Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Nuclear Waste
175th Meeting

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Thursday, December 12, 2006

Work Order No.: NRC-1377 Pages 1-223

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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175TH MEETING

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ADVISORY COMMITTEE ON NUCLEAR WASTE

(ACNW)

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THURSDAY

DECEMBER 12, 2006

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ROCKVILLE, MARYLAND

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The Advisory Committee met at 10:00 a.m. in Room T-2B3 of the U.S. Nuclear Regulatory Commission, One White Flint North, 11555 Rockville Pike, Rockville, Maryland, Dr. 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:

LATIF HAMDAN

NEIL COLEMAN

ANTONIO DIAS

JOHN T. LARKINS, Executive Director, ACRS/ACNW

MICHAEL P. LEE

DEREK WIDMAYER

FRANK GILLESPIE

I N D E X

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

(10:01 a.m.)

CHAIRMAN RYAN: All right, folks. The meeting will come to order please. And we will start our formal record.

This is the first day of the 175th meeting of the Advisory Committee on Nuclear Waste. During today's meeting, the Committee will consider the following: a semi-annual briefing from the Office of Nuclear Material Safety and Safeguards, a presentation on RACER, a tool for the process to guide decisions about risk reductions for contaminants in the environment, Nuclear Energy Institute and Electric Power Research Institute's views on NRC interim staff guidance on seismic event sequences, and discussion of Draft ACNW Letter Reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Antonio Dias --

MR. DIAS: I'm here.

CHAIRMAN RYAN: Oh, sorry, there you are -- 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 sessions. Should anyone wish to address the Committee, please make your wishes known to one of the Committee staff.

It is requested that speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

It is also requested that if you have cell phones or pagers that you kindly turn them off.

I'll begin with some items of interest. Dr. John Larkins, ACRS/ACNW Executive Director is retiring on January 4th, 2007. As Executive Director for the past 13 years, he has been devoted to the Committee and has provided outstanding management to the members. He has ensured adequate technical and administrative support to the committees in performing their statutory obligations effectively and efficiently.

His major contributions include selection of new members and consultants to the committees, reappointment of members, formulation and execution of the Committee's operating budget, resolution of conflict of interest issues, and quality assurance of ACRS/ACNW office activities.

His devotion, dedication, enthusiasm, and

unrelenting support to the committees are second to none. And are very much appreciated.

On behalf of the Committee, I'd like to thank Dr. Larkins for his outstanding support to the Committee. We wish him happiness and success in his retirement and in his future endeavors.

And I will add to the long list of things that we always have a great quality assurance check in our letters, every single one, every single time. And it is that quality that I think is reflected in our products. And, John, we really appreciate all your hard work.

And I'd ask everybody to give John a round of applause.

(Applause.)

DR. LARKINS: It has been fun. I've enjoyed it for 13 years.

CHAIRMAN RYAN: Indeed.

Well, again, we wish every success in your future endeavors.

The ACNW would also like to recognize an outstanding staff member, Ethel Barnard, who, after approximately 40 years working with the Committee will retire on January 3rd, 2007.

Ms. Barnard has handled several different

jobs for the ACRS/ACNW over her tenure with the staff. These include managing the Committee's reference library and ensuring compliance with the FACA requirements for document retention and retrieval.

There is a long list of other tasks she has handled for the Committee which would take me a long time to go through.

However, I would note that she has done an exceptional job at handling all computer hardware and software matters for the members, many of whom need the remedial help on a regular basis to keep up with technology as it evolves and changes. And she always provides that with a smile on her face and professionalism above many. And her willingness to assist the members of the staff is much appreciated. Thanks to Ethel.

I don't know that Ethel is at work today. But let's let the record reflect our sincere appreciation for her efforts as well.

All right. With that, we will turn our attention to our opening briefing this morning. This is our semi-annual briefing by the Office of Nuclear Material Safety and Safeguards. And I'm not sure exactly who is going first.

(Laughter.)

CHAIRMAN RYAN: Jack Strosnider, the Director, is here and welcome, Jack. And thanks for being with us this morning.

MR. STROSNIDER: Thank you. Nothing like a grand entrance. And I apologize for that.

I just wanted to make a few brief opening remarks. And then we will go through and hear from the divisions.

And the first thing I wanted to comment on -- is John here? John Larkins today? I just wanted to -- there's John, okay. I understand you have decided to do some different things. And I just wanted to say thank you for all of your service and for all the coordination and good cooperation that we have had. And we will miss you. And good luck.

Hello, Frank.

MR. GILLESPIE: Hi, Jack.

MR. STROSNIDER: I'm looking forward to working with you in the future. So thank you very much.

I wanted to comment a little bit on communications. First of all, I just acknowledge that I know you have a very busy schedule so we do appreciate the opportunity to meet with you periodically. And I think we have made some progress

in terms of our interactions in trying to proactively identify activities, issues that you are interested in and where we are looking for your comments and input.

And the six-month rolling calendar, I think has helped us with that. And I think one of the things we have talked about is looking to how we can be even more proactive. Looking a little further down the line when we think about our budgeting process and how far out in the future that goes that we want to continue to work on that area.

But perhaps most importantly in terms of our interactions, I want to acknowledge the value of your input. We appreciate your comments, positive and negative, on what we are doing. That helps us. It makes for a more robust program and helps us withstand the scrutiny of our programs that comes from a variety of sources.

So to comment on those things, do a brief information on the reorganization, which I hope everyone is familiar with. And what -- just in case everyone is not familiar, effective October 1st, we have a new NMSS and we also have a new Office of Federal and State Materials and Environmental Programs. Have I got that right? FSME -- I'm still learning some of the acronyms.

A little bit about the logic behind this, and I'll start with what -- the original NMSS, we had five technical divisions. And the Division of Waste Management and Environmental Protection and the Division of Medical and Industrial Nuclear Activities, those were taken out of NMSS and combined with the Office of State and Tribal Programs to create this new office, FSME.

And that was -- and I don't want to go too much into that obviously. Charlie Miller is the new Office Director there and he will be here in February, I think, to talk about what is going on in that office. So he'll give you all the detail.

But part of the motivation, at least, was recognizing the increased number of agreement states, the changes in the programs going on there, the relationship between the environmental activities and the industrial medical activities with the states and some of those other stakeholders. So a point of motivation there was to get those activities all in the same office.

And with regard to NMSS, actually we could have called it the Fuel Cycle Safety Office but there is some legislation that says we will have an Office of NMSS. So we are NMSS.

But if you look at what is left in the office now, we have the Fuel Cycle Safety and Safeguards, which deals with production of fuel, conversion, enrichment, and fabrication of fuel.

And we have the -- the org chart is up here -- we have the Division of Spent Fuel Storage and Transportation, which after the fuel comes out of the reactors, it has got to be stored someplace, shipped, et cetera. It used to be the Spent Fuel Projects Office.

And we have the Division of High-Level Waste Repository Safety for the ultimate disposition of the fuel.

So we have pretty much all of the activities associate with the fuel cycle. The one activity that did move to the other office was uranium recovery licensing. And, again, that was -- part of the logic there was recognizing the interest of the states in those activities. So that was part of the motivation there.

We have -- I think everybody knows Bob Pierson, who is not here today, but I think Gary Janosko is here representing the Fuel Cycle Safety and Safeguards. Bill Brach is here, Director of Spent Fuel Storage and Transportation. And Lawrence Kokajko

who is the Director of High-Level Waste Repository Safety. Bill Reamer retired a month or so ago now and Lawrence has taken over that position.

And I want to mention Mark Flynn is Director of our division of -- what do we call it now -- it used to be -- it's on there but our administrative activities. Mark is here.

So like I say, we appreciate these opportunities to meet with you. Like I said earlier, I think one of the things we want to continue our coordination and cooperation. I think we want to keep building on the progress we've made with the rolling calendar, look at what we can do in terms of planning consistent with the budget cycles, which means trying to look out a few years.

We recognize that we need to build into our schedule and into our budgeting interactions with the Committee so that we make sure that we can give it the right support. And try to identify our activities as early as we can so that you can look at them and identify your interest and coordinate those. So that is one of the areas we will continue to focus on.

And, again, we appreciate your independent, objective input to what we are doing. It helps us to make a more robust program.

So I'll be happy to take any questions or comments on what I said. And the plan, then, I think we are going to start off -- are you going to go first Gary? We'll start off with Gary and we will go through a little summary of what is happening in each of the divisions.

CHAIRMAN RYAN: Jack, thanks. I think we will defer questions, if we may, until the end. Are you going to be able to stay with us?

MR. STROSNIDER: Yes, I plan to stay.

CHAIRMAN RYAN: Okay. Great. But let me add, we recognize that in this time of moving from one building to another and reorganizing into two groups, you really have a lot of just organizational work to do. And I know that is always challenging.

But we still appreciate the fact that you have come here today and we continue to work with elements of the staff in the different technical areas. And from our point of view, even though you are busy with all these other reorganizational issues, our agenda stays full. And we appreciate the ongoing interaction as you have outlined it.

And we, too, think the rolling calendar is a great focal point for all of us to sharpen our thinking and plan our activities and interact with

you. So we appreciate that very much.

MR. STROSNIDER: Good. Okay. Thank you. We will turn it over to Gary, then.

CHAIRMAN RYAN: For those speakers coming up, if you would, just for our court reporter, if you could say your name and affiliation, that would be helpful as you come to the front.

MR. JANOSKO: Good morning.

CHAIRMAN RYAN: Welcome.

MR. JANOSKO: Can you hear me okay?

CHAIRMAN RYAN: Fine.

MR. JANOSKO: My name is Gary Janosko. I'm the Deputy Director in Fuel Cycle Safety and Safeguards, NMSS.

And on a personal note, I'll miss seeing John in the Fitness Center although inevitably we seem to choose lockers in the same part of the locker room so I guess that means I'll have more room now so maybe there is a good side to this.

The Division of Fuel Cycle Safety and Safeguards has chosen three subject areas for which we might be seeking your assistance over the near term.

The first is the Global Nuclear Energy Partnership, otherwise known as GNEP. And actually on your agenda tomorrow morning at 10:45, our folk who

provide oversight in that area will be providing a briefing, a very comprehensive briefing regarding our conceptual approach to the licensing of GNEP. Of course, at that time, you are welcome to ask any questions you have regarding our thoughts in that subject area.

The second area of the fuel cycle identified, for which we might be seeking your assistance, would be any advance technologies that come to our attention as a part of our licensing and inspection work. One right now on our radar screen is something called SILEX. You may or may not know about SILEX. I'll spend a few minutes talking about that.

SILEX is an acronym which stands for the Separation of Isotopes by Laser Excitation. And as the name implies, it is a laser-based enrichment process.

Basically what we have right now regarding SILEX is a letter of intent from the licensee, who is Global Nuclear Fuels, located in Wilmington, North Carolina. And that letter of intent maps out a schedule for how they plan to implement this SILEX process.

And the first part of that implementation is a test loop facility that they plan to construct on

site. They will be submitting an amendment to their current license for that facility. Sometime next month is the current schedule. And then they plan to build that test loop.

And based on a successful outcome of that test loop, they will be submitting a license application for a new enrichment facility sometime during the first quarter of fiscal `08. So, again, if all goes well, that is the current schedule mapped out by the licensee.

We can't talk much about the process itself because when you do, you kind of stray into classified information pretty quickly, most of which is secret, restricted data. So one of our challenges actually in dealing with this technology is being able to limit the dissemination of that information as much as possible without, obviously -- but in the same vein insuring that the people that need to know this information have it available. But all the same, it relies on the sensitivity with regard to this information.

And the third and final subject area that we have identified in fuel cycle is MOX. And that is a familiar topic to the Committee here. I know that we have briefed the Fuel Subcommittee of the ACRS on

the progress on MOX. And of which some of the ACNW members have participated in those briefings.

Where we stand today on MOX is we are proceeding with the acceptance review of the application. And we plan to complete that review next month. The original application has grown significantly based on interactions with our staff and the applicant.

The original application was deemed to be insufficient and again, based on communications with the licensee, they did provide a lot more information, basically moving information from the ISA summary document that accompanied the application into the application itself to ensure that it complied with our regulations. And as I say, we plan to complete that acceptance review next month.

And unless you have any questions, that completes my comments today.

CHAIRMAN RYAN: Okay. I think we will hear everybody's presentations then maybe take some questions at the end if that is okay.

CHAIRMAN RYAN: Thank you.

Lawrence?

MR. KOKAJKO: Okay. My name is Lawrence Kokajko. I'm the relative new Division Director of

the High-Level Waste Repository Safety Program in NMSS. And I appreciate the opportunity to be here today.

Mike, thank you.

CHAIRMAN RYAN: Thank you.

MR. KOKAJKO: I, too, would like to wish you well, John. You know we worked together in NRR for a while many, many years ago. And I do recall that fondly.

And welcome, Frank. We will --

MR. GILLESPIE: What have I done?

(Laughter.)

MR. WIDMAYER: This was just laughter.

CHAIRMAN RYAN: Let's keep a clean record here so one at a time.

MR. JANOSKO: Maybe that should be stricken from the record. I don't know.

CHAIRMAN RYAN: That's all right. That's fine.

MR. JANOSKO: I think you have got an exciting position and I welcome you to this program.

CHAIRMAN RYAN: And, I'm sorry, just, Frank, as the new guy, when you talk, use the microphone.

MR. JANOSKO: I said many years ago when

I had RTG, I think it was my first briefing of ACNW, I said I thought I had the best job in the house. Well, I was wrong then. I have it now.

I have always wanted to be involved in a program of national significance. And I couldn't ask for a better program to work in. Working with some great regulators, some great scientific and engineering staff members, and I do appreciate that. And I'm hoping some of that comes through today in my presentation.

I want to go to -- let's see, next -- introduction, okay. I'm going to go through these pretty quickly and just to let you know a few things. We do anticipate a license application for Yucca Mountain June 30th, 2008.

And that is what Ward Sproat committed to the Congress and the administration. And he has energized the program is making some changes in it. And I do believe he will be successful in doing so.

The Nevada Congressional delegation remains opposed to this. And, of course, the new Congress does add some uncertainty. But we will be monitoring that and we will continue our technical work to prepare for it. And I'll go into some details later on.

In doing so, we are augmenting our staff, not only recruiting, training, and continuing training of our staff, but we are also trying to get them in other program areas to get licensing experience and bringing it back as well.

Leadership in the division are examining the resources, policies and procedures to make a docketing decision, review the LA, reach decisions about safety and regulatory compliance, and to defend those decisions before the hearing board in the allotted statutory time frame of three, maybe four years. So we're working that now.

I think we are going to divide my conversation up into preclosure and postclosure. In preclosure, we have done multiple things in terms of preparing for our review. Recently, and as you noted in I think later this afternoon you are going to discuss our first ISG on Review methodology for Seismically Initiated Event Sequences. This was issued in September of 2006.

We have three others that are all on the drawing boards. PCSA, or Preclosure Safety Analysis Level of Information and Reliability Estimation is due out in March of next year. Also, PCSA-related Dose Performance Objectives and Radiation Protection in May

of 2007 is our estimate. And Human Reliability estimated in July of 2007.

We've also started looking at operating experience review, identifying operational data that may have risk significant aspects that we anticipate for the geologic repository operations area as defined by DOE right now. And we are also, of course, visiting various sites such as INEL, Savannah River, Hanford, and other areas that may have similar operations to what DOE is anticipating for the grow up.

We are also doing an exercise regarding identifying potential risk insights for our surface facility and primarily given that DOE is proposing a small pool operation for perhaps reloading certain canisters, we are looking at spent fuel operations as well.

We've had several interactions with DOE in preclosure. One is information on PCSA. We did this back in May of 2006. We presented our expectations for level of information and reliability estimation. And DOE presented its -- some information on its program in relation to reliability safety basis as well as information available at the license application phase.

They have also committed to providing a summary of their reliability assessment which they did do. And I'm going to address that in a little bit. We had a seismic meeting in June of `06. And, again, we presented our key messages and they addressed them in an open public meeting. And later we addressed a PCSA in relation to aircraft hazards, preclosure source terms, and consequences, reliability, human reliability, license specifications and training, and preclosure criticality.

DOE also addressed these topics but with the exception of preclosure criticality, we had a good exchange but they are not going to be ready in certain areas and they, in fact, deferred that as well as postclosure criticality for a future date.

DOE has recently submitted two technical documents. One was on reliability methodology and frequency analysis of aircraft hazards. We are going to respond to those letters later this month.

Also, NRC is interested in a variety of other technical exchanges related to their preclosure safety analysis such as proposed design and operations, hazard identification, event sequences, identification of the important to safety structure systems and components and source term and

consequences.

I might also add that in relation to this, we have been responding to a couple of letters from the State of Nevada on the aging facility as an integral aspect of disposal operations.

Post closure, internally we are looking at doing a revision to our Total System Performance Assessment code. Later this year, we hope to have that done -- later in `07 we hope to have that done as well as updating our users' guide in late `07 as well.

The technical work that supports the TPA models and parameters are including waste package and drip shield performance, drip degradation, unsaturated and saturated zone flow and transport and consequence of the disruptive events.

We have had two technical exchanges with DOE on this. One was on their Critical Decision-1 process. This is their conceptual design documentation to define how they are going to proceed with both their engineering surface facilities as well as their natural and engineered barriers in the postclosure phase.

At this meeting, NRC provided our expectations regarding -- and the regulatory framework for the new Transportation, Aging, and Disposal

canister. DOE just recently, last month, late last month, issued their performance specs for the vendors to begin to analyze their TAD specifications in terms of the disposal operations.

And I might note that -- and Bill Brach may go into a little bit more detail -- the Repository Safety Program and the Spent Fuel Division as well have defined a technical advisory group to discuss items of mutual interest so that we can help articulate the regulatory framework and evaluate it appropriately in whatever framework it is in, whether it is in transportation, interim storage at a reactor site, or disposal operations.

We have requested a variety of additional interactions to examine DOE's TSPA model, extractions, and process models. We are waiting to hear from DOE on that now.

As we identify issues, we are sending information and letters to DOE. Most recently, we sent one on capping seismic peak ground velocity for low frequency events. And DOE is providing on an irregular basis responses to our open KTI agreements.

A couple of other things I would like to mention just very briefly. We are also continuing our public outreach activities. We recently -- Jack --

Marty Virgilio, Jack Strosnider, Bill Brach, Janet Kotra, and I all visited the State of Nevada and visited also the Timbisha Shoshone Tribe as well as Clark County and Nye County. And we are hoping to have -- and, in fact, enhance our outreach efforts in 2007, including holding a licensee workshop in the State of Nevada sometime next year.

EPA, as you know, has been tasked with developing a new standard. They are still on track to do so. And we, of course, will issue conforming regulations afterwards, probably six to nine months after that.

Igneous activity, I know you all have expressed some interest in that. We are awaiting the report from the ACNW. And we will, of course, review that report as it reflects repository safety staff work. And, of course, we are looking forward to participating in the workshop with you in a manner commensurate with our regulatory role.

And I think that is it. And if there are any questions --

CHAIRMAN RYAN: After you all finish, we'll open it up for all questions all around.

MR. BRACH: While we are pulling up our slides, let me first introduce myself. I'm Bill

Brach. I'm Director of the Spent Fuel Storage and Transportation Division. And let me first apologize if in my presentation I use the acronym SFPO or Spent Fuel Project Office. If so, we've made the transition. As Jack had noted, we used to be the Spent Fuel Project Office. I will note that our roles and responsibilities in that regard did not change in the realignment/reorganization.

I, too, want to pass along congratulations to John on his upcoming retirement. And thank you for many years of service. I very much enjoyed working with you over the years. And wish you well.

And to Frank Gillespie. Frank and I have worked together and known each other for over 30 years now. And so, Frank, I'm looking forward to re-engaging in a different venue with you here.

Now in the overhead presentation -- in the presentation, the very first overhead, I just want to briefly note that our division's areas of responsibilities, as Jack noted, we have responsibility for licensing and certifying the storage of spent fuel at reactor facilities or away from reactor facilities.

We also are involved in the review certification of our transportation packages. That is

both spent fuel packages as well as non-spent fuel. And by non-spent fuel, I'm making reference to, for example, fissile materials and by-product material transportation packages.

We have a significant engagement with state governments and other federal agencies, both principally at Department of Transportation, Department of Energy, as well as international agencies such as the International Atomic Energy Agency, the IEA Nuclear Energy Agency as well as interface with Native American tribes. And Lawrence just mentioned the engagement meetings last week with state and tribal representatives that we participated in.

And public outreach in the area of spent fuel storage and transportation remains high. It has been high. And that is a very active area as was just noted.

Now we did brief the ACNW in May of this year. I think we spent one to two hours giving a fairly detailed overview of our office, our programs, activities, casework, and regulatory technical issues that we are addressing.

So this morning I just briefly want to provide a very brief update and then move into

a couple technical topics that may be of interest to the Advisory Committee.

I would note that since the May ACNW briefing we have been engaged with the ACNW in support first of our Office of Research in meeting with the Advisory Committee on the Dry Cask Storage PRA.

And I thank the Committee for their engagement and comments and feedback as well as subsequent briefings on two tunnel fire studies that we have carried out, the Baltimore Tunnel fire and the Caldicott Tunnel, a real accident involving a fire and a tunnel fire -- rail and road accidents involving fires.

Now we looked at those -- again, for everyone here, there was no radioactive material in those accidents but we carried out and looked at studies of what would have been or what would have happened if radioactive material spent fuel had been in those accidents. And again thanks to the Committee for your review and comments in that regard.

Our workload in the spent Fuel Storage and Transportation Division remains high with over 100 cases per year in both storage and transportation. We conduct about 15 inspections each year. Our inspections out of headquarters are focused primarily

on designers and fabricators of storage and transportation casks but we provide significant support to the regional offices and their inspection of storage facilities at the reactors or away from reactor facilities. And as noted, our engagement in public outreach continues to be high.

Now this morning I want to briefly cover with you a few topics that I believe may be of interest to the Advisory Committee as well as a couple of others that are perhaps pending.

Moderator exclusion, I have a slide that follows but moderator exclusion pertains to transportation and how we have -- I'll say how we internationally have addressed moderator exclusion. What we mean by that is the design of packages to allow moderator ingress.

And what we are looking at is taking into account the advances in designs and materials as well as, if you will, looking to risk inform our processes. Should we relook at that question? And so moderator exclusion with regard to transportation is topic that we are looking at now. Here is a slide. I'll get into a little bit more discussion in that regard.

Burnup credit is a topic that as long as I have been in the spent fuel storage activities, has

been a topic that we have been addressing. On the one hand, I'm proud of the progress we've made over the past few years. There is more to be made. And I will be addressing what collaborative efforts we, NRC, and other agencies have to address burnup credit. This issue also is primarily focused in the transportation arena.

The third topic deals with high burnup of fuel. And as noted also, it is focused with regard to transportation considerations. As power plants are continuing to try to be more effective and more efficient and get more utilization of their fuel, extending outages, increased high burnup, increasing the burnup of the fuel, that is raising questions to us with regard to both storage and transportation, most predominantly in the area of transportation.

n other words, as the fuel achieves higher burnups, questions with regard to maintaining the structural integrity, if you will, of the cladding of the spent fuel and how that material under different accident conditions and transportation would maintain its geometry or if it were to change its geometry, how it might change, and the analysis required there.

I have noted in the last bullet a few topics. Lawrence had mentioned the Transportation,

Aging, and Disposal Canister. I will discuss that a little bit more briefly later. I would note increasing complexity of reviews. I've mentioned three topics but I'll just discuss again some of the considerations and concerns as well as casework that we are seeing today that, if you will, the margins or the envelop is being pushed in some of the designs.

The last topic, there clearly are some questions with regard to the national strategy on spent fuel management and I will discuss that in a brief overview.

Moving now to moderator exclusion, as I noted, the current practice here in the U.S. and I'll offer the current practice really internationally, is in a transportation package review is to consider that moderator gets inside into the inner container of the package. That is water ingress into the package.

