Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Nuclear Waste
174th Meeting

Docket Number: (not applicable)

Location: Rockville, Maryland

Date: Monday, November 13, 2006

Work Order No.: NRC-1322 Pages 1-154

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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)

174th MEETING

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MONDAY,

NOVEMBER 13, 2006

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T-2B3, 11545 Rockville Pike, Rockville, Maryland, at 10:00 a.m., Michael T. Ryan, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

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

ACNW STAFF PRESENT:

JOHN T. LARKINS, Executive Director, ACRS/ACNW
LATIF HAMDAN
ANTONIO DIAS
NEIL M. COLEMAN
DEREK WIDMAYER
MYSORE NATARAJA
MAHENDRA SHAH
ROBERT JOHNSON
JIM RUBINSTONE
MARIE SIBELIAN
TIM McCARTIN
STUART RICHARDS
TIMOTHY FRYE
STEVE GEARY
JIM SHEPHERD
MIKE SNODDERLY
CHRISTOPHER BROWN
MIKE LEE

ALSO PRESENT:
JOHN STAMATAKOS
GREG HARDY (via telephone)
TOM BOCCI (via telephone)
LEON REITER

ALSO PRESENT: (cont'd)

ROB McCULLEN

KEN CANAVAN (via telephone)

JOHN KESSLER (via telephone)

RALPH ANDERSEN

I-N-D-E-X

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

(10:04 a.m.)

CHAIRMAN RYAN: The meeting will come to order.

This is the first day of the 174th meeting of the Advisory Committee on Nuclear Waste. During today's meeting, the Committee will consider the following: an update on status of the seismic design basis and methodology of the NRC perspective, results from the liquid radioactive release lessons learned task force, and preparation for the meeting with the NRC Commissioners scheduled for December.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Antonio Dias is the Designated Federal Official for today's session.

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

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

cell phones or pagers that you kindly turn them off.

I'll begin with some items of current interest. Mr. Christopher Brown, sitting to my left, joined the ACNW in October. Chris, welcome.

MR. BROWN: Thank you.

CHAIRMAN RYAN: He began his employment at the NRC in 1996 as a Mechanical Engineer in the Division of Industrial and Medical Nuclear Safety in the Office of Nuclear Materials Safety and Safeguards where he performed sealed source and device reviews. In 1998, he joined the Spent Fuel Project Office as a Materials Engineer where he performed materials and containment reviews for dry cask storage systems and transportation packages.

Mr. Brown has also had the opportunity to rotate to the Division of Reactor Safety Systems in the Office of Nuclear Reactor Regulation to further develop his expertise in the fuel area. Mr. Brown holds an A.B.S. in Engineering Physics from Morgan State University and an M.S. in Material Science and Engineering from the University of Maryland.

He comes to us with an excellent background that complements the skills of the staff very well. And, Chris, we welcome you to the ACNW and look -- hope this is as important to your career as

the rest of your experiences.

MR. BROWN: Thank you.

CHAIRMAN RYAN: Welcome. Thank you. Without further ado, we'll turn to the agenda. And shortly Bill Hinze will take over on the Update of Status of Seismic Design Bases and Methodology: The NRC Perspective. But, first, we'll ask our participants on the telephone to identify themselves and their organizations.

MR. HARDY: This is Greg Hardy from Aries Corporation.

MR. KESSLER: John Kessler from Electric Power Research Institute.

CHAIRMAN RYAN: Okay. Gentlemen, welcome to the meeting. We're thrilled to have you participate by telephone. Again, if I could ask you both to put your phones on mute. That way you can hear us and we can hear you if you -- when we get to comments or questions, we'll certainly ask you specifically, so that you can offer any questions or comment you might care to offer.

Without further ado, I'll turn the meeting over to Professor Hinze.

MEMBER HINZE: Thank you. Dr. Ryan.

Seismic issues continue to be of interest

to us as they pertain to Yucca Mountain, and this is certainly true in the pre-closure area. We have been looking forward to a presentation from the NMSS staff regarding their seismic design methodology that they have developed and a performance demonstration.

We have with us today Mysore Nataraja and Mahendra Shah. Raj, I believe you're going to start. And with that, welcome to the Committee. We're looking forward to this with great anticipation.

MR. NATARAJA: Hello. If I succeed in starting this one, I think it should be okay.

Good morning, everybody. I'm Mysore Nataraja, and I think that I can see here at least three or four faces who have been on this seismic issue as long as I have been. I think one of them is Dr. Hinze, I think, and John Stamatakos from the Center. I'd like to recognize John. He has been instrumental in developing our staff positions, and he has been involved in the review of DOE's work for a long time.

This morning the purpose of our presentation is to brief the Committee on the status of seismic design methodology in the context of pre-closure safety assessment requirements in 10 CFR 563. And I would also like to emphasize the fact that

we are only going to talk about pre-closure today, and some of the issues of post-closure might be discussed at a later stage.

Okay. I'm still on slide 2.

All right. What we'd like to do today is -- this presentation is organized in two parts. I'm going to go first, as you know, and then followed by my colleague, Dr. Mahendra Shaw, who will go into some of the specific details of the interim staff guidance that's related to this particular topic.

I'm going to be briefly providing some background on the issue of seismic and performance demonstration methodology. I will also describe DOE's approach and the staff review of DOE's approach and the staff actions that we took after reviewing DOE's proposals. And I will go into some details about the feedback that we gave to DOE, and after my background presentation Mahendra will take over and talk about the -- some of the details of the methodology that we have developed as guidance by the staff to review DOE's license application and this topic.

Next one, please.

We have three purposes for the briefing this morning, and the most important thing is for us to explain what role the design plays in the

demonstration of performance requirements as defined in PCSA for Part 63. In other words, how the design is a starting point and we do not have specific requirements for design itself.

And then, I will go into some details of what DOE proposed, and, finally, I'll give the status of where we are and what are some of the specific discussions that took place between NRC staff and the DOE during some technical exchange that we had in June.

Specifically, we will discuss some details of the analyses that are needed for calculating the probability of occurrence of event sequences for categorizing the event sequences as category 1, as category 2, or beyond category 2, as required in the regulation. And then, we will talk about our methodology for the guidance that we have developed for you in the seismic design in the context of PCSA.

Okay. Let me go to slide 4.

MEMBER HINZE: Raj, I'm going to interrupt you for just a moment, if I might.

MR. NATARAJA: Sure.

MEMBER HINZE: Could you explain to us the category 1 and category 2 and how that relates to the 10^{-8} for the post-closure? I think that would be

helpful as an introduction to your material.

MR. NATARAJA: Okay. That will come up when we talk about the ISG.

MEMBER HINZE: All right. Okay, fine.

MR. NATARAJA: But the 10_{-8} does not play any role here in pre-closure.

MEMBER HINZE: Right, right. That's the point.

MR. NATARAJA: Right. Okay. There is a lot of history and background, as I mentioned, for this particular topic. And very early in the pre-licensing stage both DOE and NRC staff realized that seismic issue must be dealt with at an early stage, simply because we have a lot of seismic licensing history which will impact the way in which we do the reviews.

So DOE and NRC discussed this issue several times, and DOE decided that they would attack this particular topic by writing a topical report. And as you know, that when a licensee writes a topical report the staff can review the topical report in advance and write a safety evaluation, and that safety evaluation can be -- can become a part of the licensing review later on.

In other words, we won't be going into the

details of the review during licensing, since we will have completed that during pre-licensing. But we will reference the topical report in the license application. In other words, DOE will reference the topical report, and NRC will take the SER that is written and make it part of the overall SER that will be written for the license application.

That is the intent, and we had several discussions, developed outlines, and then the standard format and content, and staff also developed a review plan for the topical reports. And that was a pretty long process. And soon DOE realized that the topic was pretty voluminous, so as they started developing the outline it became evident that it will be difficult to deal with the entire topic of interest.

So they decided to spread it into three parts, and the STR-1 -- when I say "STR" it is seismic topical report, the first one would deal with the hazard assessment methodology, STR-2 about the design methodology, and the STR-3 would simply be a compilation of all the inputs that will be used for test velocity, acceleration, response time, and so on and so forth, for the design as well as input for the performance assessment for the post-closure. All of that will be dealt with under STR-3.

However, it so happened that DOE did not complete all the three topical reports. So I have to tell you that we do not have a safety evaluation report on this issue, because the staff said that unless we have all the three written by DOE and reviewed by staff we will not be able to complete the SER. So we will only talk about STR-1 and STR-2.

Please give me the next one, please.

So STR-1, which deals with the hazard assessment, DOE -- when it says STR-2, I want to bring it to your attention that it is not topical report 2 in terms of STRs, the seismic topical report series. It only means that it is the second topical report DOE wrote, the first one being on the erosion issue. So many people have confused the numbering systems. I'm just making it clear that the TR-002 is basically seismic topical report 1.

And as you can see, it had a revision 0 in 1994 and a revision 1 in 1997. And DOE did another study called the Probabilistic Seismic Hazard Assessment, and for short PSHA, and they conducted an expert elicitation using the procedures that have been developed by NRC.

There is a staff technical position how to conduct a seismic -- any expert elicitation process.

And the staff reviewed both of them and found the methodology to be acceptable to us, and the staff review is our document dating the IRSR. It is one of the NUREGs. I think it's -- it comes in the next slide.

Next slide, please.

Okay. The second of the series, STR-2, is a topical report. It says 003, but it is STR-2. And that dealt with the pre-closure assessment design methodology. I would like -- before I get into this, I want to say one thing here, that we still have some questions about the hazard curve itself and its extension beyond assessment probability value, because the expert elicitation was limited to developing a hazard curve for the pre-closure design, didn't go far enough.

And DOE is still working on that, and NRC staff and DOE are in consultation with each other. And we are following this issue, and we have some questions about how to cut off the -- how to extend the hazard curve to 10^{-8} probability values. That's a discussion that we probably will have some other time with you, although some of it might have some impact on the pre-closure design curve also.

The topical report 2 had revision 0,

revision 1, and revision 2, until 1997, and all those were based on the requirements spelled out in 10 CFR Part 60. In other words, there was a very specific deterministic criteria spelled out in Part 60 similar to what it is in Part 50 and 72 and others.

So the topical report was based on deterministic criteria, and then later on the next revision, revision 3, that came in 2004 was DOE's attempt to address the risk-informed, performance-based requirements of Part 63. So although there is a lot of history up to revision 2, we have to just forget that and only deal with the revision 3 of October 2004.

So when we reviewed the topical report, DOE's topical report, revision 3, addressing the risk-informed, performance-based requirements of Part 63, staff had a number of questions, and DOE produced a letter almost like a letter report which tried to answer some of the questions raised by the staff.

So today we are dealing with the current status of DOE's proposal will be based on revision 3 of the topical report 2004, October 2004, plus some of the clarifications given in the letter of August 25, 2005.

Next slide, please.

Okay. Now, briefly, what did DOE propose? Taking the letter and the topical report together, essentially DOE's approach for meeting the performance-based requirements of Part 63 consist of two things. One is the design bases, and a seismic margins analysis. And the design bases -- design basis ground motion 1, and design basis ground motion 2, to correspond to category 1, seismic category 1 and seismic category 2, structures, systems, components, which Mahendra is going to discuss in detail later on.

And the criteria that were proposed -- the design criteria would be from NUREG-0800. That is the one that is used for Part 50 nuclear powerplants -- in other words, elastic, deterministic criteria and two design bases motions corresponding to seismic category 1 and seismic category 2. Essentially, in simple words, those two uprates will correspond to a 1,000-year return period and a 2,000-year return period uprates.

And the way in which they would demonstrate compliance with performance requirements will be to conduct a seismic margins assessment using SMA methodologies, the standard methodology that has been used in the past for the IPEEE. And you will

require another ground motion there, which is called the beyond design basis -- BDBGM. That ground motion is approximately similar to a safe shutdown uprate for the nuclear powerplant, like 10,000-year uprate.

Next slide, please.

So once we came to this stage when we had DOE's proposal, then we have a number of interactions with Department of Energy. We had discussions on telephone, we had, you know, onsite representatives at the office, discussions with the Department of Energy, and we asked a number of questions and sought clarifications.

Based on our understanding, then we had a workshop, which I have not mentioned here. We had a three-day workshop in Rockville where all the experts from the Center and the NRC staff got together and went over the entire history of the seismic topic, what has been to date, and what were some of the difficult points there, because everybody was thinking still in terms of the deterministic criteria from Part 60.

It was very difficult to move from the deterministic criteria to the performance-based requirements, and we have to start thinking in a totally different fashion, not confuse ourselves with

design requirements. And that took a long time, both for DOE as well as for our own staff members.

I think during that -- the workshop you were all finally -- the debate had been discussed and it was a pretty intense interaction amongst ourselves. Then, it became very clear to us, how is it that -- what should DOE do to demonstrate compliance? And what should staff do to review their demonstration?

And that's what we provided as feedback to DOE in a letter January 24, 2006, which you probably have all seen. And then, following that we had the technical exchange in June of 2006. And whatever we discussed at that time, Department of Energy is in complete agreement with the positions taken by the staff at that time, and that's all documented.

And based on -- at that time, we had a draft interim staff guidance. The ISG is not a requirement for DOE, but it is a staff guidance for us to conduct the reviews. And that went into public comments, and then we received public comments, addressed all the comments, and now the ISG -- it went public final September 29th, the contents of which will be the theme of the next presentation.

Next slide, please.

So before I conclude, I would like to

reiterate and summarize once again here what was our message to DOE in our letter, as well as in our discussions during technical exchange. Basically, what we said to DOE was the design basis ground motion and the design criteria that they proposed, similar to the elastic criteria from 0800 and the design basis motions that they selected for the starting of the design process, which is like a 2,000-year uprate, similar to PFS, etcetera. We said it's consistent with practice, and it is a good starting point.

But we had a problem with the -- we didn't have a problem with the SMA process, but we had a problem with DOE assuming that by doing a seismic margins assessment they would be meeting the intent of Part 63 requirements, because the requirements of Part 63 are very specifically defined under PCSA section.

What it requires is that you have a design, you take the design and develop your seismically-initiated events, calculate the probabilities of the event sequence, and you take it up to 10^{-6} and demonstrate that the performance requirements are met. If not, go demonstrate that you can do a consequence analysis and show that the consequences are within acceptable regulatory limits,

which is 5 rems of dose at 11 kilometers for a hypothetical individual in the category 2.

So dose requirements would not have been shown by just conducting a seismic margins analysis alone. That was the message that we gave.

Next slide, please.

And, essentially, we also tried to explain to them in our discussions that there is a methodology that is well developed and accepted, and it is becoming a standard methodology, the ASCE 43-05, which can be used in which you take the entire hazard code of the -- the seismic hazard code developed on the basis of the site characteristics, and take the fragility curve from the structures, systems, components, integrate the two, and come up with the probability of failure for the seismic event sequence, which, again, is going to be a topic of further discussion.

So we gave the details and said that this is how we are going to look at the performance demonstration submitted by DOE, and DOE seemed to be perfectly happy with the outcome of the technical exchange.

And I think, in conclusion, in summary what I would like to say is that with a lot of hard

work on the part of the staff, and with the diligent interactions and a lot of patient exchanges, we are finally able to come up with an understanding of how we can take the design requirements, design criteria, design bases, and demonstrate performance, which is what is needed in Part 63, which is something new.

We don't have too much of an experience with that other than Part 70 MOX. But, again, the requirements there are not well defined like what we have in PCSA requirements.

So this is where we are. This is the status of the seismic design methodology in the context of PCSA requirements. And some of the questions that still are pending are with the hazard curve extension to post-closure performance inputs.

What I can do is I can take questions at this stage for this part, or wait until Mahendra's presentation, which will go into the ISG details, and then we can take questions. It's your choice.

MEMBER HINZE: Well, unless there are some pressing questions by the Committee, I'd suggest we move on and then take them all at one time, because they really will feed into each other.

MR. NATARAJA: Thank you very much.

MEMBER HINZE: Thank you.

DR. SHAH: Good morning, everybody. The purpose of my presentation is to provide an overview of ISG-01, which was issued on September 29th, after we had --

MEMBER HINZE: Could you move your microphone just a little bit up, or turn it on, or make sure it's cooking? There you go. Down just a little.

DR. SHAH: Can you hear now?

MEMBER HINZE: Thank you.

DR. SHAH: Okay. Just to repeat, the purpose of my presentation is to give an overview of the high-level waste repository site, HLWRS-ISG-01, on the subject of the staff review methodology for seismically-initiated event sequences, which was issued on September 29th of this year.

