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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS) 505th MEETING, DAY 2

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THURSDAY,

SEPTEMBER 11, 2003

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ROCKVILLE, MARYLAND

The Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. Mario V. Bonaca, Chairman, presiding.

COMMITTEE MEMBERS:

MARIO V. BONACA, Chairman

GEORGE E. APOSTOLAKIS, Member

THOMAS S. KRESS, Member

GRAHAM M. LEITCH, Member

DANA A. POWERS, Member

VICTOR H RANSOM, Member

STEPHEN L. ROSEN, Member

WILLIAM J. SHACK, Member

JOHN D. SIEBER, Member

GRAHAM B. WALLIS, Member

ACRS STAFF PRESENT:

JOHN T. LARKINS, Director

SHER BAHADUR, Associate Director

SAM DURAISWAMY, Technical Assistant

B.P. JAIN

HOWARD J. LARSON, Special Assistant

ALSO PRESENT:

BRUCE BEISLER, Florida Power and Light

T.Y. CHANG

KEVIN COYNE

MARY DROUIN

NOEL DUDLEY

MICHELE EVANS

JOHN FLACK

STEVE HALE

DONNIE HARRISON

TONY HSIA

MICHAEL JOHNSON

JOHN KAUFFMAN

PT KUO

ERIC LEEDS

BRUCE LETELLIER

TILDA LIU

RON L. LLOYD

ALSO PRESENT: (CONT.)

LEDYARD (TAD) MARSH

MIKE MAYFIELD

JIM MEDOFF

GARETH PARRY

MOHAMMED SHUAIBI

HOWARD VANDERMOLEN

A-G-E-N-D-A

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

(8:31 a.m.)

CHAIRMAN BONACA: Good morning. The meeting will now come to order.

This is the second day of the 505th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting the committee will consider the following: final review of the St. Lucie license renewal application; draft final Regulatory Guide DG-1122, "Determining the Technical Adequacy of PRA Results for Risk-Informed Activities"; technical assessment and proposed recommendations for resolving GSI-186, "Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants"; draft final review standard for reviewing core power uprate applications; draft final Revision 3 to Regulatory Guide 1.82 (DG-1107), "Water Sources for Long-Term Recirculation Cooling Following a LOCA"; review of PIRT Process; and proposed ACRS reports.

A portion of this meeting will be closed to discuss a proposed ACRS report on safeguards and security.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Dr. John Larkins is the designated federal official for the initial portion of the meeting.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's session.

A transcription of portions of the meeting is being kept, and it is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

Before we start, today marks the second anniversary of the terrorist attacks of September 11, 2001. So before starting our meeting, please join me in a few moments of silence to remember those who died in the terrible tragedy.

(Whereupon, a moment of silence was observed.)

CHAIRMAN BONACA: We will proceed now with the meeting. Before we start on the first item on the agenda, I would like to point your attention to the items of interest you have in front of you. There are a number of speeches, a couple of interesting speeches by Chairman Diaz, and also quite a bit of information about operating plant issues and congressional correspondence.

MEMBER POWERS: Mr. Chairman, I will note that Dr. Teller died yesterday, that he was the founder of this committee and always especially kind and thoughtful toward me.

CHAIRMAN BONACA: John, we can talk about sending a card from the committee.

Okay. Let's start with the first item on the agenda. That's the final review of the St. Lucie license renewal application. We have with us the licensee. We have this licensee before, not only for this application but also for Turkey Point, and we have quite an interesting presentation today. So --

MR. HALE: Can you hear me okay?

CHAIRMAN BONACA: Okay.

MR. HALE: Thanks for letting me speak in front of you again for I think this is like the fourth time.

MEMBER ROSEN: You should identify yourself for the record.

MR. HALE: Oh, I'm sorry. Steve Hale, Project Manager for License Renewal for Florida Power and Light Company.

Today there were three topics that were -- I was asked to discuss. Bruce, if you'll put on the next slide. Let me introduce also -- this is Bruce

Beisler. He was the civil lead for the Turkey Point as well as the St. Lucie license renewal effort.

The three items I was asked to discuss today are aging management review of concrete below groundwater, we had some recent results from the Unit 2 reactor vessel head inspection I was asked to discuss, and then to discuss commitment tracking.