From a conservatism, from a safety standpoint, from a perspective of -- irrespective of how fuel might reconfigure if you are able to demonstrate that the package maintains subcriticality with a moderator, an optimum physical configuration, from a safety standpoint, that is a very sound place to be. So our looking at moderator exclusion is not trying to, if you will, move from or walk away from a

safe, conservative regulatory position to take but we also think we need to be looking at, from a risk informed perspective, as well as how packages perform under different accident conditions, the extent to which packages can maintain their physical integrity, their leak tightness, if you will, so that moderator under different accident conditions could not or would not ingress into the inner container.

This is an issue -- one, let me mention the regulations do current allow -- and I'll say an exception, a special case-by-case basis such a consideration for moderator exclusion. But we are looking at this or considering this in a broader context rather on a case by case but should we, as a regulatory agency, look in a broader context with regard to allowing moderator exclusion under certain conditions.

We are developing -- in the process of developing a staff paper, an options paper, I'll refer to it, that would look at various considerations that would need to be considered if we were to be embarking down this path. And one of the considerations we have is that we feel very clearly if we were to embark down this path -- and I'll offer this would be an agency-commission level decision -- I'm talking now but we

are looking at considering it, if you will, at the staff level -- but one of the considerations if we were to embark and go down this process, that we would believe a rulemaking would be probably the path to be taken, one that clearly would involve and engage all of the stakeholders with regard to opportunity for input and consideration as well as an ability and an opportunity for us to share in a broad, open, participatory process of some of the considerations, some of our thinking, some of our technical considerations.

I would note that this does have some fairly clearly related considerations that would also need to be addressed. The environmental impact statement that was prepared for Part 71. Our transportation regulation clearly is based on the regulations that have moderator ingress. And so we would have to reevaluate the extent to which the environmental impact statement would need to be revised to reflect a change as we are considering in this regard.

I would note, too, that we need to be looking at the safety -- what I'm referring to in the overhead is the safety security interface. I can't go into the details but from the standpoint of the safety

requirements that irrespective of the accident condition must demonstrate that the package maintains subcriticality under all accident conditions is irrespective of the initiating event for which -- under which water or moderator was allowed into the package.

I can't go into the details but we clearly would need to be looking at, from a safety/security perspective, this consideration and how that would need to be addressed in both safety as well as security considerations.

As noted, we are in the process of preparing the options paper, trying to, at the staff level, walk through the various considerations, technical issues that would need to be considered and addressed. And I have also been informed by the Advisory Committee staff that the ACNW is interested in the area of moderator exclusion.

So I have noted on the overhead that we are anticipating a -- I put in fiscal year `07, thinking probably the February/March time frame. And as Jack Strosnider, our Office Director, made reference to the rolling calendar, we will keep in touch with the Advisory Committee staff as appropriate timing, as our thinking and development of the options

paper evolving to engage with the Advisory Committee in this regard.

Moving now to burnup credit, as I've noted, we have made progress, as noted in the first bullet, first hashmark, we did issue interim staff guidance. It has been about four years ago but we do allow burnup credit for actinides in transportation and storage.

I would offer that that is an allowance, if you will, or a regulatory position on our part that has not been practiced by the industry too extensively at this point. We did earlier this year approve a -- this was a propriety package, a transportation package that had very limited -- and I'll stress the very -- very limited fission product burnup credit as well as actinide credit.

But I would note, and it noted in the middle, the second hashmark, there is a collaborative effort underway. It has been underway for a while but I think we are making -- hopefully on the steps of making progress in this regard, working with the Department of Energy, EPRI, NRC's Office of Research has the NRC lead although we are working very closely with the Office of Research in this regard to develop and obtain information that would allow us to consider

and, as appropriate, move into allowance of burnup credit for fission products as it relates to storage and transportation.

There is an effort underway right now to acquire what might be currently available fission product data and related type information available internationally as well as looking at what additional tests or experience may be needed to provide the complete set of information that would be needed to provide for if you have full burnup credit allowance in storage and transportation.

And so this is an effort underway. I'm always -- hopefully not the naive but the optimist that we're on the steps of moving forward and looking forward to obtaining the fission product data that is currently available internationally in the near term and hopefully it will provide us a basis for moving forward with the -- I'll say next, revision three, to our interim staff guidance on burnup credit.

And I'd offer, again, this may be an area that the Advisory Committee may be interest in in future engagements. I see Dr. Weiner is nodding her head yes but we will engage with your Advisory Committee staff as this evolves and we move forward.

The third topic I'd like to raise is with

regard to high burnup fuel. As I've noted, as power plants are continuing to be more effective and efficient and better utilization of fuel, that is resulting in higher burnups of the fuel. And the question that has raised is with regard to storage but primarily in the area of transportation, is questions with regard to what might be hydriting or other phenomena, if you will, that is occurring with regard to the cladding of the spent fuel.

And from the standpoint of under the different transportation accident condition testing as well as if they were involved in a real accident, how would the integrity of that cladding withstand the impacts of different accident conditions or the accident situations or accident conditions with the regulations, primarily looking at, if you will, from the standpoint of impact tests.

And this is, as noted in the overhead, has raised questions with regard to how much we know or don't know about the ability of that material to withstand -- or to maintain its integrity, withstand the different accident condition tests.

I have noted under considerations this issue is related to a topic I have discussed with regard to burnup credit as well as moderator

exclusion. If under burnup credit we are able to allow burnup credit for the spent fuel and if under accident conditions there were to be some recombination of the fuel under burnup credit, some of the considerations with regard to maintaining subcriticality we'd be able to demonstrate through modeling and analysis.

Related to moderator exclusion, if moderator is excluded from the package, then the physical -- potentially physical reconfiguration of the fuel inside the container would provide some measures with regard to safety and analysis. It would provide us a basis for perhaps moving forward.

I've noted in the third bullet other considerations or additional like poison to the package. I would note though that many of the package designs today are optimizing how much fuel can be placed into the canister so that if we are looking to add additional poison or other materials, that would then tend to reduce the available storage space.

Now there are a number of activities underway both within the NRC and outside the NRC. I have noted that there is a workshop coming up early February -- I believe it is the last week of January, early February in California. The focus of the

workshop is on hydriting of cladding. And gaining a broader understanding.

I understand this will be both a national and international participatory workshop. We will have staff from our office involved as well. As well as we have had numerous ongoing discussions with the nuclear fuel vendors.

Often times when I refer to a vendor, I'm making reference to a transportation package, cask, or transportation cask designer. We have had ongoing interactions with the fuel vendors, the global nuclear fuels, the Westinghouse companies, for example, with regard to information and activities they currently have underway to develop a better, improved understanding of the fuel -- of high burnup fuel and the integrity of the cladding materials.

The third bullet makes reference to a collaborative effort also the Department of Energy, NRC, and EPRI have had underway to address and gain a better, improved understanding of high burnup fuels. And again I'd offer this is an area as the Advisory Committee is interested, we will keep the Advisory Committee staff informed of progress and opportunities for engagement as the Committee may with.

The last slide I have identified a few

areas. The first is the Transportation, Aging, and Disposal Canister. Lawrence had noted the Department of Energy, as part of their repository design, has developed and made available the performance specifications. I believe they are called the preliminary performance specifications for the TAD canister.

This is an area, as Lawrence noted, that the TAD canister transportation, if you will, would be under Part 71. Aging is considered part of the inherent activity at the repository. Disposal, of course, at the repository as well. But the Department of Energy has asked that these packages also be evaluated under Part 72 for temporary storage, for example, at a power reactor facility. So that would be storage at the power reactor facility or another interim facility as it is, if you will, incidental to its eventual journey to the repository.

Our two divisions are working very closely together to be sure that we are integrating amongst our technical staff these technical-type issues that we are raising whether it be a Part 63 disposal-related or aging-related question or issue or a transportation, Part 71, storage, Part 72 issue to be sure that we are fairly integrating and collaborating

amongst our staffs so that hopefully folks on the outside of the NRC would see that we are one agency. We may be addressing a Part 71 or a Part 63 issue but we are one agency collaborating amongst ourselves with regard to issues and considerations involving the TAD canister design.

The second area I have identified -- now I have mentioned moderator exclusion, burnup credit, as well as high burnup fuel, and my second note is increasing complexity of our casework.

The vendors, over the past few years, clearly are looking to optimize their designs, if you will, reduce their margins, increase the capacity whether it be for storage or transportation and that is with regard to our technical staff has, if you will, quite a significant challenge with regard to the types of reviews, the levels of reviews, some of the margins that we felt comfortable with before that might allow a less -- a more scoping type review as opposed to a more detailed review.

Those times are changing. And so these are areas that as certain cases come along that might be of a nature that might be appropriate for Advisory Committee engagement or information, again, this is an area that I will identify to the Advisory Committee.

We may engage at the Committee's interest.

The last topic -- and actually I have to admit when I was preparing the overheads, this was before the Congress had closed but I think all of you are aware that the national strategy with regard to spent fuel management and now I'm looking at it from the standpoint of some of the Congressional proposals that have been proposed in the last Congress with regard to interim storage facilities.

There was one proposal of having facilities in each of the states, maybe a regional -- a statewide facility in each of the states where spent fuel was generated. That was under consideration of having a SPISB at the Yucca Mountain repository location and other considerations. I have this on here.

There has been quite a bit of continuing debate and discussion at the national level with regard to the overall management programs and strategies for spent fuel. And this is one that we are trying to watch very closely.

Gary Janosko made reference as well to the Global Nuclear Energy Partnership. And it, too, has potential ramifications that might influence our office with regard to whether it be recycling or

reprocessing and the increasing transportation of spent fuel as well as other fuels that might be supportive of some of the advanced reactor concepts in the GNEP program.

Those are aspects that would impinge and impact our office as well as well to the extent there is reprocessing or recycling may change the profile of spent fuel that might eventually be in the TAD canisters.

So I would note that those are areas that are downstream. We are trying to keep our eyes open and maintain awareness of what might be evolving programs in that regard that might have a direct influence not only on Spent Fuel, Storage and Transportation Division but other parts of NMSS.

And that completes my planned remarks. I guess at this point Jack, I believe, has a few closing comments he would like to make.

MR. STROSNIDER: Okay.

MR. BRACH: Thank you.

MR. STROSNIDER: Thank you. That was sort of a whirlwind tour of what is going on in the office. One of the things, as I mentioned earlier, I think we have all the right pieces to deal with fuel cycle safety in the office. And one of the key things I

hope we will be able to accomplish is the good sort of cooperation, coordination of our activities as Bill and others talked about because there is a real nexus between all these pieces.

Sam Jones is handing out a brochure on the Office of Nuclear Material Safety and Safeguards. It gives a brief summary of the responsibilities of each division within the office. And it also has the organizational chart with the managers pictures on there so you can put some faces with the names.

I did just want to call to your attention on that vision statement on the front of it. And a part of that I wanted to focus on was our goal to be a world class high performing organization. And as I said in my opening remarks, we really appreciate the expertise that this group brings and the independent observations and input that you provide on our programs because that helps us achieve that world class status that we want to be as an office.

So with that, thank you very much. And I guess we will -- I'll stay here so I can direct the questions to the right person.

CHAIRMAN RYAN: If you fellows want to come up and just at the front table, that would be all right, too.

MR. STROSNIDER: Okay. Let's get a couple of chairs.

CHAIRMAN RYAN: Sure. We will get a couple of chairs and take a minute. And while we are getting that organized, Jack, let me second your thoughts that our collaboration with you helps us meet our goal which is to provide the Commission advice on topics of significance and interest to them in accordance with our action plan and our annual plan and our charter as well. So we appreciate that cooperation.

I'd be remiss if I didn't recognize Sam Jones who is our point of contact. He is the one that carries messages to and from and does it very well. And we really appreciate his continued interest in our work and our work together.

MR. STROSNIDER: If I could, before we start the questions and answers, I wonder if we could get the projector turned off.

CHAIRMAN RYAN: Yes, that would be great. We can do that.

MR. STROSNIDER: Unless that is a new technique.

CHAIRMAN RYAN: If I may, just let me start I think with Lawrence Kokajko and the High-Level

Waste Program. Lawrence, welcome to your new assignment. It is a challenging job and it is of national importance. And I'm glad you embrace it.

We have been thinking, of course, as we read the announcements from DOE on 2008 and the license application coming in, you might recall we were kind of geared up when the decision was made to change the standard. And we are working toward a date there as well. I think we are getting back into the mode.

And as we think about that, and how we are preparing ourselves and trying to advise the Commission and certainly interact with you and DOE and others, we're trying to focus on the risk significant things.

So let me just leave that thought with you to say what, from your view, will be the risk significant issues where we can provide the best counsel and advice and interaction with you that helps us to do a better job of advising the Commission? I think you have touched on a couple of the igneous activities. Seismic issues are a couple.

But I just want to share with you our focus is to expend our time and resources on those things that are risk significant where we can add

valuable commentary to the dialog as we move ahead.

We have also -- we are thinking about how we will interact with DOE and what briefings we might get from them. And certainly we want to stay cognizant of the activities and exchanges that you are having with the idea that we don't want to duplicate effort.

If you are attending a briefing and we can gain from that, we hope to stay in touch so we can learn those schedules and participate in a meaningful way. And vice versa. If we're going to have briefings, we will obviously keep you up to date so you and your staff can certainly benefit from any information that we gather in our forum here.

So I that is something I know we are both interested in being as efficient and economical as we can and getting our work done.

MR. KOKAJKO: I appreciate that. I agree with you. I know you all are on track to continue to deal with the igneous activity area. We, of course, are hoping to have a technical exchange with DOE in January or February on the TAD specs. And, of course, Bill Brach will be involved in that one as well. And clearly, you know, your participation and attendance would be most welcome.

You mentioned seismic, peak seismic ground velocity is an item that I think might be useful for you to become involved in. And you can start by looking at our letter last September. That could be very helpful.

And, of course, our ISG reviews as well. I know you are going to get a perhaps an opposing viewpoint this afternoon on our ISG1, on Seismic, but I think it is -- I think it would be helpful to have you take a look at, you know, the work that we are doing and how we are preparing to review the license application since this essentially supplements the Yucca Mountain review plan.

An area that I think we perhaps can talk more about later is a topic that is being discussed internally is on drift degradation. And I think that perhaps a future workshop under the auspices of the ACNW would probably be a good idea and I'd like to, you know, work with you to see how best we can do that.

CHAIRMAN RYAN: Sounds great. And again we will work to get all that on our rolling calendar so it is timely, efficient, effective, and uses our resources to the best possible advantage. So well said, right? So we appreciate that. And I'm sure we

will have a good dialog as we move forward.

Let me turn to the other members of the Committee. Jim, you want to start with any questions for anybody?

MEMBER CLARKE: Just a couple questions. Lawrence, you mentioned that the EPA is on track with issuing the standard, which will be a final standard. That's right?

MR. KOKAJKO: Correct.

MEMBER CLARKE: And is that for `07? When is that scheduled?

MR. KOKAJKO: I think they are trying to get something published before the end of this month.

MEMBER CLARKE: Before the end of this month? Okay.

And I had a question for Bill. You mentioned both GNEP and TAD. The specifications for the TAD, I believe, came out last week or very recently. Is it too soon to have an estimate of when they might be available?

MR. BRACH: Well, no, it is not too inappropriate to ask the question. I have a similar question but from the standpoint I was asking DOE just last week, we had a quarterly management meeting with them, and I asked them the question from the

standpoint of when we, the NRC, may be expecting applications from vendors coming to us.

The comment was that the -- the response was that they expected that the applications would be in to us at least by June of 2008, matching, if you will, with the date for the repository application. But they noted it may be in advance of that date, recognizing that the Department of Energy is planning, if you will, in the marketplace to, if you will, compete the various cask designers with regard to having multiple cast vendors designing tab specifications. And recognizing that that is a fairly competitive market today and I would envision it to be a competitive market in the future.

That June 2008 is probably the outside date with a date between -- oh, well, heck, I can't say between today and then but in the -- probably somewhere in advance of June 2008 I would anticipate applications.

Now that is coming in to us. Typically a review on our part takes about a year for transportation, about roughly two years for storage, that includes the rulemaking time frame for the Part 72 rulemaking to proceed as well.

So from the standpoint of applications

into us, if it is June 2008, taking that as the outside date and one to two years after that for the completion of the technical reviews, assuming that the completion is an issuance of a certificate. And then deployment would be within a year or so after that.

It takes a period of time for cask development and then deployment. So it is still a few years away which would also then mean that the current dry cask storage systems that are being used today will be in use for the next few years anyway.

MEMBER CLARKE: Okay. Thank you.

The other question is -- just so I understand the TAD, the TAD is the final container for the spent fuel and will go directly into the repository. In other words, it will not be reopened once it is loaded.

How does that -- or has any thought been given to how that coordinates with GNEP or spent fuel, ISK, to be used in a reprocessing, recycle --

MR. BRACH: I'm really not in a position to answer that.

MEMBER CLARKE: I know.

MR. BRACH: At the end of the presentation, I was trying to make reference to a number of initiatives and considerations that we are

trying to maintain cognizance of. But personally with regard to --

MEMBER CLARKE: I know these are DOE decisions but I just thought I'd ask.

MR. STROSNIDER: I can only give a very general answer and again I would reemphasize the focus of this office now where the lead for GNEP activities is in Fuel Cycle Safety and Safeguards.

But we recognize very clearly that depending what would happen in either reprocessing or recycling or the different methods that that could impact the waste form that would go into storage and transportation. And ultimately into the mountain.

And so I think, as I said earlier, we have the right groups to be prepared for that. We are looking at our regulatory infrastructure in terms of what would we need to do to address the potential scenarios that could come out of that. But, of course, it is a national policy level decision which will depend on some Congressional decisions and those sort of things.

But part of the reason for putting this office together was to be ready to address that. But I realize that is a pretty general answer but just as Bill said, we are watching as close as we can and

trying to anticipate what we will need to do to fulfil our role.

MEMBER CLARKE: If I have just add to that question, I'm trying to study the chart here a little bit and understand where the uranium in situ leach mining activity is. It is not specifically identified.

MR. STROSNIDER: I may have gone over that a little too quickly but that was actually transferred to the new office that is in the Division of Waste Management and Environmental Protection. Okay. Larry Camper is sitting back there.

MEMBER CLARKE: Okay. That's great. I just wanted to make sure I was clear on that part.

MR. STROSNIDER: The rationale for that was the recognition of the close interactions of state involvement in a lot of those environmental activities that are associated with that. And so we felt it was good to have it in that office.

And, of course, it had been there historically. It has been back and forth. But it is back there again.

MEMBER CLARKE: Well, I think from the meeting we had yesterday in briefing the Commission, it was clear from Larry's comments -- I don't want to

steal your thunder but with the groundwater protection being the key issue between two agencies, that made a lot of sense because it is similar to what they deal with in other areas.

All right, thanks.

MR. STROSNIDER: I just want to make that clear.

MEMBER CLARKE: Okay. Thank you, Jack, that was a fine answer to the question.

MEMBER WEINER: I would like to follow up on some of the questions that were asked of Bill Brach naturally. How are you addressing the question that the utilities have raised of fuel that is already canistered in various canister designs sitting in storage, dry storage?

MR. BRACH: Are you making reference to the transportability of the --

MEMBER WEINER: Yeah.

MR. BRACH: Right. When dry cast storage first was put into practice, all of the dry cask storage systems were, we call them single purpose but storage only. There are -- and there are a number of casks that are currently deployed at plants across the country in storage only casks. In the last couple of years we've had a number of I'll say preapplication

meetings with vendors of some of these storage only casks designs as they're looking at ways that they can design and submit to us and application for a transportation overpack the would allow the transportation of those packages without having to reopen and repackage, if you will, the inner contents.

We had not -- none of those have come to completion or issuance, if you will, where we have concluded or issued a certificate but we've had quite a few pre-application meetings engagement with vendors with regard to looking at how a -- on their part, how they can design a transportation overpack to transport those packages without having to reopen them.

MEMBER WEINER: So the overpack would then have to meet the cask -- Type B cask standards.

MR. BRACH: Yes, it would, yes, the entire package, the contents as well as the overpack and packovers would all have to meet the Part 71 transportation --

MEMBER WEINER: Well, I'm really glad that question is being addressed because that comes up quite frequently. Have you -- I know that you all have -- that DOE has transferred a triga fuel which hydrites. Have you looked at the condition of that fuel after transportation? Are you taking any looks

at how that would effect any potential accident scenarios?

MR. BRACH: Personally, I may have to refer to technical staff who may be a little closer to this than I am. Clearly transport triga fuel has occurred for a number of years. Now, with regard to examination of the fuel condition after transport, I'd have to look to staff to see do we have any information on that, Ed, or -- are you familiar, Ed?

AUDIENCE MEMBER: No.

MR. BRACH: That may be a question I need to follow up with John or Frank. I don't have -- personally, I don't have that information, but let me see what we can do.

MEMBER WEINER: Yeah. It was just a general question because this, it seems to me would be a source for lessons learned on transportation, the fuel with hydrites. Do you anticipate any changes in cask design as a result of transporting high burn-up fuel, because you're going to have some thermal stresses that you didn't have before?

MR. BRACH: Well, it's probably a little early to tell. First, frankly, I'd be looking to the vendors to in making that analysis, their proposal. I really would wait to see what the vendors are

proposing with regard to -- again, I identified a moderator exclusion and burn-up credit are two aspects that may help address the transport of high burn-up fuel where the issue of high burn-up fuel would be. Potentially reconfiguration of the fuel under accident -- in an accident or under accident conditions. But with regard to any materials or other design aspects, personally, I'm not aware of any but I would look to the vendors, if there's a need to be, what they would be proposing.

MEMBER WEINER: A question for Mr. Kokajko. We've heard off and on that technical exchanges with DOE won't continue, are going to be limited and you talked about continuing technical exchanges. What's the status of those?

MR. KOKAJKO: I believe we will continue the technical exchanges. In fact, we believe we have a commitment from Morris Rhoat (phonetic)that he wants to see these exchanges continue. However, you know, DOE as they're preparing their LA is working on a schedule that clearly is going to be pretty intense right now. And that what we need to do is somehow get involved with their schedule to say, "Hey, we want to have, you know, some moments where we can have these technical exchanges", and as they develop their work,

we will then offer the opportunity to have technical exchange on those sets of topics.

That has not been worked out yet. They're just recently they're coming up with a strategy to finalize their LA and until that happens, you know, we can't do it. Now, we are planning, you know, hopefully a technical exchange on PAD in February and I understand by that time they may have a little more certainty as to when their products are going to be ready and then we can follow on with the tech exchanges. Our goal is to have then as early as possible. Theirs, of course, is to get their LA in. So we've got to figure out some mutually agreeable way of getting the information. But Morris Rhoat has indicated and Paul Bauman (phonetic) at the quarterly meeting, that he's interested in doing this and so we're going to continue them.

MEMBER WEINER: Thanks. I'd like to close by commending Jack Strosnider for the statement that you're going to include ACNW in your planning. I know that that was a question that came up some years ago and we were hoping that that would happen, so that's great. Thank you.

CHAIRMAN RYAN: If I could just, Gary, let's talk for a second about GNEP. I mean, we heard

a few briefings just kind of scratching the surface a bit. And one of the thoughts that caught my attention and I think caught the committee's attention was a slide where it showed what wastes are going to be generated. Uranium oxide was listed as a Class C waste. I said, how did it get to Class C? This was a DOE presentation. And they said, well, there's some TRU in it. And I said, how much. Well, we don't know yet. Well, it could be Class C grade or Class C TRU or high level waste based on how much. So it raised the question in my mind that from our perspective, what goes where, the devil of the details of what goes where is really a big part of thinking of GNEP from a waste perspective.

You know, how much will be low level waste, how much will be high level waste? And even, is there any rationale for thinking about an intermediate level waste category. I take note that a lot of the countries of the world that have reprocessing have an intermediate level waste category for lots of reasons that you know, may be fully appropriate or not appropriate in our case. I don't know. So you know, other than the facilities themselves, whether it's the advanced reactor or the reprocessing facility, which obviously are very big

challenges in complex facilities that need lots of technical attention in their licensing.