After we have considered the public comments from various organizations, government organizations, committee organizations, DOE, NEI, very carefully, and then responded to those comments and made changes to the ISG.

The reason we decided to write an ISG, as Raj mentioned, that what DOE had proposed was not addressing the issue of compliance with regulations of Part 63, which requires demonstration of performance

of structures and not just the design. They have a design basis which is -- as was discussed earlier for category 2 are the BDBGM-2 event sequences where the -- it's a defined regulation, but the potential for release -- it's based on the dose release. It would be higher than 15 millirem.

And for those structures, systems, and components which are required to maintain the -- or meet the dose performance requirements of 5 rem at the boundary, they have to be designed to a higher level earthquake, which is the 2,000-year return period. And the reason they chose 2,000 years is based on the ECP facility, because they are comparing that with an ECP facility, which is Part 72.

So that is the design basis, which seems reasonable. But seismic margin assessment, their intent was to demonstrate that the performance of the structures is sufficient. The probability of failure at that value, which is 10,000-year design basis, is about two times the design basis of 2,000-year earthquake. That probability of failure would be about 1 percent.

This was the procedure used in reviewing the already-licensed nuclear powerplants during IPEEE program to demonstrate that the designs have margins.

But the regulations are very specific as far as demonstrating performance -- Part 63 regulations, I mean. And that's why we need -- we had to look at the -- what is the -- how they can demonstrate or how we can review what DOE would provide later on during the license applications to comply with regulations. And that is the reason we decided to write an ISG.

So let me first discuss, then, the regulations.

Next slide, please.

10 CFR 63.11(a)(B)(i) is for category 1 event sequences, and they are defined as those that are expected to occur one or more times before permanent closure of the geological repository operations facility.

63.11(b)(2) is for category 2 event sequences. Category 2 event sequences are those that are likely to occur, 1 in 10,000 during the -- before the permanent closure, which could be as high as 100 years. So on an annual basis, then, the standard is 10^{-4} divided 10^{-2}. If you assume 100-year pre-closure period, you get 10^{-6} per year frequency of this event.

And mostly we are concerned about category 2 event sequences in this ISG, because that is the area where we need to make sure that

performance is demonstrated. And then, there are corresponding dose performance requirements for category 1 event sequences and category 2 event sequences, which is -- for category 2 it's 5 rem at the end of the boundary for public.

Next slide, please.

Now, let's see what category event sequence -- first, before I go into this, category event -- how do you define the category of a -- category event -- category of event sequences? You had to identify the hazards which could occur, and then what could happen to the structures, systems, and components, and the event sequences which could occur? So it could be one or more components or structures, systems, and components, in that event sequence, which could release -- could lead to the release of radioactivity.

So the design has to be such that the probability of such an event, if you want release -- you can design -- you can allow the structures, systems, and components to fail, and calculate the dose, or you can make the components, the SSCs, structures, systems, and components, strong enough, robust enough, so that it will not fail.

The probability of failure will be 10^{-6}

per year, not just the component, but the event sequence. So that includes the hazard, in this particular case seismic hazard probability of exceedance, and integration with whatever structure capacity, which I will be discussing in a few minutes.

So keep that in mind, that it's not just the SSC failure probability, but it's in combination with the hazard probability. So it's a combination of fragility and the probability of exceedance of seismic hazard. And that's what we had to define, that beyond category 2, if you want to -- this SSC not to fail. That's the thing to keep in mind.

Now, this just lists the Yucca Mountain, ISG supplements, the current staff guidelines, which is in the Yucca Mountain review plan, NUREG-1804, revision 2. So this just lists them. And we have in ISG specific sections which are revised, and specific wording, so when you want to -- you can incorporate the letter, if necessary, and it can be revised very directly, without further work.

Next slide, please.

So in order to determine this event sequence probability of occurrence on an annual basis or frequency, you need to have a seismic hazard curve, which is defined for pre-closure facility, which is at

a surface of the ground. And then, the fragility curve and SSC ITS, which ITS is important to safety.

Those structures, systems, and components which are required -- relied on to ensure that the -- release of the dose performance requires math. Only those SSCs have to have this evaluation performance.

And then, these two can be combined to get a probability of failure of an SSC ITS to compute the event sequence, and then to get the event sequence probability of occurrence or the frequency to categorize whether it's category 2 event sequence with 10^{-6} per year or beyond category 2. If you show it to beyond category 2, then you don't have to do dose performance evaluation.

And the methodology is available. It has been used recently in ASCE 43-05, which spells out exactly how to do this calculation.

Next slide, please.

The hazard curve didn't show up. Okay. Sorry.

Do the printed copies have hazard curves?

MEMBER HINZE: Yes.

DR. SHAH: Okay. The hazard curve is just the -- showing the probability of exceedance on the vertical curve at acceleration or any other down

motion parameter. The one I have on the slide is extra spectral acceleration at a specific frequency, which could be 1, 2.5, 5, 10, or peak ground acceleration.

And this one shows an example of a fragility curve, which shows the -- if you have a 5g probability of failure it's a community probability distribution function. It's -- .2 is the probability of failure. And this can then be combined to get -- the process is called convolution to get the probability of failure.

Next slide, please.

The development -- hazard curve development, Raj talked about earlier is -- described briefly the fragility curve development. It can be developed using -- you've got to have functional requirements, what is a failure definition, and then develop what is the probability of failure. So it could be different depending on the function of a system, whether it's -- it can be formed to the extent whatever -- you've got to define what is a failure criteria at a particular hazard level.

The log-normal distribution is normally used for the fragility curve. It has found to be a reasonable approximation. This is a density --

probability density function. And then, the fragility curve for an SSC can be developed using another method like Monte Carlo where you vary the properties and trend them using Monte Carlo method. Or you can use a simplified method, which is outlined in the EPRI document, or any other method that may capture appropriately the uncertainty and the variability of the capacity.

So one could use any one of these methods to develop the fragility curve for a structure, system, or component.

Next slide, please.

Now, but after you find out that the P_F is less than 1 in 10,000 during the pre-closure period, then the event sequence would be a beyond category 2 event sequence, and you don't have to go into dose calculations or modification of design, whatever, to bring it beyond category 2 event sequence.

Next slide, please.

If, however, P_F or the probability of failure for an individual SSC is -- this is just a screening criteria. You don't have to use an individual SSC. You can use a number of SSCs in an event sequence, which will be the next step. But this like a screening to start with this approach. You can

just say -- all my SSCs in the event -- event sequence have a probability of failure less than 1 in 10,000 or 10^{-6} per year, assuming a pre-closure period of 100 years.

Then, you don't have to worry about that event sequence, because you know that the likelihood of such an event is -- it's very low based on the definitions in Part 63. If, however, any one of the SSCs exceeds this standard of 10^{-6} per year, then you can consider a combination of these SSCs to determine the probability of failure, because both of them, or three of them, whatever numbers you have, have to fail in order to have this event sequence exceed the 10^{-6} per year.

So you can combine the two or three, the number of SSCs, to determine the probability of event sequence -- occurrence of event sequence or frequency on an annual basis, and then show that it's beyond category 2. If, however, you always have a choice -- option if you don't want to do anything you can always determine the dose consequence and show that it's less than the dose limits in 10 CFR 63.11(b)(2).

This shows the process in a flow chart format, like seismic hazard curve and this fragility curve are combined to get seismically -- probability

of failure in seismically-initiated event sequences. And then, if event sequence frequency is less than 1 in 10,000, then you comply with it.

If it is more, then -- then you can either do dose consequence, if it is less than category 2 limit dose -- which I just mentioned, then it complies with it. If it is not, then you can either modify the design in order to recalculate the whole process again. So it's an iterative process which has to be done at -- before or during the design of this facility. So this just shows it in a very simple format the process which is used in the ISG.

ISG also has two appendices, which describes with example -- provides examples. I assume you have copies of the ISG, which gives an example of how the process works.

Next slide, please.

To summarize, the interim staff guidance provides guidance to the staff on the review methodology, as I mentioned earlier, and the methodology is consistent with the industry standard ASCE 43-05 as far as determining the performance and the event sequence probabilities, and was used in a mixed oxide fuel fabrication facility in South Carolina.

Part 70 does not have the specific thresholds like what Part 63 has, based on some judgment. They did that evaluation to demonstrate that probability of such an event occurring is between 10^{-5} and 10^{-6} per year.

But they don't have the threshold so they can make engineering judgment. Right here, in Part 63, there are specific thresholds we had to meet as far as category event sequences.

I think that concludes my formal presentation. I'd be willing to -- we'll be willing to take an questions you may have.

MEMBER HINZE: Thank you very much, Dr. Shah.

We'll ask the Committee for their questions first, starting with you, Allen. Any concerns, questions?

VICE CHAIRMAN CROFF: I've got a question. I'm not quite sure how to articulate it. But as I understand your going through this, there is sort of a less than 1 in 10,000 frequency criterion that, you know, if you meet it you get the check mark. Given that, I don't see where the category 1 events that you introduced earlier fit in.

They seem to be higher probability events,

what I understood was expected to happen in 100 years, and I sort of assumed from that their higher probability but lower magnitude. So where would they make any difference? Where do they come into this whole thing?

DR. SHAH: I think category event sequence -- category 1 event sequences, as far as meeting the performance requirements, should not be a problem if you meet category 2 requirements.

VICE CHAIRMAN CROFF: Why is it even in the regulation?

DR. SHAH: Well, there are other events other than seismic and hazard which could be category 1 event sequences.

VICE CHAIRMAN CROFF: Oh. This covers more than just seismic, you're saying.

DR. SHAH: Right.

VICE CHAIRMAN CROFF: Oh, okay. Okay, thanks.

MEMBER HINZE: Dr. Ryan?

MR. NATARAJA: Also, the category 1 is for normal operations, and the focus there is worker safety. In category 2, we are more concerned about the public safety. That's the main distinction for seismic design.

VICE CHAIRMAN CROFF: Okay. Thanks.

CHAIRMAN RYAN: No questions, Bill. Thank you.

MEMBER HINZE: Dr. Weiner.

MEMBER WEINER: I have a number of questions. How do you incorporate uncertainty in your fragility curves? In other words, do you run a -- have a series of fragility curves and you sample on those with Monte Carlo sampling? Could you describe that?

DR. SHAH: Well, yes, you do consider these uncertainties in developing mean -- I mean, 95 percent confidence, 5 percent, and different percentage fractiles. And then, you take the mean fragility curve as far as the computations here are concerned. So we're you're talking about mean fragility curves.

MEMBER WEINER: Yes. I'm -- my question is: how do you get there?

DR. SHAH: Okay. You can use a Monte Carlo -- you're talking about Monte Carlo analysis?

MEMBER WEINER: Yes.

DR. SHAH: You can have the properties, like the strength is governed by steel property, let's say, the yield point of the material. So you have the

properties which would be 5 percent confidence level, the distribution function, so you use dose in order to sample --

MEMBER WEINER: Okay.

DR. SHAH: -- the Monte Carlo.

MEMBER WEINER: Yes, that's what I thought. What are the steps that get you from the seismic event, if you will, to a dose? In other words, what assumptions are you making to get to the dose? What -- how does the release -- you know, what is the release? What -- how do you get there?

DR. SHAH: Suppose during a seismic event the structure fails.

MEMBER WEINER: Yes.

DR. SHAH: And then, the second thing, what happens after the structure fails? Will the waste package or the canister where the fuel is, will the canister fail or not? If the canister fails, then even the structural may have failed completely, is it going to just crumble into pieces, or it will have some -- because of cracking, you know, of the structures it's going to have less resistance to the radioactivity release, less shielding. So those things have to be considered.

But the important thing is if the waste

package or the canister can be shown to survive, and there is no release, then it doesn't matter.

MEMBER WEINER: But suppose you get -- first of all, do you just assume one waste package is affected, or do you -- is there some range of waste packages that you assume?

DR. SHAH: You have to consider all the canisters or the fuel canisters, which are -- which are there, or could be there during the normal operation.

MEMBER WEINER: And then, do you make some assumptions about how the material that's released moves in the environment?

DR. SHAH: Yes. You're talking about the dose --

MEMBER WEINER: Yes.

DR. SHAH: I'm not familiar with those requirements.

MR. NATARAJA: I think the PCSA has got a methodology, and each event sequence -- there are a number of positive event sequences and scenarios. One of them could be exposed fuel that is there at the time of the seismic event, and a roof might collapse or something might happen. The ventilation system might fail, and the particulates might be released

into the atmosphere. And then, there are wind conditions that have to be taken into account.

And the usual calculations that are made, like in any other -- will come into the picture, but we are not going into those details here, because the PCSA is another --

MEMBER WEINER: Okay.

MR. NATARAJA: -- topic by itself where they can come and answer many of these questions about the -- what are we talking about? How do we factor the seismic design part into the performance?

MEMBER WEINER: I see. Thank you.

MR. NATARAJA: And then, there are a number of other things that need to be discussed.

MEMBER WEINER: One final question. You say on this slide that this method has a precedent for use with a mixed oxide fuel fabrication facility. But there are chemical hazards that -- whose consequences way exceed any radiation dose. How do you factor those in if you're using this method for the MOX fuel facility?

DR. SHAH: We are just talking about the process of calculating the probability of failure in the event sequence. Were' just talking about the process.

MEMBER WEINER: Okay. You're just talking about the process.

DR. SHAH: Yes.

MEMBER WEINER: Thank you.

MEMBER HINZE: Dr. Clarke.

MEMBER CLARKE: This question is coming from someone who doesn't work in this area at all, and it's very basic. But I wanted to follow up on Allen Croff's question.

You talk about event sequences throughout your presentation, and slide 19 has an overview of approach for determining compliance. That third -- well, the second box, seismically-initiated event sequences, could you just tell us a little more about what the event sequences are? Is this a --

DR. SHAH: Okay. The event sequence --

MEMBER CLARKE: -- standard format to follow in accordance with a particular method or --

DR. SHAH: During a seismic event, let's say that crane is operating and the crane can fail.

MEMBER CLARKE: Okay.

DR. SHAH: Which could lead to drop of a canister.

MEMBER CLARKE: So these are things that can go wrong.

DR. SHAH: Right.

MEMBER CLARKE: And do you --

DR. SHAH: Things that can go wrong.

MEMBER CLARKE: Do you do an event tree analysis to --

DR. SHAH: Yes.

MEMBER CLARKE: -- define the structure for the --

DR. SHAH: Yes.

MEMBER CLARKE: Okay. And do you assign probabilities to that so it's really a fault tree analysis?

DR. SHAH: Right. Exactly.

MEMBER CLARKE: Okay. Thank you.

MEMBER HINZE: A few questions, Raj and Dr. Shah. This is the first ISG to the Yucca Mountain Review Plan?

DR. SHAH: Yes.

MEMBER HINZE: Why did you take this approach? And why didn't you go back and just change the Yucca Mountain Review Plan?

DR. SHAH: The reason we took this --

MEMBER HINZE: If you could, please.

DR. SHAH: Oh, I am already there. Okay.

MEMBER HINZE: Yes.

DR. SHAH: The reason we took this approach because -- this was a focused change, focused revision to YMRP. It was in a specific area, and we didn't want to have a big document revised just for a small area.

Now, when we have sufficient number of ISGs in the future that we may consider revising the YMRP. So this was --

MEMBER HINZE: And then, this would be incorporated into that change.

DR. SHAH: This will be incorporated, if we revise the YMRP.

MEMBER HINZE: Can we expect to see more ISGs coming down the pike?

DR. SHAH: Yes. ISG 2 is also issued for draft. This is for PCSA process. It's --

MEMBER HINZE: It's for what?

DR. SHAH: ISG 2.

MEMBER HINZE: Yes.

DR. SHAH: Pre-closure safety analysis.

MEMBER HINZE: Okay.

DR. SHAH: Issued on September 29th. And the --

MEMBER HINZE: That's the first, right?

DR. SHAH: That's the second one.

MEMBER HINZE: Second. Ah, okay.

MR. NATARAJA: This is the final one.

MEMBER HINZE: Okay. This is the final one.

DR. SHAH: This is the final one.

MEMBER HINZE: All right.

DR. SHAH: The second one is issued -- draft was issued on September 29th, and the comments are due -- I think one-month extension was granted, so it's due on December 13th.