With regards to concrete, at the onset we established our groundwater as aggressive, being on a saltwater site. And looking at the GALL report, our chlorides, of course, exceeded 500 ppm, sulfates were greater than 1,500 ppm, although the groundwater pH was not less than 5.5.

We did sample for phosphates based on some recent discussions and measured our phosphate levels to be very, very low, but, you know, it was somewhat moot considering we considered our water aggressive from the onset.

The concrete at St. Lucie that is exposed to groundwater is essentially -- the first two items are essentially big pieces of concrete base mats that have a small portion of it that's exposed to the groundwater, which is the containment base mat and the steam trestle.

The auxiliary building bottom floor, which is about 17 -- actually, I guess it's about 20 feet below grade, a small portion of the wall and the floor is exposed to groundwater. The intake structure, although we dewater and inspect the external portions of that, gives us an assessment on the condition of that concrete, and we do the same with ultimate heat sink dam. This is the extent of the concrete that's actually exposed to groundwater.

We address aging below groundwater concrete by design, and we also have our systems and structures monitoring program. I won't go into the details here unless there is some specific questions, because the next few slides I presented at the last subcommittee presentation I made.

This really summarizes the actual design of the concrete and actual measured values to verify the concrete was within those criteria.

So, Bruce, if you would just page through that.

MEMBER LEITCH: Steve, I noticed in the NRC inspection report that there was an omission in your procedures for the opportunistic inspection of buried concrete -- that is, that if you had to do a dig up, the procedure didn't necessarily flag the people --

MR. HALE: Right.

MEMBER LEITCH: -- to specifically inspect the concrete. And that was promptly rectified, and the procedure now specifically instructs people to inspect the concrete when those occasions occur.

MR. HALE: And although it wasn't proceduralized, we have actually done those inspections when we have excavated. In fact, I have a couple of areas that we did do that.

MEMBER LEITCH: I guess my question was, there are other components that are inspected on an opportunistic basis, such as buried pipes and tanks. And I wondered if that procedural linkage was involved -- was in those procedures as well.

MR. HALE: Well, with regards to piping, the major piping that -- well, actually, we don't have a lot of piping that's exposed to groundwater. In fact, I'm not aware of any piping other than right at the discharge structure that's actually exposed to groundwater.

MEMBER LEITCH: Okay.

MR. HALE: And that piping gets crawl-through inspections. So that's the intake -- what we call our intake cooling water system, and we do crawl-through inspections consistent with the requirements as an ASME Section 3 system. And they do -- they completely crawl through the whole pipe.

So, but there's only a very small portion of that that's actually exposed to groundwater. The piping itself is not below the grade level.

MEMBER LEITCH: Okay. And buried tanks, do you have --

MR. HALE: No, we have no buried tanks.

MEMBER LEITCH: You have no buried tanks.

MR. HALE: All of our tanks are above ground.

MEMBER LEITCH: Okay, good. Thank you.

MR. HALE: Again, this is just summarizing the design features that we instituted. We do have waterproof membranes, high compressive strength concrete. I would like to mention that concrete on the aux building walls and floor is three foot thick.

Next slide, Bruce.

What we propose to do in terms of trying to get an indication of this besides, you know, opportunistically looking at concrete when we excavate it is as part of our systems and structures monitoring program, we will be monitoring the aux building areas that are below groundwater for bleeding, rust bleeding, things of this sort, to get any indication if there are problems, although we don't anticipate it.

When you look at the full scope of the concrete that is exposed to groundwater, that would be the area that's the thinnest and, as a result, should be the first indicator if you did have a problem.

In speaking to what you had mentioned before, the buried -- we have done some inspections of buried concrete structures. This is a summary of the opportunistic inspections that we have made. The Unit 1 containment, this was during the 1997 steam generator repair project.

The ultimate heat sink dam, we actually -- we did a cathodic protection system replacement, and we actually excavated and inspected some of that concrete. The Unit 1 -- and I'd like to highlight this is not necessarily concrete below groundwater. This is just buried concrete, because the CCW building is not really below the groundwater.

We did an exploratory excavation in 2002, and then, as Bruce well knows, we are upgrading our spent fuel cask frame, and they've gotten into quite a bit of inspections with the cask frame foundations and looking at the condition of the concrete. And in all cases we saw no degradation in the concrete.

MEMBER ROSEN: No degradation.