How about the waste side, are you thinking in that area as well or is that something that we should think more about or -- that's a big question. I'm sorry to just kind of overload you but I didn't want you to go away empty handed.

(Laughter)

MR. JANOSKO: My feelings weren't hurt up to this point. Dr. Ryan, actually, I'll have to defer to our GNEP experts who will be here tomorrow morning.

CHAIRMAN RYAN: And that's fine. I just wanted to tell you we're thinking about that, and that's --

MR. STROSNIDER: I'd offer a simple answer to your big question, though, yes. I mean, we agree that is an issue that we need to understand and we need to follow. And again, depending upon how GNEP evolves and which processes are decided on and what comes out, we'll have coordinate closely with our counterparts in FSME with regard to the various levels of --

CHAIRMAN RYAN: That's really kind of why I asked the question, with all of our folks here in the audience is that is obviously a point of

coordination.

MR. STROSNIDER: And I see Larry's head going, yes, yes, yes. So I think we're all in agreement.

CHAIRMAN RYAN: And I think that's an area, you know, as GNEP evolves a bit, that's an area where the committee certainly will be taking some interest. Thanks. Allen.

VICE CHAIRMAN CROFF: I'll defer my GNEP questions until tomorrow. I think that we'll have an intensive discussion. On SILEX and noting there may be sensitivities and if so, say it but do you have any sense whether SILEX raises any unique technical issues you might not see in gaseous diffusion or centrifuge?

MR. JANOSKO: Absolutely, and you're right, the details of that would be considered classified information but there definitely are considerations in that regard, proliferation considerations that we need to be very careful when dealing with that information. As I mentioned, a lot of the information dealing with the process itself basically slides into sensitive restricted data category, so it would be very difficult to discuss much about the process itself.

VICE CHAIRMAN CROFF: Okay, I'm going to suggest to the committee, you know, I'd be interested in getting a briefing on SILEX. I have no real sense of what it is, if you will, equipment-wise and I don't know if the rest of the committee is interested. It would have to be obviously, a closed briefing or if the committee is not, you know, I can come in for a one-on-one at some point but I --

CHAIRMAN RYAN: Let's leave that open and we'll think about it and talk about it some more, but yeah, that's an idea.

VICE CHAIRMAN CROFF: Talk about it a little, at least an educational thing just to understand what it is, because I just don't have a feel.

MR. JANOSKO: I have a very short list in front of me of unclassified information. It will take me 10 seconds to read it, so let me do that.

VICE CHAIRMAN CROFF: Okay.

MR. JANOSKO: Basically SILEX will enrich uranium up to five percent enrichment, utilizes UF6 in gas form and multiple machines will be required in various test cases. Beyond that, anything additional details basically --

(Laughter)

MR. JANOSKO: We briefed the commission on this topic and had to be very careful about what it is we said and we had to limit it basically to that description. And aside from that, it does stray into classified space. So appreciate it, please, we'll be in touch.

CHAIRMAN RYAN: We'll follow up, okay, great.

VICE CHAIRMAN CROFF: Okay, on the MOX plant, the ACRS has had the lead in general on it but we've been involved in it and got well at least previously tried to bore in a little bit on the waste management aspects. And at the time we did it, this goes back at least a year, there wasn't much detail in the then available documentation. I'm assuming the LA will have a lot of detail on this. Do you have any insights as to where they stand on managing their waste to -- as I recall it previously, the -- was it Duke, whoever is building this plant, basically said they were going to throw the waste over the wall to Savannah River site.

People in DOE, some elements of them said, "Well, oh, no, you're not", and that's sort of where it stood at the time. Do you have any sense of where they're going on their waste management at this point?

MR. JANOSKO: I'm going to refer you question to a staff member in the audience, Bill Trekofski, who is Mr. MOX and allow me to ask Bill that question.

MR. TREKOFSKI: There has not been a lot of changes. It's still been a somewhat fluid situation with DOE there as far as what they've gotten in the license application with our doing the acceptance review and we'd be pleased to get with the ACNW staff and update on them and have them forward that to you.

VICE CHAIRMAN CROFF: I think we'd still be interested in it. Whether we do it in an ACNW meeting or as a part of a briefing for the ACRS that we would attend, we'll have to sort that out. That's the way we did it before. It was an ACRS meeting. But our, you know, assuming that they can get it over the wall, meaning DOE will take it, our interest at the time is making sure they had safe shutdown capability. In other words, if they shut down and they couldn't get the waste over the wall for whatever reason, that they could handle it you know, for some realistic amount of time and not get into trouble. So I think --

CHAIRMAN RYAN: Yeah, I think we actually

focused on maybe even three time horizons of, you know, this week, you know, this six months or five years from now. I mean, there's three different time horizons to think about of short, intermediate and long on the safety questions.

VICE CHAIRMAN CROFF: Okay, but if you're briefing the ACRS on this thing at some point in the future, I think maybe getting the staff in the loop and getting some people up here we may be able to handle that way.

MR. JANOSKO: Certainly.

VICE CHAIRMAN CROFF: Okay. Thanks.

CHAIRMAN RYAN: Mr. Hinze?

MEMBER HINZE: Thank you, Mike. My comments are directed primarily to you, Lawrence, and certainly I was extremely pleased to hear that you and your staff are going to participate in our working group meeting in February on igneous activity. It's very important to us that we do have a rather thorough review by your staff of the positions that we have stated that the NRC has taken with regard to the various elements of the igneous activity problem, and we look forward to your comments on the scientific aspects as well as the regulatory aspects of that.

And I'm sure we'll end up with a much

better document. Mike has commented about the risk significance of what we are doing and what we are all doing. Some years ago, a couple of years ago, your staff prepared a report on risk insights from the old TPA. I'm wondering if the new TPA is leading to any variation in their risk insights to the problems of Yucca Mountain. Do you have any insight into what the new TPA is doing in regard to the risk significance?

MR. KOKAJKO: It would be premature for me to comment on that at this time, primarily because the revised code is in development and until that time is over, we really don't have any -- there are no further risk insights at this time but if that does happen, we certainly will.

MEMBER HINZE: Right, that's terribly important that we keep up with where you are in terms of that.

MR. KOKAJKO: I recognize that.

MEMBER HINZE: Perhaps I missed it, but when do you anticipate that being completed and will we be briefed on that?

MR. KOKAJKO: We can brief you on that, but it won't be ready until toward the end of 2007.

MEMBER HINZE: The end of 2007. As you mentioned we are going to be hearing later today about

the response of NEI and EPRI to one of your interim staff guidances that relates to the Yucca Mountain Review Plan. I'm wondering and I don't want to get ahead of their presentation, but I think there is some concern being raised about the role of interim staff guidance and how it fits into the overall review of the license. Can we anticipate further interim staff guidance reports coming in?

You've mentioned four of them and could you give us a bit of philosophy of the management here in terms of the use of the staff guidance? Can we anticipate that there will be a change of the Yucca Mountain -- a revision of the Yucca Mountain Review Plan eventually incorporating these or where are we headed with that?

MR. KOKAJKO: I don't also want to speak for Bill Broad or Jack but I'll try for just a moment and let you guys chime in. First of all, interim staff guidance as a term of art, was adopted in the Spent Fuel Project Office back a number of years ago and that was a process by which the staff had met some what seemed to be some intractable problems and we -- and that the Standard Review Plans did not address and I think all the Standard Review Plans at the time in SFPO were still in draft, I believe.

And so these were concerns and problems that we needed to move forward on. And so the first six, I believe, in SFPO were generated to get over those issues. I was there at the time and so I had some experience in what they were dealing with and that helped move some of the licensing reviews along. Similarly, in the Yucca Mountain Review Plan, we have some areas that the guidance was not as clear or precise or perhaps needing clarification such that we anticipated there being a problem in an application of the Yucca Mountain Review Plan and in this case, seismic event sequences was one such topic.

And it is still guidance to staff. We can do any number of approaches as to how they want to address regulatory compliance. But this is our view of how a certain process could be followed for us to confirm and ultimately make a regulatory decision on whatever DOE submits. In terms of a revise in the Yucca Mountain Review Plan, I don't think -- I don't think, but I have not made any judgment that we will revise the Yucca Mountain Review Plan. We're talking essentially if the LA comes in on June 30th, 2008, roughly 18 months from now, and I would rather be using my time to prepare and supplement the review plan as needed rather than trying to spend the time to

go through a formal process of revising the whole review plan.

I think that it's just not a good way of utilizing limited resources. Now we did meet with NEI and EPRI before we issued ISG-1 and the Repository Safety Program and we heard what they said and we went ahead and issued it anyway. I will tell you NEI and EPRI's concern is broader than just the Repository Program. I think they view this as applicable to whatever NRR is doing, the SFST, I used the acronym right, didn't I. So I think their issue is broader than just limited to repository operations.

MEMBER HINZE: Right. The term de facto regulation is one that we hear in regard to the --

MR. KOKAJKO: Yeah, I don't buy that. I think -- I don't buy that at all. I think that it was meant to provide guidance to staff to try to deal with very difficult problems that needed to be addressed and you know, no one has said that the staff is really wrong. I mean, I think -- and again, so I'm looking at aid to the staff and that's been my prime concern all along.

MEMBER HINZE: If I may, Laurence, are there any reports come of the center or out of your staff that are on the horizon that you can see that we

would be interested in and are important to the high level waste program?

MR. KOKAJKO: I mentioned one after Mike Ryan's earlier opening remarks during the questioning period. There's one on drift degradation that's coming out. I clearly would like you to take a look at it and you know, and as I said, I would hope that you may consider a workshop on that so we can get some other eyes on it and maybe some other people from outside to take a look at what we're doing and I think that would be of interest to you as well as interest to us, so I'm looking forward to that.

There are some other variety of things that could be coming out soon, but I'd have to go get a listing and get it back to you somehow. I -- my brain is older now than it was before, so I don't remember the --

MEMBER HINZE: We've been looking forward to the airborne remobilization report. Is that on the immediate horizon?

MR. KOKAJKO: I couldn't tell you offhand. I don't see anyone back in the audience that could answer that but I can follow-up on that.

CHAIRMAN RYAN: Well, maybe we could take the action that we'll communicate with Laurence, you

know, after the meeting and understand any other items that might be coming along and we can follow up.

MEMBER HINZE: As we prepare the Igneous Activity White Paper, there is obviously a hole there in the airborne remobilization and it's -- we hate to leave that hole in the White Paper.

MR. KOKAJKO: To be honest, I don't know if any time soon it's coming out but I can find out.

MEMBER HINZE: Thank you.

MR. STROSNIDER: If I could come back just for a second to this subject of interim staff guidance, I just heard and you'll hear industry perspective this afternoon, but I would share just a couple of thoughts. One is, I think you know, I believe there is value in writing down this sort of guidance, writing down the expectations and I have asked in various public meetings of licensees and of DOE whether they see value in it and the answer I got was yes.

And having said that, there are at least two issues that come up and one is the de facto regulation issue. That is, are we doing more than guidance or are we changing, trying to change regulations or et cetera. That is not the intent of it. We shouldn't be doing that and I've told the

industry and NEI if they see that, they should bring it to our attention. They have the opportunity to comment and you know, that's not what we intend to use that for. So that's a legitimate, you know, question, if you will and I don't think we do, but if the people think we are, then they should call us on it, and we need to deal with it.

The second part of it is the process issue, which if you look at all the agency processes and I know this has been brought up in discussions we've had with NEI, is this duplicative or and do we need this process, are there other vehicles that we could be using to do the same thing. So I know those are at least two of the other issues. But I think fundamentally, the message I'd want to leave you with is that it is important.

You know, when I look at our strategic goal of openness, you know, part of my interpretation, I think the agency's interpretation of that is to make sure that our expectations are clear, that people understand the process, they understand the opportunities for participation and they understand our expectations. And this is one way that we get that documented. It certainly encourages a dialogue that I think, you know, adds value to the whole

process. So, yeah, we need to be careful that we're using it for what it's intended to be used for. There may be some questions about various processes for accomplishing the same thing but fundamentally, I think it's of value and I've had that feedback from licensees.

CHAIRMAN RYAN: Jack, as a former licensee and applicant in a number of arenas, I would tell you that I really appreciated any time I get clear guidance or there was clear guidance written down of what I needed to do or what the review would be about and all that, so I will second that motion.

So I think that's very important and I think the comment that you just made that if people feel it's something other than that, they're more than welcome to challenge it. It's also an openness approach and I think that's to be commended as well, but from my own personal experience when there was clear guidance on what was expected, it's a whole lot clearer and your task before you becomes a little more straightforward. So three cheers.

Ruth, you had one question you wanted to ask.

MEMBER WEINER: I had a quick follow-up question for Larry Kokajko. Is there still the

difference of opinion over drift degradation that we heard from the Center and from DOE several years ago?

MR. KOKAJKO: Difference of opinion in --

MEMBER WEINER: Yeah, difference of opinion as to what the mechanism was, how likely the drifts were to collapse and so on.

MR. KOKAJKO: You mean between staff and DOE or --

MEMBER WEINER: Or between -- well, we heard it from the center, between staff and DOE basically.

MR. KOKAJKO: Well, the answer is, we clearly have some disagreements. The extent and nature of them, I think, is still to be fully determined. We've not come out with a final report. I do believe we have some relatively general consistency internally but, you know, this hasn't been hashed out yet. And I know the DOE is taking some different views on some things than what we have, and I mean, that's what regulators are supposed to do. You know, find these things, get them out there and make the judgments and so we're still waiting.

And remember, there is no DOE position, there is no NRC position. We're still in a pre-licensing, pre-application phase and we're just sort

of understanding where we each are at this moment.

MEMBER WEINER: Thank you.

CHAIRMAN RYAN: Yes, sir.

MR. BRACH: If I can, I'd like to go back to a question from Dr. Weiner. She asked me earlier about triga fuel and in the intervening time during questions and answers, I did get some additional information I'd like to share with you. We have had, over the last year, a series of pre -- what I'll refer to as pre-application meetings with the Department of Energy on their standardized cannister they're planning for use of transport and eventual disposal. And the standard DOE container would include triga fuel and staff has pointed out to me in our discussions and meetings with DOE, they've not identified to us nor have we seen any information yet with regard to triga fuel and its ability or any hydriting or structural integrity questions, although they did point out that DOE is considering that all the fuel would rumbilize (phonetic)in the cannister under accident conditions. So whether that is based solely on the technical information that does raise into question the continued integrity or if that's being looked at in more of a simplistic, I'll say assumption and modeling case, but they are looking at

rumbilization of the fuel in the cannister as one of the considerations. That's also in conjunction with moderator exclusion considerations as well. I just wanted to provide that additional information. I apologize I didn't have that at my fingers before that. Thank you.

CHAIRMAN RYAN: Dr. Larkins?

DR. LARKINS: I just want to make one comment. Ruth, you mentioned about communications and coordination. I just was going to say I think communications and coordination has been excellent this past year. I had a chance to participate in NMSS's planning a retreat for the first time and I think that was an excellent exchange and opportunity that Jack provided for me to help keep the committee informed as to what was going on in NMSS and so I think it's been good and hopefully it will continue to be excellent.

CHAIRMAN RYAN: Thank you. I mean, I think in closing I'll say we really appreciate, Jack, you and your management team coming down and giving us this very informative briefing. I know it's going to help us become more focused and efficient in our work and hopefully our interactions with be will be constructive and helpful to you as well. So with

that, I'll say thanks very much unless there are any last questions. Thanks very much.

MR. STROSNIDER: Thank you for your time.

CHAIRMAN RYAN: Thank you. With that, we're at the appointed hour for our lunch period. We'll break until 1:00 p.m. and we'll reconvene promptly then.

(Whereupon, at 11:30 a.m. a luncheon recess was taken.)

AFTERNOON SESSION

1:02 p.m.

CHAIRMAN RYAN: All right, I guess we'll reconvene and start our record again, please. Okay. The next presentation is going to be led by Dr. Clarke and so, Dr. Clarke, I'll turn the meeting over to you.

MEMBER CLARKE: Thank you, Mike. Dr. John Till is going to be presenting to us on a methodology that he had developed to guide risk reduction for contaminants in the environment. Dr. Till is President of Risk Assessment Corporation. We're very pleased that you can be here. Thank you.

CHAIRMAN RYAN: If I may, Dr. Clarke, just to help John in the context of this, we've been on an adventure and I think Jim can offer comment as well, on looking at how to risk inform a variety of situations and we've spent a lot of time thinking about monitoring and modeling. For example, if you have a contaminated site, or an operating site and you detect contamination, is that a bad thing or a good thing? Is it trending upward or downward? What's the pattern that you see over time?

And the idea is if you can understand the relationship of your monitoring data to compliance, that's one thing you need to do. And then if you can

understand it in terms of risk or behavior into the future, that's the second thing. And I think when Jim and I talked about this, we agreed that hearing about John's work that he's been doing in this area sounded pretty exciting and is something that would address that very point of how do you take what seems to be a complex picture of lots and lots of data and sort it out so you really can tease out some risk significant information. So we're thrilled to have you here to tell us about your capabilities and how this works. So with that, I'll --

MEMBER CLARKE: Thanks, Mike.

DR. TILL: Well, thank you very much, Mr. Chairman and members of the committee for the invitation to be back with you today. It's been about two years, I think, since I was here before and it's always an honor. I may have mentioned two years ago and I think I did, that this project was underway called RACER, and that stands for Risk Analysis, Communication, Evaluation and Reduction. It's an acronym that we developed and it's catching on at a lot of places now and that's what I'm going to talk to you about today.

I am going to have two parts to this. One part, I'm going to go through some slides to explain

to you what RACER is about, basically how it works and a little bit about the history. And then the other part will be a demonstration of some of the software that we've developed that do just these things, Mike, that you've been talking about.

I need to give credit to my research team who worked with me on this project. That's a photograph of our team and also to Colorado State University because we're actually working for Colorado State University and those of you who may know Dr. Ward Wicker at Colorado State. Colorado State is actually the primary contractor to Los Alamos for this work and Ward is actually the PI on the project and it's set up that way so that we maintain our independence in what we do. And I'll talk about that a little bit more later, but we never would have gotten to this point without our independence from the Department of Energy and Los Alamos.

I think too, as I go through this, if you have questions, just hit me with those if that's all right, and then if I see that I'm struggling getting through the talk, I'll let you know, because I want you to see the software, because that's really the power of RACER are these tools we've developed. I've been in this field for 35 years now and what our team

does is to calculate risk to humans and the environment from radioactive materials and chemicals once they get into the environment. So you need to recognize my starting point is a source or what you might call a source term.

And I also want to clarify that when I talk about risk, it's probably different from the context in which you're accustomed to risk. My risk is to individuals. Generally, the end point is cancer or the incidents of cancer or some health effect to humans or ecology as opposed to the risk or chance or probability of an event that releases these materials into the environment in the first place.

So keep that distinction. That's just where I'm coming from. There's no reason why you can't in some cases, combine those and I know many people do. But over the years that I've done this work, I've -- this project, more than anything is really the culmination of like I said, 30 years of work and many studies on Department of Energy sites, on industrial sites and sort of if I had a chance to go back and help someone prevent bad things from happening, prevent legal situations from coming up, how would I do it. And that's really what RACER is about. It deals with current and prospective risk and

really most of my career has dealt with retrospective risk. But it's been a unique project and I'm very grateful for the chance to have an opportunity to talk to you about it today.

So if I had to boil down the basic principles that I've learned in 35 years, they would come down to this; and these are the principles of RACER. Some of you may not agree with me on these and I've talked to audiences who are very, very much in opposition to these points, but I strongly believe in these principles. First of all, that environmental data related to public exposures are public information. You may not agree with me on that. Some facilities strongly disagree with that, but I can tell you that if it's information that ultimately would be used to calculate a risk, a dose to the public, that it will be public information at some point.

My point to facilities is, get it out there, get it on the table. RACER is all about getting it organized and helping people understand it. The second point is that risk must be a fundamental starting point for decision making to protect the public. And again, people may not agree with me on that. We talk about human and ecological risk here but this is a starting point. Risk to humans in

particular, is the only common denominator we have for chemical and radionuclide exposure, and therefore, it is a good place to start. It's not the only factor in making decisions and I'll talk some more about that, and we all know that, but it is, in my opinion, the most fundamental starting point.

Why ecological risk, this is important because we spend millions of dollars trying to reduce human risk but at the same time, we destroy the ecology. And what RACER is about is trying to balance those two and make it very clear how we do this balancing between the two. The third point is that all sources of risk must be considered in evaluating public exposures. I'll explain what that means but I think you hit on that, Mike, too. RACER is not just about cleanup of a contaminated site. It's about an operational source, what's coming out of a stack. It's about a new facility that you might want to build.

I believe very strongly that you have to put all of this into one package and the reason you have to do that is because we often get trapped into focusing on one source of risk when there might be another source among the spectrum of the facility that's far more important. And then the fourth

principle is that readily accessible and user friendly tools must be available to aid in decision making about risk.

Frankly, I believe that the days are gone when we can simply issue a massive report that calculates risk to the public. We have to do far more than this. And I'm going to show you because this is what RACER is about, is providing tools that with a limited amount of training and experience on these tools, you can understand how to use them. The tools have to be transparent. You've heard that word many times. They have to be flexible. What that means is you need to be able to change the parameters used in these calculations very easily. They have to be repeatable. What that means is that someone could come behind you, if you've made the calculations with these tools and repeat them and come up with the same answer. And they have to be independent and that's a key factor.

I have seen over and over again and I know you have as well, where a facility who creates some report or some calculation of risk because of the lack of credibility or trust, cannot go any further with that document. If that calculation then is made by an independent source, it has more credibility. That's

just a fact of life in the business that we're in.

And then finally there has to be a process for public advice to decision makers. And I emphasize the word "advice". The public are not decision makers but they should have an avenue to advise the decision makers. Those are the principles that RACER incorporates.

This is generally the area that's addressed by the tools and in fact, the tools will calculate risk to anyone in the area. If you're familiar with Los Alamos, which is here. The National Laboratory is in the Historic Area here, the town of Santa Fe is here. I'll point out San Ildefonso Pueblo sits right in here, one of the Native American Pueblos sits right up next to the laboratory. Santa Clara Pueblo next to them, town of Los Alamos. Water resources are of tremendous value there and are extremely precious. Any contamination of any kind, chemical or radionuclides, in water there is a crisis if it gets offsite.

It will get offsite at some point. There is contamination there now and RACER is helping people to understand what this is going to mean when the material does get offsite. Okay, this graphic will try to illustrate the concepts of RACER and the

software and how it works, but we start on the left with what we call boxes, box sources. They might be contaminated sites, operational sources, new sources. There are background sources. At Los Alamos there are about 2,000 of these different sources within that boundary of the laboratory, 2,000 different sources. Most of these are contaminated land sites. They are historical legacy waste sites. They are not all characterized at this point and they're in a mode of trying to characterize these sources.

CHAIRMAN RYAN: John, could you give us a little bit more in terms of size and differences? What's the range here of all the sites?

DR. TILL: Well, Mike, they go -- some of these sites might be legacy landfill sites that contain low level radioactive waste and even some probably higher level stuff that was put there many years ago. These are material disposal areas they're called and those are acres on the order of probably several acres to tens of acres in size. Some of the other sites are much smaller. Some are not as large as this table. So it's a wide spectrum of the type of site and also the type of contamination.

Chemicals, a lot of explosives that were used there over the years, other chemicals, PCBs, you

name it, it is there, and then the entire spectrum of radioactive materials are there.

I'll say this, too, Los Alamos, I've studied DOE sites for years; Hanford, Rocky Flats, Fernald, Idaho, Savannah River. We've done historical dose reconstruction on those and more sites. Los Alamos National Laboratory is the most complex of any DOE site. And I say complex because of the spectrum of nuclides, the extent of the contamination there and also the ecology there is so sensitive, it's a very arid area. It is not a simple -- it's a very complex terrain if you're doing air modeling. So you name it, and it's thrown into Los Alamos.

