CROFF: I'm sort of astounded. But all right, it is what it is.

MR. RUBENSTONE: Can I - these packages don't fail?

DR. HINZE: Jim, could you identify yourself for the record please? Thanks.

MR. RUBENSTONE: I'm sorry. Jim Rubenstone, NRC. What Gene just said is that the amount of water coming in is only important if those packages will let water into the waste packages.

So if you don't have many failures, then the water basically just washes through.

VICE CHAIRMAN CROFF: I maybe wasn't clear. I am astounded there isn't any data out there.

MR. PETERS: There are no direct measurements of net infiltration. Other researchers,

including USGS, have used other surrogate measurements, things like neutron probe and heat resistance probes, heat dissipation probes excuse me, to represent those.

Those - and this is an interesting point - those data were qualified by the program as appropriate for intended use. Sandia, the lead lab, chose to not use those data for calibration because they felt that there was some bias in those data, that when one drills a hole in the bedrock, creates a preferential pathway, and allows more water to get down and access the probe, creating a bias, and therefore higher than anticipated results.

Again, some of the presentation materials Dewey (phonetic) has offered shows that the neutron probe estimates conversions of water capacity or water content to infiltration produced much higher results.

So if one were to look solely at the neutron probe data one would come up with very much higher estimates of net infiltration beyond that which would be considered reasonable.

CHAIRMAN RYAN: I think - I mean to me, again, correct me if I'm wrong, Gene - but I think it's a tough environment. I mean the desert is an awfully hard place to know your net infiltration, if

it rains at night or during the day you get a whole different situation on the evaporation parts. So that is a real tough place to try and do that.

MR. PETERS: It is. The average annual precipitation is on the order of 200 millimeters per year. The average pan evaporation is 1,200. So.

CHAIRMAN RYAN: So it's gone away while you are trying to figure out what's happening.

VICE CHAIRMAN CROFF: Okay, thanks.

A couple of questions before we open it up to general questions.

If I understand correctly, there has been no problem found with potential errors in the measurements that were made by the US Geological Survey, but that really - and they basically use the same equations, but it is a problem with the discretizing of the data into - the application of that fundamental data to the distribution over the site? Is that correct?

MR. PETERS: Yes, it is. Of course there was an extensive investigation by the inspectors general of the Energy Department and the Interior Department, and the Department of Justice. There was no criminal wrongdoing that they found.

So then it became, how well did they

follow the administrative Q/A procedures that were in place at the time. The nine qualification reports that the Department of Energy put forth suggest that perhaps they did follow them, but the data were nonetheless appropriate for their intended use.

However, now we have a different modeling group, and like scientists the world over, view these data with a different set of eyes, and choose to use some data, not use other data, and to take that data they use and use it in different ways.

Assume different distributions. I mentioned earlier that soil thickness, everybody agrees, NRC, USGS, DOE, agreements that it is the most important factor at this site for infiltration. Seventy-eight percent of the domain is represented by 35 data points.

Clearly anyone of us can come up with a distribution that satisfies our own internal compass but differs from one another.

DR. HINZE: Did the INFIL have a set of criteria that they used to interpolate or extrapolate between these 35 sites?

MR. PETERS: They did.

DR. HINZE: Can you go back, and can you reproduce it?

MR. PETERS: Yes, well the - most of these data can be reproduced. Sandia did make that attempt; could not reproduce all, but were able to reproduce some.

The USGS reports used a - broke the soil thickness down on the basis of the slope of this ground surface, and derive an empirical relationship that is used to predict soil thickness based on those.

In Sandia's representation they look at that area of soil classified as depth Class 4; it's just a binning approach. And a samples distribution from 0.1 to 0.5 meters in thickness from the uniform distribution.

Now some of the things we are looking at very closely is, how well supported is this assumption of a uniform distribution.

Again, it depends on how you bin the data. If you have big bins, you get a uniform distribution. If you change the size of the bin you migh8t get a different distribution.