MR. HALE: No. The next topic was -- unless there are any questions, I'll move on to the recent operating experience at St. Lucie.

With the inspection of Unit 2, this has completed all of our reactor vessel head inspections, both at Turkey Point and St. Lucie. At Turkey Point 3 and 4, and at St. Lucie 1, we did both visual and ultrasonic inspection, and we found no indications in the reactor vessel head penetrations and no evidence of leakage.

However, at St. Lucie 2, which we inspected in the spring of this year -- well, let me just run through what the inspection requirements were. There was 100 percent bare metal visual inspection we were requested to do. We did have a specific relaxation request for an area under the shroud ring, which was about less than one percent of the reactor vessel head surface area; 100 percent ultrasonic examination of 102 reactor vessel head penetrations.

We did have a request for portions of the tubing that we may not be able to get a good ultrasonic signal below the weld, about one inch below the weld. So that was the scope of the inspection that we did on Unit 2.

Now flip to the next slide.

For the bare metal visual examination results, we had no evidence of leakage, and there was no evidence of wastage on the reactor vessel head. However, as opposed to our three other units, on Unit 2 we did get indications on two reactor vessel head penetrations of a single axial flaw in two of those head penetrations.

Now, again, this not a throughwall crack. There was no evidence of leakage. However, we went into repairs on those penetrations.

Next slide, Bruce.

We removed the lower portion of the CEDM nozzle in the flaw by machining. We repaired both penetrations by welding. We used -- it was about the mid-thickness of the head. This is a temper bead weld process that has been used in other repairs at other utilities. And then, we again inspected to ensure that we had removed all of the flaws.

The process, the repair configuration, and the overall inspection was approved by the NRC prior to embarking on it.

MEMBER ROSEN: When you removed the flaws by machining, were you able to confirm the ultrasonic testing in any way? Did that, in fact --

MR. HALE: I can't answer that question. I'm really not, you know, prepared to do that. I do have a copy of the inspection report that was issued to the NRC, the 60-day report. I'm not sure -- I would assume that our inspection folks would have tried to confirm what they saw, you know, that -- that they got some calibration or confirmation that their ultrasonic techniques --

MEMBER ROSEN: You say you have a copy with you?

MR. HALE: I have a copy of the 60-day report, yes.

MEMBER ROSEN: You can do it offline.

MR. HALE: Okay. So, in conclusion, so the Unit 2 inspection, we had no wastage or leakage or identified leakage. And we completed repairs on the two reactor vessel head penetrations, and to a condition which was free of cracks and degradation.

I would like to mention we have ordered a new reactor vessel head, as we have on all our other three units. And we'll continue to perform the inspections in accordance with the order.

Well, that's what I wanted to cover with reactor vessel head inspection. Have you got any other questions?

CHAIRMAN BONACA: Could you just refresh our memory on the Unit 1?

MR. HALE: Oh. On the Unit 1 inspection?

CHAIRMAN BONACA: Yes.

MR. HALE: Yes. On Unit 1, we had no indication of leakage with 100 percent bare metal visual. We performed the same inspection, and we had no indications with the ultrasonic inspection.

CHAIRMAN BONACA: So you did the ultrasonic now on both heads.

MR. HALE: Right. Right.

CHAIRMAN BONACA: Okay. Because I remember when you had the presentation to us in the subcommittee Unit 2 had not received --

MR. HALE: Right.

CHAIRMAN BONACA: Yes, okay.

MR. HALE: Exactly.

CHAIRMAN BONACA: Right.

MR. HALE: So based on the results, we also have an upcoming steam generator replacement for Unit 2 sometime in the future. So I think they're going to plan to coordinate those two activities.

CHAIRMAN BONACA: And you said you have ordered the heads of this --

MR. HALE: Yes.

CHAIRMAN BONACA: -- new heads.

MR. HALE: Yes, we've --

CHAIRMAN BONACA: Okay.

MR. HALE: In fact, we've ordered four.

CHAIRMAN BONACA: Okay.

MEMBER ROSEN: Now, tell me two other things. How old -- how long have these units been in service?

MR. HALE: Actually, Unit 2 is our youngest unit. So it kind of defied, you know, some of the criteria. Turkey Point is highly -- in the highly susceptible category, and they had no indications and no leakage. They are our oldest plants. St. Lucie 1 is fairly close to Turkey Point. They went in service -- Turkey Point went in service in '72/'73, and St. Lucie in '76. Unit 2 went in service in '83.