My point would be that if you could do what I've done or what I'll show you and what we're doing at Los Alamos, if you could do this at Los Alamos, you can certainly do it at a simpler site much simpler, okay. Does that answer your question okay?

CHAIRMAN RYAN: Yeah.

DR. TILL: All right, so the point is that if we have sources to the environment, whether they're air or contaminated soil or in groundwater whatever they are, that we know that we have mathematical methods in our science today that will allow us to take these sources and make some kind of a calculation

using similar methods and to prioritize these sources and basically, I could run this software, I'll show you, and prioritize all 2,000 sources at Los Alamos and it can be done very quickly.

But the point is, we don't make our decisions just based on risk and that's what this is prioritized by is risk to humans. What we know is that in order to do something about these sites whether it's remediation or reducing risk from stacks or whatever, we need other information. We need to know something about ecological risk, cost, feasibility of a method. Culture is a huge issue there because of the pueblos, for example. And so trying to convince the San I Pueblo that a little bit of tritium in your water is not a big deal, is a huge deal. It is a real challenge. And so what we have is another tool. I probably won't get to this one today but it's called a decision support tool, and basically it says if you have these estimates of risk from different from different sources and you want to make some decision about reducing that risk you can take into account these other factors and it gives you a traceable way to show people how you made that decision.

This is really decision analysis software

that we've adapted for RACER.

MEMBER WEINER: Excuse me.

DR. TILL: I'm sorry, yes.

MEMBER WEINER: Excuse me, what decision analysis software did you use? I'm just curious.

DR. TILL: Precision Pro.

MEMBER WEINER: Thanks.

DR. TILL: Okay. Throughout this process it's very important that you tell people what you're doing and you document all the methods. All of what you see demonstrated in the software is documented in hard reports that has been peer reviewed and that was part of Colorado State University's function, was to provide a national peer review team for the RACER methodology. But we received input from the public and the public changed the methods. They changed the way that we laid out the screens and the RACER tools and they made a huge difference. The idea of RACER and I'll talk about this briefly, is that there is long-term some kind of advisory panel that works with the risk managers that understands the tools and how they work and they can provide feedback to the risk managers who ultimately make the decisions. But that's the concept of RACER.

The heart of RACER is the data base.

Environmental data are our most solid evidence and the most solid input material that we have to risk calculations if you have data. If you're talking about a future facility, you may not have release data but certainly you have environmental data that help to characterize your location.

When we got to Los Alamos, what we found was there are a lot of data. It's been collected there for years and years. It's been collected within the laboratory by different groups but they all have their own system, they all have their own data base. They all name their analytes differently and so we found that you couldn't just go in, take the LANL data, put it into a single data base that you could use for the RACER tool and it took us two years to get all the data consistent in a format, put into a data base that was retrievable and that's the RACER data base and I'll be using that today to demonstrate the tools.

There are five million records currently in the RACER data base that go back to 1956. But it's not just Los Alamos data. The regulator there is the Environment Department and their data have to go into this data base as well. They had the same issues within their department with regard to different

groups collecting different -- collecting the same data in different ways and so this took us a tremendous amount of work.

It's done. This data base is in ACCESS and we did that deliberately because we think these tools should be available to as many people as possible. ACCESS is readily available and it works. The vision for the data base is something like this, and you'll remember one of my key points we independence. The idea is that this data base would be maintained by what we call a technical steward, that is outside of Los Alamos National Laboratory. It would likely be a university, possibly a community college but they'd have to have a person dedicated to keeping up the data base to making sure it's maintained but the information from the laboratory, from the environment department, from EPA or any other data producers, would be automatically fed into this data base and then this would be available on the web for public and other end point users.

The data analysis tool I'll demonstrate in a moment, but really takes all of this information and lets you do things with it, lets you plot data on maps, lets you look at trends, special distribution of data, those kinds of things. It's a tremendously

powerful tool, comparison to standards, for example. This is an example, if you look at the data analysis tool, you're interested in getting a plot of cesium 137 in soil compared to background. This is the kind of a background that comes up. Every one of these blue dots or dots on the map, you could actually zoom in on, click on the dot, find out everything about that data point, when it was collected, when the analysis was done, everything about that bit of information.

The risk calculation tool, then, takes the information and calculates risk to humans. This tool is GIS based and every data point has a GIS locator associated with it. So the idea is, and you've been challenged with this, I'm sure many times, where you go talk to the public and say, "Here's how I calculated your risk. I'll let you breathe this much, I'll let you live here. I'll let you work there, I'll let you recreate over here in this canyon", and then they come up and say, "Yeah, but I don't live there. What if I lived over here, and what if I were an native American and I had a special diet that wasn't like your diet". Well, what I'll show you is that the tool is so flexible you just go in and on the spot make the changes and then you come back and you can

rerun the calculation and show that person what the difference would be. And you know and I know that generally these questions don't amount to much in terms of a significant change in the result, but the power of this is that at least you can show people on the spot rather than go back, make the calculation and get back to them.

So this is the idea is that the flexibility of scenarios is a very important feature. We talk about current risk, we talk about prospective risk and here is where we had to use 25 years of our experience. How do you get a groundwater model into a tool as simple as this or an air dispersion model into a tool as simple as this when you have a complex terrain? There's a way to do this and it's actually done by what we call environmental transfer factors. So you lay a grid over the area and if you take for example, a release from any point in this grid, we can calculate -- let's say this is air dispersion, we can calculate -- if we had a source here, we can calculate chi over Q is for any other points on this grid. So basically, all you have to do is come in, inject your source and you prerun these calculations so the tool is actually going into a massive spreadsheet to get out a result.

MEMBER WEINER: I have another question.

DR. TILL: Yeah.

MEMBER WEINER: Do you calibrate your results? Do you have any kind of monitoring against which you calibrate what you get?

DR. TILL: Yes, absolutely. Any validation that we can use and incorporate into the models, the air dispersion models, sediment models, groundwater models, we use to check the modeling, of course. This is a huge, huge step forward and otherwise RACER wouldn't work as simply if you couldn't -- if you didn't have a system like this where you could prerun your transport calculations. We have grids for air, we have grids for surface water. We have grids for sediment and I'll just give you a couple of examples of the risk tool and we'll come back and see these but if you were to ask the tool to show me Los Alamos and hypothetically put a person in every 100 meter by 100 meter grid across the site and let them stand there for a year, which is unrealistic, but this is the picture you would get back of risk to that person in that 100 meter by 100 meter grid.

And what -- I mean, to me this tells me a lot. It says, yeah, there's a lot of contamination

around there but the risk is pretty darn small. It also says there's a lot of area on Los Alamos that has no contamination whatsoever. I'll show you in the tool but we can zoom in into areas. The pink and red spots of course, are the areas of higher risk. This is Mortandad Canyon right here. It's a very highly contaminated canyon out there but you could go into these grids. You could see what the contaminates are. This is for radionuclide risk. You could look at the same graphic for chemicals. This is chemicals. This is a close-up of those same grids so you'll see this is Mortandad Canyon and you'll see exactly where the locations are of higher risk if that's what you're plodding.

If you wanted to look at 10 sources, for example, you could compare the sources. This is health impact value which is basically risk for 10 different sources across the site.

MEMBER CLARKE: And just to confirm what you said in your introduction --

DR. TILL: Yes.

MEMBER CLARKE: Those risks are cancer risks.

DR. TILL: These are cancer incidents risk. There's also a non-carcinogenic risk from

chemicals and that's a separate calculation which you plot separately.

MEMBER CLARKE: And the chemical cancer risk is additive, if you have more than one chemical, that's a total?

DR. TILL: Yes.

MEMBER CLARKE: A total risk?

DR. TILL: Yes.

MEMBER WEINER: How do you get from your dose to cancer risk?

DR. TILL: Well, we use risk coefficients and they're in here and I can show you where they are if I could get to them, but if you know your dose, if you have your exposure and you know your dose to various organs of the body for the various radionuclides, we convert to cancer incidents using risk coefficients. That's how it's done.

CHAIRMAN RYAN: I got a more sharp question. How do you get around the fact that you're calculating micro-doses to mega people?

DR. TILL: No, we're not --

CHAIRMAN RYAN: An unfair estimate of the cancer risk when you're at very low doses.

DR. TILL: Okay, wait a minute now. I'm calculating only a dose to an individual in the RACER

tool.

CHAIRMAN RYAN: Right, you can't use a global risk estimate and estimate risk to an individual cancer. You can't do it. It's just not right. Now, if you want to do it over a group and then look at Case A versus Case B as a relative measure, I've got no problem with that.

DR. TILL: Well, I understand --

CHAIRMAN RYAN: An absolute risk estimate, John, it's just -- there's no validation. It's the same as getting hit by you know, one-mile an hour wind for 200 hours or a 200 mile an hour wind for one hour. Same amount of air goes by me.

DR. TILL: Okay. But remember what I'm doing here in RACER is prioritizing.

CHAIRMAN RYAN: And that's a relative measure, so I'm okay with that. You've said that before, so --

DR. TILL: It's a relative measure, okay.

CHAIRMAN RYAN: -- I would just caution you to try and calculate or present it as an absolute cancer risk for an individual. That's an intermediate step towards the relative measure, right?

DR. TILL: That's fine.

CHAIRMAN RYAN: Okay, I just want to make

sure --

DR. TILL: And also if you had a risk coefficient that you preferred or maybe you're only interested in dose, that's fine. It's on here. Stop at dose if you don't want to go to risk. That's another factor.

CHAIRMAN RYAN: That's a nice flexibility to have.

DR. TILL: Absolutely.

CHAIRMAN RYAN: Okay, great.

MEMBER WEINER: I have one other comment along those lines. You talk about communicating to the public.

DR. TILL: Yes.

MEMBER WEINER: What this conversion of dose to cancer has done is, basically, to convince people that if there is any exposure, they will get cancer, because that's the simplistic way that it's interpreted.

DR. TILL: Well, yes. On the other hand, I'm convinced that one of the powers of this tool is the communication of a calculation, whether it's dose, whether it's a chemical exposure, whatever it is, it's all in here, and you can stop where you want. But for a relative comparison, I would agree - I would say

very strongly that I think we can use some risk end point for relative comparison, that that would be all right.

CHAIRMAN RYAN: My own view is I like the idea of the relative part, and I think we're on record as saying relative comparisons are very meaningful.

DR. TILL: Yes.

CHAIRMAN RYAN: We use them in ALARA in the workplace all the time. Method A gives this person, Method B, so if Method B is just as effective from an economic point of view as some other, and the dose is a lot lower, obviously, it's a numeric choice.

DR. TILL: Right.

CHAIRMAN RYAN: But, by the same token, I think Ruth's hit the nail on the head. We're also on record as saying absolute estimates like that are flat out wrong.

DR. TILL: Well, you don't have to use it for that, but RACER was developed so that the decision makers could identify where the potentially highest risk areas are for making decisions relative to other sites. You've got to make a decision about 2,000 sites at Los Alamos, how are you going to do it? I think this is a perfectly valid way to do it.

MEMBER WEINER: Is the relative risk

appreciably different from the relative dose?

DR. TILL: Well, no, it would be the same. Okay? And that was a very strong point that the Environment Department insisted that we put in, was this idea of dose, and not just go to risk, so that -- your point is well taken, and others are with you on that. Okay. And when we look at the tool, you'll see either one. I can show you either one.

I won't say much about this, but this is the decision support tool, which basically takes these risk - you see this is your stack on the left. If you took your sources and stacked them up on the basis of risk alone, you'd get the left-hand stack. And then you'd reorganize your stack, when you take into account other factors. And then you may have identified the Source B on top as being the one you want to concentrate on. And then you can look at alternatives for doing something to reduce risk on that site. And that's what the decision support tool does.

CHAIRMAN RYAN: Derek, could you hold them there for that. That looks an awful lot to me like a relative or a comparative ALARA approach. I mean, what you do is you --

DR. TILL: Let my -- I think it is.

CHAIRMAN RYAN: You're ranking them by certain measures, it could be cost, it could be dose, it could work as the hours spent in the hazardous area like the high heat zone.

DR. TILL: Exactly.

CHAIRMAN RYAN: Could be any one of a dozen things.

DR. TILL: Exactly.

CHAIRMAN RYAN: And then you're ranking them in a relative way, and then you come out with your ranking based on the alternate factors, so that looks an awful lot to me like at least the conceptual framework that you go through on ALARA evaluations. Is that a fair thing to say?

DR. TILL: I'm not as familiar with what you're talking about, but it does -- it is ALARA, in a sense. Absolutely it's ALARA.

CHAIRMAN RYAN: Okay. I think it is.

DR. TILL: And the key is that the decision support tool, it's a very flexible thing, just like the risk tool is. You can go through, make calculations very quickly and see what the impact would be on changing your alternatives.

MEMBER WEINER: Are your ranking factors and your weights independently arrived at?

DR. TILL: The weights on the different factors taken into account, you would insert. In other words, that's the flexibility of it. You might be dealing with a alternative that is a source that's going to affect the San I. Pueblo. And if you say cultural impact, what am I going to weight that compared to risk? You might weight cultural impact very highly, but you put in the weights. We have done some focus groups to see what people around Los Alamos would say about weighting factors, but that's all done by the user.

I'll talk briefly about the RACER process. Many of you have probably dealt with public panels. They can be a nightmare, and we all know that. They also could be very effective, and there are secrets, not secrets, but there are ways that if you set up a panel correctly, it can work very, very effectively. One of those is size, and my idea is you'd never have more than 11 people on a panel. That's the max.

Anyway, I won't dwell on this, but I think it's very important for any source of risk, industry, DOE facility, whatever, to have some kind of a panel where you actually ask communities what they think. And then the RACER process in the end would be set up something like this. The database and the risk tools,

the decision support tool would be maintained by a public institution, and that's just to guarantee the independence of these tools. The panel itself would be maintained and taken care of by what I call a process steward. And in Los Alamos, we have the New Mexico Community Foundation working with us to do this, again, independent from the source of risk.

I'll say something about funding. Funding in any process like this to make it effective needs to come not only from the source of risk, but from the regulators. And that way, no single organization has the power to withdraw the funding and shut down the process. Once you make a commitment to a public process like this, it's very difficult to back out of it, and you don't want to venture into this territory unless you're prepared to make that commitment.

Now I'll demonstrate the tools. I'm going to just go through the data analysis tool. I'm going to pick some things that I know fairly well. My team could probably let you just sit here and shout out what you want to see, but I might not be able to do that, but it truly is that flexible. So this is the data analysis tool that just lets us look at these 5 million data records and try to make some sense of these.

I'm going to select - you have several different options. You can look at specific data for a particular site, a particular analyte, evaluate spatial trends, evaluate trends over time for a single location, evaluate trends over time for an analyte. I'm going to select looking at spatial trends, as an illustration.

The Environmental Remediation folks at Los Alamos really have most of these data, but this lets you select where your data come from, if you wanted only to look at the New Mexico Environment Department's data, or one of the other group's data, that would be fine. Most of the data are categorized as rock, sediment, and soil, so we're going to take a look at those data to give us a lot to select from. Now what it's doing now is running a query. Well, we're not quite there yet. Okay. So now we're going to -- these are all the data here. There's, apparently, 14,150 data records that ER has collected, so it's gone into the database, it's identified those. In order to make this run a little more quickly, I'm going to pick that Mortondad Canyon area, which I showed you earlier, because we know it's got a lot of stuff there.

Let's see. See if I push that button,

what happens. I think this is going to give us a map of, I think it was 2,843 data points in Mortondad Canyon. This software, Map Select, was developed as a part of this work, so it is special to the RACER tools, so this just gives you - this is Mortondad Canyon. Obviously, there are many records at the same site. But, anyway, this just gives you an idea of some of the data that have been collected there. So let's next.

We're going to now - let's select Cesium-137. We know we have a lot. I'm trying to narrow this down so it'll run a little more quickly. So it's going to go into the database now and search all of those records, finding only the records related to Cesium-137. There's quite a bit of contamination there that is Cesium. So this will take me about a minute here for this to go through the records and find all the data, and then we can make some more plots. Any other questions while we're waiting? Jim.

MEMBER CLARKE: One question. Where should this data reside?

DR. TILL: Where should it --

MEMBER CLARKE: Once you've collected it, and put it in the access, would you recommend it reside locally?

DR. TILL: Well, the vision, as I said, was that it would reside in the RACER database that is maintained by an independent institution from Los Alamos or the regulator.

MEMBER CLARKE: And anyone would have access to it.

DR. TILL: And anyone would have access to it. In fact, our plan always has been to take these tools and make them, to the extent that we can, web available. That's a challenging task, though. The database itself we've already done, made web available. It's just that now you can't use these tools on it, because we don't have the tools web-ready yet. Okay?

I believe very strongly, as I said at the beginning, environmental data should be public information. I think it gets us out of trouble before it happens, and many people don't agree with me on that.

MEMBER WEINER: How do you handle the question that, say, the concentration of any radionuclide in any given point changes with time? Do you go back and assay again? How do you look at the temporal changes of the source term, so to speak?

DR. TILL: Well, I don't know if - maybe

I didn't make it clear, but you can take a look at a specific location, and Cesium-137 for as far back as they've collected samples at a given site, and look at trend over time. Okay? In other words, you can see if that concentration is increasing or decreasing over time.

MEMBER WEINER: But then what do you use as the basis for your risk calculation, the latest one?

DR. TILL: Actually, we have a feature that allows you to decay it. The models will also transport it in time. In other words, you may have a sediment location that's contaminated. You could refine your calculation to only those data in the last year, if you want to. Okay?

MEMBER WEINER: My question is, really, if you're comparing risk.

DR. TILL: Right.

MEMBER WEINER: Or comparing dose --

DR. TILL: Right.

MEMBER WEINER: -- what do you use, or do you use them all, as the basis of your comparison? I'm thinking specifically of what happened before and after the el Serro fire at Los Alamos, or any one of the fires that have occurred there in the last 30

years. Do you just -- if people say okay, I want to know what my risk is, if I go hiking at someplace up there. Do you use the latest data? Do you use them all? How do you do that?

DR. TILL: What do you want? I would use whatever you want.

MEMBER WEINER: I want to know what my risk is. I want to --

DR. TILL: If it were me, I would know a little bit about the analyte, how mobile or immobile that material is in soil, say. And if I was only interested in Plutonium, I would say I'm not too worried about it. It's not going anywhere much, so I might go back 10 years, use 10 years worth of data, something more mobile, even Cesium, fairly mobile. I might just go back five years, or two years, and use the most recent data for that. I could do it either way. I could also make it both ways, and show you the difference, how it changes the dose. That's the idea of flexibility. I could do any of that. And I'll show you in just a minute, I'll show you some of these features that you can select.

The key to this is once you get the data organized, the modeling you know, I know, and we had the methods around for years. Then how can you take

the appropriate shortcuts in the modeling to make it work in something like Access. That's unique. On the other hand, the methods are fairly standard that we use.

CHAIRMAN RYAN: John, are you going to talk about uncertainty analysis, and error estimation?

DR. TILL: Yes, but I don't have that built into what I show you today. All right? That we compute an exact uncertainty with the calculation. I haven't finished that yet. It will be a separate module. We know how to do it, but I don't have that in what I'm showing you today. Okay? But the answer is, we will have it. I can't talk much about it today. Okay?

CHAIRMAN RYAN: How are you going to deal with it?

DR. TILL: How are we going to deal with it? That's a very good question, because we've struggled with that, too, in particular with the public. I think, and what we've decided is, you can make a calculation and include uncertainties, but broadly speaking, you take uncertainties and you put into categories, which you might help people define, a small uncertainty, a medium uncertainty, or a large uncertainty. In your decision support tool, we think

that's where it goes, because if you're making a calculation or decision that has huge uncertainty, you're going to weight some of those factors differently. If it's a small uncertainty, you will weight those factors differently, and that's where we think we go with uncertainty.

CHAIRMAN RYAN: But you have data uncertainty, and you have model uncertainty. I mean, if you're going to go into the subsurface, you're going to have model uncertainty.

DR. TILL: Exactly.

CHAIRMAN RYAN: And so how are you going to treat those? You stated that the models are all known. That's not true. There's a lot of uncertainty.

DR. TILL: Okay. Remember, too, we're talking about relative comparisons of things, which helps us some out of the uncertainty quandrum. Okay? It does at Los Alamos. If you know generally the area of Los Alamos, the uncertainties for a particular media, like ground water, might be about the same in this area, and a little different over in this area, but about the same. Okay? So we think the relative comparison helps, because they, essentially, wash one another. Okay?

MEMBER HINZE: Well, there's a great deal of difference between the uncertainty that you have in modeling an anderite or a lava flow, versus the sediments. I mean, there's a great deal of --

DR. TILL: Oh, absolutely. Absolutely. I understand that. And believe me, I know that with regard to ground water modeling, the particular model you select, the vadose zone, the huge uncertainties in that at Los Alamos, so my question to you would be, what difference does it make in terms of risk? And if you understood whether it made a big difference or a small difference in terms of risk to somebody down here, that helps. That's what RACER would help you do.

You could change -- we have three choices of models for the ground water, for the vadose zone. You can very quickly pick which one you want to try. There may be one that's recommended by the scientist at Los Alamos, and one that's recommended by the Environment Department, and they don't agree. So my answer to the Environment Department and the laboratory is, okay, you may not agree, but what difference does it make in terms of risk, or dose? And it may not make much difference, whichever one you pick.

MEMBER HINZE: It could, though.

DR. TILL: Oh, it could, and you would see it. That's my point. You would see it, if it did make a difference. Okay? Yes.

CHAIRMAN RYAN: I'm thinking about the two words, "accuracy" and "precision". Now precision is significant digits, and accuracy is did I hit the duck. And relative comparison tends to make your prediction of accuracy not as important.

DR. TILL: That might be true. Yes.

CHAIRMAN RYAN: But the other element of uncertainty is precision. And, of course, with the dose conversion factor, the typical precision is an order of magnitude, just on the dose factor alone.

DR. TILL: Yes.

CHAIRMAN RYAN: So I'm trying to sort that out. I guess that's something you're wrestling with, too, from what you said.

DR. TILL: Yes. But the dose factor might, take for example the dose factor, uncertainty, but if it's a dose factor you're applying in two pathways, the uncertainty washes if you're trying to make a comparison.

CHAIRMAN RYAN: Well, I just think with a relative comparison, I agree with you.

DR. TILL: Right. I mean, I am not proposing RACER be the end product for making your risk calculation that's submitted to the Commission, that says we know the risk is small because. I'm saying what RACER does, it helps you sort through all the pathways, all the sources very quickly, and come to grips with what is on top of the pile, so that you can focus --

CHAIRMAN RYAN: I come back to that slide we talked about, which basically says, John, that it's kind of an ALARA tool, with all those features of ALARA that you're now listing.

DR. TILL: Yes, that's right.

CHAIRMAN RYAN: So I appreciate that.

DR. TILL: That's right. Then your staff go to work on those things that count the most.

CHAIRMAN RYAN: Right.

DR. TILL: The other thing about RACER is its transparency, its flexibility, all that stuff when you're out talking to people and somebody challenges you on the ground water model. I can't do it today, but somebody says yes, but we know that's a fractured flow, we think it's fractured flow, they don't. They think it stays there 10,000 years. All right. Let's check it real quick. Does it make a difference? Yes,

you could see real quickly it might make a difference, or maybe it doesn't make a difference in terms of dose, but that's -- I'm not trying to sell this product to anybody as the endpoint of a risk calculation, but I'm trying to take us a notch up in how we have tools that help us to do this, and how we explain it to people as we go through the process. Okay?

MEMBER CLARKE: Excuse me, Mike. From a time management standpoint, we --

DR. TILL: We need to go quick.

MEMBER CLARKE: We are just getting into your demonstration, and how long will it take? Will we still have time for questions?

DR. TILL: Let me go through this. What is our time? Yes. Okay. I probably need another 10 or 15 minutes in the demonstration.

MEMBER CLARKE: I hate to cut the committee off, but we don't -- we want to see the rest of this presentation.