MEMBER HINZE: Going to the ISG, you have incorporated a methodology into that. And reading the comments from the public on that, there was concern that this might constrain/bias the DOE in terms of their methodology. Instead of using an exact specified methodology as an illustration, would it have been possible and perhaps better to use a series of criteria? Because the ISG, as I understand it, is for the -- is to give guidance to the staff on the acceptance of a methodology.

And I guess my question is: what are your criteria that you can use for accepting a methodology? A methodology that the DOE may use may be quite different than what you have, and how is the NMSS personnel going to use that methodology that you have

described to translate into theirs?

DR. SHAH: You are saying that if DOE has a different methodology --

MEMBER HINZE: Yes.

DR. SHAH: -- which -- they can. They have all the freedom and all the options according to regulations to propose an alternative methodology. This is just guidance of a methodology. This is one way we think it can be done.

MEMBER HINZE: Well, can you specify some criteria that the staff should use in saying that this methodology is correct in a safety analysis?

DR. SHAH: Well, the criteria are already there in the regulation as far as -- as long as you demonstrate the event sequence frequency of occurrence during a seismic event.

MEMBER HINZE: Okay. But you felt that more specificity was needed by virtue of your illustration. And so is it -- is it desirable to have more specificity to the regulation?

MR. NATARAJA: I think that the reason why we went into this kind of a specific methodology is because we are not communicating well with the Department of Energy. Anybody who is thinking still in the deterministic methodology approach and somehow,

if a particular design method is adopted and a certain design basis is adopted, you know, everything is fine and dandy.

And then, when you started talking about performance, they were thinking about a margins analysis, and they will combine the margin that they get with the design margin and somehow come up with a 10^{-6}, but that would have been okay if you are only talking about one design event. But we are talking about a design -- continuous hazard seismic curve, not just one event.

So the methodology requires that you have to look at the entire hazard, the range of hazards possible at the site, and look at the possibilities of failures and the fragilities of various structures, systems, and components. That's what this method talks about. It looks at the hazard curve in its entirety, and the fragility, which is a continuous curve again. And the two of them together is what gives you the probability of the event sequence.

MEMBER HINZE: Right.

MR. NATARAJA: So, unfortunately, there was no other way to do this. If DOE wants to do something else, we would still probably be doing this as an independent check to satisfy ourselves that the

-- their methodology would yield a demonstration, a satisfactory demonstration that the requirements of the regulations are met.

But if they use, it will be easy, because, you know, we'll be doing the same thing. But if they don't, I think the staff would use this methodology to check their performance.

MEMBER HINZE: So there will -- so this is a -- have you looked at the results from your methodology? Have you actually calculated a situation that might occur at Yucca Mountain using your methodology? And what have you found from that?

DR. SHAH: Well, we have -- in fact, the examples -- example in Appendix A and B uses, to some extent, what Yucca Mountain has -- has occurred, even though it's hypothetical. Beyond 10^{-4} it could be different curve. We have used a straight line to extend it.

As far as the components, we have selected the one which we know they have, so --

MEMBER HINZE: Is --

DR. SHAH: -- my estimate is that if you use a single component, just a single component, you will get a probability of event sequence 10^{-5} to 10^{-6} per year, in between. But when you have more than one

component in that event sequence, you should be able to get less than 10^{-6} without any significant effort.

MEMBER HINZE: So this is -- in terms of the potential risk from seismicity in the pre-closure period, this is -- in terms of comparing this with other possible events, this is not a particularly important one? Is that what I'm hearing from you? That seismicity is not an important aspect to the risk?

DR. SHAH: No, I didn't say that.

MEMBER HINZE: Okay. I'm just trying to make certain I understand.

DR. SHAH: I'm saying --

MEMBER HINZE: Is this -- how important is this in terms of --

DR. SHAH: I think this is very important as far as the qualification of SSCs. Seismic loads are significant for the design. Design basis is 2,000 years, which is reasonable, because that's very similar to ECP facility. But you have to go a step beyond that to demonstrate performance. This process will lead you to compliance to a regulation.

MEMBER HINZE: Does the methodology call for consideration of the effect of preceding events? In other words, if you have an event sequence which

leads to --

DR. SHAH: Some deterioration, you mean?

MEMBER HINZE: Right. Deterioration.

DR. SHAH: Okay. In that --

MEMBER HINZE: How is that convolved with the -- with future events?

DR. SHAH: Okay. That was one of the questions I think my committee had, about recurring seismic events. Is that what you're talking about?

MEMBER HINZE: Yes.

DR. SHAH: Our position is that the hazard curve itself has incorporated this potential of recurring events in determining the magnitudes of the hazard accelerations. So it reflects that kind of a thing occurring.

However, if somebody is -- let's just say from the process point of view, if that is not done, then what you need to do is evaluate the fragility -- revise the fragility of the component considering what the damage is.

MEMBER HINZE: So there would be a revised fragility --

DR. SHAH: There would be a step-by-step approach, yes.

MEMBER HINZE: Right.

DR. SHAH: But for Yucca Mountain they have considered this as far as the magnitude of the hazard, the effects of this recurring event.

MEMBER HINZE: Well, while I'm asking about that, what have -- have you thought about the connection, the nexus if you will, between a possible volcanic hazard and the seismic hazards associated with a volcanic event during the pre-closure period?

DR. SHAH: No. These events are considered independently.

MR. NATARAJA: I think if you combine the two probabilities it will probably go beyond the regulatory interest. I'm not an expert. I think that is John.

DR. SHAH: John, do you want to answer that?

MR. STAMATAKOS: Yes, Bill. It's John Stamatakos. The seismic -- the PSHA explicitly incorporated seismicity from volcanic events as one of many of the sources. So there is already a component of earthquakes related to volcanism. In the seismic hazard curve that gets pulled in at some lower probability in the pre-closure.

The probability of a volcanic event separate is below that threshold. So it's not

considered at all, and it's just screened as if it were one single component, event sequence. So it's just screened out of the pre-closure all together.

MEMBER HINZE: Thank you. You -- on your last slide you refer to the methodology being consistent with ASCE 43-05, and this is specified as a consensus standard. What's a consensus standard?

DR. SHAH: Consensus standard is prepared by participation of the industry people and economics and all the experts in the industry, has ben reviewed. They have a process which they go through.

MEMBER HINZE: And that has been -- was that used --

DR. SHAH: Adopted.

MEMBER CLARKE: -- at the MOX facility, then?

DR. SHAH: Well, the process was used, not specifically ASCE 43-05. Just the process of calculating the probability of failure was used.

MEMBER HINZE: Are there any differences between what you -- the methodology that you've used as illustrative in that -- in the ASCE document?

DR. SHAH: John, do you want to answer that?

MR. STAMATAKOS: This is John Stamatakos

again. Yes, Bill, I worked on that MOX facility, and there is -- there are some differences. The MOX licensing basis was for the construction authorization part of the license, so they are now in the proceed and possess part of the review, and they are doing an iterative safety analysis for that later one.

But for the construction authorization, the licensing basis for the hazard was the -- that they used the same design spectra that was adopted for the nearby Vogtle nuclear powerplant. And we asked them during the review to support that licensing basis with some demonstration of how well their SSCs will perform, and so they picked six of the most critical SSCs and they did this kind of an analysis using the 43-05 methodology to show that the likelihood that those six critical SSCs would fail would be very small. They were generally less than 10^{-5} and a few less than 10^{-6}.

But they did not have to, then, incorporate them into an event sequence, and there is no PCSA-like requirement for MOX as there is for Yucca Mountain.

MEMBER HINZE: Is it possible for you to help us obtain a copy of 43-05?

DR. SHAH: Yes, I have. But I can send

you electronically.

MEMBER HINZE: If you could electronically, that would be really very good.

DR. SHAH: I will send you --

MEMBER HINZE: We really do need that. Let me ask a few more questions. You've had some interesting comments to your request for public comment. I notice in the Federal Register your responses to those, but I don't know who the comments are coming from. Is it possible for us to have information on the identity of the comments? Do you have a document that is sufficiently public that we could see those --

DR. SHAH: Yes, I could --

MEMBER HINZE: -- comments and --

DR. SHAH: -- I can --

MEMBER HINZE: -- your responses, other than the Federal Register? I think that would be helpful to us.

And, certainly, one of the more provocative of the comments is the concern that the methodology that you have prescribed may be much more stringent than that being applied to nuclear powerplants. You know the question had to come sooner or later.

I, frankly, thought your Federal Register comments were not very specific, at least in my reading of them. And I wonder if you could expand upon your Federal Register comments in which you reacted/responded to the comment?

MR. NATARAJA: I think Mahendra will answer the details, but one thing I would like to talk about, the design being more stringent -- or the requirements being more stringent for this facility than for other facilities, is a comment that we keep hearing again and again. But I think, finally, DOE was convinced that we are not asking for anything more than what -- we are -- actually, they recommended a design basis ground motion of 2,000 years for category 2.

If you compare this to a similar facility like the PFS or the ECP -- one of those, it is comparable. So you're not asking them for any design that will be more robust than what they would do for a similar facility of similar risk. But there is a requirement in Part 63 which is not there in 72, it is not there in Part 50 and other things. That's what people seem to forget.

And we have had lots of discussions with our OGC on this issue, and the OGC has given us the

legal guidance on this. That the requirements of PCSA are to be met, which means that they have to demonstrate performance, taking into account an initiating event, a seismically-initiated event, and carry it all the way, and to see whether it ends up in a release.

If it does, the probability of that release should be less than 10^{-6}. But if it is more, then they have to show that the dose is less than 5 rems. They achieve this a number of ways. They can do this by a robust design, or they can take number of events that have to happen one after the other in order to reduce the overall probability of the event sequence, or simply assume that everything fails and show that the consequence is acceptable.

So they have a number of options, and there is a requirement in PCSA, and there's nothing we can do about it. And if you think of that as something more stringent than what is needed for other facilities, it is not more stringent, it's a different requirement, and it's part of the regulation.

So that's the answer that we are giving to DOE, and I think DOE finally has understood that and accepted that. And I think if you follow the procedures, I don't think they will end up with any

more stringent design. That's, you know, understanding at this stage, but they have to go through the process, and that's -- there is a requirement and staff has no choice but to implement it.

MEMBER HINZE: Did DOE have -- did you respond to DOE comments to your request in the Federal Register statement? Was DOE's comments in there?

DR. SHAH: Yes. I can --

MEMBER HINZE: Well, that's why we really need to see who is asking what.

DR. SHAH: Okay. If you look at the comment numbers, I can tell you comment number 1 through 12 are from DOE. In the Federal Register notice, the comment numbers.

MEMBER HINZE: 1 through 12.

DR. SHAH: Yes. And then, the next five of them are from NEI. And the other three later on are from committees.

MEMBER HINZE: Do you have something more to add to --

DR. SHAH: I will. As far as what it said, I was going to say that you've got to keep in mind that this is for a single event sequence dose performance requirement, not a combination of all of

the event sequences. So that is a very high dose performance requirements limit for a single event sequence. And also, it includes not just one component. There are other SSCs in -- it's an event sequence, so it's a combination of one or more SSCs in an vent sequence.

MEMBER HINZE: Rather than a safe shutdown or --

DR. SHAH: Rather than just -- oh, yes -- a design basis for one particular earthquake level.

MEMBER HINZE: Let me ask another question if I may, and that is that there -- we're having someone come in to discuss -- from DOE come in to discuss with us pre-closure planning by DOE. You hear discussions about the possibility that the pre-closure period indeed might be something more than 100 years -- at least that question has been raised -- and keeping it open for a longer period of time.

How robust is your ISG? How much do we have to -- how much -- let's say that Congress decides that this shall be a 500-year pre-closure period. What would this mean to your requirements that you're setting up?

MR. NATARAJA: I think that the -- I would say that the active operation period is what we are

really illustrating when we talk about the seismic design, not simply keeping open the repository for 500 years. I do not expect an active waste handling operation to be going on for 500 years.

So we have to temper the comment that, you know, you can have a extended period of the repository being open. In fact, there is -- looking at reducing from 100 to 50 years or something like that in order to show it will be more easy for them to demonstrate compliance with a shorter period.

And if they can say that their active waste handling operation is confined to, say, 20 or 30 years, less than 50 years, they might be able to do that. So I don't think we should worry too much about the methodology being outdated before the repository is closed.

MEMBER HINZE: But wouldn't it just -- an increase in the time period would simply increase the limit or change -- or decrease the limit to 10^{-7} or 10^{-5} times 10^{-6}, something like that? So if you met 10^{-6} --

MR. NATARAJA: Yes, but what I'm saying -- that the waste handling operations is what we are talking about.

MEMBER HINZE: I know what you're saying.

MR. NATARAJA: Yes.

MEMBER HINZE: But if the waste handling also was incorporated into a longer time period, it would -- it would lower it from 10^{-6} to something less obviously.

MR. NATARAJA: That's a scenario we haven't really thought about. I think it's -- John, do you want to say something?

MR. STAMATAKOS: Yes, I think -- I think the methodology is independent of whatever cutoff frequency we choose. So we can -- the methodology is quite robust in that regard. So if -- if the pre-closure period gets much longer, then we're just going to simply be looking at things with lower probability.

MEMBER HINZE: With lower probability. Simply that.

I might mention that, if I'm correct on this -- and, Mike, you can check me on it -- but next month we will have NEI and EPRI in to also discuss the ISG with us. And I'm sure we're going to be hearing -- well, we're going to be hearing more about this.

I would now like to open this up to -- please, Dr. Weiner.

MEMBER WEINER: Just one follow-up question to Dr. Hinze's question. One of the

suggestions that has been made for keeping the repository open longer is to do surface aging -- aging on the surface. Would the ISG encompass the -- this would involve many more than one waste package, if there were seismic event, it seems to me. Is your -- does your methodology encompass that?

DR. SHAH: The methodology, in general, is applicable to that part of the facility also. However, we are -- we are looking into that to see if there is an alternate way to satisfy the regulation.

MEMBER HINZE: Mike?

MR. STAMATAKOS: Can I just add something? The current approach that DOE is adopting in many areas in pre-closure is to try to find ways not to look at the doses, but to meet the regulations in terms of the probability performance. So there has not been a lot of analyses done to look at, you know, whether it's one waste package or many waste packages, and what the release scenarios might be.

The approach here that DOE is adopting, and one that we're just providing guidance on, is how you can meet the regulations in terms of their performance probabilities, not yet specifically, then, how you might calculate doses. So the target is almost like zero dose rather than what's in the

regulation.

MEMBER HINZE: Please, Mike.

MR. LEE: Sure. I've just got two questions. Was the NRC part of the consensus-building team, if you will, on the ASCE 43-05? I mean, were they part of that committee?

DR. SHAH: I don't think so.

MR. LEE: Seeing that they have an oar in the water when it comes to how this standard is being implemented?

DR. SHAH: As far as I know, we were not.

MR. HARDY: This is Greg Hardy. Just a comment. The NRC was part of that process. They had representation on the ACSE standard.

DR. SHAH: I think --

MR. LEE: Do we know who that was?

DR. SHAH: I think it must be Tom Bocci, I assume, but --

MR. HARDY: That was Greg Hardy from Aries Corporation.

MR. LEE: Yes. But the question was, who from the NRC was participating on that committee. Do you know?

MR. BOCCI: This is Tom Bocci for -- one for sure that I'm aware of. I'd have to check, there

might have been several people, but --

MR. LEE: Okay. All right. Thank you.

The other question I had is: if I go back to slide 19, I look at the -- your approach and I see hazard curve, you can almost put -- I mean, would I be wrong in saying that you could say flooding initiated event sequences? I mean, is there an issue in the Yucca Mountain Review Plan that there is the need for additional guidance on how to evaluate event sequences for any hazard, or is this just a specific issue that you identified?

DR. SHAH: This is specific only for seismic.

MR. LEE: All right.

MR. NATARAJA: I think flooding can be handled by actual design by elevating or to put it about the maximum flood level, and so on and so forth.

MR. LEE: I just used that as an example. I didn't mean to focus on flooding. I mean, you could put fire hazard, volcanic hazard. I mean, there's -- you could probably have a list of hazards that you can go through that might lead to some event sequence of a failure of a structure, system, or component.

I guess my question is: are you -- is the staff aware of any other areas in the review plan for

which there is a need for additional guidance on how to identify event sequences or guidance similar to this?

DR. SHAH: We are not aware of any area.

MR. LEE: Okay. So this is more of like an anomaly.

MR. NATARAJA: No such questions have been raised during any of our discussions.

MR. LEE: Okay.

MR. NATARAJA: And seismic is probably the one that has caused some confusion.