MEMBER ROSEN: So it's 20 years old.

MR. HALE: Right. Right.

MEMBER SHACK: And the operating head temperature is?

MEMBER ROSEN: That's my other question.

MR. HALE: It's less than -- it's around 600 degrees, a little less than 600.

MEMBER SHACK: Oh, so that's fine.

MR. HALE: Yes. But if you look at the categorization and the susceptibility, Turkey Point was our highest susceptible units, followed by St. Lucie 1 and then St. Lucie 2. And we didn't have leakage; we just had indications of our flaws in a couple of tubes. So, you know, they could have been preservice as well, so we don't really know.

MEMBER ROSEN: Well, we're always interested in confirm -- trying to confirm the time and temperature model.

MR. HALE: Right.

MEMBER ROSEN: This doesn't help.

(Laughter.)

MR. HALE: There's a lot of other factors, I believe -- you know, fabrication techniques and --

MEMBER ROSEN: We are aware of it.

(Laughter.)

MR. HALE: I believe this is probably the one topic the committee is most interested in is what we're doing in the area of commitment tracking. I believe we have a very aggressive program for commitment tracking for license renewal at both Turkey Point and St. Lucie, and, you know, we were able to do quite a bit at Turkey Point.

In fact, we've formally turned over the activities to the current operating group, and at St. Lucie 2 we're in the midst of that implementation as well.

Early on, we had started with, you know, incorporating commitments into our commitment -- our existing commitment tracking program, which are hard commitments to the NRC. And we put special designators in the license renewals, so they could be sorted and picked up and identified.

When I say "commitments" here, this goes beyond the commitments of the -- that are identified specifically in the -- in fact, this is probably a misnomer here. This should probably be "activity supporting commitments." We plan to have 70 to 80 percent of the activity supporting commitments implemented prior to issuing the renewed license.

And what this is is everything -- like if you have a program, whether it's existing or new, we identify specific activities that you have to perform. You have to get the commitments integrated into the procedures. You know, you have to have change processes to ensure that when procedures are changed, if there's a license renewal commitment, they realize at the plant level they can't change that commitment.

So when I say 70 to 80, and we were able to accomplish it at -- this at Turkey Point, and we're well on our way at St. Lucie, we should have all of the activities supporting our commitments -- 70 to 80 percent of those -- already implemented by the time we get the new license. And this is in the area of new programs and changes to the existing program. I mean, existing programs and changes to existing programs.

Next slide, Bruce.

And then once we implement commitments, we maintain them through, you know, three -- I'll call it legs of the stool, or whatever -- configuration control documents, our change control processes, and our training. We have had a very extensive training program that we initiated very early.

Next slide, Bruce.

The configuration control documents that we've implemented -- first is the license renewal design basis document. We implemented one -- in fact, we just issued final drafts of these. They basically incorporate the six-column tables into the -- a design basis document that becomes part of our overall design basis document system.

We have fire protection, station blackout, specific system DBDs, and now there will be a license renewal DBD.

The second item, which are ongoing and are very similar to a design basis document, is our program basis documents. These documents define the program, they define the specific procedures to implement that program, and they also draw the specific commitments and changes that need to be implemented.

Design drawings -- early on we put our license renewal flags on P&IDs. If you'll recall, we did that before we even submitted our initial application at Turkey Point, and we did the same at St. Lucie. We used a system of flags very similar to what we used for code boundaries that identify LR flags, and this is primarily for the mechanical systems.

Calculations -- in the calculations we identify specific calcs that are identified as TLAAs that support the license renewal commitments. And the UFSARs -- in the UFSARs we have specific commitments identified as well as program summaries in the new chapter we created for the FSARs. And we have a summary of the TLAAs in the FSAR.

And then finally, and probably the most extensive thing we've done, we've got into the individual operating and maintenance procedures that specifically implement the programs. You'll have a program on a high level, and you may have 10 procedures that implement that program.

And we went into each procedure and identified specific steps that were license renewal commitments, and we flagged those as license renewal commitments. And we changed the procedure process -- well, I'll get into that in a minute, but we actually flagged specific commitments in the operations and maintenance procedures we credited for license renewal.