DR. TILL: Okay. So I've got to find out where I am. We're going to -- oh, let's see, spatial trends. We're going to make select comparison values, and here, I'm going to use a background value that we can make a comparison to, and an upper tolerance

limit, because you have all these choices in the data. We can run this calculation using all the data with - let's just say 1950 to 2006, but I could constrain it to whatever I wanted here.

MEMBER WEINER: And does your background change?

DR. TILL: Does my background change? I don't know the answer to that. I'd have to ask my team. If we had the data for background at an earlier time, it probably does change. Okay?

MEMBER WEINER: Thank you.

DR. TILL: You could correct it for decay, for example, samples taken 10 or 20 years ago.

MEMBER HINZE: How about elevation?

DR. TILL: Elevation? Well, background certainly is a function of all of those things, time, elevation, media, and that is taken into account. Let's see. I'm going to go straight, I think, and just try to move on with this, and just map the data. You can see as I go through, there are just a lot of choices you've got with regard to what you want, what you might want to see.

Okay. So now we're looking -- this is actually the graphic I showed you in my presentation. We could take and zoom in, so you can see these sample

locations very clearly, and see which ones are higher. You can take and look, I think, and find out everything about that data point, the magnitude of Cesium, 147 pecocuries per gram, more information about the data point, itself. That's why I say that the database is really the heart of RACER. That's the data tool. I'm going to move on to the risk tool, now.

CHAIRMAN RYAN: John, just while that's coming up, is there any limit to the amount of data you can manipulate?

DR. TILL: No.

CHAIRMAN RYAN: I think that's a huge strength, because if you can take thousands of data points --

DR. TILL: You can take 5 million records from Los Alamos - now what we're doing, Mike, right now is, Access is a wonderful piece of software that everybody has access to, but we're going to bump up against data limitations. And they're putting half a million records into this system a year now. It's an awful lot of information, and so we're shifting the database to another software called "My Sequel", which is very similar in terms of its free. I mean, you download it from the web, so most anyone could get it.

But the fact is, there's no data limitation to it that we found yet. In fact, even all these calculations - I mean, I'm sure you appreciate how fast it's going through some of this, but if I were showing you some of the more complicated ones, it's still quite fast.

Now I'm going to show you the risk tool. I'm going to just do a simple site analysis using surface soil. And the reason I do this is because the laboratory spent, I don't know how much money, but a lot, and produced a very thick report that does basically what I'm going to show you in a matter of minutes, so we're going to use soil. I'm probably going to go kind of fast, just to give us some time. Okay?

MEMBER CLARKE: I'm sure there are more questions, but if you want us to get through this.

DR. TILL: I'm going to select this Mortondad area again. They actually picked 10 sites for an analysis to prioritize, basically. And they made the calculation, submit it to the regulator exactly the way we do it in RACER. I'm going to just use three of these to make it go a little more quickly. There are a lot of other choices one can select. I could actually go to the map, and all of those contaminated areas around the site, I could just

draw three areas. I can draw them on the map, polygons. So we're going to -- okay. It's going to take a second here.

Now it's going into the database, and it's picking those three sites. And it's going to collect every sample that's been collected within the GIS coordinates of those sites. And I'll show you the sites here in just a minute. I could have brought that up, but this will save us just a little time here. And it's actually going through the entire 5 million record database while we watch.

You can do cross-media. I can select soil and releases to air, for example, because this is important. Are you worried about what's coming out of the Lance facility, as much as you are this contaminated land over here? And, yet, the Lance facility is licensed, it's regulated by the EPA, and it's in compliance, and the risk may be larger. That kind of perspective, I think, is very important for people to know.

What you're going to see at the end, when we get to risk, don't be upset by that quantitative estimate of risk. Remember, I'm using that to prioritize sites. Okay? So I'm going to give you a heads-up about that. We can screen, so we have an

area. We picked three areas that we're trying to set priorities for. We know that a lot of stuff in those areas is below a valid screening limit, either an EPA limit, or someone else has set a limit. I'm going to use what's known as a risk-based reference value to screen, and I'm going to go in, and I'm going to use the EPA Region 9 PRG values for chemicals, and I'm going to use the EPA Superfund values for radionuclides. I'm going to pick - let's see - you can pick your PRG value. I'll just leave it on residential soil, so now it's creating a - it's going through the thousands of records, and it just screened out the ones that are no longer valid. And I'll show you, here's the list. Everything checked. These are the sites on the left-hand site, the source ID, your analyte codes, and we can cross those - you see the analyte description, so a lot of these are chemicals. If it's not checked, it's not going to be included in the calculation because it was screened out. I'll make it go a little bit faster. I could have just thrown it all in the mix, if we wanted to. But, anyway, we've now screened, so next we're going to decide how we're going to use this land.

What they have to do at Los Alamos, is put a resident on the land. Sounds crazy, I know, but

that's what the regulator is making them do. You could put the resident off the area, and make a calculation, so let's just leave it as the default. These are our three areas here that we could go into this, and what you can do is change your scenario to be anything that you want, the number of days, whether you want male or female, adult, child, and then you have all of these different parameters that you can use to describe the person. I'm just going to leave it set up to the default. We're going to go into the next screen, which is going to actually calculate the exposure.

Many different types of samples, of course, we're going to use a mean value to calculate the concentration in these contaminated areas. You have choices of excluding non-detects, of excluding all non-detects, including them all, using half the value for the remainder. Different people do different things, but that's -- the point is, this is very flexible.

Okay. Now it's taking those three sites, and hypothetically putting a person on the site to calculate what the exposure is from both the chemicals and the radionuclides on the site. Okay?

MEMBER WEINER: How long a time are you

accumulating the exposure?

DR. TILL: One year.

MEMBER WEINER: This is the exposure - this is the person sits on that site.

DR. TILL: That's right, which doesn't make any sense. All right? I agree, but that's what they are required to do to the regulator to prioritize their sites. I could put the person off the site. I could make it so that the person is only recreating on the site, hiking on the site for a number of hours a year. That's all, I could have done that very easily. So we're finished with the exposure calculations, and now we're going to calculate risk, and dose, and the health impact.

MEMBER CLARKE: I guess, John, for the exposure factors you could use the EPA defaults. You could use the 90th percentile.

DR. TILL: Exactly.

MEMBER CLARKE: You could use whatever you want.

DR. TILL: Exactly. I didn't show the screens but you could just go in and make changes. You just create this person. This is very important for Los Alamos, because of the Native Americans who live next door.

MEMBER WEINER: What do those numbers mean?

DR. TILL: Okay. So what we're doing now is looking at East Ten Site Slope. That's one of my three sites. Right? I have three sites. East Ten Site Slope, if that person sat on that area for one year, it would be 2.3 times 10 to the minus 5, that's a risk number. The dose would be 30 millirem, would be that person's dose. You want in SI units, that would be in sivert. The carcinogenic chemical risk, 5.2 E minus 7. The non-carcinogenic hazard index risk, 5.0 E minus 2.

Let's look at another site - Mesa Top. These are the values you would get. Now let's just - what you can do, too, is you can set this as a benchmark. What that means is you want to go into the site, hypothetically remove 50 percent of that material. That would be your remediation mode. You go back through. It will allow you to reduce those concentrations, and then you can see how much the change in risk would be. That's what the benchmark allows you to do.

We can do all kinds of analyses on these. You can look at risk result, all the details of the analysis in terms of exposure route, analyte,

concentrations, units, and this is the whole idea of transparency. And this is what it means to me, so that I can go back and see anything used in the calculations for a parameter or a result that comes from the calculation.

I'll try to show you one more thing here, and I'll try to just wrap this up. Let's take a look at the three areas, just in terms of chemical carcinogenic risk. This would be how they stack up, Mortondad Slope, Mesa Top, East Ten Site Slope. If you look at radionuclide dose, Ruth, you were asking about, there's your dose comparison. Is that different from the risk comparison? It shouldn't be. Nope, looks the same in terms of relative comparison. Okay?

I'll show you one more thing. Let's see. Well, I won't go through this, but we can take any of those areas, or pieces of those areas. I can draw a polygon around a portion of it where you feel like you've got good sample coverage, and I can calculate using whatever I tell it to use as a calculation or value, whether it's your average depth of samples, your maximum depth of any sample, any of those that can calculate the volume you'd have to take out to completely, the volume of soil you'd have to take out

to complete decontaminate that area.

MEMBER CLARKE: John, one quick question on soil data, say, for example.

DR. TILL: Yes.

MEMBER CLARKE: You put in the data they have. Do you do any statistics with it? Could you creek it if you wanted to?

DR. TILL: Yes. In fact, that's another feature on here. Some things you can do, you can look at the number of samples in an area, and we have a calculation that will tell you how representative you've sampled that area statistically. All right? Which is a very important feature at Los Alamos, because they're getting reamed, really hurt by the regulator making them collect far more samples than they think should be collected, so we hope this is going to help sort of come to some agreement on that.

MEMBER CLARKE: You wanted a data point in a location where you didn't have a sample, you could do something with that.

DR. TILL: That's right.

MEMBER CLARKE: Yes.

DR. TILL: I'm going to stop the demonstration. I think you get the idea of the tools and what they do. We've been working on this for

almost three years. It's -- I think some people look at this and think, well, this is very simple stuff, we have all the methods down. But, believe me, it's not, and I would say five years ago we couldn't do this. We wouldn't have had the technology to do it from the computer standpoint, but it's a very sophisticated amount of team work pulling together a number of different skills to put it into a format that's easy to use like this.

My final word on this is, it's never meant to be the ultimate thing. What people tell me when they look at this is, more than anything, it's a very helpful risk communication tool. There are a lot of features we're going to add to this, so that you have perspective on risk, comparisons to make, to background, to other kinds of risk, whatever, so I think it will be of a lot of value when we get those features added to it.

That's an update, ladies and gentlemen.

MEMBER CLARKE: Thank you very much. Mike, you were just about to ask a question, when I suggested we move on. Would you like to follow that?

CHAIRMAN RYAN: Well, I guess my question is really more a comment. I really think that the next step of adding some of the uncertainty analysis

things you discussed would really kick up a notch, as the chef says, because some of those graphs, for example, where you're using relative risk, if you had an uncertainty bar on that, you could really say well, these two are the same, and don't sweat the numbers so much.

DR. TILL: Right.

CHAIRMAN RYAN: And then this one is double that one, or roughly double, on the average of that kind of thing. And I think in terms of -- first of all, that's a fairer comparison when you're doing those relative things. And, second, based on the context --

DR. TILL: Yes.

CHAIRMAN RYAN: -- of what you're calculating, and how you're using it. And, really, in terms of risk communication, uncertainty is a key part of that component there.

DR. TILL: Yes.

CHAIRMAN RYAN: This reminds me a little bit of what Tim McCartin has done with the TPA, which is the same kind of analyses for many different performance assessment runs of -- for Yucca Mountain, for example, or any other performance assessment code. I mean, could you take it to the next step? Okay.

I've got contamination, and then I think this is maybe what Bill was talking about, predict its behavior in the environment. Right now you're taking a snapshot of what is. Well, do you see this eventually evolving into well, what is it now, what's it going to look like 20, or 30, or 50 years from now if we do nothing, if we do this, or if we remove it all, that kind of thing.

DR. TILL: It actually can. And we could illustrate this - I couldn't today, and I don't think I've got the data in here that would allow me to show you the Chromium plume, for example, where it is today at Los Alamos. It's been a huge issue out there, and the lab has been fined significantly over the last few months for this, but the Chromium plume and where it's going to go.

What I think is, RACER will never replace the in-depth, very necessary, sophisticated science that goes into -- underlies the work for any facility, Yucca Mountain, in particular. On the other hand, I am convinced that we can take something like that, and simplify it with some shortcuts, so that it would work in a very easy-to-use tool like this, would help people understand the implications of ground water there, compared to other pathways, whatever. I mean,

I know you can do that. Yes?

CHAIRMAN RYAN: But it's very intriguing, because it really does, in a simple way, give you meaningful risk-significant insight.

DR. TILL: Yes, absolutely it does.

CHAIRMAN RYAN: That's a real plus.

DR. TILL: I think we have to go in this direction in order for the industry to survive, and to go where I think it's going. I think Yucca Mountain's got to do the same thing. We can't just keep telling people we're scientists, we know what we're doing, trust me. It doesn't work any more. That's what RACER is about.

CHAIRMAN RYAN: Yes. Thanks, John. Thank you.

MEMBER CLARKE: Bill, I know you have some more questions.

MEMBER HINZE: Well, I'm just really having some trouble accepting what you've just said. This comes across as elitist, but I can see the potential danger of mishandling these kinds of data, putting in all of the right modes of modeling, and coming up with a result that could be misconstrued. I just wonder how -- to what depth of knowledge one has to have in order to be able to use this in a

useful fashion, so that you will get results.

DR. TILL: Right.

MEMBER HINZE: I think you, and I think I've dealt with enough of the citizenry, who have very good intentions, but they don't understand the subtleties of modeling of uncertainty, of data input, of the interconnection between parameters, and putting this in the hands of people and just saying this will give you a meaningful risk, even a relative risk - I don't know. John, I'm really having some problems.

DR. TILL: No. I think we've struggled with that, as well. I think the whole idea of the web aspect of it, we're not sold on. I want to say, though, that this panel that I showed you in the graphic, and I said if you want that panel to be successful, and I said that there would be certain criteria they would have to meet - I am convinced that you could create a panel who could learn to use these tools enough with some training, and with the backing of this technical steward that I was talking about, so that these calculations are very meaningful. And one more thing I'm going to tell you, I know exactly what you're talking about. I've been there.

Information like this is misused all the time by people I know, very, very well, and they're

misleading a lot of people. All right? I just don't agree that keeping it from them is the solution. I'm much more in favor of putting something on the table that the methods are approved and peer reviewed, and where you can see, and if they are manipulating, you can see exactly what's being done. That's a difference in philosophy between us, but I've learned a lot of this the hard way, as well. And I've been burned, too.

MEMBER HINZE: I'm wrestling with this because I'm doing exactly the same thing you are, except for the gravity data of the United States, the conterminous U.S., as well as North America. And these data are extremely useful, and you can develop all kinds of software to process. But that data also can be very much misused if you don't understand those tools. And you put those tools into the websites, and my group and I are wrestling with these same problems. And we're very concerned about misinterpreting. And I think you need to put in a lot of caveats, and make them very visible.

DR. TILL: You know, that's part of the way you do this. Do you know when I said you create the scenario, we have a page in there that if you go in and put in a breathing rate, or an ingestion rate,

or something, you actually have a meter that you look at, and it says breathing rate. If you start throwing up your breathing rate, which is done. You know this is done all the time, where unrealistic values are inserted, it reaches a peg. It turns red, and you're not allowed to go above an upper bound limit. Those are the kinds of things I can see we can add to this. We will never prevent people from misusing. I don't think we can do it, no matter what.

MEMBER CLARKE: All right. Ruth.

MEMBER WEINER: Just to take off from that last - I manage a code that does similar things, and one way which you can't prevent misuse, but you can certainly expose misuse, is always to display the inputs with the outputs, and that way, what we tell people is, you put in an unrealistic input, you're going to get an unrealistic output. And it's always, always echoed. Two more comments.

One is, that one of the ways to introduce uncertainty is to put in distributed variables, and then sample, but it takes a fast code to really make that operable and access, access isn't that fast.

DR. TILL: Right.

MEMBER WEINER: So you might look at different codes. The other question I have is, how is

your panel selected? Do you have people who work at Los Alamos on the panel, or are they prohibited?

DR. TILL: Well, there isn't a panel, yet. That's where we are in the whole process. How will they be selected? They would be selected by the process steward. Would they be people that work at Los Alamos? They could be, they could be community people. I have criteria that I certainly would use in selecting a panel, and I've talked to our process steward about this many times. I mean, you have to have someone on there from the environmental groups, who there, at Los Alamos, are the most in-depth, knowledgeable, tough people I've met anywhere, but they've got to be on there somehow represented. Okay? You have to have the Pueblos represented, so how this is done, there would be some criteria that have to be followed to select the people. That's all I can tell you.

MEMBER WEINER: And I think it's -- for its purpose, and I have to agree with Bill, you have to make things very, very clear. I mean, my immediate question is, what are the underlying equations? And I think although only one person in a thousand is going to ask you that, it has to be available.

DR. TILL: And they're there, they're on

the web. They're on our website, in fact.

MEMBER WEINER: That's good.

DR. TILL: The equations are on the website, if they're not in the model itself. That's exactly right. That's the idea of transparency.

MEMBER WEINER: Thank you.

MEMBER CLARKE: Thanks, Ruth. The reason I asked you about where the data should reside is, I can think of more than one superfund site where all of the data through the record of decision is one location, for example, for Love Canal, all of the data through the record of decision is in the archives for the State University of New York at Buffalo library. All the data after construction is in somebody's office, and so there are information management disconnects that this can go a long way to solve, I think.

I was going to ask you - Ruth asked you about the panel, and I was going to ask you about your technical steward - what are the criteria for --

dR. TILL: Yes. Interestingly enough, there are a lot of people who want to be the technical steward of RACER, and I mean, I --

MEMBER CLARKE: This is a site-to-site decision, by the way.

DR. TILL: That's right. It's a tough decision, and I'll be very honest, we went - we were talking to a local community college for a long time, because they were -- they came to all the meetings, and they really were interested in the tools. And the problem is, this is fairly sophisticated stuff, and you - in order to have -- the technical steward would be the only one allowed to make the changes internally to the tools. That's the way our vision is, so you would have to have a fairly high level person, who knows what they're doing, who knows the tools pretty much inside and out, and who that's going to be, I don't know right now. I mean, New Mexico State and the one individual has worked with us on this on the mapping software, Tom Kershner, he knows this solid. It's not our vision to stay there very long. We want to finish this and get out, but probably, a university within the state.

MEMBER CLARKE: Yes, that was where I was going. I wasn't thinking of one person, I was thinking the technical steward would be a decision made on a site-by-site basis.

DR. TILL: Oh, that's exactly right. Yes.

MEMBER CLARKE: Okay.

DR. TILL: Yes. Mike, do you have any

more questions?

CHAIRMAN RYAN: No.

MEMBER CLARKE: Anyone on the committee, any more questions? Anyone from the staff? A few more minutes.

MR. FLACK: Yes, I will comment, if I can. John Flack of ACNW. You know, following up on the discussion on uncertainties, one way to get around some of it, anyway, is to do sensitivity studies to try to understand how great or how big is the uncertainty, or whether the uncertainties really matter, in some cases. But, also, doing sensitivity studies help you to understand whether the model is predicting what you expect it to predict, so by going in and looking at changes, and seeing how it affects the results is, I think, a very use of the tools. But, again, if you get to the bottom line, and say I have to report the risk, or I have - you know, this is a bottom line result, and from working with risk for a long time, it's usually the weakest point in the analysis, because people tend to focus there and not understand how you got there. But by doing sensitivity studies, I think it gives you more understanding of the model, and whether you believe the results are giving you the right results, but

through your expectation of what the performance would be. So I think in that context it would be useful to do some of those.

DR. TILL: You know, uncertainties really do complicate things, and yet that's where the science is today. What we've struggled with this ever since we started RACER was how to address uncertainties. We have deliberately left them out up until this point until we get to this point; because, obviously, we're going to have to take some shortcuts to make this a very viable, user-friendly - to keep it very viable and user-friendly, and so probably doing something like you're talking about, Ruth, with regard to precalculating uncertainties, some work with sensitivities. I mean, the idea is where is your uncertainty for a given pathway? Is the ground water model uncertainty far, far huger than your air dispersion model uncertainty? Probably. Okay? So that just knowing those things helps us a lot, and that's how we'll probably take some shortcuts as we incorporate uncertainty. We know how to do it, and we've done this for years in all of our work. This is the first time we've just been stumped with how to incorporate uncertainties as a part of the feature of RACER, but we'll get it. We'll get it .

MEMBER CLARKE: Can you make it quick?

MEMBER WEINER: It's quick. At the beginning of your talk, you talked about environmental risk, in other words, non-human, but you didn't - I notice you don't have any of that, and I was going to ask you what is the metric that you're using for non-human risk?

DR. TILL: Well, believe it or not, it's not dose, and it's not risk in the sense that we've calculated it to humans. What we think is that, ecological risk is more of a decision support tool item, where the idea of how much destruction to this one acre of land would be to clean up, and that you would weight that with some factor in your decision support tool. That's where we think it goes, rather than a --

CHAIRMAN RYAN: Value system, it's not a risk system.

DR. TILL: Yes. Exactly. Yes, we thought a lot about that.

MEMBER CLARKE: Focusing on habitat loss.

DR. TILL: Exactly. Exactly.

CHAIRMAN RYAN: No, that's not the -- I don't think that's what I heard. Habit loss is --

dR. TILL: Well, habitat loss, destruction

to the environment.

CHAIRMAN RYAN: Okay.

DR. TILL: Delaying the process of remediation.

MEMBER CLARKE: By the way, that's -- I think it was at the same working group meeting that you attended, John, we asked the EPA how ecological risk factored into remediation decisions, and they basically gave the same answer. It was more of a tool to decide what not to do, than what to do.

DR. TILL: Right.

MEMBER CLARKE: Okay.

DR. TILL: Thank you very much for the chance to come, and I appreciate the very candid thoughts from all of you, and the challenges from you. This has been a tough piece of work, but we're very proud of it, and think we're headed somewhere with this, so thanks for the invitation.

CHAIRMAN RYAN: Jim, thank you. John, that's a great step forward. It really is. I mean, the fabulous part to me is you can handle 5 million records, and sort through it pretty quickly, and gain insight. And even though we challenge you on the uncertainty side, we already know you've got this part fixed, so we're talking about what's next. But we

really appreciate you coming and sharing this with us. It really gives us an idea of the state-of-the-art.

DR. TILL: Thank you. Good.

CHAIRMAN RYAN: Thank you. With that, we'll adjourn for 15 minutes, and reconvene for our next presentation at 2:45.

(Whereupon, the proceedings went off the record at 2:27:04 p.m., and went back on the record at 2:43:24 p.m.)

CHAIRMAN RYAN: Okay. If I could ask everybody to come to order, please, we'll reconvene. We'll now turn the meeting over to Professor Bill Hinze, who's going to lead us in our next session. Professor Hinze.

MEMBER HINZE: Thank you very much, Dr. Ryan. We are pleased to welcome to us today representatives from the NEI and EPRI, who will be discussing with us the interim staff guidance that deals with seismically initiated event sequences. We heard the staff make a presentation on this a month ago, and at that time, both NEI and EPRI made some comments during the discussion period. But today, we are going to hear a more formal presentation on the industry perspectives on the NRC interim staff guidance. And with that, Rod, we'll turn it over to

you. Rod McCullum.

MR. McCULLUM: Thank you, Dr. Hinze, and Dr. Ryan. I am Rod McCullum of NEI, and to my left here is Ken Canavan of EPRI. Also in the audience, and we hope to have a good discussion here, and to help us out with the discussion, we have Greg Hardy from EPRI, and John Kessler, from EPRI, as well as Everett Redman from NEI.

This is going to be a rarely integrated NEI/EPRI presentation. You see, NEI and EPRI logos on the cover slide here. We try no to do that. EPRI is industry's independent scientific organization, NEI is responsible for regulatory and policy issues, but the reason we have integrated, the reason we're actually showing two logos on the same presentation here, is because we have a couple of issues that we feel are very closely linked. Our concerns with ISG-01 are both from a regulatory policy standpoint, and from a technical standpoint. And we feel that some of the issues in the regulatory policy side, that inevitably with these types of regulatory tools, lead to the technical problems that we see.

We have had a very spirited dialogue with the NRC staff on this topic. We appreciated the committee's interest in that a month ago, and

certainly, are interested in continuing to advance this dialogue, not just on ISG-01, but in terms of the general issue of the role of ISGs in the regulatory process, and are very interested to hear the committee's views on the subject.