When we examine infiltration we tend to see a spike at about 0.2 meters, as the infiltration optimum. That is based on our values of bedrock hydraulic conductivity. I have discussed this with Sandia. They use higher values of bedrock

conductivity than we do, so they don't see that sweet spot of infiltration the same way we do, so they feel it is not as important to be overly concerned about that distribution, whether it's a log normal or a uniform distribution of soil thickness within that particular bin.

DR. HINZE: Were there - as I recall someone did a pretty extensive study of field capacity; is that right?

MR. PETERS: Yes.

DR. HINZE: And those results are appropriate. It just depends on what that thickness of the soil is?

MR. PETERS: The field capacity of course refers to the amount of water that porous medium will hold against gravity through surface tension and capillary forces. It's interesting you bring that up.

The Sandia effort to develop a database for field capacity was found to be - they decided the Yucca Mountain dataset was insufficient. It's very small. There was not a large database.

The - my preceding speaker was speaking of Hanford, and that's actually the source of the field capacity data at Yucca Mountain.

They - the project investigators used a

very large and robust source of field capacity and other soil hydraulic characteristics from Hanford, and linked them to Yucca Mountain through what is called a pedotransfer process in which one compares the soil texture and grain size distribution.

When you achieve some convergence between characteristics in terms of the physical attributes of the soil - grain size, textural classification and grain size distribution - one can then assume that the hydraulic properties are similar.

So the Sandia approach to developing a database for field capacity in particular was to use this pedotransfer process to bring in analog soils from the Hanford reservation.

Did that make sense the way I explained that?

DR. HINZE: No, it does. The Sandia - did Sandia go out and redo any of the measurements?

MR. PETERS: No. The lead lab did not collect any new data at all. They visited the site; they observed; they walked around and kicked the rocks so to speak. But they did not collect any new data about soil thickness or any of the other parameters.

DR. HINZE: Now you mentioned that the NRC is doing some field studies?

MR. PETERS: We hope to be able to collect some additional data if we are given the opportunity to do so. But in the past we have collected our own data on soil thickness and certain other physical parameters.

DR. HINZE: And these previous measurements have corroborated the USGS INFIL basic data?

MR. PETERS: Our data fall in the same range as those used in the project.

DR. HINZE: So it's basically how that data is distributed over the - that is where the rubber meets the road.

MR. PETERS: Yes, and when you are doing the stochastic simulations, the probabilistic simulations, how you sample from that distribution becomes an important factor. If you assume a uniform distribution versus a log uniform distribution you are going to get different results, because you will see more central tendency values in that log uniform distribution.

DR. HINZE: Going back to one of the things that Dr. Croff was mentioning, is there any consideration by either Sandia or the USGS of the effect of high intensity precipitation events?

MR. PETERS: The simulation of future

precipitation is done on a stochastic basis, and they do have low probability high intensity events in their simulation. So yes, there are - the average precip right now is abou8t 200 millimeters per year. For the monsoonal climate it's assumed to be on the order of 400 - I'm speaking of very round numbers of course. Glacial transition in the 250 to 300 millimeters per year; that is precipitation, water entering the system from the top.

They go up to almost 800 millimeters per year in their range of values sampled for future precipitation, 753 I believe is the highest value that they sample from. But it has very low probabilistic weight.

DR. HINZE: In terms of - if you do have the opportunity to do some field studies, where do you feel the most critical measurement - what are the most critical measurements you can make in terms of trying to make some sense out of these differences?

MR. PETERS: Well, our own work, and as I mentioned earlier, the Department of Energy's work, indicates that soil thickness dominates uncertainty; and therefore, the more data you have about soil thickness perhaps you can narrow that range and get a more robust estimate.

That would be, if I had the opportunity to have more data, that would be my first choice, would be to have more information on soil thickness and on bedrock hydraulic conductivity.

DR. HINZE: Let me get to the bedrock hydraulic conductivity.

MR. PETERS: Infiltration tests?

DR. HINZE: If I understand correctly you will - you and Tim McCartin will be - or Tim McCartin will be presenting some of your results on infiltration at the September meeting.