MR. LEE: Sure.

MR. NATARAJA: And a lot of discussion.

MR. LEE: Okay. That's all I have. Thank you.

MEMBER HINZE: Further questions by the staff or the public?

DR. COLEMAN: Raj, you mentioned earlier, it was just sort of an introduction to scenarios of concern, and you used the expression there could be exposed fuel lying around, somehow converted to a dust that would be released and carried on the wind. What I was wondering is: how could there be exposed fuel laying around?

I mean, what scenario might there be,

given DOE's intent to use a new canister design, the TAD? Because as I understand it, there would be no fuel repackaging onsite unless a TAD were to arrive severely damaged or defective. So what scenario could realistically happen where ceramic fuel pellets, which are very strong, are somehow laying around, turned into dust, and carried on the wind?

MR. NATARAJA: Well, this -- all this discussion took place before DOE made the decision on the TAD. You know, in the PCSA there are some scenarios where they have some exposed -- open fuel could be exposed. And if it so happens that there is an earthquake at that particular time, there could be scenarios where damage could be there to the fuel, and so forth.

There are based on some reasonable assumptions of the scenarios that you make calculations. PCSA is not based on reality. It is based on a series of assumptions, of possible things that can go wrong, calculating the probabilities and calculating the consequences. That's how you get assurance that your design is working for you.

So, I mean, it's realistic in some cases. In some cases, it may not be. And it -- we don't want to make some totally unrealistic and ridiculous

assumptions, but based on what we know of the design in the -- up to the point when you are making these discussions, there was a scenario that was possible. I think Robert is there. If he wants to correct me, he could. But that was possible, but, you know, it may not be real, but in the scenarios that were assumed it was possible.

DR. COLEMAN: Well, the thing is that if some strange accident happened that would rupture a canister, folks aren't going to leave fuel pellets laying around waiting for an earthquake. They would be cleaned up.

MR. NATARAJA: Yes. Robert?

MR. JOHNSON: Hello. This is Robert Johnson with staff. I'm not sure that we've suggested that fuel pellets could actually turn to dust. I think there are a number of event sequences. At the time, I think some of the initial discussion started with respect to seismically-initiated event sequences. We were looking at DOE handling a significant amount of bare fuel.

Now they've made a change to the design that moves to TAD, but there are some other things that need to be considered at this point. There will be DPC cutting, there will be pool storage with I

think a significant amount of fuel. So there are things that we still may need that -- let me rephrase that. That DOE still may need to address with respect to seismically-initiated event sequences.

One other note I think, Mike, earlier you had mentioned. We have put together ISG-02, and it's out for public comment. It is on the PCSA process or information supporting the PCSA, as well as level of information to support the PCSA. So that's out for public comment, and I believe the date is -- for us to receive public comment is December 13th.

MEMBER HINZE: Are there any ISGs being considered with related -- with relation to post-closure seismic? Are those in the mill?

MR. NATARAJA: Jim, do you want to --

MR. RUBINSTONE: Not at this time.

MR. NATARAJA: Jim Rubinstone.

MR. RUBINSTONE: Sorry. Jim Rubinstone, NRC.

MEMBER HINZE: Raj, you mentioned the possibility of coming in and talking about post-closure with us. Do you have a timeframe or a window that you're working towards that we could fold into our thinking?

MR. NATARAJA: I think I'll let Jim answer

this question further, but all I know right now is that we have made some comments on DOE's work related to this area. And there have been some discussions, and it's one of the topics mentioned for a potential technical exchange between NRC and DOE. And DOE is struggling with this question of how to -- how to cap the hazard.

MEMBER HINZE: Right.

MR. NATARAJA: And they have -- they had extended it in a straight line, which ended up being, you know, some numbers which are unbelievable. But they are struggling with the technical basis how to do that, and our -- our own experts at the Center have looked at this problem, and we have a report that has been written and has been sent to DOE. And DOE wanted to clarify some of those points, and we had some discussions. We might have a technical exchange on that.

So we are still in discussion on that, and until we have more information from DOE, I don't know whether we can come and talk to you about anything knew. Jim?

MR. RUBINSTONE: Yes, Jim Rubinstone. That's a good summary, Raj. We sent a letter on September 20th that enclosed a report prepared by the

Center with comments on an approach that DOE had proposed about a year ago. And I provided -- both of those are in ADAMS. I provided them to Mike Lee, and I think he can distribute those to the Committee.

Right now, we're sort of waiting for DOE. DOE had said they thought they could clarify some things. They said they will probably reissue the report in a revised form at some future date, but we're somewhat on hold now until we can get clarification from DOE on exactly what their approach will be.

MEMBER HINZE: Thank you. Further questions? Leon?

DR. REITER: This is Leon Reiter. I'm here representing the Nuclear Waste Technical Review Board, but these are my own personal comments. I did want to pursue a little bit what Dr. Hinze talked about, the comparison between nuclear powerplants and what's happening at Yucca Mountain. There's two simple questions -- two questions. From what I -- if I'm not mistaken, there's a draft reg guide -- I don't know the number, I think it's maybe 1146 I think.

DR. SHAH: DG-1146.

DR. REITER: In which the proposal is that the nuclear powerplants will also follow this ASCE

criteria. They call it the performance-based approach.

DR. SHAH: Performance-based, yes.

DR. REITER: And I guess the question is: has anybody looked at that? And are you consistent in the way you're applying that approach? Can you then say, "Well, it's like it's being done there, or it's different, and there was a reason for it"?

DR. SHAH: I am a member of the Committee -- structural issues are -- technical advisory group which worked on this DG-1146. I'm very familiar with it. The approach they've taken is, what is a performance of particular structure, system, or component? Not an event sequence.

And that's what I was pointing out, that they are still doing the design -- deterministic design basis. They are still selecting these earthquake performance SSC, so that the performance of a particular -- any one component is 10^{-5} per year. We are talking about event sequence, so that you have to keep in mind. The process is the same.

DR. REITER: Right. They -- you probably know a lot more about this than I. That's what I was thinking about. They had a 10^{-5} criteria, something called the onset of inelastic --

DR. SHAH: Onset, right.

DR. REITER: And then, they somehow associated that with a 10^{-6} core damage.

DR. SHAH: Right, because --

DR. REITER: So has anybody prepared what they're doing and the way they're doing and what you -- what you're doing in terms of consequences, in terms of dose to the public? That may be able to help try and understand if there really is a difference or isn't a difference.

DR. SHAH: There is a difference, because they are still using the deterministic design basis for design of the structure or the SSC for 10^{-4} per year, which was the mean value. To get that 10^{5} they are adjusting the SSC at different -- depending on where the plant is located. So they are preparing -- they are determining this performance-based SSC to get that performance for individual structure, system, or component.

And that's not what we are doing. We are doing the actual performance of these event sequence, you know, like a safety analysis.

DR. REITER: But I guess what I'm trying to get at, has anybody looked at what -- the implications of what you're doing and they're doing?

Not trying to explain why you're doing it, but what are the implications? Does one rely -- result in a lower or higher seismic --

DR. SHAH: Well, we really -- based on my familiarity with this thing is that the structures, systems, and components will not be as stringent, because you're talking about one particular component meeting that. And we are -- here we have event sequence, so you're going to get more than one component in the event sequence, which will reduce your -- reduce your performance.

DR. REITER: Yes. I guess what I'm getting at, too, is: has anybody looked at it quantitatively? Saying what is the difference? Now, I understand you're trying to explain the different approaches, but what are the implications of that vis-a-vis dose? And I guess, is there -- are you a member -- is there some sort of an --

DR. SHAH: I'm a member of that committee.

DR. REITER: Is there a group, an NRC-wide group that's looking at seismic issues?

DR. SHAH: This is an NRC-wide group. They are familiar with what I am doing also.

DR. REITER: Okay.

MEMBER HINZE: I think what Dr. Reiter is

getting at is that it would be great if we had a quantitative assessment of the difference between those, and anything that could be done to encourage that would be useful to the Yucca Mountain program.

MR. NATARAJA: Well, they are not determining the performance except they are going about it in a roundabout way by using a deterministic design basis.

MEMBER HINZE: Right.

MR. CANAVAN: This is Ken Canavan at the Electric Power Research Institute.

MEMBER HINZE: Could you hang on? We'll call on you in just a second.

MR. McCULLEN: Hey, Ken. I beat you to it. Rob McCullen, Nuclear Energy Institute. I just want to follow-on to what Leon Reiter just said. I think that's an excellent question, and I heard Dr. Hinze's line of questioning, some of the same curiosity about the implications of this.

I mean, clearly, we're -- NRC is asking the applicant here to do something different, and the question is: what are the implications of doing that? And we have a view that you'll hear about at the next meeting on what those implications might be.

But just to suggest -- remember, that is

the fundamental problem with this being done in an ISG as opposed to an update to the review plan itself. When you do things in an ISG -- remember that interim phase -- it does not get the same broad level of review within the agency that a revision to the review plan would. This very question that we're asking here has not been put to the Commission, for example, because it is an ISG, and it is not a revision to the Yucca Mountain review plan.

So we will talk -- we'll talk more about that at the next meeting, but I just want to -- you know, in following on Leon's question, the Committee should think about what broader level review should be done. Thanks.

MEMBER HINZE: Thank you, Rob. That's a good --

MS. SIBELIAN: Could I respond to that comment just briefly? This is Marie Sibelian. I'm with High-Level Waste. Our view is that the ISG is a revision to the Yucca Mountain review plan, that it is a very, very focused revision, and that's why we chose the ISG approach. Our view is that it has been vetted through the Commission, and it has received a 45-day comment period. And so it has gone through the process of being reviewed and including by the

Commission and receiving public comment.

MEMBER HINZE: Well, let me ask you the question: what would be the level of the review that would exceed what you have for the ISG, if it went to the Yucca Mountain review plan? What additional review would it have?

MS. SIBELIAN: I don't believe it would have received any additional review.

MEMBER HINZE: Thank you.

Please. On the phone, then.

MR. CANAVAN: This is Ken Canavan at the Electric Power Research Institute. I guess I'd have one comment and one question. The first comment would be on what Leon Reiter was saying, which was it is important to get sort of a dose comparison at the end of this. I'm not sure that that's being done. People are not necessarily looking at the consequences and keeping them commensurate with public safety.

The other comment that I would make -- maybe it's even a question -- in the comparison of the seismic methodologies, it was brought up that they're looking at event sequences. I will point out that seismic brings up a few new event sequences that are often the result of a single failure. Civil structures are an example where you might look at a

single point failure as causing an accident sequence.

For example, if the building fails, then that might be viewed as a single event, rather than the sequence of events, which contains multiple failures. So there probably are a few singles in there that we probably should be concerned about when we look at seismic.

MEMBER HINZE: Thank you.

MR. NATARAJA: May I respond to what Ken said?

MEMBER HINZE: Please.

MR. NATARAJA: Suppose a building failed. You still have another barrier, which is a waste package. And this -- what they are proposing now. So you just don't have a single --

MR. CANAVAN: Can you speak up, please?

MR. NATARAJA: In this example you gave of the structure failed, you still have another barrier where the fuel is contained in a canister, and another -- and also a barrier outside of that, too, which is a package or transfer cask or the transportation cask. So you have always -- I haven't seen just one barrier. There is always more than one barrier where the performance of that -- both components are important in the event sequence before --

MR. CANAVAN: Yes. I guess I might make the argument that if the building fails you could have -- and the package is inside the building, you might make an argument that that -- the package fails on a causal basis. In other words, as a direct result of the building falling on it. So --

MR. NATARAJA: Yes. That you have to evaluate, right.

MR. CANAVAN: Yes. So it can come down to a single in seismic, especially in the area of civil structural. There is probably a few others where you might be able to postulate for seismic events as single. And I guess my concern is, you know, what's defined as seismic failure is always very up in the air. Is it, you know, the onset of deformation? Is it displacement? Or is it true building failure? And it's very difficult to design seismic structures to the screening criteria that's proposed.

MR. NATARAJA: Well, you have to meet the dose performance requirements. That is the requirement of the regulation. That's all we have to do. It doesn't matter what happens in between. It's the dose -- whether the dose will exceed the limits or not.

MEMBER HINZE: Further comments on this or

any other issues?

MR. KESSLER: This is John Kessler, also from the Electric Power Research Institute.

MEMBER HINZE: Please, John.

MR. KESSLER: Yes. I'd like to I guess make two kind of conclusions based on what I've heard today, and I just want to bounce this off NRC staff. The first is, again, back to the use of the ISG process. Essentially, what was discussed with NRC -- in the NEI/NRC meeting was that NRC has already a long history of suggesting methodologies to DOE via their technical exchanges and letters that go back and forth. So the question we had was: why is this ISG process being involved for this particular narrow seismic issue?

And it seems as if NRC's response was that they're using this particular ISG process as what we heard just this morning, because DOE wasn't accepting the methodology that NRC was suggesting, for example, in this June technical exchange. So I'm left to conclude that NRC is using the ISG process specifically to force DOE to use this particular methodology, since it has not been invoked before.

Now, while I understand the ISG process is formally just to guide staff, and that DOE can come in

with any approaches it wants, being a user of ISG on the storage and transportation side --

CHAIRMAN RYAN: John, is there a question in there somewhere?

MR. KESSLER: Yes. The question --

CHAIRMAN RYAN: Okay.

MR. KESSLER: -- is that the -- this ISG process seems to be used specifically to force DOE into a particular methodology, whereas in other times they've just used technical exchanges and that seems inconsistent, or I want to understand why the ISG process was invoked for this one. What makes it special?

MR. NATARAJA: Let me respond to that partially, and I am sure there are others who might want to say something. It's not to force DOE -- we can't force DOE to do anything. There are regulations, and DOE is supposed to meet the regulations, and the staff would review and determine whether they met the regulations or not.

So by coming up with ISG we are not really forcing DOE. I don't think that's the intent. If anybody mistook whatever I said, I'm trying to correct it here. What I was trying to convey was that we were not communicating well, even amongst ourselves here,

because we are always still thinking in terms of deterministic design, and it was a quantum jump we had to make from going from design to a performance.

And that's when we came across this methodology that has been used, and it is becoming a consensus standard, and we proposed this so that we can use this methodology whether or not DOE uses this. It really doesn't matter.

CHAIRMAN RYAN: You need to let go of the microphone.

MR. NATARAJA: Oh.

CHAIRMAN RYAN: You keep hitting it.

MR. NATARAJA: Sorry.

CHAIRMAN RYAN: That's all right.

MR. NATARAJA: So if you thought that I was saying that we did this to force DOE, I'm correcting that. We didn't do that for that reason. And DOE is definitely not obligated to follow this methodology. I said that in the very beginning. ISG is not a requirement, it is not a regulation. It is guidance to staff, and that's an acceptable methodology, which we all think can be used in the review process. And we are going to do that, since we agree with that methodology.

If DOE wants to use it, fine. If they

have some other procedure, that's okay, too. It will all be acceptable as a part of the license application. Maybe --

DR. SHAH: I'd like to add that during that June 7th technical exchange DOE had agreed completely with what we had presented. In fact, their slides reflect what we had. There was no disagreement with DOE, and DOE is in agreement with us on this.

MR. KESSLER: That makes it all the more curious why the ISG was, you know, issued.

DR. SHAH: Well, this -- it came up to this point. Before that, we had a lot of discussion, so it came up to this point where we had prepared -- ISG was issued for draft in May, and then that was presented on June 7th. So it -- this one really crystallized everything into what the process should be.

MR. KESSLER: Okay. Again, I don't understand. If DOE is on board, like they have been in -- you know, or has happened in other technical exchanges and letters, why NRC felt it necessary to proceed with the ISG anyway. I have one other -- I mean, all right -- well, just continue with that I guess, but I have one other comment about the discussion on whether the methodology suggesting an

ISG 1 is or isn't more stringent than what is used for nuclear powerplants.

The response I heard was that it is more stringent. However, I heard there were specific cat. 2 issues, category 2 issues, that are different for obviously Part 63 that don't exist for nuclear powerplants. It seems to me that category 2 issues do seem to be driving the surface design at Yucca Mountain to some degree, perhaps to a large degree, which implies to me then that in effect the ISG 1 methodology is driving the Yucca Mountain design to being more conservative than nuclear powerplants. Any comments from NRC on this?

MR. NATARAJA: I do not believe the design is going to be any more conservative. I think the requirement is different, and we have an acceptable methodology to implement that. I said that before, and I'm saying it again. We have to be convinced otherwise. Somebody has to come and show by actual design saying that you made us do this, and this is more stringent than what you would have done for nuclear powerplants.