This is a bit of background here, starting with what we think we heard from the staff. And, again, there's a lot of members of the staff here I'm glad to see, and if we got this wrong, I certainly hope they will correct us. But starting with what we heard from the staff about ISG-01 last month, and leading up to a little bit of our position, it was described the staff as addressing a communications problem regarding DOE's proposed approach for compliance. They had received, I believe, a topical report from DOE that was more deterministically-based, Part 63 is a probabilistic regulation, so they felt that their staff, NRC staff, needed more guidance. We'll get into why we feel that's interesting in a little bit. So what they did is propose an ISG and example methodology to review seismically initiated event sequences in the context of the probabilistic method for looking at the failures of structure, systems, and components by convolving hazard curves and fragility curves, and the extent to which you do

that, we feel is unprecedented, the number of fragility and hazard - the number of fragility curves you'll be looking at and comparing to the hazard curve, and where that will drive design. And Ken will be speaking to that, more specifically.

Using an interim staff guidance to us is a very interesting term. It is something that was done out in what is now SFST or SFPO world, the dry cask storage and transportation regulations establish this precedent. They have, I believe, 20 ISGs, maybe 22 including the ones that are currently draft. We have problems with the use of ISGs being a regulatory tool that does not follow the same regulatory process as do review plans, and regulations, themselves. We feel that that is a lack of regulatory discipline, and that that does lead to problems. And we feel ISG-01 is an example, so while we do have concerns with the use of that type of tool, in general, and we'll describe those in some detail in the presentation. We specifically find that tool inappropriate for Yucca Mountain, where there isn't even an application yet, so we're wondering where the interim is, where the situation out there that has safety implications that the staff needs to move faster than regulatory due process would let them move, so that's that concern.

This is the timeline. I think it's pretty - it is what you saw last month, but just as a reminder, the draft ISG was issued on May 22nd. NEI submitted comments on July 6th, and we requested a public meeting with NRC. That meeting was held on September 14th, 2006. Even though we left the meeting not agreeing with each other, I really want to thank the NRC staff for both responding to our request. They brought a very robust team to that meeting. I think - I didn't count the number of NRC people, but it was certainly in the dozens, and they were able to cover all the issues, and very frank discussion on both sides. I would hope however this issue plays out, both in the specifics and the general, that we can continue to have that form of dialogue with the staff. Nevertheless, they did issue ISG-01 on September 29th, and there were no significant changes in response to the NEI comments.

These are the NEI comments, and I brought a copy of the comment letter with me that I'd be happy to leave with the committee. I know you had some questions about what you saw on the public record in terms of who the comments came from, and --

MEMBER HINZE: That would be helpful. Thank you.

MR. McCULLUM: Yes. But, anyway, there are five comments, essentially, in that letter. Numbers one, three, and four are really regulatory policy issues. Numbers three and five, are the technical issues. I'll be addressing the regulatory policy issues, Ken will be addressing the technical issues.

As I've said, we don't believe ISGs are an effective regulatory tool. They lack the regulatory due process, the rigor, the structure of regulations, review plans, reg guides, and we feel those process components are there for a reason, and when they are not used, you run into situations where you have unintended consequences. And we feel the technical analysis being called for in ISG-01 will lead to many unintended consequences in the way it drives design at Yucca Mountain.

They were originally intended as a generic tool to address emerging issues affecting multiple licensees with ongoing operations. None of these describe the situation at Yucca. We are well in advance of an application. We are going to be revising a review plan, anyway, when the EPA standard comes out. We don't see - whatever the rationale was for using ISGs in the dry cask world that you had

multiple licensees out there that were doing things in their casks, in their pools, NRC saw an emerging issue. They needed to get it out quickly. None of that logic applies in the case of Yucca Mountain.

We believe, and this is where Ken's technical work will - and he's done a lot of work leading up to this - will be important; that application of the methodology in ISG-01 will lead to a more stringent standard for Yucca Mountain surface facilities than exist for higher hazard facilities; namely, reactors. And we really want to ask the question, is this what the commission intended with the Yucca Mountain regulations and review plans, and would again remind you that when ISGs are used, and there isn't the broad review, there isn't the commission approval, that question never gets to be asked. So we are still looking for an answer, is that what was intended? And while the staff has indicated that this is just guidance to the staff, we find it curious that the staff did this in response to something DOE submitted, that the staff did not find acceptable, so DOE submits the methodology, the staff responds to that by issuing guidance to themselves; yet, it's not meant to be a requirement, or an expectation being placed on DOE. And we find that to

be, at the least, a bit curious.

And this particular methodology, we were searching hard, and we have not found any precedent for the use of the methodology described in ISG-01. And we, again, ask the question - we've designed hundreds of seismic structures at nuclear reactors and other nuclear facilities very safely. Why do the Yucca Mountain surface facilities really need a new way of doing business?

So getting back to the general concerns with ISGs, they introduce instability and unpredictability in the regulatory framework. You heard from the staff last month that the reason they're using an ISG, instead of revising review plan - why go to the trouble to revise the whole review plan, when you're only looking at one specific issue? And that, to us, is the crux of the problem; is when the regulations can change, and they can change too easily, you don't have a playing field that stays fixed. You do have a moving target. And our experience in the world of dry cask storage has been exactly that with ISGs. We've had RAIs written against draft ISGs in the middle of review processes. It's very hard to do business in a world where the playing field is a moving target. And the

consequences of a moving target are three-fold here. The possibility when you're only looking at one narrow aspect of the regulatory structure of something, such as the seismic analysis, is you could miss other aspects. If you're looking at just the seismic methodology, are you really thinking about how the seismic methodology, the application of that methodology will affect the other aspects of the design. Again, Ken is going to explain how that will happen here.

Inconsistencies in the regulatory framework, and I know this was something that this committee commented on, on the Yucca Mountain review plan, and that Commissioner Diaz specifically wrote in the approval of the Yucca Mountain review plan, very responsive language in terms of the review plan being applied in a manner that was focused on risk. You don't apply the review plan across the board, the same way that you focus on the areas of the most risk-significance. This committee commented on that, and the Commission was responsive to that comment in the COM SECY approving the release of the review plan. And, again, if you don't have that comprehensive review, if you don't have that level of regulatory process rigor, how do you assure that you're not

picking out an area over here in seismic, and treating it with respect to risk differently than you're treating other aspects of the regulation? And even with the best of intentions with these things, you're going to get unintended consequences.

Dry cask storage licensees don't have backfit protection like Part 50 licensees do. I guess in the case of Yucca, you call it a forfeit, a forward fit, more aptly, because now that this ISG is out, the DOE designers are going to be designing things differently, perhaps, in response to this methodology. And, again, I would ask the question - is this really what's intended? Are the designs that are going to evolve from this untested methodology really going to be better designs? Are they going to be necessary designs? So why they're particularly ineffective for Yucca Mountain, I pretty much covered this. You don't have a situation where you need a generic communication tool. There's nothing going on in the interim here, and there is ample time to revise the Yucca Mountain review plan.

I am about to introduce Ken. He's going to speak to the first point. We strongly believe - now last month I think this committee did a good job of questioning the staff on what they felt the

implications of using this methodology would be. I don't think you got a lot of certainties in terms of them being able to demonstrate that it wouldn't lead to more stringent design. You're going to hear from Ken, as to why we think that this will lead to a lot of design complexity that won't add additional safety, and will make the design of Yucca Mountain much more challenging.

And then after Ken talks more to that first point, I'm going to - I just want to put in your minds here these next two points. We believe there is a provision in Part 63 which would allow the use of traditional, you may call them more deterministic approaches, at Yucca Mountain consistent with precedent because they're reasonable, because they're proven. I will concede that we raised this point in the meeting we had with NRC. The author of the particular section of the regulation was there, as well as the lawyer that interprets the regulation, and they both told us that's not what they meant. We think it's what they should mean, and we at least think that the commission should be asked that; again, did you really mean this?

So coming down to the final point here is, as we look at the question of whether or not this

untested methodology gives us a more stringent standard, the question is, did you really intend to do this? And that's question, I would submit to you, hasn't had the opportunity to be asked, because of the unique nature of the way ISGs are promulgated, without the same inputs as more formal regulatory tools. So with that, I'll turn it over to Ken to walk through the argument of how we feel this is going to drive the design.

MR. CANAVAN: That's got to be the record in speed. Good afternoon. I'm Ken Canavan. I'm the Risk and Safety Program Manager at EPRI. The program includes, just to give you a little bit of my background, includes risk on both standard probabilistic risk assessments for nuclear power plants, but also includes items like grid risk, risk-informed applications. And we do a lot of work in external events, fires and seismic. And that's our role here today.

The slides I'll be presenting are the ones with the EPRI logos on the lower left, so if you need to go back later and figure out which ones I was speaking to, you can notice it by the logo.

The presentation contents that I'm going to go through, I'm going to go through an overview of

ISG-01, then an overview of traditional seismic PRA-type methods. I'll compare and contrast a couple of the important elements of those. And then I'll talk about some of the technical issues that we see with ISG-01. And then I'll have a brief conclusion on some of those activities.

Ron put up here a slide for you to look at that you've already seen before in the earlier briefing about a month ago, and this slide is to represent the methodology for ISG-01 for seismically initiated events. It goes to our first point, that if you look at this figure, it doesn't actually represent exactly what ISG-01 says. What ISG-01 says is that the first step is to assess the seismic performance of individual SSCs on the ITS. The second step is that failure probability exceeds one in 10,000 during the pre-closure period, then it's retained. If it's below that, then it's just screened, and the intent of 10 CFR Part 63 is met. In the case where the components don't screen, you need to demonstrate that the seismic sequence is less than one times one in 10,000 over the pre-closure period. And if that screening test fails, alternately, you demonstrate that the consequences are accepted. So if you go back to the chart, that's not really what's here. The chart is demonstrating

something that's a little bit more typical of what I would call seismic PRA. This is a little bit more typical of that type of approach, with the exception of a few boxes. But this actual is the event sequence less than one in 10,000, and is the dose category exceeded, actually occurs a little bit earlier in the process.

First you're doing the components, is what is said in the ISG. And that's sort of a significant point, as we'll get to in future slides. But let's talk a little bit about the Seismic Probabilistic Risk Assessment approach, and this is, obviously, a very brief overview of a very complicated topic. But just to try and compare and contrast some of the steps, the first step in a - and just a quick note before I go too far into the methodology - there's a number of methodological documents that are available, and that we could have referenced here. We didn't print out - some of the references are, indeed, NRC NUREGS and Reg Guides. We won't point to those right now, but if we need to get a list of references together, we can do that.

But seismic PRA methodology starts with screening out of high capacity components. There's, traditionally, a number of components that could be

screened out because they're of known high capacity. The next step in the seismic PRA would be to identify the seismically controlling components, but that's done by function, so you're looking at a system function that's important to safety, and then you identify the components or components that are the drivers of the seismic risk. And that's generally referred to as the weak link approach.

In the seismic PRA, these are then immediately incorporated into the seismic sequence model, which is usually a version of the Level One PRA that exists. Then that model is evaluated, and then a results review is performed, so you evaluate that model and come up with results. You then take those results, and you look, first, to find out if you need to refine your seismic model? Did you miss anything? Are there things that need to be included?

Other activities are to look at potential mitigative and recovery actions that may or may not have been initially included in the model. Some of those are hardware, some of them are procedure-related. And then, generally, you repeat the above steps. If you find any mitigation or any recovery actions that you wish to include in the model, you ca put those in. And then the last part of that is, you

perform physical modifications. The physical modifications part for the plant is where you look at the seismic sequences and decide if there's any cost-beneficial changes that you can make to the plant that make sense from a design perspective.

I will note here that, at least in the past, our experience with the IPEEE, the individual plant examination for external events, indicates that not always the highest contributor is the one that upon which modifications are designed for. Often, it's one of the lower contributors that may be very cost-effective to fix. In other words, it's so easy to fix, you just go ahead and do it.

There are other ones that might require a cost-benefit-type analysis that you might go through and decide that it applies to multiple sequences; and, therefore, a larger piece of the risk; and, therefore, that is something that you would want to go through. But this is part of the risk-informed process that you go through in the seismic PRA, and subsequent modifications to the plant. You then incorporate - if you make any physical modifications, you may then incorporate those into the model, and repeat the procedure again.

Having talked about both methodologies,

let's -- the relative -- we wanted to compare some of the relative elements of each approach in the weak link or the traditional seismic PRA approach. We tend to identify the seismically control failures at a function level. For the ISG-01 methodology, we're examining all the fragilities for all the components, regardless of importance. Now that may not be actually what is being done, or what the licensee and licensor have agreed to, but that is certainly what is stated in the ISG-01.

In the case of the seismic PRA, we may perform fragility analysis for selected component, or components, for that particular function. And that in both cases will convolve the fragility with the hazards, but in the case of the seismic PRA, it's only for those selected components that drive the seismic risk. And in the end, when you look at these two approaches, the seismic PRA is sort of a top-down approach to managing the risk at the facility, where it's looked at holistically, not a sequence-based approach, but a more across sequences and whole facility type approach; whereas, in the ISG-01 methodology, it's sort of a bottoms-up approach. If it didn't screen the first - if the individual component doesn't screen, then we look at the seismic

sequences, so we're going from the bottom to the top.

Some of the technical issues that come out of the ISG-01, is that it forces - and maybe that's a strong word - but it forces a method that is not consistent with the majority of seismic probabilistic risk assessments, or analyses. I purposely didn't call it seismic PRAs here. There are probably 40 seismic PRAs done in the nuclear power arena, maybe it's a little bit less than that, but it's around that figure. And in the case of ISG-01, it's not a seismic PRA, per se, and the methodology that's in ISG-01 is certainly not widely demonstrated.

We also feel it imposes an alternative design requirement. If you go through the first step, and you actually take each individual component, and you perform fragility analysis, and compare that to a cut-off, is essentially imposing a new design requirement upon that component, if you expect it to screen. So if you're the procurer of a particular component at your plant at this facility, and you're looking at two components, one that may screen and one that may not, you may choose the one that screens. You're not differentiating among the risk-significance of the pieces of equipment. Is that more important in the overall scheme of safety, than, let's say, the

next component that you look at?

This approach is very -- the ISG-01 approach is very resource-intensive, if you perform the first step, as it's stated. If you go and you look at each component that's important to safety, and you perform a fragility analysis, that is certainly going to be a very resource-intensive process.

The next bullet, just to give you a little comparison - a typical seismic PRA, anywhere from about a typical range of fragilities might be about 25 to 75, there are some plants with some more, there are some plants - there actually are a few plants with a few less fragilities that are performed. For a site in excess of, let's say, approximately 50,000 components - again, another approximation - but in the case of ISG-01, if we were doing this for a facility with 50,000 components, we'd be performing 50,000 fragilities. Fragilities are not cheap. The expertise available to perform fragilities is getting harder and harder to find. There are fewer and fewer seismic experts out there who are capable of performing this type of analysis.

Again, I was going to make the point that ISG-01 is component and sort of sequence-based, as opposed to facility-based. The ISG-01 really does

look at components, then sequences, doesn't really speak about among sequences; where the seismic PRA attacks the results in a more holistic perspective and a downward-looking approach, where it might look across sequences for potential mitigative or recovery actions. ISG-01, currently, is also silent on the area of mitigative and recovery actions, but it does talk about modifications on that chart, design modifications prior to considering both mitigative and recovery actions. In other words, that box isn't there, but the box on modifications is there, so if you're a design engineer, you're not looking for mitigative and recovery actions, you're looking for hardware changes. And it imposes those hardware changes before the consideration of uncertainty, cost-benefit, and other factors. It's interesting, your previous presentation will have little to do with what we're going to talk about here where you were discussing uncertainty, but I'll discuss that on a future slide.

The screening criteria is of one in 10,000 over the pre-closure periods imposed without consideration of, for example, the commensurate threat. It's significantly lower, more than a factor of hundred, than the safety goals for operating

reactors, so you're looking at a one times ten to the minus four over the closure period.

The other interesting fact that we're looking at here is the tails of the distributions, and that's the fragility curve. The tails of the fragility curve can drive the design, and the tails of that fragility curve has an extremely large uncertainty associated with it.

I did want to make a couple of other points on the technical issues. There are a lot of potential single SSC sequences that are possible in the case of evaluating seismic. We know this from all the seismic PRAs performed, things like building failure is the potential for a single event sequence, and there are several others. For example, if like equipment is used in two trains of a mitigative system, and those trains are located in the same part of the building, they are assumed, through the methodology of seismic PRAs and probabilistic analysis, to both fail with the exact same fragility, so only one fragility is used; therefore, it really is a single event, even though there are two pieces of equipment involved. And the results of that is the potential to over-design some of the structures and equipment. And there are some ancillary things here,

like the cost of construction, and there's even the possibility in the case of the extreme hazards, and the very low threshold criteria that are being used here, that there may be some situations of the design that actually haven't been encountered in modern construction. It is possible, for example, to find it very difficult to design a pole or crane to be able to withstand the seismic forces we're talking about in this particular facility.

And I did a quick back-of-the-envelope analysis just to look at the pre-closure facility and get some idea of what the building itself would look like, and I estimate something greater than three and a half feet of maximum steel - the maximum steel reinforcement allowed by code being required, and that's really - I think I can say with pretty good assurance - that that's the minimum. It may even be about four feet thick concrete with maximum reinforcement. That's a lot of concrete, that's a lot of reinforcement. That's stronger than a typical BWR secondary containment, and as strong as some of the existing containments in the nuclear industry.

But the most important point of that whole discussion, is that this is an artifact of the analysis technique, it's not an artifact of physical

reality. I don't think we would be discussing it if it was a physical reality, but what I mean by that is an artifact of the analysis, is the seismic hazard curves are designed, are based largely on expert judgment, especially in the higher acceleration regions we're looking at. And that expert judgment has a lot of uncertainty associated with it, several orders of magnitude. And it's probably in the conservative direction right now, so this is an artifact of a - this is sort of a mathematical artifact, or artifact of the expert judgment.

And just to give you an example, I can take the fragility, the hazard curve that's being used for Yucca Mountain, and I can find on that curve the probability of a 15G earthquake occurring, the probability of a 15G earthquake - yes, there's no physical reality that we can have that earthquake, but that curve will produce a probability that is very low, but it will produce that probability, even though it's not physical.

And the last part of the ISG, the ISG also doesn't provide any guidance on the performance of consequence analysis. It does refer to it being the last part of the screening process, but certainly doesn't provide any guidance on its performance.

These were my technical concluding remarks. In overview, the ISG appears to be a little bit more risk-based than it appears to be risk-informed. I do have a bullet here that the current state-of-the-art of seismic probabilistic analysis may not support the extremely low criteria that's currently proposed, and uncertainties are extreme in the tails of those curves, and it's important to know that when you're making risk-informed decisions, risk-informed decisions are made in the light of uncertainty, and understanding that uncertainty. So I would argue that it may not be risk-informed, it also may not be prudent to design the structures to those higher acceleration levels without consideration of what are the impacts, both financially, both on other hazards that you may need to consider.

And the last part is, more flexible methodologies than what's proposed in ISG-01 may be required to support a real practical risk-informed framework for Yucca Mountain, especially in the area of seismic. And those conclude my remarks on this part.

MR. McCULLUM: There'll be one more technical subject coming up, but first I want to take you back to something I mentioned on the introductory

slides to Ken's talk here, which is, this is the belief, why we at NEI believe there is a regulatory basis for - well, certainly, we believe there's a strong basis for NRC not imposing expectations on DOE through guidance to its staff, but why, specifically, the original, more traditional approaches originally proposed by DOE should be accepted at Yucca Mountain.

Now, again, I will already concede that both DOE staff and GC disagree with this interpretation. We'd certainly like to see it explored, and we think it's a very useful interpretation, particularly, again, looking at how much work has been done successfully with the more traditional approaches, and how unprecedented, and perhaps sending us off in a non-productive direction ISG-01 is.

But, anyway, initiating events would be considered only if they are reasonable, and reasonable is defined as, in part, consistent with precedents adopted for nuclear facilities with comparable or higher risks. We feel this in the regulation should give DOE the ability to use traditional approaches. I remember when the staff was speaking to you last month, the reason given for the rejection of the original methodology, and the decision to issue

guidance - again, guidance to the staff to correct a problem that DOE was having, yet it's not really a requirement being issued upon DOE - had to do with well, the regulation requires a different approach.

Well, the second question to that is, why? And that's, again, why you need the broader level review. That's why the regulatory discipline is in the system, and that's why ISGs should not be used, and similar tools should not used to circumvent the regulatory discipline, because that's second why question never gets asked. The interpretation is that 63.102(f) does not allow DOE to submit analysis based on existing precedent, even if it's not exactly what you might have envisioned when you were writing Part 63; yet, the question of why you have to reinvent the wheel in a broader sense doesn't get addressed.

This goes back to the point I just mentioned, and we have a lot of experience with ISGs. And I will say that not everything in an ISG is bad. I know when I first mentioned this in a public meeting in a DOE/NRC technical exchange, Lawrence Kokajko came up to me afterwards, and he pointed to all the things that are in the ISGs that folks in the vendor community may have found useful. I'm not sure folks in the utility community would agree with all of

those, but whatever - I'm not contending that everything that's in an ISG is bad. What I am contending is, when NRC staff does sense a legitimate need to address an issue with guidance, or with promulgating an expectation, that they do it with the same level of rigor and process that the original instrument had associated with it. I mean, the staff has told us that these ISGs essentially amend the Yucca Mountain review plan; yet, they don't have the same level of process, the same level of approval.

And so we do find - our experience with 22 ISGs now, is they do - although, they're written as guidance to NRC staff - they do tend to become de facto requirements. And the fact that this methodology is out there, and is out there in specific response to a methodology of DOE's that the staff rejected, it does reduce DOE's flexibility. One of, I think, NRC's best tools is the TPA code. NRC uses the TPA code to do its own independent analysis, and it looks at DOE's TSPA, and it can do all kinds of nifty comparisons there. NRC could use this methodology to do its own internal studies, and to take apart pieces of DOE's design. It would be very, I think, instructive if DOE was designing with the top-down approach. NRC starts to look at that

bottoms-up, they might come up with some very interesting questions in doing that. But NRC staff wouldn't think of imposing its TPA code on DOE, through interim staff guide, or any form of regulatory tool. It's very clear that that's a tool that NRC does to do its own independent work.

I would submit to you that this methodology could be such a tool. There is really, in our minds, no rationale to support imposing it on DOE through an ISG. And if the conclusion is that it should be imposed on DOE, well then it should be imposed appropriately. It should be imposed by taking the review plan, or even the regulation, to a greater level of detail. But, again, ask yourself the question - why the review plan, and why the regulation originally left the flexibility there.

CHAIRMAN RYAN: Rod, let me just stop you a second. I'm struggling here. I'll tell you why.

I have no guidance from OGC or anything. We are here to give technical advice to the Commission.

If I was to follow your guidance, everything would be in 10 CFR 63.

MR. McCULLUM: I would say everything that is necessary would be in 1063 or the Review Plan.

CHAIRMAN RYAN: Oh, wait a minute now. You said it should follow the highest level that it came from. It all came from 63.

MR. McCULLUM: Right.

CHAIRMAN RYAN: Why don't we write everything in regulation and be done with it? I'm really struggling to follow the logic of how an interim staff guidance is inappropriate for a reason that is really kind of a regulatory structure reason. I don't follow that.

I'm not trying to argue with you as much as I'm just trying to understand your point. I don't get it.

MR. McCULLUM: Yes, I'm glad you brought that up because I need to clarify it, absolutely.

CHAIRMAN RYAN: Let me give you my counter example. The NRC uses license conditions, letters to licensees, branch technical positions, reg guides, I mean dozens of different kinds of instruments to communicate to applicants, licensees, and others. Why are you picking on this one?

Now I did understand -- and if I may just take a minute -- I appreciate the fact you had some very specific technical issues. So you are kind of disagreeing with the process and you are disagreeing

with the content. Somewhere along the line I would like to understand which one is more important to you.

MR. McCULLUM: Well, I think all those tools you mentioned have a higher degree of process rigor. I think that you get down to the point where you have technical things being imposed on a licensee that aren't as well-thought-out as they should be when you abdicate some of your process rigor.