MR. PETERS: A little bit of reservation about the timing. We have to follow EPA. They have not promulgated their new standards.

DR. HINZE: I understand.

MR. PETERS: And once they do that we will propose to the commission our standards, and we have been doing infiltration studies all along to support the LA review and the Part 63 revisions. Once that effort is complete we will be making those results publicly available.

DR. HINZE: There will be a new AMR with the Sandia results?

MR. PETERS: Yes.

DR. HINZE: And you will be assessing that

AMR?

MR. PETERS: When it becomes available we will certainly read it to gain an understanding. We will be really reviewing it as part of the license application. I am assuming that based on the timing those are going to be in close proximity.

DR. HINZE: That was my next question. Is there any chance that that will be done so this committee will be hearing about that before the license application? Do you have any idea?

MR. PETERS: Our best estimates from the Department of Energy are that the infiltration AMR, which is in the review process now - it's been finalized from Sandia's perspective coming ou8t of the lead lab. It's just undergone this audit in June, DOE line management has to review it as well.

So I would assume late summer, early fall is when we are most likely to see that become available.

DR. HINZE: Let me ask one final question, and that's the question that Mike Ryan asked somewhat differently.

He asked about dopes (phonetic). What about deep percolation? How much is this difference going to affect the deep percolation?

MR. PETERS: We have not seen any results from the department on that.

DR. HINZE: Any indication?

MR. PETERS: The TRB meeting also had a presentation on saturated flow, and they generally have lower values than that model of infiltration. So we are looking forward to understanding in greater detail how the Department of Energy's two different models link up.

DR. HINZE: With that I will open it to the staff or to the public.

Did I also - West Patrick was supposed to be on the line and I forgot to ask about that.

Wes, are you on the line?

(No response)

MR. PETERS: He can call me any time.

MR. HAMDAN: Gene, to me the most important question is the one that Mike Ryan asked, which is the so what question. And that is the impact of the change of efficient rate in performers. And if I were to do this, it seems to me that the first thing I would do is run - I don't know about DOE, you know, I will not speak for them, because they are probably doing that - but in the TPA code we have - the TPA code we have done a sensitive analysis and in fact,

there was a reason why the infiltration was rated as medium risk. It came from the sensitive analysis.

So you can almost say that we have already on the TPA code you know, maybe years ago, two years ago. And at least to my understanding a conclusion was that the coefficient rate is not that significant a factor in its impact on the dose. So I'm - it seems to me that if I were to do this, I would first do the sensitive analysis to verify that the impact is big or small before I do this. You may still want to do this, but I'm surprised, you know, when the question comes, what is the impact on the dose, that's surprising.

MR. PETERS: We haven't done it, because this is DOE's work product. So in terms of the values that we - that the NRC staff has always used are much closer to these kinds of numbers for present day climate. The numbers that are in the TPA older versions are similar to the measure of central tendency you see up here out of the MASSIF model.

From those we get medium significance to risk because those waste packages don't fail in the first 10,000 years, or very few of them do.

MR. HAMDAN: I think the medium significance comes from the sensitivity of the

analysis.

MR. PETERS: Yes.

MR. HAMDAN: I think the medium significance comes from the sensitivity analysis, would you agree?

MR. PETERS: And the most sensitive parameter within that is soil thickness. All the variation in infiltration derives, most of it, from variation in soil thickness, which is a very difficult parameter to pin down. When you are standing at Yucca Mountain - I know you - we've all been out there - you could poke a piece of rebar in the ground and find one inch; move over on the other side of your body and get six inches.

So there is a great deal of natural variability in the system.

MR. HAMDAN: Thank you.

DR. HINZE: Further questions?

If not, Gene, we very much appreciate this excellent presentation. We'd like to have you come back just as soon as you want to, perhaps even before.

(Laughter)

With that, I'll turn it back to Dr. Ryan.

CHAIRMAN RYAN: I think that we have concluded the day's business, so I will adjourn the

meeting at this point. Thank you very much.

(Whereupon at 4:52 p.m. the proceeding in the above-entitled matter was adjourned)