MR. KESSLER: Well, all I can say is that I've heard DOE make presentations that say we are -- we are coming up with particular design features

specifically to lower the probability sequences below 10^{-6}. That sounds like cat. 2 considerations are partially at least driving DOE's design.

MEMBER HINZE: Well, I think, John, that we'll be hearing a lot more about this next month from you, and with a chance for you to spell things out in some detail.

MR. KESSLER: Okay. Thanks.

MEMBER HINZE: Tim McCartin has a comment?

MR. McCARTIN: Yes, just briefly on the -- another perspective on why the staff did this ISG. As Raj indicated earlier, and Mahendra, you know, seismicity is a continuum of different types of events. We've had a lot of discussion internally on how to deal with this continuum, and what you saw was a presentation of, with this hazard curve, here is a way of dealing with event sequences in the pre-closure area for this continuum.

And rather than relive these discussions, say three or four years from now, it was decided that an appropriate thing to do was to embody it in an ISG, so the staff doesn't have to revisit the discussions we had. That is one part of why the ISG came about.

MEMBER HINZE: Thanks, Tim.

Further comments? Any issues?

MR. STAMATAKOS: I have one. This is John Stamatakos. I just would ask you, when you look at nuclear powerplant regulations, do you -- are you, you know, at all aware of any possibility that they ever have analysis by simply showing dose requirements are lower than some standard? I mean, my understanding of the new application of 43-05 and nuclear powerplants basis is still attempting to try to limit failure of single SSCs at some probability level.

And one of the important points for the Yucca Mountain regulation in the PCSA is that DOE always has an opportunity to instead of meeting something based on design or even on some probability is to just show that doses are less than the specified performance doses in the rule.

MEMBER HINZE: Good point. Thank you, John.

MR. CANAVAN: This is Ken Canavan, Electric Power Research Institute. I just wanted to make one quick comment. In the case of Yucca Mountain, it's a little bit different. This is where I agree that there are significant differences between Yucca Mountain and the plant -- an operating nuclear facility. And that is, we are -- the design is being driven risk-informed or probabilistically if you will.

And there are some criteria that specify dose. The NRC PRA policy statements clearly address public risk, and clearly address public risk in terms of health effects on the public. So you can take the quantitative health objectives and turn them -- which were turned into subsidiary safety objectives, and you can work that backwards to doses. So yes, the answer to the question is yes.

MEMBER HINZE: With that, if there are no further comments, I'll turn it back to you, Dr. Ryan, and with our many thanks to both of you for the presentations and to the commenters for their involvement in the discussion.

Thank you.

CHAIRMAN RYAN: Thank you, Professor Hinze. And as I think everybody has noted, we'll take up this -- these topics in part next month when we hear more information on it. So we appreciate everybody's participation.

With that, we have finished our morning agenda. We're scheduled to adjourn for lunch, and we will do that and reconvene promptly at 1:00.

Thank you very much.

(Whereupon, at 11:45 a.m., the proceedings in the foregoing matter

recessed for lunch.)

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

(1:05 p.m.)

CHAIRMAN RYAN: Okay. Without further ado, we'll reconvene the afternoon session. This is the 1:00 to 2:30 time slot, and the cognizant member for this session is Dr. Clarke. So without further ado, I'll turn over the Results From Liquid Radioactive Release Lessons Learned Task Force to Dr. Clarke.

MEMBER CLARKE: Thank you, Mike. We have two presenters for this presentation, Stuart Richards and Timothy Frye. Stuart is the Deputy Director for the Division of Inspection and Regional Support in the Office of Nuclear Reactor Regulation. He was the leader of the task force. And Tim was the assistant leader. He is the Chief of the Health Physics Branch, Division of Inspection and Regional Support, Office of Nuclear Reactor Regulation.

Stuart will be with us until 2:00, at which time he has to leave. Tim will stay on.

Thank you.

MR. RICHARDS: Thank you very much. I have a few slides. I'd like to talk about an overview of our lessons learned task force and some of the recommendations, and then try and answer any questions

you may have. So if we can go to slide 2, please.

As you're probably aware, what got our task force going were two events, in particular the event at Braidwood and at Indian Point. Just to recap, at Braidwood actually there were a number of events that occurred over a series of years. The most significant releases occurred in 1996, '98, and 2000. Between those three releases there was about 6-1/4 million gallons of water that was released through a vacuum breaker on their normal effluent discharge line to the river.

I might note that the distance from the plant to the river is about five miles, so these vacuum breakers are spaced out over quite a bit of a distance. They're not really, you know, directly on the powerplant site where the -- you know, you normally would associate having the main structures of the powerplant located.

This really came to the attention of the NRC in the fall of 2005 when the licensee reported finding contamination. It got quite a bit of attention from the state at that point, and they found contamination that was offsite. The maximum levels for tritium were about 250,000 picocuries per liter.

The event at Indian Point occurred in

August of 2005, and it came about due to some excavation that the licensee was doing in the Unit 2 spent fuel pool building. During that excavation they found what appeared to be some leakage, and as they explored that they identified that as potentially spent fuel pool leakage from Unit 2.

Subsequent to that, and based on some follow-up activity on their part, they also identified what appeared to be leakage coming from the decommissioned Unit 1. That plant shut down in 1974.

This also got a considerable amount of public interest in the, you know, New York State area. And they did quite a bit of follow-up work, and that follow-up work continues to this day. The second bullet, as it states, there was a lot of public interest, and, consequently, a lot of congressional interest, particularly from members of Congress from the State of Illinois. Of particular note is that Senator Obama introduced legislation to lower the reporting requirements for some of these types of events and make it a federal law. That legislation had cleared the Committee last I checked, so that may go into law.

As a result of these events and additional questioning about some other plants, the EDO chartered

our lessons learned task force in March of 2006. I might note that in addition to the local and media interests that occurred we did receive, as an agency, a 2.206 petition from a group of different people. I think there was about 26 different organizations or individuals who signed on to that petition demonstrating their interest in how the agency would follow up on that.

Next slide, please.

I'd like to talk for a minute about the task force composition. There were a total of 14 task force members. The membership included a diverse professional background, if you will. We had six members who had health physics backgrounds, including representatives from each of the four regional offices.

We had Tom Nicholson from Research who is an expert in hydrology; Jim Shepherd who I believe is in the audience today representing NMSS on decommissioning; we had an NRR engineer, Andrea Keim, who is an expert in system standards; and we had Scott Burnell and Undine Shupe with public affairs and communications expertise; and from the State of Illinois we had Rich Allen representing the states, and Rich is a certified health physicist.

Next slide, please.

So what were we chartered to do? We had a fairly broad charter. The EDO's office asked us to go out and look at power reactors only, which included decommissioning power reactors. We weren't to look at fuels or materials licensees as part of this effort. And we were to evaluate the regulatory process related to liquid effluents that were inadvertently released in an unmonitored way.

And some of the main areas we would review, which are covered in the report, we were chartered to do a historic review of events that had actually occurred. And in the interest of putting some limits on that, we were asked to go back 10 years. So we covered the period of '96 to 2006. There were a few events that went back before 1996 that we thought we'd bring into the report because of some point it illustrated. But by and large, we were looking back at the known events for that 10-year period.

We were chartered with taking a look at the public health impacts given the available information. We did not go out and try and develop new information about any of these events, so we gathered what information was available and made an

assessment of what the public health impact was.

Importantly, we were chartered to look at the regulatory framework in this whole area. That's -- you know, the largest question is: how is the agency regulating this area, and how do we respond? That included Part 20, of course, the reporting requirements under Part 20, Part 50.72/73, and the tech specs, and we were looking for the requirements for the fabrication, testing, and maintenance of the various components that were leaking, which is a different aspect from the health physics aspect.

We also looked at the NRC inspection program and the enforcement program in this area, both under the new reactor oversight process, which went into place in 2000, and we compared that with the previous inspection program that had occurred for many years before that.

We looked at how the industry reacted to these kind of events and their history as far as remediation goes. We looked at the implications for decommissioning and the lessons that could be learned from decommissioning plants, which I think for us turned out to be a fairly enlightening exercise.

Of course, when you go to decommissioning, you have to characterize the site, so you start

looking for ground contamination, whereas when the plant was operating you didn't necessarily have to do that. So when a plant went into active decommissioning you found out things that you didn't know when the plant was up and running.

We took a look at international perspectives, and last but not least, we looked at the communications with stakeholders, how some members of the public responded to this kind of event, and how the agency responded when these kind of things happened.

Next slide, please.

This is a summary of the results. We were given until July -- let's see, August 31st to deliver the report, and we were one day late, so we got the report issued on September 1st, and it's publicly available. It's on the website.

Most important, I think, our conclusion was that none of the events that we reviewed resulted in significant impact to any public health and safety. So that was very good news from our perspective.

However, having said that, given the present regulatory framework, we did conclude that the potential existed for unplanned and unmonitored liquid releases to migrate offsite undetected. You might

wonder, how can that be? And it's basically because the environmental monitoring program and the effluent release program are designed to monitor contamination that is planned to be released.

So the effluents that are going out to analyze release pathways, you know, they're accounted for. And the radiological environmental monitoring program is designed to look for buildup of contamination in the areas where those normal discharges occur.

So there are no requirements, for instance, to do onsite monitoring unless you use the groundwater for drinking water onsite. Consequently, if you have buried components that leak into the ground, it could occur at a leakage rate low enough that it wouldn't be detected by operational tests or surveillances, and it's potential that once it gets into the ground that it could migrate offsite without anybody knowing it's occurring.

The next bullet, the fact that groundwater contamination can be difficult to monitor and predict, I think is particularly highlighted by the experience at Indian Point. As I mentioned earlier, that event kind of kicked off in 2005. I think they have about 45 or so monitoring wells onsite right now, and

they're still challenged with identifying where the -- you know, where the groundwater contamination is on that site and what it consists of.

We concluded that the external stakeholder interest can be significant, and I think more importantly is that once you're -- once you're in a position that you have had contamination get offsite, it's very difficult to convince the public that that necessarily is not a problem.

You can get in front of public audiences and talk about the public impact, but the fact that it -- the contamination has gotten offsite without anybody knowing about it, and in some cases such as Braidwood it hadn't been reported to the local officials or the public for some time, you lose the public's trust in both the licensee and the regulatory agency, and at that point you're really behind the curve.

When it came time to come up with some recommendations, the task force sat down and one of the things we had to balance was the fact that, you know,i n all of this the public impact was very, very low. So why -- you know, why recommend further actions be taken by the agency, because the agency, of course, is doing business on a risk-informed basis,

and the risk here is very low.

On the other hand, our view was is that there's a public confidence element to this, and that, you know, it's worthy of taking some actions to try and ensure that the public confidence in the agency remains strong, if possible.

Next slide, please.

We came up with 26 recommendations, and I didn't want to talk about all 26. But they are listed in the appendix to the report, and I think you have that report. And we're prepared to talk to any of the 26 if you'd like. But I did list what I thought were the -- kind of the highlights of those 26, just as points if you had questions on those.

The first point -- and, personally, I think that's the most important -- is I think we ought to be able to tell the public that if there's going to be leakage from a powerplant that it's going to be detected before it migrates offsite. I just think that's a fundamental principle we need to be able to meet.

We want to have the license renewal process verify that their reviews take a look at some of these systems that historically have leaked and that those are being considered as part of the license

renewal process.

In the decommissioning area, it was identified that significant contamination in the ground below the plant can have a big impact on the cost of decommissioning, and, therefore, that the decommissioning funding process should ensure that that's considered somehow.

We thought it was appropriate to develop additional guidance for addressing spills and leaks. For instance, under 10 CFR 50.75(g), licensees are required, if they have significant spills, to maintain a decommissioning file, so that they know it's out there and they can go deal with it when the plant decommissions.

There isn't any guidance, however, on what that means. So, you know, what is significant? What do you have to put in the file? When do you have to do that? Likewise, if you have some kind of a significant release, there isn't much guidance on what's expected, so we think we need to work with the industry to identify that.

I think we'd all agree that there is some very minor things that occur as a routine basis on plants that have really no -- no significance and that the amount of action by a licensee should be very,

very small, if anything. On the other hand, there are some events that should require more. Where do you draw that line? We need to have that dialogue with the industry.

A lot of our guidance was really developed with 1970s experience, and we think that based on the technology and the change in the effluent stream that it's time to update some of that guidance, particularly with regard to new reactors that will be coming online.

And, finally, when we processed the Braidwood issue through our enforcement process -- under the ROP it's called the significance determination process -- we found that the process in place at that time could have dealt with the issue, we thought, in a better way. So we took that as something that needed to be revised, and we started meeting with the industry and the public to talk that through.

The last thing I'd like to mention -- I don't have a bullet on it -- but I should mention that the industry has undertaken an initiative on their own. They recognize the importance of this event, particularly in maintaining public confidence, and they kicked off a groundwater protection initiative.

I believe Ralph Andersen, the NEI lead for this, is in the audience today. I don't want to speak to the industry's initiative, but it's something that we've met with them three or four times on, and it's a significant effort on their part.

That completes the prepared remarks, and we'd be glad to answer any questions that you may have.

MEMBER CLARKE: Thanks, Stuart. I have a couple quick questions, and then I'd like to turn it back to the Committee. But how many reactors were included in this study, and how many releases, if those are --

MR. RICHARDS: Well, it was basically all operating reactors, so 103 units, and then it was any of the plants in decommissioning. I don't know what the count on that was. We did not specifically go and look at each plant. What we did is we relied on the work done by the four regional offices to identify plants that had had more than minor leakage.

And, quite frankly, once Braidwood and Indian Point got going, you know, a lot of licensees -- they became aware of the sensitivity to the issue, and they started to talk with the regional offices about it, even though these issues weren't necessarily

required to be reported.

So starting in probably around March when our task force kicked off, it seemed like almost a daily basis there would be new reports coming in, a lot of them very, very minor. So we had a lot of different examples to choose from. We decided as a task force we -- you know, we had to truncate that to something workable, so we tried to pick what we considered, you know, the most significant releases, and we focused on that.

So the number of plant events that we actually described, I don't know exactly what the count was, but it's probably in about the dozen range.

MEMBER CLARKE: So it was a very comprehensive survey.

MR. RICHARDS: Well, yes. But, again, it's known releases. It's -- none of these -- well, a few of these smaller ones were news to people in the regions. But the larger events were not news. You know, these were things that by and large had been known I believe by the regions as part of their normal inspection process, but the event -- because of the amount of radioactive material that was released was not reportable, it was known at that time that it wasn't a public health issue, so people went back and,

you know, revisited that, and we just brought it into our task force and gave it a second look, if you will.

MEMBER CLARKE: Okay. I have a number of other questions, but I suspect they'll come out in the questions from the Committee. Your report says "final." Have you completed your charter? Is there any ongoing work for the task force, or --

MR. RICHARDS: No. The task force is done. The report went to the EDO's office. The EDO's office then reviewed the report, and it went through the agency lessons learned program. That's a new program that just started up. In fact, this was the first lessons learned report that went through that.

The purpose of that program was to try and make sure that significant issues are properly tracked through resolution, so there's a screening process where agency senior managers get together and they review the recommendations and they decide if any of them should go in this higher level program.

None of our 26 made the cut, but that doesn't mean they are followed up on. The issues are then sent out, tasked out by the EDO's office to the program offices -- in this case, NRR, Research, NMSS -- and the program offices are required to follow through on those recommendations. So that's where we

are today is the actions have been tasked out to the program offices for action.

MEMBER CLARKE: The Committee is familiar with the lessons learned initiative going back to I guess April of 2005 when the decommissioning staff had a workshop on the proposed revisions to the decommissioning guidance. We've also been briefed on the rulemaking -- proposed rulemaking and guidance under the prevention of legacy sites initiative, and now we have your task force.

When you say your recommendation -- your results didn't make the cut, are you referring to the website, the lessons learned website, or --

MR. RICHARDS: No, it's the -- you know, it's a tracking system maintained for these very high-level lessons learned recommendations. You know, backing up out of Davis-Besse, the staff did a lot of reviews, and one of the things we found out is that the staff had examples from the past where we had identified problems with industry performance. There had been action taken.

But then, as the years went by, we didn't do a very good job of following through, and we should improve in that area. So the agenda came up with this higher level tracking program, but it was meant for

items that -- at a pretty significant level. One of the criteria you have to meet is that if the agency doesn't follow through with the recommendation that it's likely we wouldn't meet one of our strategic goals.