You use the term "everything should be in the regulation." I guess where the disconnect is coming is in that definition of everything. I said everything that's necessary.

We firmly believe that regulation should be the high level, and it should be incumbent upon the applicants and the licensees to define how to apply those regulations, how to comply with those regulations.

What you have with ISGs is, without revisiting the overall structure of the regulation, you have a more detailed expectation being placed on a prospective licensee.

I would submit, why go to that level of detail?

CHAIRMAN RYAN: Well, you know, I've been a licensee and an applicant both at this Agency.

Whenever I've got the NRC to write something down, tell me what they wanted, I always went away feeling pretty good, if I thought I was technically correct and sound, for all the reasons that you just cited.

MR. McCULLUM: Right.

CHAIRMAN RYAN: I guess my own view is I didn't much care what they called it.

MR. McCULLUM: Well, no, and, again, that's why I would concede there are things in ISGs where there are licensees out there who are glad they got that in writing. There are times that the regulator needs to clarify.

We find, as a matter of course, though, that ISGs are not an effective way of doing that. Remember, the title says, "interim." Let me ask you, of the 22 interim staff guides in the dry storage and transportation world, why are they all still interim? What comes next? Interim doesn't convey a level of permanence.

It also gets back to the fixed playing field issue. When the regulator can convey expectations in an interim fashion, in a fashion without the controls that are placed on the regulations and the other tools themselves, the licensees can be surprised.

There are cases in the dry storage world where, again, RAIs are written against draft ISGs in the middle of review processes. If there legitimately is an emerging issue that is discovered, that may be appropriate, and ISGs may have been the most effective tool at hand at the time to do that.

But, again, in Yucca Mountain, that is not the case. There is no interim here. If there is an emerging issue, why can't it be dealt with in the context of the review plan itself?

I hope that is helpful, but it is our contention that you get to the technical problems such as this by not following the appropriate level of process rigor. That process is put there in place for a reason.

If we found a problem that I haven't got the right cause, I apologize for that, but our experience with ISGs would suggest that we should answer that question of, why are they interim indefinitely? Then maybe many of them would find appropriate permanent vehicles. Maybe some of them wouldn't.

But the overall, the overarching review should be done, particularly in light of the risk information that is known about dry cask. You've

heard about the dry cask PRAs and what low risk levels you are dealing with there, and you have all these expectations promulgated through ISGs.

Are we focusing enough attention on the right risk-significant areas there?

CHAIRMAN RYAN: I appreciate your clarifications. Thanks.

But what I am trying to separate in my mind, or at least from what you both have said, is, what are the technical challenges that you see in the ISG? That is one set of things.

Forgive me, I just don't know the area well enough of the seismic questions, but I am trying to separate what your process problems are from the technical points.

MR. McCULLUM: Right. The only relationship is that we feel that --

CHAIRMAN RYAN: I'm trying to ask you don't relate them.

MR. McCULLUM: Okay.

CHAIRMAN RYAN: Just tell me what your technical issues are, and I now understand what your process points are, but what are the technical issues, separate from those?

MR. McCULLUM: I'll let Ken speak to that.

CHAIRMAN RYAN: Okay.

MR. McCULLUM: I think it has to do with how we feel the design will be driven by this methodology in ways that might not otherwise make sense.

MR. CANAVAN: Yes. I think, if I might, I'll step us back to here.

The ISG is a --

CHAIRMAN RYAN: What page is that?

MR. CANAVAN: I have a lack of page numbers.

MR. McCULLUM: You went back one, two slides from where you were. So you're at slide 16 or 15.

MR. CANAVAN: Yes, it is on page 8 of your presentation slides. Did we all find it? Fifteen?

I would start with this is sort of a summary of the major issues. The devil's always in the details. So I would encourage us that, if we are going to pursue something, that we look at some more of the details.

But the ISG wants more of a bottom-up approach. So it is not really risk-informed. It is looking at mostly -- it starts off with individual components and moves to sequences, and then it never

discusses among sequences.

So let's say I have 15 sequences that all impact fuel pool draining. It never looks at, well, is there some piece of equipment that we should have in place or procedure to refill the pool, because of this seismic event? And what does that do to the probability of those 15 sequences? Some of them are initiated by seismic events; some are initiated by fire; some are initiated by random events.

That is why it is important to look holistically; rather than from the bottom-up, look from the top-down, so that we can look at a variety of sequences. The ISG-01 never discusses looking across sequences. The ISG-01 says look at a component. Look at a sequence. Does it screen? No. Modify the structure.

That brings us to the next, one of the other concerns that is actually not on this page that was made earlier, which is you may be modifying the structure prior to doing something that is a little bit more holistic, a little bit more risk-informed rather than risk-based.

The next bullet talks about -- there's actually two things implied in here. One is that the state-of-the-art of probabilistic assessment may not

support the extremely low criteria that Yucca Mountain currently has. That criteria is based on a hazard curve. That hazard curve is formed by expert judgment, especially in the tailends. The tailends, it can be up to two orders of magnitude in the tails of the probability at a certain G-level.

So you're now designing for a G-level because the design of .58 didn't make the cutoff, because you're looking at 1(-6), and that's upping your G-force level to something very high, where the structure fails. So now you go back and you say, "I want to make this structure stronger," but that whole convolution of the seismic hazard curve and the building fragility is driven by the tail of that structure.

If you said, "I don't know G-force levels higher than 1 G, I don't even physically know them," and you cut off the hazard curve, you would find that the design actually now does screen. So it is a sort of a mathematical artifact, based on expert judgment, and you're making a building that might be significantly stronger based on a curve that comes from expert judgment that we know is conservative, and therefore, may not be risk-informed.

The nuclear industry as a whole struggles

with some of this on the seismic area as well, but only in the cases where you're looking at extremely high G-forces and you're at the tails of those curves.

I did a quick study that I was going to put in the slides, and I decided not to, where if you cut off the top, because I thought it was a little too in-depth, if you cut off the top 20 percent of the hazard curve, you can reduce the risk by up to 30 to 40 percent in some cases.

So you basically are saying, when you cut off that hazard curve, I don't know any more after this. I'm going to stop. I'm not going to take it to 15 G and 1 E (-22) because I know that those aren't real values; they can't really happen.

If I start truncating that curve, I find that the risk starts reducing. In the case of Yucca Mountain, some of these components would start screening.

So, in this case, since we know that a significant portion of the components will not screen based on their current design, they are going to actually be designed to this probabilistic framework on a component-by-component basis, and that is risk-based, not risk-informed.

It is also beyond the state-of-the-art, in

my opinion, given the uncertainties that the seismic can support, seismic methodologies can support.

The last part is more flexible methodologies than given in ISG-01, for example, looking at recovery, looking at repair, looking at mitigative actions, isn't included in ISG-01 and would be an important aspect of reducing the probabilities of sequences in ISGs and equipment, so that they would screen.

CHAIRMAN RYAN: Is it fair for me to conclude from your comments that you think ISG-01 is inconsistent with other guidance that the NRC has put out on seismic issues?

MR. CANAVAN: Yes, completely.

CHAIRMAN RYAN: Have you said that?

MR. McCULLUM: We can go straight to this one now.

MR. CANAVAN: This is exactly where we are headed.

The ISG-01 cites the MOX example of the MOX plan as supporting ISG-01. We reviewed the reference that's in ISG-01, and it really doesn't provide sufficient information to demonstrate it as a precedent. It's also only one facility.

We compared some of the design processes

that were in the MOX facility and what was planned for ISG-01 in Yucca Mountain. These are just some differences in the criteria shown on the table.

But other than MOX, there's certainly no other facility using this that we're aware of, and the MOX is a little light in technical information and figuring out whether or not they really do qualify as precedent, as opposed to commercial nuclear facilities that have a large body of both PRAs performed and guidance available, some of it even the fast guidance in the form of new regs and new reg CRs, that goes through the development of a seismic hearing.

CHAIRMAN RYAN: I mean just as a non-expert, it seems to me that those technical comparisons are more compelling than the process comparisons.

MR. CANAVAN: Well, I'm a technical guy. So I feel they're very compelling.

CHAIRMAN RYAN: And I do, too. But, again, just to review, our focus here is to give the Commission technical guidance on technical matters. So the process matters are not in our wheelhouse, but these tend to be.

So I am interested to hear a little bit more about what your insights are here on these kinds

of points.

You know, for example, talk a little bit more, if you would, please, about the PRAs that have been done at power plants and utilities, and how does that information come to bear, and what are the new regs that are involved, if you could?

I know I'm putting you on the spot because you probably don't have all that at hand, but --

MR. CANAVAN: Greg?

MR. HARDY: Can I just talk to this real briefly?

MR. CANAVAN: Yes, please.

MR. HARDY: I helped put this together.

CHAIRMAN RYAN: You have to sit at a microphone and tell everybody who you are.

MR. HARDY: Even if I talk loud?

CHAIRMAN RYAN: Yes.

MR. HARDY: All right. I'm Greg Hardy with ARES, and I'm a consultant to EPRI, worked on seismic PRAs since the very first one in the commercial -- Oyster Creek.

I don't know whose seat I am stealing here. I apologize.

If you are interested in this particular thing, and I think maybe it makes sense to flow

through it a little more, we have this one precedent for MOX. What they did for MOX is design to a one-time 1x10(-4) curve, which if you're into probabilities, what it means, it is a little more of a higher level for that site than, for instance, what happens at Yucca Mountain, a 5x10(-4) design.

And it is key for a number of reasons. In truth, yes, there was a performance goal that was raised at an RAI stage within the MOX facility, and that RAI asked, well, what does it mean beyond the design basis, which is frequently asked, but not in a prescriptive -- it is usually asked in a more broad sense: Can you go beyond the design basis of what will happen?

Well, here in MOX, in truth, there was an RAI that they responded to which basically asks that question. But the performance goal is a 10(-5) goal. That's a significant difference than the 10(-6) that Yucca Mountain is being asked to address.

So what they did in the MOX SER, and they've got some references to that, they come up with this quantity called the risk reduction ratio, which is a factor of 10. It is basically dividing those two quantities. It says, how far do you have to leap beyond the design in order to demonstrate this

particular seismic performance goal?

The significance, and the reason we put it here, if you look at what happens for Yucca Mountain, where they have designed to a 5x10(-4) and the performance goal is 1x10(-6), a very different situation, a factor of 500.

So what it means is -- and that's that last column -- what they found at the very -- they only looked at six kind of very generic components at the MOX facility. They concluded everything is okay; our design holds; we don't change it.

But for Yucca Mountain, with that factor, I would be very surprised if they didn't have to drive the design based on that performance goal criteria, which means you could do the design for a 5x10(-4) earthquake, which is about .58 Gs. It is what that corresponds to, at least currently. I know they are redoing the hazards someday.

But you do that design; it's not going to hold. You're going to find you don't meet this criteria. You going to have to raise it up and up and up, and you're going to have to do a feedback system, which basically comes back, I believe, and has this thing, control to your design based on a performance goal.

The reason I say that, with that factor of 500 there, you just can't, I can't see it, unless you have such a very big system of components with parallel branches, et cetera, that you don't drive the risk by any singletons.

I know the NRC has said -- I was part of a conference call you guys had a while ago; I was part on a cell phone; I apologize. But I think I heard that they had done something that they believed that wouldn't change the design, but I haven't seen anything to that effect. I would be very surprised if that were the case, based on my experience of, what would happen with that design and some conversations with the Yucca Mountain people.

So that is kind of the significance here of, if you're using this as your precedence, it is a little different animal; it really isn't the same beast, at least results-wise and what the effect is.

CHAIRMAN RYAN: Thanks.

MR. HARDY: Sure.

CHAIRMAN RYAN: We appreciate that.

MR. CANAVAN: I was going to, if you wanted just a little bit more information on it --

CHAIRMAN RYAN: Let's have it.

MR. CANAVAN: Okay. Let's talk a little

bit more about this part. This is the traditional seismic PRA methodology, and this is very overview. Obviously, the devil is in the details.

I was going to make that part that says "under consider" much, much larger and talk about many of the other items that you need to consider to be called risk-informed.

But I would say in the seismic method you will be looking at seismic-initiated sequences, which will include the normal sequences that come from a PRA plus those that are strictly seismic-related.

So the normal items that are in the PRA, the normal sequences, will not have seismic failures in them, but there will be a few unique ones that are related just to seismic.

When you are finished with all your results and you look at the end result of the PRA, what you will find is that there are some seismic sequences that drive the results that you may want to look at to see if you want to modify.

This is of a structure that has already been built. It has been running. It is operating. It has a seismic design.

So you are looking back at, well, what are the things that I can do to mitigate or recover these

sequences? The chances are you don't pick mitigation and recovery-type actions to incorporate your facility except those that indicate that you can recover multiple sequences with.

One of the items that you will find is that, if you look at some of the severe accident strategies now at nuclear power plants, you find that a lot of the things that they are doing in severe accident management mitigate many of the sequences, including those initiated by, for example, fires and seismic and other events.

ISG-01, at least the current guidance, lacks that. If you look at that picture or the flow diagram, it drives you right to modification if you don't meet. So it doesn't look at, well, do I refine these, based on new information or things that I might do to make them lower?

Those actions can include some things like hardware. The best example I can give you is, for example, a portable pump not kept on site that can be brought to the site in a short period of time that you might use to mitigate fuel drain-down-type events.

There are many others that we could walk through that you could credit in the accident sequences and essentially not drive your design

strictly by the hardware meeting a certain threshold, which is essentially, as Greg pointed out, changing the design point.

You might as well not design for .58 G; you might as well just go convolve the single, take the hazard curve, take a component, figure out what that has to be seismically-designed to, and design all your structures there, because that's really where you are headed.

The seismic PRA, we would repeat the above steps a bunch of times. We would iterate through the process, making refinements to the model, doing mitigative and recovery-type actions, incorporating those into the model. Then, lastly, we would go about the process of physical modification. So it's actually the last step in the seismic PRA, not in the middle of convolving.

The last step in the seismic modification may not, for example, go after the most significant seismic contributor. It might look at that significant seismic contributor and say, in this particular case, it is being driven by the tail. So we do uncertainty and some sensitivity analysis, and we say this is actually an artifact of the mathematics and the judgment that went into making the hazard

curve, not necessarily something we need to spend $16 million fixing, for example. Let's say it is a structure, and it's an expensive fix.

But there are these other things that are more cost-effective to do and lower the risk about as much. So you might look at a tradeoff and say, well, I'll only be spending a million here, but I'll be reducing the risk twice as much, but not by reducing the top, but by reducing the other lower contributors, maybe several.

So, in that case, you're being risk-informed, recognizing that your resources are fixed and you are trying to make the best design you can for that situation.

None of this appears in the brief ISG-01 methodology that is put out.

So I would argue that a seismic PRA methodology might be a better methodology to use, with the one caveat that, even the current state-of-the-art seismic probabilistic risk assessments, and even the current, are still held hostage to uncertainty and the fact that the seismic curves remain largely based on expert judgment, especially in the tails.

Is that clarification sufficient?

CHAIRMAN RYAN: It sure helps me. Thanks.

MR. McCULLUM: I think if we were done speaking to this particular issue here, that would bring us to our concluding slide, which --

MEMBER HINZE: Can we make certain we understand what all the items are in that table?

MR. McCULLUM: Yes, sure.

MEMBER HINZE: The likelihood of increase in design level, what is that?

MR. HARDY: Let me just go back to that. Sorry.

At MOX, the relative closeness of what they design to to the performance goal -- and we use this risk reduction ratio, and this is something in the MOX documentation. That particular nomenclature you might not see.

So this number is just these two numbers divided. What it says is it's relatively easy to meet that performance goal if your design level is close to it.

So what that low means is that, as it was, MOX did nothing to change their design basis. All they did was a study to show that they had reached this performance goal.

What I'm saying at Yucca Mountain likely will happen, certainly if you use this first approach

where you take a fragility and convolve it with a hazard, and not do the whole process of going through and looking at the consequences, you are going to have a very tough time bridging that 500 gap. So I would say there's a high probability that your design basis is going to be predicated on this performance goal and not on this design level they are currently marching to, and they know that.

MEMBER HINZE: Isn't it true, though, that the concern here is meeting a certain dose level? If that dose level does not exceed the standard, then you don't have to worry about design adjustments?

MR. HARDY: Yes. I'll let Ken talk to that.

It's a truth, but it is very difficult to do. They didn't do it at MOX. It is basically a --

MEMBER HINZE: That is just one, as you say.

MR. HARDY: Yes, and the only one that is a precedent, unfortunately.

MR. CANAVAN: I'll bring us back to this particular slide.

The box that you are referring to is, "Is the dose less than the Category 2 limit," and if the answer is yes, you're in compliance. If the answer is

no, you're modifying the design.

The dose is the last step. This is another note I will make on ISG-01. ISG-01 is very detailed on developing hazard curves. It is very detailed in reference to how to develop fragilities. It is pretty detailed on convolving them.

Then, all of a sudden, the detail in ISG-01 starts to disappear. There's no mitigative, no recovery actions, and there's no discussion about how you would calculate consequence.

There is a reason, I think there is a reason for that. It is very difficult to assess how you calculate consequence in this particular facility.

When does the seismic event occur? Does it occur on-shift or off-shift? Where's the crane? If the building fails and the crane hits, how many casks does it hit and how do they fail, and what's the source term that you use?

All these things start to become a very subjective-type evaluation. You probably can assess the probabilities of earthquakes day or night and times, but it is a very convoluted and relatively subjective analysis to even come up with the source term, and then, nevertheless, how that source term gets distributed.

Also, given the process, given this process being posed during design, I would argue that the person that's procuring the equipment certainly feels a significant amount of pressure not to be the person who causes the consequence analysis to be performed, because it is hard. So they would try to defer, I would believe, to a more rugged piece of equipment, as opposed to doing an analysis that is subjective and difficult, and especially in licensing a regulatory space.

Also, there isn't a whole lot of guidance in that area available. So while it is true that it is an avenue, a potential avenue of relief, I think it would be less availed than the modification approach, less used, if you will.

MEMBER HINZE: You know, Ken, I may be approaching this from completely the wrong manner, but if I were DOE and I was using this methodology, I would use the methodology until I met the standard, and I would change the design. I would do that in-house before putting this into a license application.

As I see it, what NRC can accept, can expect from the DOE is a presentation of this in a manner that meets the design, the standards, and the design would have been changed. So we don't have to

worry about this mitigation problem that you are dealing with.

Where am I wrong in this approach?

MR. CANAVAN: ISG-01, well, it depends on how you read the ISG-01. I understand what you are saying. You would do a traditional seismic PRA. You would finish it before submitting --

MEMBER HINZE: Yes, yes, yes, and I would just design until I met the standard.

MR. CANAVAN: Then you would submit and you would hope that the person reading ISG-01 reads it the same way, reads that a seismic PRA is acceptable.

My big concern is that the people at this table and the discussions that are happening now, 10 years later, when Yucca Mountain is fully designed, there's a new person in here that says, "You did a seismic PRA. You didn't do ISG-01. You can't credit recovery actions because it is not an ISG-01," because ISG-01 does not allow -- does not say that recovery actions can be included.

ISG-01 says do each component. Do each sequence, and then compare it to these criteria. If you don't do what's in ISG-01, 10 years down the road, someone might turn around and say, "Where's the fragilities for all the components? You credited a

recovery. It's not allowed by ISG-01."

MEMBER HINZE: But where am I wrong in this --

MR. CANAVAN: You're not.

MEMBER HINZE: -- that the NRC has put it onto paper that this is not a de facto regulation? You are worried about the term "interim," and you should be worried about the term "interim," but the term "guidance" is there. It doesn't say, "regulation." It's guidance.

MR. CANAVAN: I would agree with you, and if we didn't have the experience of the 22 ISGs that we already have, and if we really believed they were just guidance to the staff, we wouldn't be having this discussion.

MEMBER HINZE: Point well-made.

CHAIRMAN RYAN: Do you want to sum up?

MR. McCULLUM: Yes, and I'll go to the summary slide. Again, thank you for your indulgence.

The first three points here are process points, and I'm not going to belabor those. I have heard in this room, I guess all I'll say is "uncle."

But with this particular, what we would call, unintended consequence of those process deficiencies, we do find technical issues. We do see

it being interpreted as more than guidance, and we think it should be withdrawn.

So, with that, I'll conclude.

CHAIRMAN RYAN: Thank you very much.

We will turn to the Committee for any questions they have. I can't conceive that there would be any questions, but let's try it anyhow.

(Laughter.)

Dr. Clarke, one of the problems of sitting at that end is you're called on first.

MEMBER CLARKE: Well, I am happy to reply that I don't have any questions.

CHAIRMAN RYAN: Dr. Weiner?

MEMBER WEINER: I can't comment at all on the regulatory problem because that is not our purview anyway. But something struck me; early in your presentation, you said that the Yucca Mountain, that the ISG was used -- a reactor in Yucca Mountain is not a reactor.

What would you use as a comparison for the surface facilities at Yucca Mountain to design a seismic standard?

MR. McCULLUM: Well, we think that it would be a conservative, and not wholly inappropriate, comparison to compare Yucca Mountain to a reactor. I

think the concern here is that you're driving to a level of stringency that is beyond what is applied in most reactors.

MEMBER WEINER: I guess my point is Yucca Mountain isn't a reactor. Are the differences such that that would be an adequate or appropriate comparison?

MR. McCULLUM: I think it would be an appropriately conservative comparison, unless, of course, the argument is that Yucca Mountain is a higher hazard, that the Yucca Mountain service facilities were higher hazard than a reactor. Absent a nuclear chain reaction, the temperatures and pressures, and all that, and the accident possibilities -- I wouldn't go there.

But I would say it is not that far -- again, the seismic design of the reactors is all quite conservative and quite safe. If Yucca Mountain is a lower hazard facility, it is not so much lower that I would start proposing that we design a much less robust structure.

MEMBER WEINER: What would you do for a seismic standard in the absence of ISG-01?

MR. CANAVAN: I would propose a tried-and-true methodology. The seismic PRAs that have been

done in the industry have shown great strengths as being able to improve a design. They do so in a risk-informed framework. So they don't impose a new design criteria.

They suggest that we use a combination of realizing we have fixed resources and some common sense, that we don't necessarily have to design structures that are 4.5, 4 feet, 3 feet of steel-reinforced concrete for a hazard that doesn't require it.

So I would advocate an approach similar to what was taken in the IPEEEs and performing seismic PRAs for Yucca Mountain or a seismic PRA for Yucca Mountain, with all the bells and whistles that come with doing that: looking at recovery across sequences, looking at mitigative actions and strategies that make sense, as part of lowering the design -- I think it makes the most sense resource-wise and safety-wise. I think it is safety-focused and resource-focused.

MR. McCULLUM: And I would add that what exists in the regulation Part 63 in the Yucca Mountain Review Plan is sufficient to allow DOE to make the choice, to do that, to submit that to NRC, and for NRC to review it, using whatever tools they want to review

it.

So I would contend the existing regulatory framework is adequate, without the ISG, is adequate to allow that to happen.

MEMBER WEINER: Thank you.

CHAIRMAN RYAN: Well, this has been an interesting discussion. I appreciate your candor and detail.

A couple of just follow-up questions: I sympathized with the struggle of what's Yucca Mountain-like or not like. To that end, I would say it's certainly not a MOX facility, either, particularly the MOX facility at Savannah River, which is going to be a lot different in terms of its feed material than spent fuel.

It's going to be plutonium, not spent fuel. That's a big difference, particularly when you think of consequence and events that disrupt and airborne, and all the rest.

MR. McCULLUM: Yes, I would agree with that. That was the only reference we have.

CHAIRMAN RYAN: And I fully appreciate the fact, well, it's either that or nothing. So I am sympathetic. But I think we've got to be careful.

I am taken, Ken, by your comments that the

state-of-the-art approach, and thinking about how to use the seismic PRA, even though, clearly, that's not my area of expertise, that is a compelling argument to think about: How would you do it if you were at a power plant?