Well, when you get to the strategic goals, they're high. So in our case, because the risk to the public is low, under that criteria alone none of the 26 made it into that list.

MEMBER CLARKE: Okay. Well, I guess the risk is low because of what we released. But I think one of the questions I certainly have, and you can be thinking about how all of this ties together, the lessons learned that came from your work is going to be captured, tied into the lessons learned initiative on decommissioning, all of which will hopefully feed back and provide valuable information for designing new facilities.

MR. RICHARDS: Yes.

MEMBER CLARKE: And for preventing legacy sites. At some point, is there -- is there a process that's tying all of this together? Is there -- to your knowledge or --

MR. RICHARDS: Well, I think the -- you know, where the sharing of information and bringing it

together will -- I believe will occur is that, you know, at the working level in Tim Frye's branch and working with people in NMSS and Research, you know, one of the benefits of this task force was the opportunity to work with people like Jim Shepherd and share views.

So hopefully we've established a working relationship and, you know, it will make us better at communicating what the various offices are going moving forward. And now we're all tasked to follow up on these recommendations, so clearly there is a role in a lot of these recommendations for multiple offices, just as the lead for each recommendation has been assigned to one office and it's their responsibility to work with the others as appropriate.

MEMBER CLARKE: Okay. Thank you.

Ruth?

MEMBER WEINER: First of all, I read through your recommendations, and I'd like to commend you. That's a very comprehensive series.

MR. RICHARDS: Thank you.

MEMBER WEINER: Are any of those recommendations going to improve public health and safety?

MR. RICHARDS: Well, that's a tough

question, because it comes back to the question of: is it very likely that there would be leakage from a site that would get offsite undetected, get into the public domain, and a cause significant dose to a member of the public?

We don't have an example of that happening. I think, as our task force, our conclusion was it was very unlikely that that would occur for a number of reasons. But that's -- you know, it's a judgment thing. I just believe, my own personal belief, is that we should be able to say that if something is going to leak into -- leak out of a radioactive system that we identify that before it gets offsite.

But, you know, I wouldn't -- I would not -- well, I hate to speculate. I'm sorry.

MEMBER WEINER: No, that's fine, because my followup question is -- or comment is that it's a tougher job to justify something where you can't see in advance that there's going to be any real improvement on public health and safety. So I wish you luck in justifying expenditures.

MR. RICHARDS: Well, and that's -- you know, I think the report discusses this. One of the challenges that we face, of course, is if you want to

place any kind of a requirement on operating plants, the plants that are out there right now, we would have to pass the backfit test, because of the backfit rule, and that -- you know, that has a standard to it. I would guess that for most, if not all, of our recommendations that would be difficult to do.

On the other hand, if there are going to be a number of new plants built going forward, we ought to take these lessons learned, plus the lessons learned from the last 30, 35 years of plant operation, and apply that to new reactors. So, you know, the backfit process, as long as we get moving on it, doesn't apply to those plants.

MEMBER WEINER: Did any of you -- the plants that you discuss in the report, did any of them have repeat events after the ones that you discussed in the reports? Because I notice most of them -- just looking through them and as I recollect, most of them did institute some additional monitoring onsite and offsite, and they went and tested offsite wells and so on. I just wondered if there were repeats -- repeat excursions.

MR. RICHARDS: Of a significant magnitude, I don't remember any that came to mind. The industry, as part of their initiative, sent us correspondence

voluntarily with some historical information of spills or leaks that they had had, and I believe some of those reported more than one event, but almost -- you know, in most cases, there were small events that really probably normally wouldn't gather much interest.

So it depends on where you draw the line on what's significant. I think most plants have had, you know, leaking systems, because these systems just weren't designed to be leakproof. For instance --

MEMBER WEINER: That's right.

MR. RICHARDS: -- at Braidwood this pipe is a concrete pipe. It's not safety-related. It's commercial grade. It's five miles long, you know. If I had to guess if it's leaking somewhere along that length, well, probably a little bit, but does it matter? I'd say no.

MEMBER WEINER: And most of your releases offset are way below the MCLs.

MR. RICHARDS: Yes.

MEMBER WEINER: I mean, you're down in the noise as far as the MCLs is concerned.

I have one final question, which isn't quite related. Where did the 3 millirem come from? That's such an odd --

MR. FRYE: Are you talking about the appendix --

MEMBER WEINER: Yes.

MR. FRYE: -- in Part 50 --

MEMBER WEINER: Yes.

MR. FRYE: Steve Geary might be able to answer that.

MEMBER WEINER: I'm just curious as to where that number -- how that number was arrived at.

MR. GEARY: I don't have the thorough background on that. However, the public dose limit was originally set at 500 millirem, and it wanted to be a small fraction of that. They took a look, then, at the engineering capability of the plants and the liquid cleanup systems that could be used and felt that a low -- a small fraction of that public dose limit could be achieved. And so that's basically where the 3 millirem come from.

I think if anyone else wants to answer that, there may be more historical information here, too.

MR. FRYE: Let me just introduce Steve. Steve is a member of the Health Physics Branch in NRR, so he's a member of my staff.

MEMBER WEINER: So that verifies that,

like many of the EPA standards, you're going for as low as reasonably achievable. That's --

MR. GEARY: Right.

MEMBER WEINER: All right. Practical quantitation. Thank you.

That's all. Thanks.

MR. RICHARDS: Thank you.

CHAIRMAN RYAN: A little math. I looked at page 11. There's a table, and there's 15 units out of 103 in that table, so that's roughly 15 percent.

MR. FRYE: Yes. And just to amplify on what Stu mentioned earlier, you know, we were tasked to go back 10 years, to 1996, to look at significant events. And as Stu said, we weren't trying to capture all of the events, but we want to get a good cross-section of the significant events to be able to, you know, capture some good lessons learned, and, you know, we were trying to get a variety of causes included and get the significant events. So --

CHAIRMAN RYAN: Okay. Well, I just -- somebody had asked, what's the fraction, or what's the number of --

MR. FRYE: Right.

CHAIRMAN RYAN: -- units that are in your study. So that's one measure of it. It may not be a

good one, but that's one.

One of the things that I've been thinking about, and I'd like you to help me understand -- and it may not be a question for you folks, maybe some of the industry folks can answer it as well. To me, the fact that all of the tritium values were compliant in the broadest sense, there was no public health and safety concern on all of that, in a way could be viewed as being fortuitous. Or that the system was designed so that that -- you know, the releases would be so small they wouldn't raise any question against public health and safety.

You know, the fact that this issue sort of blossomed all of a sudden based on one plant and then other plants looking at it, to me the aspect of it that this is something that, oh my goodness, what's going on here, was sort of the review of it is really kind of the interesting question for me. I'm glad the doses of projections of dose are low and compliant and there's no public health and safety consequence from the perspective of your report.

But what have you done on this other side of saying, well, okay, if we build new plants, how do we make sure we don't have this problem again? By the way, a concrete pipe will have about the same

permeability as a halfway decent clay. So it's, in essence, clay.

MR. RICHARDS: All right. You know, Jim Shepherd might be able to help me out on this. But as far as new plants going forward, I'm not from the Office of New Reactors and I haven't really been involved in, you know, the design of those plants. I do know that there is a regulation that requires that when a licensee comes in with an application that they should describe measures that they're going to take to limit the contamination.

And I think that was an outcome of our decommissioning experience, going out and finding out that plants had had weeks that weren't identified during plant operation and that impacted the ability of them to clean up the site.

Jim Shepherd?

MR. SHEPHERD: Yes. Am I on?

CHAIRMAN RYAN: Hi, Jim.

MR. SHEPHERD: Our goal on now FSME, formerly NMSS, side is to provide the reactor people with our insights from the decommissioning to identify, to a somewhat greater extent than the operating plants can, where leaks occurred from the decommissioning plants, because now we have the

opportunity to go out and dig everything up and see actually what did leak, and then make suggestions to them on how they might perhaps modify or enhance a design.

I don't think, given that the plants are made primarily of concrete, steel, and water, we're going to have a zero release facility.

CHAIRMAN RYAN: Right.

MR. SHEPHERD: But I think certain design considerations, so that releases may occur in areas that are better controlled, either for the use of sumps or other double enclosures of some form, if you will, and also perhaps enhanced instrumentation or other things like the under-drain systems to detect leakage when it occurs rather than waiting until we get to decommissioning when it has been leaking, what we've seen is typically very small leaks that occur over long periods of time.

But a tenth of a gpm will leak a million gallons over a 20-year operating life. And it's very difficult to detect the tenth of a gpm. We're looking to help them somehow identify the million gallons before it gets quite that large.

CHAIRMAN RYAN: It's not quite so hard, though, if you have a tracer like tritium in it. You

know, you can get there a whole lot sooner than 20 years down the line.

And I guess what I'm -- I've been thinking about, you know, the fifth bullet on -- I'm sorry, slide 5, the fourth bullet, if you could back it -- is everybody over there? No, I guess not. Oh, there we go. Thank you, Michelle. I didn't see you hiding behind the screen there. Slide 5.

And I'll just read the bullet while it's coming up on the screen. "Groundwater contamination can be difficult to monitor and predict its movement." I couldn't agree with you more, particularly in a highly engineered environment where you've got a, you know, fully manmade construction with God knows exactly what kind of foundation and footing and all the rest. And somehow out some distance from it that's married to a more natural-looking kind of soil column. You can be -- Tom Nicholson would be thrilled to help you, you know, spend lots of years modeling all of that, I'm sure. Right, Bobby?

And it is quite a challenge to do that. But it's interesting, I think, to try and think about that. What can we do different in terms of early detection? To meet the fact that it wasn't detected early in some of these, you know, kind of older leaks

that have been progressing for some time is really the heads-up message out of all of this, is how do you avoid that kind of challenge to public confidence? That, you know, I think the public would be saying, "We didn't know it was happening."

MR. RICHARDS: Yes. Well --

CHAIRMAN RYAN: And that to me is the kind of top-of-the-pile message. And, you know, we've heard from Connecticut Yankee. They ran into lots of stuff they didn't anticipate. We've heard on a couple of the decommissioning projects, oops, there were surprises. And in my own experience, that's true as well in -- having tritium, you know, at a low-level waste site. I mean, it -- until you've figured out how it behaves, you really don't know how it behaves.

MR. RICHARDS: Well, and I think a lot of people would agree with you. You know, of course, Ralph Andersen can speak for the industry. But I think -- I think the task force, the industry, through their groundwater production initiative and some of the citizens groups through their 2.206 petition all kind of came to the same conclusion. We ought to detect leakage or contamination before it gets offsite and has an impact to public health.

It's just that the number of ways of doing

that are infinite I guess. But, you know, one fix does not fit all.

CHAIRMAN RYAN: Oh. And in various parts of the country, in various geohydrologic regimes, one could be counterproductive over here, but works fine over there. So I'm with you 100 percent.

MR. RICHARDS: But the question --

CHAIRMAN RYAN: The premise still stands.

MR. RICHARDS: The question is how to get there. You know, the industry has chartered all their plants to take an individual look at their sites and come up with a plan to do that. So they -- you know, they could come up with 67 different plans or however many sites there are. The 2.206 petition had a more one-size-fits-all approach.

From our viewpoint, we think that there's a lot of different ways you can get there, and then, of course, we're also challenged by the backfit requirements for existing plants.

CHAIRMAN RYAN: The other question that came to my mind is, okay, tritium we all know is the leading indicator of what's coming next. Has anybody looked for carbon-14 or other radionuclides or --

MR. FRYE: Like you said, tritium is the -- usually the first radionuclide that we find. But,

you know, at some of these sites we have found other radionuclides. You know, tritium is the leader. Strontium-90 at Indian Point has been detected, cesium-137, so, you know, we are -- as we look we're finding these other radionuclides.

CHAIRMAN RYAN: Have you looked for carbon at any of the other sites, carbon-14 in particular?

MR. FRYE: I can't say for sure, but I'm pretty -- you know, Region I for example, at Indian Point in particular, is doing a broad spectrum analysis, and they're looking for the hard-to-detect nuclear --

CHAIRMAN RYAN: So I guess that's data that will be coming. You know, you think about other things like tech-99 and I-129, and, again, it's a matter of what's in the source term of the inventory and what moves. But those are most certainly mobile in water, and, you know, if tritium shows up, some of these others will show up.

MR. RICHARDS: There isn't really at least regulatory guidance on what to do in this area. Again, once you get this into the ground, it I think would behoove us in the industry and the regulatory agency got together with the public and, you know, had a dialogue about, okay, if this kind of event occurs,

what's expected? You know, what nuclides should you be looking for?

CHAIRMAN RYAN: And let me quickly add that I -- I mean, I recognize that airborne effluents dwarf anything that we're talking about here in terms of releases to groundwater. So I fully appreciate that the magnitude of the release is small, but it was the surprise of the release I think that has the public, you know, concern raised somewhat, it seems like. I mean, maybe I'm --

MR. FRYE: Yes. I think part of the public's concern was, you know, we needed to be sure what was out there and what had happened historically before we could say definitively that there was no, you know, impact on public health and safety. And, you know, we're working to get that knowledge of what has happened and --

MEMBER CLARKE: Mike, the Table 1 that you referenced earlier has the radionuclides that were found for each of the reactors.

CHAIRMAN RYAN: That's one question. The second question is: did anybody look for carbon? Because if you didn't look for it, you're not going to find it. I'd look for it, if it was me.

The other question it raises in my mind is

the idea that your report and all of your work could really help in an area that's a little bit different from the physical design of, say, a fuel pool. It certainly could help in that regard.

But what does it imply to you, or did you think about it, or is anybody talking about, how do you model the geohydrology of a reactor site? I know we spent a lot of time worrying about seismic issues in terms of design of powerplants, but where do you figure out groundwater and how it actually does behave on a given site? That's been something that has been certainly generally kind of identified at various sites, but there's not a lot of detail there.

MR. RICHARDS: Well, and it's unfortunate that Tom Nicholson is not here today. He would probably be able to describe that better. But there was -- you know, there's the initial characterization of the site as part of licensing, and then beyond that, if I remember my discussions with Tom correctly, you know, there isn't a requirement to do any more.

As Tom describes it, you know, you start digging holes and putting pipes in and you really change the way the hydrology reacts to any kind of a leakage. After that point, you don't necessarily have to maintain a good knowledge of that, nor is there any

requirement again to monitor the ground onsite unless you use it for drinking water.

So it's true. If something goes into the ground, you may not know where it's going to go. It could be difficult to determine. I think at Indian Point, you know, there are wells that were fairly close together that gave completely different results. But on the other hand, I think you could make the argument that if it's unlikely to result in a public health problem, you know, is that level of effort by a licensee worth it?

CHAIRMAN RYAN: Yes. And I'm not suggesting we, you know, race out there and employ over geohydrological well-drilling company in, you know, the United States to drill homes in every powerplant. But it sure is -- it sure is part of the equation when you think about, well, how do I know what I know? I mean, and I think that's something to think about. And, again, I'm not thinking about in the context of evaluating current plants, but thinking about what we do down the line at new sites.

MR. RICHARDS: I think Indian Point is a good case to take a look at, because they're -- you know, they've launched a very large effort from our point of view to make sure they can characterize

what's going on there. Arguably, you could say that very little if any of it is really driven by regulation. It's driven mostly by the interest of the people in the local community, and, you know, others in New York State.

MR. FRYE: I was just going to add that -- and Stu mentioned the industry initiative, and a big part of the industry initiative, and, of course, this is voluntary. But the NRC is assessing and following up on it, but a big part of the initiative is for each site to review their site hydrology and update it as necessary to -- so that they do have a better understanding of the groundwater flow and how it, you know, acts on each site.

CHAIRMAN RYAN: Sure.

MR. RICHARDS: But I think, you know, the industry representative can correct me if I'm wrong, but there's a caveat there. They'd only need to do that to the degree that it's important to ensuring they detect material before it gets offsite and impacts the public. For instance, if you have a site that's located on the ocean, and you know that if something goes into the ground it's going to go out in the ocean, you'd probably say, "Well, that's all I need to know." And maybe that's as far as you go.

So I don't think the licensee's groundwater protection initiative specifically says everybody should go out and refresh their knowledge in that area. They should take a look at their own set of circumstances and decide what they need to do.

CHAIRMAN RYAN: But, I mean, in your summary there it makes a lot of sense to me. I'm not disagreeing with that view at all. But, again, my questioning is not so much, what are the current plants doing, because I think there's a pretty robust program to look at all that. It's, how do we take all that information and say, well, you know, if we make this change and that change, or designed a protection system and/or sump in or, you know, there are some simple things that could help test nearer the source.

I mean, my own experience is the closer you get to the potential source with whatever monitoring you want to do, the higher your reliability. And if you get to where you could even, you know, have an intermediate engineering access to some location to see where things are leaking even inside of a building, before it gets outside of a building, that's a better place to be.

So I'm just wondering if there's any thinking yet along those lines. And maybe that will

come later as people sort out what's working and not.

MR. FRYE: To get back to one of your earlier questions about how we're going to apply this to the new reactors, which is kind of in line with your last question, you know, Jim Shepherd gave a pretty good explanation of some of the work that we're doing, and what we're trying to do is we're working -- NRR is working with Jim and NMSS and Research to get these lessons learned, and to develop regulatory guidance for what we are looking for out of this 20.1406, and we're working to get, you know, new reg guides developed and I think get this stuff in our standard review plan updates. So we -- you know, we have something to --

CHAIRMAN RYAN: There's the knowledge management right there.

MR. FRYE: Right.

CHAIRMAN RYAN: Okay. Great. Thanks. I've taken enough time. Thank you.

VICE CHAIRMAN CROFF: At the start, you noted that your task force focused on reactors. If you were to extend it or have a phase 2 on materials facilities, do you think it would reveal anything new or any additional lessons or recommendations?

MR. RICHARDS: I guess I'm not prepared to

answer that, because I know very little about materials facilities. Maybe there's somebody in the audience who has more knowledge, but I personally have never been a part of the inspection or licensing program for materials facilities. Does anyone care to offer up an opinion on that?

MR. SHEPHERD: Yes, this is Jim Shepherd. I don't think we were -- would be likely to find any new insights. I think many of the issues that we see of leaks that occur in areas that are not easily monitored, either visually or by existing instrumentation, have occurred with some regularity at material sites, much to the same extent on a relative scale that they have at the reactor facilities.

VICE CHAIRMAN CROFF: Thank you.

MEMBER CLARKE: Professor Hinze.

MEMBER HINZE: Concerning the application of your lessons learned, I was pleased to hear the discussion regarding the movement of groundwater and the new nuclear powerplants. It seems to me that there is a concern here about the level of site characterization required at new nuclear powerplants. I'm reminded of a judge's statement some years ago, a Missouri judge, that said that the movement of water in the subsurface was unknowable.

I think you'd find that most geohydrologists would not subscribe to that. We can know. It's a matter of how important it is to know it and how much money you -- therefore, how much money you put into it.

But also, it's a matter of placing monitors in the correct position, and it seems to me that that's part and parcel of the modeling and monitoring, that you have to have sufficient information so that you can model, and on the basis of that you decide where you're going to do the monitoring.

And it seems to me that there's a lesson learned there, not only for existing plants but new plants, and also other nuclear waste sites. We know that tritium has escaped outside the site from other plants, so I would encourage that.

One of the questions that I had was the -- you arrived at the decision of minimal risk, and I'm sure that's well documented. But I'm wondering if you considered how much uncertainty there was in your decision and how you arrived at that uncertainty.

MR. RICHARDS: Well, I guess the short answer is no, we didn't -- you know, we didn't do that. What we did is we just took a look at, again,

the available information, which was based on largely inspections that had already occurred by the NRC or weren't done by licensees, and using those -- you know, that available data to assess impact on the public, you know, there is always the possibility that there was contamination beyond what the licensee or the NRC detected.

But on the other hand, you know, one of the questions that came up is: how do you know it's not worse? One of the things we did look at is, where do these leaks predominantly come from? And there's a couple of locations -- spent fuel pools, buried pipes, particularly from, you know, condensate storage tank or some kind of a large water tank that feeds, and a boiler that, you know, feeds some pumps that inject into the reactor vessel, and discharge paths.

Well, you know, and the spent fuel pools, of course, are -- have a purification system on them, so the level of contamination is typically maintained fairly low there in relative terms. For discharges to the environment, a lot of those discharges have been processed before they -- they go, too.

And likewise, the contamination in the water that's in condensate storage tanks is not very high. So when you look at it, I don't remember us

looking at any events that really involved resins or, you know, some of these materials that you would expect to have high levels of contamination. Most of it has been water that has already been, you know, processed or is a relatively low level of contamination.

So, you know, that gives us some level of comfort that we're not going to have or we haven't had major contamination events that go undetected.

MEMBER HINZE: Excuse me. But is there a temporal variation associated with these tritium leaks? In other words, is it constantly increasing, or is -- are there cyclic variations? What information do you have?

MR. RICHARDS: Well, we just have the history record, and we went back and looked 10 years. That's -- you know, quite frankly, that's something that we didn't consider. So I can't really answer that.

MR. FRYE: You know, I was just going to add -- add on to Stu's response to your question about, you know, our -- I guess our confidence of the impact on public health and safety. And the licensees for both Braidwood and Indian Point did very comprehensive evaluations of the dose from the

releases, you know, bounding calculations with very conservative values, and we reviewed these as part of the lessons learned task force, and these were, you know, major contributors to our conclusions.

And even with their conservative, you know, assumptions that they made, they -- the doses to the public from these releases and spills and leaks were, you know, fractions of the Appendix I, 3 millirem limit. So, you know, I think that's -- that's the --

MEMBER HINZE: It gives you a lot more confidence if you have some idea of where your -- of what your uncertainties are, which means you know how to look at your uncertainties. You know, you might --

MR. FRYE: Right.

MEMBER HINZE: -- look for high permeability zones in the subsurface. These are the areas where you're going to get the maximum movement, where you're going to get the longest reach if you will of the contaminants. And those might give you a better idea of what's really happening in the extreme.

MR. FRYE: Right. You know, I think one of the approaches that, you know, these sites have taken is they have drilled so many monitoring wells, and they've done --

MEMBER HINZE: The number of monitoring wells never impresses me. It's where they're located.

MR. FRYE: Well, right, and that's the key that -- that's one of the key lessons learned, that, you know, we have identified and the industry has identified that you have to take the time to evaluate the site hydrology and drill the right wells in the right locations to the right depth. And we've -- the licensees have done that, and we've -- we've several times, you know, reviewed their analysis. Tom Nicholson has gone up with the regions and reviewed the analysis and --

MEMBER HINZE: I've sat in on some of the early site permit reviews, and, as I look back on it now, and thinking about this problem, I wonder, you know, has there been enough concern raised about really defining the groundwater situation, the groundwater movement, in the -- particularly in the unsaturated zone. Yes.

CHAIRMAN RYAN: Bill, one amendment I'd offer into your comments -- and I thought they were all good ones -- is it's interesting to think about -- and it's a tough problem, because you've got this very large engineered unit that you've plunked down with a lot of subsurface engineering, you know, to build it.

And you basically made your own geohydrologic regime close to the plant.

MR. FRYE: Yes. You know, I think that was one of the lessons learned, that we have identified and the industry has identified, is that they've done an initial site hydrology study. And then, they built a site, and --

CHAIRMAN RYAN: So the hydrology is all different than the study.

MR. FRYE: -- the foundations they've put in, and the backfill they've put in, has changed the hydrology.

CHAIRMAN RYAN: Okay. Now, let me offer you a thought here and see if this is crazy or not. But to me, it's interesting to say, well, okay, I'm going to start up this new plant. Well, it would be interesting to have some kind of a protocol to develop information that would tell you about where to monitor, where to intercept, or where to find something that might happen 10, 20 years down the line.

And it's not something you're going to spend a lot -- a huge amount of money on, you know, in year 1 and year 2. But something that if there's a little bit of effort to collect water levels, you

know, in a few key wells. You can know whether water is going that way or that way.

Now, if you do it all at once like I'm sure some plants have had to do at this point, they put in 30 or 40 wells, just so they can figure out where are the tilts in -- you know, where does the water go?

So my view of it is it's a lot better if we can do something smart like, say, we'll gather a little bit of information close in to your engineering feature, so you can see how it not necessarily grows, but how it evolves in the context of the bigger geohydrologic system as things settle down, for lack of a better phrase, because it will finally seek its own level. I mean, you make a big hole, you fill it up with an engineered thing, and it's going to take a while to reequilibrate with the system around it.

You know, I mean, we've learned at Hanford, for example, after they stopped putting so much cooling water out of the system at Hanford, the water level went from having a big, huge slope to being essentially flat, which is the way it was before it was changed by all this release to the surface.

So I'm just trying to think, you know, is there a smart way to take new plants and think about,

how do we avoid these later detection of leaks as opposed to an earlier detection by doing a little bit along the way rather than wait until we have to plunk down a big program. Does any of that make sense to you guys? Have you looked at --

MR. RICHARDS: Well, it does. And, you know, it brings us back to one of our recommendations, which is that we ought to be able to detect leakage before it gets offsite, and the recognition that there's a variety of ways to do that. I think in some cases it would be appropriate to do the kind of monitoring that you're suggesting, and in other cases a licensee might make the case that the site is so big or it's located on an ocean that, you know, a lot of effort isn't worthwhile.

And it's -- you know, that's the kind of thing we're going to have to work out with our public stakeholders in the industry to see if we can come up with a way forward.

CHAIRMAN RYAN: And all well and good. I mean, I see, you know, without any bias or prejudice that the wide range of options of do nothing do a lot. Everything in between in terms of this modeling and monitoring kind of concept could be appropriate based on the geohydrologic regime. But there's a real

opportunity to -- if we get at it early, it's not nearly as expensive.

Now, the other side of it -- I'll put on my old licensee hat from years gone by -- is, okay, if I do all these things, where's my benefit? Do I have a lower decommissioning cost if I have leak detection capability and monitoring? I would hope so. Because there is an investment there and site knowledge, and that site knowledge gives me the ability to say, you know, my risks are better established, better confined, and defined, and maybe there ought to be a benefit somehow in there to me.

Now, I don't know if managing, you know, lower decommissioning trust fund requirements is the way to go. But there ought to be some way for me to take advantage of the fact if I'm investing in this knowledge that there's a benefit for it. Has that -- did that aspect come into your thinking?

MR. RICHARDS: Yes, it did. And it -- you know, it gets to the heart of things, which there has to be a benefit. If you wanted to backfit this on present licensees, you'd have to demonstrate that benefit. And I think, you know, if you wanted to go forward and put some kind of rule into place, you would have to convince the Commission and the senior

staff and, you know, panels like yourself that there is a benefit.

So, and that's a tough thing to do. It comes back to -- and one of the previous questions we had is, well, you know, is there really a problem here that we need to address? Or does the history suggest that the impact on the public is negligible and it's not worth that -- you know, that expenditure of effort?

CHAIRMAN RYAN: It seems like a great first step in your report, but it sounds like that there's a lot of other activity coming after your report that will --

MR. FRYE: Well, I think what you'll see is that there are a handful of recommendations that say, you know, the staff needs to evaluate the need to -- needs to evaluate our regulations for, you know, changing the radiological environmental monitoring program to change the requirements, you know, improve some of the requirements for offsite monitoring, you know, consider changes for onsite groundwater monitoring, to review changing the regulations to -- for leakage detection.

So we have the recommendations there to -- for the staff to evaluate these things and consider

what, if anything, can be done. But obviously, it's too early to say, you know, what direction we might take.

CHAIRMAN RYAN: Again, I'd offer an amendment that just adding requirements for monitoring isn't going to get it. What you've got to really add is value added monitoring. I don't want to put in a well unless it's going to tell me something I need to know.

MR. RICHARDS: We agree with that.

CHAIRMAN RYAN: Every geologist and hydrologist, present company excepted, always want to drill one more hole.

(Laughter.)

MR. LARKINS: Stu, I think everybody agrees there is no public health impact from these leaks. But there is a public confidence issue which seems to have grown out of this, and we're going to continue to have these leaks occurring over time. How do you recapture the public confidence? How do you better risk communicate this information to the public, so you don't have to deal with unnecessary burden from some type of legislation, additional reporting requirements, or things like that?

MR. RICHARDS: Well, again, I can give you

my opinion, and it's somewhat captured I think in the report, which I think most of the people involved would agree with. But once you've had a leak and you didn't know it was coming, and you've got to turn to the public and say, "Gosh, we've leaked radioactive material out there in the environment," and, even worse, "it happened years ago and we didn't tell you about it," you're in a pretty bad place.

CHAIRMAN RYAN: Yes.

MR. RICHARDS: So your credibility with the public is probably not very good. I know that in the case of Braidwood the licensee had a number of public meetings, and then they had some open houses where they had people come out and you could talk one on one, and I think they found that to be effective. So over a period of time, maybe the public has become more confident in the utility.

In Exelon's case, they instituted a monitoring program, a very extensive program at all of their sites nationwide, and they've been pretty upfront in letting people know that they spent a lot of money to do that. It's hard to judge, you know, how successful they've been at recapturing that confidence.

I think from our point of view the -- you

know, the lesson to be learned there is don't get into that position. Don't -- you know, we should take some kind of measures to ensure that, you know, we may -- we detect this leakage before it gets offsite, getting back to Jim Shepherd's comment that it's not like you're going to have a leakproof plant, nor is, you know, that really called for. On the other hand, we shouldn't be in a position like we found ourselves at Braidwood.

MR. FRYE: You know, just to add to that, and I think we mentioned this earlier, but just the ability to say that we have done a good job of identifying over the years the historical leaks that have occurred, that was a big part of the public confidence concern upfront. And, really, the point of the 2.206 petition that Stu mentioned was that there was no confidence that either the NRC or the industry knew the extent of the spills or leaks that had occurred historically.

And the industry, as part of their initiative, has, you know, voluntarily responded through a questionnaire to provide that historical information. And so, you know, once we have that and we can have some confidence that it's a complete history, I think that goes a long way.

MR. LARKINS: Yes. You seem to be going back looking, maybe proposing some changes to the significance determination process and what the impact of that might be. But that doesn't seem to address root cause -- I mean, getting back to the public confidence issue.

CHAIRMAN RYAN: No.

MR. RICHARDS: That's too much into the bureaucratic details. It's really how much of an impact. But, again, I think our recommendation that there be action so that if there is leakage it's detected before it gets offsite, I think that's -- for public confidence, that's the most important thing.

The second thing is reporting it. You know, I think we need to make sure that when these issues come up that we put that out in the public domain. Another recommendation was is that we revise the ROP process to allow some of these things to be put into inspection reports that normally would have been considered not significant enough to warrant writing about.

So that, you know, it is in the public record, and we can point to it. Hopefully, if somebody later on says, "Hey, what about this?" well, yes, we told you. If you didn't read it, you know,

there's not much we can do about that. But it wasn't worthy of a larger effort, because of the -- you know, the public significance.

MR. LARKINS: So you would allow more opportunity as part of the reactor oversight process to pick up on those things which might not ordinarily come out in the inspection programs, like in the area of effluent monitoring and things like that.

MR. RICHARDS: Well, we would allow --under the recommendation we would suggest that there would be a lower threshold for documenting these kind of events in inspection reports, because the threshold that's there now would screen a lot of these events out.

And so if you're a member of the public and you wanted to read about your plant, you'd read an inspection report, there would be nothing there. That doesn't necessarily mean there wasn't some kind of a leakage event. It just meant it didn't meet the threshold for writing about, so we'd say lower that threshold just for that reason.

MR. LARKINS: Yes. I guess where I was going at -- I mean, from a risk-informed perspective, it's probably correct to leave a lot of this stuff out. But from a public confidence perspective, you

may want to include other things.

MR. RICHARDS: That's exactly right.

MR. LARKINS: Yes.

MEMBER CLARKE: Ruth, and then Bill.

MEMBER WEINER: Okay. Especially in your older, the more historical leaks, did you make any attempt to correlate or do you correlate them in any way with the tritium that you might be getting from fallout?

This was a question that came up some years ago in Washington State in looking at tritium in the Columbia River, and they discovered that when you looked at lakes that had nothing to do with Columbia or any leaks you found a considerable amount of tritium from fallout.

I wondered if that was something you had run into also, or if you correct for it, or if you just ignore it.

MR. RICHARDS: We did look the various sources of tritium, and, of course, you know, there is the fallout from weapons testing, and then there is the tritium that occurs naturally from cosmic ray interaction in the upper atmosphere, which is a much larger fraction than anything a nuclear powerplant puts out.

So, but, you know, when you spread that out over the volume of the earth, it doesn't necessarily -- generally, it doesn't give you a background level that's significant compared to the levels we're talking here.