To the extent that Yucca Mountain is going to have spent fuel from power plants in some inventory -- I don't know how much -- you know, you get a lot closer to thinking about radioactive material at risk. At least there's some alignment there.

So you can think about, what does a power plant look like and what should the facilities at Yucca Mountain look like, at least in concept. When you get to the details, it may fall apart in some way.

But that means something to me just from a health/physics point of view. If I have an inventory of "X" curries of this profiled fission products and actinides, and it's half of this inventory, well, I've got a foot on the ground, that kind of thing. Then using the techniques, which obviously are Professor Hinze's area of expertise on seismic issues, seems to make a lot of sense.

I would urge you to focus on the technical questions. At least from our standpoint of what we can advise the Commission on, the process and OGC

questions of, what can the staff write and how does it relate to this, that, and the other, that's not a wheelhouse.

So from our point of view, I am glad we have done what we have done. We've just kind of separate them into two bins to really understand your technical challenges to the content of the ISG and some of these other things. That's helpful. I am glad we've gone through that, but we have some more to think about.

With that, I'll turn it back to Professor Hinze.

MEMBER HINZE: Allen?

VICE CHAIRMAN CROFF: While I make a comment, I would like to get the slides back. Is Michelle back there? Can we get the slides back up?

Maybe, first, a comment: I'll take off on what Mike was saying. It looks to me like the pre-closure in the surface facilities at Yucca Mountain look an awful lot like reactor spent fuel pools and reactor dry storage operations to me. It is not exact, but real close.

The slide I had wanted -- you had in the presentation three slides with a title of "Technical Issues with ISG-01." Let's see if we can get these up

here.

CHAIRMAN RYAN: There it is.

VICE CHAIRMAN CROFF: That's it.

It seems to me pretty much this slide, coupled with your thought of going out on the tail of some distribution into unphysical space, are a set of potentially-compelling technical arguments just encapsulated here in terms of not differentiating risk significance, and that is something that at least I think I could understand.

Have you discussed the issues on this slide with NRC staff, and do they agree with them or not?

MR. CANAVAN: We have had some conversation -- I wouldn't call it formal -- during breaks at other meetings.

MR. McCULLUM: This issue, in a more general sense, was discussed in a meeting we had on September 29th.

MR. CANAVAN: Yes.

CHAIRMAN RYAN: But he's not asking in general. Have you talked about your specific technical questions?

MR. CANAVAN: I would have to say that it was mentioned in brief and not in detail, and there

was a difference of opinion.

CHAIRMAN RYAN: It seems to me that conversation should probably continue.

MR. McCULLUM: Yes, no, it should. I think, as we have gone on beyond the meeting and put some more effort into it, even post our comments, I think we have learned a few more things. We would like the dialog to continue, yes.

VICE CHAIRMAN CROFF: It seems to me that's the focus there, whether that's valid or not.

With that, I'll pass.

MR. McCARTIN: Yes, I guess one comment. I was at the meeting and --

CHAIRMAN RYAN: I'm sorry, Tim. Would you tell us who you are?

MR. McCARTIN: Tim McCartin, NRC staff.

I was at the meeting. I would say the details of these slides, as I remember, we did not hear. I go with my memory, but the details were not mentioned.

MR. McCULLUM: Yes, our thinking over the last several months continued to advance on this.

MEMBER HINZE: I want to leave sufficient time for the NRC staff to make some comments and raise whatever issues they wish to.

But while we have this slide on, I am very sensitive to the very resource-intensive approach here.

Ken, have you evaluated the -- and I'm also concerned about the development of fragility curves. Although they're expert elicitation, there's a lot of expert elicitation in PRA, as we are all very well aware.

We do have a large number of fragility curves in the nuclear power plants. How many fragility curves might we see in the pre-closure site? Have you evaluated that? Is this really of concern to anyone?

MR. McCULLUM: I think if it was performed as the first step, so each component that they identify is, indeed, going to require a fragility analysis performed for it, I think it could get extremely resource-intensive and extremely costly.

In general, we perform 25 to 75 for a typical nuclear facility, operating nuclear reactor. If we look at Yucca Mountain surface facilities, you could easily be into the thousands, if you would do each component. That is just a very broad estimate on my part.

In side discussions with the Yucca

Mountain folks as well, they indicate that they feel that there would be a number of components that they would have to do.

MEMBER HINZE: And you see the ISG guidance as that the DOE would have to consider fragility curve of each component? Is that -- I heard you say that, I believe?

MR. McCULLUM: That is what the methodology says. I'm not sure how DOE's interpreting it or what they plan to submit.

I will say that in public meetings they both said that wasn't what they were going to do, both the licensee and licensor. NRC and DOE both said in a public meeting that they didn't intend to look at every component, which I found odd because the ISG does say that, and it is exact.

I even put in the quotes because I am sort of surprised by the party who wrote the document as saying, "No, well, that's not exactly what we're going to do." I always have concerns when someone says that because my experience of 22 years in the nuclear power industry, most of it as a licensee, has been that exactly what's written is exactly what's meant.

Ten years from now or 20 years from now, when the people who do the interpretation are gone,

there's a brand-new interpretation that comes in. That is what is usually written on the page. It is not up for negotiation at that particular time.

CHAIRMAN RYAN: If I may, Bill -- Ken, I think that is an important point for us to think about. Again, I sympathize with the view that drift of guidance over time, whether it is a decade or 15 years, is not a good thing typically.

MR. CANAVAN: I have 22 years of --

CHAIRMAN RYAN: Clarity upfront is what you are reaching for. If we can focus on the technical clarity issues that are in front of you now with this interim staff guidance, I think that is real helpful. So I appreciate the comment that 15 years from now your son or grandson will be wrestling with it.

MR. CANAVAN: I have 20 years to early retirement, so I may still be here.

(Laughter.)

CHAIRMAN RYAN: Okay, well, there you go. So you'll be the voice of reason and history in the whole thing.

(Laughter.)

MEMBER HINZE: Another question, if I may: You're reasonably familiar with ASCE 43-05?

MR. CANAVAN: No.

MEMBER HINZE: No? Okay. Is someone in EPRI?

MR. CANAVAN: ASME?

MEMBER HINZE: The American Society of Civil Engineers 43-05.

MR. McCULLUM: I think Greg can help us out there.

MR. HARDY: I am relatively familiar, if you want to just ask the --

CHAIRMAN RYAN: You'll have to use a microphone.

MEMBER HINZE: Would you, please?

You can introduce yourself again.

MR. HARDY: Greg Hardy with ARES.

MEMBER HINZE: Let me ask a question then. What is the difference between that standard and the methodology prescribed in ISG-01?

MR. HARDY: They come up with a technique for coming up with a design basis. It is a relatively new kind of criteria that is not geared to a -- as opposed to 1165 or something -- is not geared to a strict 10(-4) design criteria. It is a sliding scale based on the slope of your hazard curve.

So it is a risk, what they would call, a

risk-informed criteria for how you come up with what you should design to, which that risk-informing, hopefully, alleviates the need for looking beyond the design basis.

So traditional may be to come up with either a number or a return period, a 10(-4) hazard like MOX did, like it sort of started down the path.

ASCE, and this is applying to the new nuclear power plants -- that's what they're going to be using, which is what I'm meeting on the next two days -- but that particular path is a different approach. It comes up with a criteria for a design basis.

Then you are, for new plants, if you want to go down that road, because there's another piece of it, you look at a margin beyond that design basis in a traditional SPRA sense, like Ken is talking about. But it is not the design; it is more of a looking at that margin.

MEMBER HINZE: Well, let me pick out a few words in your reply.

MR. HARDY: Okay.

MEMBER HINZE: That is, you stated that these are the standards that, presumably, are going to apply to new nuclear power plants.

MR. HARDY: Yes.

MEMBER HINZE: So what's the difference between using ISG-01, which basically follows 43-05 and --

MR. HARDY: Well, I'm not sure. It makes reference to it, but I'm not sure it follows the approach.

There's a different approach on what new plants are doing and what Yucca Mountain is doing in response to this.

MEMBER HINZE: Can you specify what those differences are?

MR. HARDY: I'll try it again. I mean, stop me if I'm going off in the wrong direction.

One is a prescriptive design criteria -- that's Yucca Mountain -- where you are designing to a certain level, and then you have this second check, which is this second column I had, which is a performance goal approach. That will throw you back in the space of redefining your design so that your performance goal is met, if I understand it right.

What the new plants -- what 43-05, and 43-05 is the basis for what the new plants are doing, and we are revising the standard of a new plant and the reg guides, you know. So I will say it is based

on 43-05, but what they're going to do for new plants, they will take and define, instead of either of these two here, 10(-4) or 5x10(-4), they will define that number based on the hazard and some generic fragilities at a site.

It may be something between a 10(-4) and a 10(-5), depending on your location, how severe the hazard is, something like that. That defines your design. You don't have to go through this performance goal assessment, which may change your design for the new plants, once you have verified you've met the design.

So let's say you do have to do -- I mean it's not completely devoid of what goes on beyond the design basis. There is a separate check where they require you to do a margin or a PRA review of that to demonstrate some margin, but it's not to this kind of a performance goal. So that's the basic difference.

Did I explain it right or --

MEMBER HINZE: Right.

MR. HARDY: Okay. It's not an easy concept, and it is still evolving. So I apologize if I've gone off in the wrong direction some.

MEMBER HINZE: Thanks very much, Greg.

MR. HARDY: Good.

MEMBER HINZE: I am going to ask, does the staff have any questions? Mike?

MR. LEE: Yes.

Ken, I think you mentioned that DOE was considering doing a conventional analysis and --

MR. CANAVAN: Yes. At their last meeting, they seemed to indicate that they performed or were performing a standard PRA-type analysis.

MR. LEE: All right. So, from the staff's perspective, if they choose to apply a different methodology to review that design, they are not necessarily mutually-exclusive, are they?

MR. CANAVAN: No, they are not.

MR. LEE: Okay. So I'm still kind of struggling with, if your concern in some respects is regulatory creep, that the methodology that is used to review the design may over time become a de facto requirement --

MR. CANAVAN: Or that DOE does not complete their seismic PRA and decides to follow ISG-01.

MR. McCULLUM: Yes, that's based on our experience with, again, the 22 ISGs in the dry cask storage rule, that they do tend to become de facto requirements.

MR. LEE: But, I mean, in the professional world, DOE is a big -- you know, an adult, for lack of a better word, I guess. I am sure they can pull in the right type of expertise to do a seismic PRA and to develop a facility that meets, that follows a conventional design approach.

I'm just not sure where the real issue is. This is the staff -- the staff's proposing a methodology that they're going to be using. They haven't told DOE that DOE has to use this methodology.

MR. McCULLUM: Yes, I would agree with you. I think on one of my slides that is exactly the point I made. That was my analogy to the TPA.

If that is, indeed, the way this is used, if the staff uses it to compare what they do to what DOE does, that is actually very valuable. If DOE does a traditional top-down design, and the staff crawls under and looks up at it from the bottom-up, that would, in fact, be a very good, independent check. That is the world I guess we hope to find.

MEMBER HINZE: Thank you.

John?

MR. KESSLER: John Kessler, EPRI.

One clarification that maybe could be made, I am not clear, when NRC provides guidance to

its staff, what that means in terms of the RAI cycle. So, for example, if DOE comes in with methodology one and DOE staff are required to look at methodology two, where not all the information that DOE provided -- or there's some information that DOE did not provide to conduct methodology two, is that a whole bunch of RAIs where DOE is going to have to go back out and collect a bunch of information to do ISG-01 type or not? That's the part I'm not clear about in terms of how much more work DOE is going to wind up having to do anyway if the staff are required to do an analysis against ISG-01.

CHAIRMAN RYAN: Again, John, we're drifting. I appreciate the question, but I think we're drifting a little bit back into what is a process control question within the Agency and is not in the wheelhouse of this Committee.

And I appreciate the question. It is a very valid one. So I'm not putting it away, but our mission is focused on the technical stuff.

MR. KESSLER: I appreciate that.

MEMBER HINZE: Tim?

MR. McCARTIN: Well, Tim McCartin, NRC staff.

With respect to an RAI, whenever one is

generated, there is discussion internally of, do we need this information? While it is hard for me to imagine that the sole need for information would be "they didn't follow what we said in the ISG, and so we want more information," I just don't see how that would make it past -- what's the safety significance of the information? There has to be more than "they didn't follow what was in our guidance."

Now I'm talking my view of how I would defend why I need additional information.

CHAIRMAN RYAN: Again, I've got to ask that we stay on our --

MR. McCARTIN: But I thought that was what you were asking me to address. But we're ready to respond when the Committee -- we have some perspectives on what we have heard.

CHAIRMAN RYAN: We would appreciate them now.

MR. McCARTIN: Now? Okay.

I will give some broad perspectives on what we have heard, and then my colleagues here can go into more detail.

First of all, I would say some of the specifics that have been provided, my view is that if the ISG is requiring that, that's wrong, but I don't

believe the ISG is requiring some of the things that have been asserted.

I will promise you that I'm going to go back and reread it to see if this interpretation, can I pull that out from there? We are sensitive to that interpretation -- things like requiring 50,000 fragility curves, analyzing all the components, considering things like at a 15-G acceleration that is not realistic.

The citation from the regulation that was put up was put in precisely to preclude that kind of assessment, where if you have a 15-G and it's not even credible for the site, how does it get in? I mean that whole part of the regulation was put in to don't include unrealistic things in the analysis.

Certainly, the intent by the staff was not to have an ISG that brought those things back in. So, like I said, we will go back and look at that, but certainly that was not the intent of the ISG.

With respect to the comments about design, yes, in that chart that was shown there is a loop that goes back to design, but it was not the NRC's intent to try to tell DOE how to design the facility.

The approach that Dr. Hinze suggested, that you do the seismic analysis, you iterate it as

best you can. You determine what you want to do. At the end of the day, you then come up with, well, what are the things we're relying on? For those things you're relying on for safety, what the ISG is trying to say is that you are going to have to address the 1 in 10,000 chance, and that's what we would expect.

But how you design and how you iterate, do that as the process; whatever process the Department of Energy wants to use, at the end of the day, it is looking at the things you are relying on, and the intent of ISG, we felt was, how do you deal with the spectrum of seismic events down to the 1 in 10,000? And it was a way to deal with that.

With respect to risk, I know the suggestion was there's no consideration for risk. We disagree. As I believe it was Dr. Hinze suggested, for the Category 2 events, there's a 5-rem dose to the public. If something isn't going to challenge that 5-rem dose, you don't have to do anything. No design is required. It is only when you are challenging that, and I think from a risk standpoint, if you're challenging a 5-rem dose to the public, it's useful to look at those pieces of equipment as important to safety.

I think, with that -- that is sort of a

broad view of some of the things we heard, but I think, from our action on the staff, we will go back and reread the ISG and see what some of these things said. We did not intend some of the assertions that were made, and I guess I would be upset if I read it that way myself.

But I want to offer there are other staff members that, in terms of specific aspects of what was presented, have more to add.

MR. SHAH: This is Mahendra Shah.

I have just a couple of points. The first one is that Part 63 has a specific requirement in PCSA for 10(-6), which is a little different from any other regulation that we have. So we just cannot avoid that.

That is the reason why we had a need to write this particular ISG, because that has been totally ignored. There was a miscommunication, as I said. DOE's methodology that was presented to us, the feedback that we gave to them was that it would not meet the intent of the regulation. That was the reason for writing this particular ISG.

The second thing is the consequence of our writing did not elaborate on that in this ISG, it is because that is not the focus of this particular ISG.

This was only the pre-closure design, assessment and design part, and there are other areas that it was intended to talk about the consequences.

So it was understood that the actual way in which you do the consequence analysis is not within the scope of this particular ISG.

The fact that --

CHAIRMAN RYAN: Just a quick followup to clarify: Is that written down in the ISG, what you just said? Is that explained?

MR. SHAH: About the consequence --

CHAIRMAN RYAN: This flow from 63 and on down through, is that laid out clearly?

MR. SHAH: Yes, yes, it was written by staff.

CHAIRMAN RYAN: But I guess I heard these guys say it isn't laid out clearly.

MR. CANAVAN: I would disagree on several of the points that have been made.

CHAIRMAN RYAN: Well, just on this one point. Because I hear what you said, but putting myself in the shoes of the folks that are on the other side of the table, if that's not spelled out clearly as to your intent, and the flow of the intent, and why it's different and what flows from 63, and all that,

that roadmapping really gives them a place to put their foot and understand the framework.

So that could be maybe just a suggestion, a possibility, that if that's clearly laid out in the document, it would help everybody understand it.

MR. SHAH: It is not only laid out in the document, we also had a very detailed technical exchange where we made presentations and answered all the questions. That's all public documents.

CHAIRMAN RYAN: I understand that, but the point is, if it's not explicit in the guidance, in the interim staff guidance itself, it falls, in my own view, from my own experience, a little short.

MR. SHAH: We have a letter that went out before we had the ISG, and then we had the technical exchange and meeting minutes. Then we had the ISG and then the public comments and responses. So there were numerous opportunities for clarifications, and DOE did ask all the questions they wanted to. I thought we answered them satisfactorily.

But in spite of whether there is a problem, DOE has not expressed those problems. It's only the --

CHAIRMAN RYAN: No, no, I understand that. This is a new set of questions. But it's never too

late to get it right.

MR. NATARAJA: May I add something? My name is Mysore Nataraja. I'm from staff.

The ISG described why this particular ISG was written. It described a sure way one how can demonstrate compliance with regulations for onsite nuclear event sequences. So it does describe that process and why we generated this ISG. The information is there.

MR. McCARTIN: In fairness, I think we need to go back and read the document with the concerns in mind.

CHAIRMAN RYAN: That's a great suggestion, and I appreciate that, Tim, that that's going to happen.

MR. SHAH: And the last point I would like to make -- I think John probably has a few points; I don't want to take all the time, but --

CHAIRMAN RYAN: We're actually over time. So we need to wrap up promptly.

MR. SHAH: Okay. Quickly, the design examples that were given here were probably because of the unrealistic hazard curves more than anything.

MR. STAMATKOS: Yes, I just want to make --

CHAIRMAN RYAN: I'm sorry, could you tell us who you are for the record?

MR. STAMATKOS: Oh, I'm sorry. John Stamatkos from the Center at San Antonio, CNWRA.

Ken, I would take a different view of your description of the hazard curve. A hazard curve, it is true, is built on expert judgment or expert elicitation, but the higher ground motions you get at very low probabilities are not the result of expert judgment as much as they are of the promulgation of uncertainty. That uncertainty plays out in the 100-year earthquake as well as it plays out in the million-year earthquake. It is the uncertainty of the inputs into a PSHA that drive those hard ground motions. It is not whether or not you use an expert elicitation.

I also want to point out that I think that one slide you had where you had the comparison with MOX has both I think some errors and some apples-and-oranges comparisons. First of all, the MOX facility as a seismic design, it's to a deterministic design spectrum, though old Reg Guide 160 spectrum. So the design level, seismic design level, differs as you move from the different structure of frequencies from one to another. I think it goes from around 10,000 at

some values to about 50,000 for some others.

And the seismic performance goal -- let me finish my comment -- the seismic performance goal for that facility is 10(-5) as a rough sort of gauge of performance, but it is for single-component SSCs.

The economic design level is something that DOE has prescribed. There's nothing in the regulation that we are telling DOE how or what level they need to design to.

The performance goal there, 1x7(-6) is really the performance goal for the event sequences. You do need -- that would only happen, that risk reduction, very large risk reduction would only happen in the event of where there might be singles. We have discussed with DOE at the moment there doesn't seem to be in anybody's imagination that there will be a large number or any singles in their evaluation.

I have other comments, but I think I'll just stop at those.

MEMBER HINZE: John, if you would like to give us a few notes to take away, we would appreciate those.

MR. STAMATKOS: Okay.

MEMBER HINZE: If you don't have time -- we are running near the edge of time.

Dr. Ryan, I would really like to have the presenters have a chance to respond to these remarks, even though we are over time.

CHAIRMAN RYAN: Sure.

MR. McCULLUM: Yes, I just want to say a couple of things really quick here.

First of all, on the MOX, I again want to point out that the apples-to-oranges nature of this comparison is the precise reason why we raised this issue. MOX was cited by the staff as the example of a precedent for the ISG-01 methodology. It is our contention the methodology does not have a precedent. So it is, indeed, our attempt to illustrate that this is an apples-to-oranges comparison.

I also want to thank the staff for their very forthright responses here and their willingness to consider.

As I mentioned, we had a very lively discussion back on September 29th. I think, as a result of that discussion, we went back and we dug a little harder. That is why you are getting a presentation here today where we have, hopefully, advanced the dialog, and I think the Committee's questions continue to advance the dialog.

So I look forward to hearing what the

staff has to say after they go back and look at some of these questions then.

Ken, do you have anything?

MR. CANAVAN: I just want to make a few quick notes. With the 15-G non-physical example, I didn't mean to imply that the ISG inferred that. I mean to imply, correctly, that you can take hazards curves and you can find 15-G and you can find a probability associated with that. It is non-physical, but it is still there. It is an artifact of hazard curves, unless you cut it off. Since you do cut it off somewhere, there's always an argument about exactly where you cut it off, where it becomes truly non-physical.

Just to make another comment on the expert elicitation, I think I used expert judgment, as used in the development of seismic hazard curves. In general, that's based on some geological findings, and oftentimes those geological findings are known in the 100-year type of range, less known in the thousand, and, obviously, less known in the -- so I guess the point would be, when you're looking at million-year return periods, there's certainly less evidence of what truly happened, how big the G-force was, and it really is based on a lot of the expert judgment and

opinion, and tends to be certainly more uncertain than the hundred-year return period, which we have recorded data for. At least we knew the earth shook for a fact.

So I would argue that at the tails of the curves it becomes a little bit more uncertain because the data is more sparse and certainly more uncertain.

I don't want to say that there was no consideration of risk except if you follow the strict procedure that is outlined. I stand by my comments that the ISG is, indeed, written, at least that's how I read it -- and I went through and read it several times just to make sure I didn't misquote or say anything wrong. It actually says the first step is to assess seismic performance of individual SSCs on the ITS in that period. So if I were to read that literally, that is what I would do, which would mean every SSC on the ITS.

So I don't think I was implying anything that isn't there. Maybe it wasn't intentional, but it is written that way.

If it is followed, there is no weighting of risk. If you go to the next step, it certainly does. If you go through all the steps, I do feel that there is more of a risk-informed approach. It just

seems bottom-up rather than top-down.

And Greg Hardy had one other comment.

MR. HARDY: Yes. In response to what John just said, if you could go back to that one, you are exactly correct. What they used at MOX was not the 10(-4), although that is what they say in their submittal. It is a .2-G reg guide. What happens is it envelops this. So they argue that they met that criteria, and this risk reduction ratio goes even lower.

So the point is still clear, that it is even lower than shown here. I agree with you, this was done on an individual fragility basis at a lower probability, and that might be something to entertain for Yucca Mountain. I would be happy to do that because it is conservative to use that first screen Ken talked about on individual fragilities with a hazard at this kind of level. If there were an alternative approach that would avoid all this system modeling, going back and forth, that might be something worth looking into.

MEMBER HINZE: Thank you very much, Greg.

With that, I'm going to turn it back to Dr. Ryan and thank our presenters and the staff and their Center associate.

I have a feeling that we haven't heard the end of this.

(Laughter.)

CHAIRMAN RYAN: I want to compliment everybody on bringing their views to the table in a professional and clear manner. I appreciate the staff's willingness to revisit and rethink. If we squeeze out a little harder, maybe we will get a little better view of the world here.

Again, I want to thank all of the presenters and all the participants for coming. It is really helpful to address complicated, and sometimes tough, issues like this. We really appreciate the open dialog, and we were pleased to facilitate it.

Thank you very much.

MR. McCULLUM: Thank you.

CHAIRMAN RYAN: We will take a short, very short, 5-minute break. The Committee will reconvene to consider its letter-writing activities in five minutes.

(Whereupon, at 4:26 p.m., the Committee went off the record.)