You know, for instance, kind of a separate issue that we talked about in the report, some of these powerplants use manmade lakes for cooling sources. And, as a consequence, they put a lot of tritium out there. It's below the MCL levels. Those lakes are open for, you know, public enjoyment and don't really constitute a radiation hazard. But the levels that exist in those lakes are far beyond what would be there if it was just a natural lake.

MEMBER WEINER: So you do -- if there is another source, you recognize it and correct for it.

MR. RICHARDS: I would say, yes, we would have, yes.

MEMBER WEINER: If it's significant.

MR. RICHARDS: Yes, right.

CHAIRMAN RYAN: Well, the only real source of tritium that's important is global fallout.

MEMBER WEINER: Well, that's --

CHAIRMAN RYAN: And natural -- I mean, it's -- anywhere in the United States, tritium in

groundwater or surface water -- well, near surface groundwater is 400 to 1,000 picocuries per liter based on what you are -- that's about it. It doesn't vary much.

MEMBER CLARKE: Dr. Andersen, did you want to say --

MR. RICHARDS: Mr. Chairman, I apologize, but I need to leave.

CHAIRMAN RYAN: Stu, you did a great job. I'm sure Tim will hold up your end after you've gone, and thank you very much for a real informative presentation.

MR. RICHARDS: Thank you very much for allowing me to be here today.

CHAIRMAN RYAN: Thank you.

MEMBER CLARKE: Thank you, Stuart.

DR. ANDERSEN: Before the NRC staff leaves, I just want to say that it has really been a pleasure over the last year interacting with them. I think we had nearly half a dozen public meetings, a lot of very candid interchange, and I really appreciate the efforts of the task force. So I just wanted to compliment them on that before they got away.

I just wanted to make a few remarks.

First, is that the Committee may want to consider inviting us to come back at some future meeting and discussing the industry initiative that we've undertaken on our own.

CHAIRMAN RYAN: Consider yourself invited.

(Laughter.)

There's a lot of followup, obviously, we heard hints of, and we'd love to hear that as well.

DR. ANDERSEN: But I'll offer just a couple of teasers to help with that. First of all, it's an initiative with a capital I. It's not just a good idea, it's a formal commitment, and we have a process for doing those. We did a lot in the security area after 9/11 where real things get done, and they are very publicly disclosed, and the NRC, in fact, does look very closely at what we're doing in these, even though they aren't a requirement.

So I want to be able to explain more about that to you, what it means that it's an initiative with a capital I.

Secondly, to the public confidence issue, what we instituted immediately was an obligation on all of our plants, which we made very, very public, is that any leak or spill that we identify of greater than 100 gallons of contaminated water -- and the word

"contaminated" isn't bounded. If it's contaminated from plant radioactivity, then it meets the bill as communicated to our local officials and states within one working day of discovery, which well exceeds any existing regulatory requirements of NRC or the EPA.

Secondly, we then are obligated to provide a 30-day written report to explain what we found out and what we're doing about it. And then, thirdly, we published a summary of all of that information in our annual effluent reports, which we will be submitting after the first of the year, so that in case somebody missed it the first time or the second time they've got it available to them in the annual reports.

The same holds true for any groundwater sample that we take that exceeds the MCL for drinking water. We don't -- we make that notification within one working day, also do the followup and explain circumstances, and then also include it in the annual report. So we've put in place about as low a threshold for disclosure as we can, because we really think that was one of the biggest aspects here is the appearance that things had happened years before and that nobody knew about them.

Along with our states and our local communities, by the way, and oversight on my part, we

also communicate with the NRC. And to date, most of those communications actually have been done formally under 10 CFR 50.72, which requires us to report to the NRC when we have interactions with state agencies. So it actually becomes documented through the NRC's daily report as well.

So there has been a very, very large change there. And, in fact, we have made such notification such we implemented this on July 31st. So there are instances, both in NRC's records and in the newspapers, and so forth, where people have self-disclosed. But the important part and the one I'd like the opportunity to come back in much more detail is what we're doing with the geohydrology, what we're doing with the site monitoring programs, modeling, and so forth.

That's a good topic for discussion. Always enjoy seeing your colleagues on topics like that, and also appreciate the insights that we get.

I do want to respond to one thing, though, if you don't mind on the uncertainty issue. The point is extremely valid, and here's the difficulty that we run into. When we do our bounding analyses, we assume that the source is in fact the point of exposure. One thing we know about tritium in water is that you don't

concentrate it. At least the last time I looked at it, I don't know a way to concentrate water beyond its normal concentration.

So we do assume that is the most conservative assessment, to say, well, for this leak or spill, what if the concentration in fact were what the concentration is at the source? And what if a person drank that water all year, which that's as much as they can drink? So you can't get more conservative than that. That's where we have found doses of less than a fraction of a millirem.

So, although the point is valid about uncertainties, and we need to greatly improve that, our starting point without any uncertainty is if they drank the water from the source for an entire year, their maximum exposure is going to be a fraction of a millirem. Any interaction beyond that is going to have the effect of reducing that dose. So we always have to weigh how well we need to understand the uncertainties within that context.

CHAIRMAN RYAN: That's a point well taken, Ralph. I guess my thought is that some of the ideas of detection, and so forth, really, frankly, get more at avoiding a public confidence question --

DR. ANDERSEN: Right.

CHAIRMAN RYAN: -- than a real dosimetry or a potential human exposure question, as that if you can detect it early, one is you're confident and you're head of the game, and all of that, but you also have a better chance if you're going to mitigate, or you need to repair or do something else, that you're maybe a little bit ahead of the power curve in that regard, too. So I couldn't agree with you more and would welcome insights to that in your next --

DR. ANDERSEN: Right.

CHAIRMAN RYAN: -- next visit with us.

DR. ANDERSEN: And, again, to reinforce the point, where the uncertainty I really do think plays a part is, as you suggested, do I really know where the plume is? Do I know if it's offsite? That's the part where the uncertainty certainly exists that we need to work on.

Thank you. I appreciate the time.

CHAIRMAN RYAN: Thank you.

MEMBER CLARKE: Thanks, Ralph. Mike, and then Latif.

MR. SNODDERLY: Thank you, Jim. This is Mike Snodderly from the staff. Tim or Jim Shepherd, I was wondering if you could help us. On your slide 6, I wanted to make sure the Committee has the

opportunity to look at the additional guidance that's being developed and the guidance that's being updated. Could you give us some idea of what reg guides and guidelines are being updated and developed, so that we're aware of them when they're coming in?

MR. FRYE: Do you want to do that, Steve?

MR. WIDMAYER: Yes, Mike. One of the things I was going to interject is tomorrow afternoon's session is where we're going to hear the initial thinking about the --

MR. SNODDERLY: Well, I just want to make sure, because what I want to clarify is -- is part of the Committee's review to help the staff in updating all the reg guides and SRP sections. Right now, all -- we've been forwarded all of the reg guides that we understand are going to be updated to support the March '07 deadline, to support new reactor licensing.

And I guess I'm just concerned because in my just quick review of those reg guides I didn't see where these particular insights are addressed. So is it -- and it sounds like you are developing some additional guidance, so I just want to make sure -- is there anything besides Reg Guide 1.112 and Reg Guide 4.15 the Committee should be aware of or that we should be looking for coming down the pike?

MR. FRYE: You know, I think that's -- I think that's it for the high priority reg guides that we're trying to get for --

MR. SNODDERLY: Okay.

MR. FRYE: -- from new reactors.

MR. SNODDERLY: I just want to make sure I'm not missing something.

MR. FRYE: We're also -- and I think what you'll hear tomorrow is some of the work that we're doing for the DSRP updates also.

MR. SNODDERLY: Great. Okay.

MR. FRYE: And so it's --

MR. SNODDERLY: I just wanted to make sure we weren't missing anything.

MR. FRYE: -- a combination of a presentation tomorrow and Wednesday, the two specific reg guides. But we are working on additional reg guides to address these lessons learned that aren't included in the high priority March 2007 set that we've identified for new reactors.

MR. GEARY: And the titles of those -- this is Steve Geary. The titles of those two is going to be Reg Guide 1.21, which is measuring, evaluating, and reporting effluent releases, and that will be revised to include unplanned releases, because it's

primarily aimed, as was mentioned earlier, the original licensing basis was for planned effluents.

So we're going to update that to include unplanned effluents and include measuring, evaluating, and reporting those as well.

The other reg guide is 4.8, which is a very old reg guide on environmental monitoring. And additional guidance has been put forward since that reg guide was originally issued in the early '70s in the form of branch technical position. So I've already begin our staff -- Tim's staff has already begun revising the Reg Guide 4.8 on environmental monitoring, and we are also going to be pushing forward on Reg. Guide 1.21.

MR. SNODDERLY: Thank you very much. That's -- I just want to make sure, so we know what to look for for the Committee.

MEMBER CLARKE: Okay. Does that cover it, Derek?

MR. SNODDERLY: I'm sorry. I had just one other clarification. Do you have a timeframe or a schedule? I'm sorry.

MR. GEARY: Well, we've just taken a look here. We've got the final recommendations out of the task force report. We've divided those 27

recommendations into assignments between Research, NMSS, and NRR.

The recommendations that are going to be incorporated under NRR primarily will be incorporated into those two reg guides. And we haven't taken a look at the budgeting process or how long it's going to take to complete those, but just off the cuff it's going to be high priority to us, and we will be working on them in the near term.

CHAIRMAN RYAN: If you can keep us up to date on your schedules in that area, that would be real helpful.

MR. GEARY: Okay.

CHAIRMAN RYAN: Thank you.

MR. FRYE: Yes, I think one of the things Stu mentioned a while ago was the lessons learned task force's recommendations, and the staff is responding to all of them. But we are still really trying to resource estimate and develop schedules for a lot of these recommendations. And we're just in the initial steps of, you know, trying to scope out the work.

But, you know, to get -- to evaluate these reg guides and, you know, develop changes and get stakeholder input, you know, it's at least a year, if not longer. So it's -- although it's a high priority,

it's going to take probably at least a year to get through these.

MR. SNODDERLY: So then, Tim, for those plants that plan to submit in September '07, they'll have to use the existing guidance, or it will be reviewed as part of their early site permit?

MR. FRYE: Well, we've -- we've identified the bare minimum reg guides that we need to update for March 2007 to support the, you know, first expected applications to come in. And those are the two reg guides that we identified and that we'll be talking about on Wednesday. But we're working to -- and those were the highest priority March 2007.

We're working -- we're working with Research to try to get the additional reg guides for -- to support new reactors updated in the next round of updates that they'll be working on -- I think, you know, the medium priority reg guide updates. So there is more out there that we need to do, but the two we'll be talking about on Wednesday are the -- were the two highest priority.

MEMBER CLARKE: Okay. If I could just make one comment. Mike alluded to a working group meeting we had several weeks ago on modeling and monitoring and trying to work the interface between

the two -- the goal being to improve our confidence in these models, because they're being used to -- to predict and to forecast for very long periods of time.

And one of the things that came out of that meeting, one of several things that came out of that meeting, is the merits of distinguishing between sites where there is existing contamination and sites that are new. And it struck me that as I suspect that new reactors will be proposed on existing sites where there are reactors, and there may be some knowledge of the subsurface there from the decommissioning efforts that are going on or not, or if there have been releases. New sites, it's a different story.

And there is a fair amount of work going on by other groups that are interested in siting on what's called groundwater vulnerability. And I think that's what Professor Hinze was getting to, if you release something to the subsurface. What do you know about developing the conceptual model that then can be used to guide numerical models?

So I think we -- those distinctions have some merit, and in some cases we're going to have some knowledge, and in other cases we won't. And I would hope that we would -- we would have to get it in the case where we don't I guess.

So, Latif, you wanted to --

DR. HAMDAN: Yes, one quick question, Tim. For constituents that are not tritium, like strontium, carbon-14, iodine, do you feel that there is enough information already for you to make a determination that the contamination to the groundwater is within the established standards to protect groundwater? Or that you need to continue to monitor and you make that determination sometime in the future?

MR. FRYE: You know, I think from what we've seen so far that except for strontium-90, which has been above the EPA limits for safe drinking water, we really haven't seen much else out there that exceeds, you know, the limits for safe drinking water limits, except for tritium also in certain instances.

You know, one of the -- like I said, one of the things we're doing, the licensees are doing comprehensive sampling, and, you know, they've drilled a lot more monitoring wells and they've expanded their sampling programs and --

DR. HAMDAN: So what I'm getting at, you know, I don't think that you have some decommissioning funding for remediation.

MR. FRYE: Right.

DR. HAMDAN: If it comes to that. The

question I have is: do you have in your recommendation a recommendation for a monitoring program for a long time for licensees to consider, or not?

MR. FRYE: I think it's covered by the recommendations. It's something we need to -- it's one of the -- and I think Stu mentioned, we get into the fact that, you know, analysis -- it's covered -- I think it's covered under the recommendations, that we need to evaluate the need for changes in our regulations and reg guides for whatever it takes to be able to monitor and detect these leaks before they get offsite. So I really can't say right now, you know.

What we would try to pursue is requirements for enhanced long-term monitoring, but, you know, it's there in the recommendations, and it's something we're going to be looking at.

MEMBER CLARKE: Okay. Okay.

MR. DIAS: It's actually for my understanding. The release that happened in Braidwood, was that a normal release? Because they would throw it into a ditch, and the ditch would eventually take it to the river. Is that considered a normal release of effluents?

MR. FRYE: It was originally intended as

a normal release. The leaks in question occurred --

MR. DIAS: And they probably find it as normal whenever they were releasing --

MR. FRYE: They --

MR. DIAS: -- it still shows up as a high level of tritium?

MR. GEARY: Let me add to that. The release at Braidwood occurred out of vacuum breakers. So you've got a five-mile pipe running along, and you've got some vacuum breakers that were installed equipment in that -- in that circulating water discharge line. And the leaks occurred out of those vacuum breakers.

And then, it was surface water that ran across the top of the water down into the slew or the low-lying areas and accumulated there. So that release there was -- it started out, like Tim said, as a normal effluent release. It was designed to go out the circ water. And then, the vacuum breaker leaked and it obviously came out into the vault and onto the ground and down to the slew.

MR. DIAS: Thank you.

MR. BROWN: Chris Brown, ACNW. This is also just for my education. Could you just tell me, were more of the releases due to the vacuum breakers

or human error or to material degradation?

MR. GEARY: Well, I think basically you could divide it into two release points. Really, equipment that's located right at the plant, such as a spent fuel pool, you know, that leaked like at Indian Point, or a discharge line, and there are different plants -- I mean, all plants have discharge lines. And a lot of the leaks have occurred along those discharge lines, either through a vacuum breaker or a crack in the pipe or a break in a weld. So those are kind of the two major categories.

The leaks that occur right at the plant normally would go down, down into the groundwater right there. And most of our environmental monitoring program is offsite, so those leaks hadn't shown up in the early -- I mean, in any of the routine environmental monitoring programs.

At Braidwood, one of the offsite welds did show up with detectable tritium at about 1,500 picocuries per liter, which is roughly 7 or 8 percent of a drinking water limit. So that was detectable contamination in an offsite well. But the majority of the releases have come from monitoring wells, not drinking water wells but monitoring wells. And the higher concentrations are closer to the plant.

MR. FRYE: If I could just add to what Steve just mentioned. If you go through the report, I think you -- we saw three main causes of the leaks. One was spent fuel pools are -- a lot of the spills and leaks have occurred to spent fuel pool leakage clogged. The spent fuel pools have tell-tale drains on them to -- and they are supposed to work that if the liner leaks the leakage will go through into this tell-tale drain and you can identify it. But there has been maintenance problems with the tell-tale drains.

And if the spent fuel pools have been leaking, that's one major source. Another broad category is buried piping, which also includes the spent fuel pools a little bit, because usually that's underground, so it's buried piping and components that are not readily, you know, accessible for visual examination.

And the third broad category, as Steve was mentioning, was just failures of components on discharge lines due to inadequate maintenance and testing and surveillance.

MEMBER CLARKE: Thank you. We have reached the appointed hour. I would just note that, again, your Table 1 has a nice summary of the source

of the release, and these are really the lessons learned that I think we want to capture.

So let me turn it back to you, Mike Ryan.

CHAIRMAN RYAN: Okay. Thank you, Jim.

That brings us to the end of our formal presentations today, so we will end our formal transcript at this point.

(Whereupon, at 2:31 p.m., the proceedings in the foregoing matter went off the record.)