In the change control procedures we've already -- in fact, currently my mechanical lead is giving training to the site right now for the final quality instructions we develop. These are our design control procedures. We've put specific forms in the design change process that forces the engineering folks to document reviews relative to license renewal, to see if there are impacts from a design standpoint, scoping standpoint, that sort of thing.

We developed a series of engineering desktop procedures. The folks that will be most involved in looking at this will be those involved with equipment procurement and engineering design. We actually had special sessions with the supervisors, gave them desktop guidelines, and then trained their people as well on what they need to be looking for, the kind of things that could impact not only the scope but aging management programs.

And then we went into the plant change process. We actually went into, you know, like PMs, admin procedures, this sort of thing, and actually changed their process, the plant's process for changing these procedures, to require specific questions and checkpoints and signoffs related to license renewal.

And finally, in the license renewal training area, we -- again, as I mentioned, we initiated it early, and this was plant-wide. We addressed multiple groups, multiple management levels. Our training has been ongoing with the engineering training program. That training is all documented.

In fact, one of the audits the NRC came in. They actually looked specifically at our records and the things documenting the training. And it's going to be ongoing. We will continually have specific training sessions related to license renewal to keep people posted. We're also considering a QA audit in the next year or so to make sure that we're following the various procedures and things we put in place.

MEMBER LEITCH: Steve, I had a question right on that point. As I read some of the NRC inspection material, it seemed to me that there was procedural compliance having to do with pumping out water from manholes.

MR. HALE: Right.

MEMBER LEITCH: I guess there's been a chronic problem of water getting in manholes, and there's a procedure to inspect the manholes periodically, and that was not done I guess or not done fully. And there were other incidents pointed out where safety-related manholes were inspected on one unit but the same corresponding manhole was not inspected on the other unit.

MR. HALE: Right.

MEMBER LEITCH: I guess it gives me a little bit of concern about your procedural compliance. In other words, these procedures are all good, but they have to be rigorously followed. And could you --

MR. HALE: If I might --

MEMBER LEITCH: -- make some comments about that?

MR. HALE: Yes. The problem was not necessarily procedure-compliance. The problem was the procedure itself. What we had is a difference between Unit 1 and Unit 2. Unit 2 has cascading manholes to a sump with a sump pump.

Unit 1 does not have that similar feature, so Unit 1 was inspecting all of the safety-related manholes. The procedure that was developed for St. Lucie 2 only had them inspecting the sumps with the sump pumps.

MEMBER LEITCH: Okay.

MR. HALE: Okay? So the plant was following the procedure. The issue was we weren't inspecting all of the manholes, and you could have a manhole upstream with a plugged drain, you know, things of that sort. So we instituted a condition report and immediately corrected that to ensure that all safety-related manholes -- in fact, I have a backup slide that talks about that.

We instituted changes -- in fact, we integrated it into our license renewal program basis document that requires that as part of a licensing commitment under license renewal to ensure that, you know, people can't change that, and that sort of thing. So we had -- I think it's 24 months. Every 24 months we inspect all safety-related manholes.

MEMBER LEITCH: So it's not a procedural compliance issue, then. The procedure itself was --

MR. HALE: If the procedure itself wasn't -- didn't fully cover the entire scope that it needed to.

MEMBER LEITCH: Okay. Thanks.

MEMBER ROSEN: This committee has been concerned for a long time about the whole overall process of license renewal in the sense that there was a perception early on that things would -- it would be business as usual until he got to the term of the current -- the end of the current term. And then, on that day everything would change, that the plant would begin implementing license renewal features.

And we worried, a) for the plant; and we worried, b) for the staff trying to deal with inspection of such an abrupt change. What you've talked to us about today is very commendable. It is an idea that even before you get licensed, even before you get a license renewed, a piece of paper from the staff, you begin implementing and training and work towards the day where you have a renewed license.

And even in the current term before the renewed license becomes -- I don't know what quite to say. Until you enter the license renewal term, much of the -- all of the implementation goes on very, very early, and so the day that St. Lucie actually enters its license renewal term I would expect that almost nothing would be different from that day to the next day.

MR. HALE: The only thing that carried forward are the one-time inspections. You've got individual one-time inspections that need to be tracked. There are certain activities -- for example, let's take the internals inspection. We have five -- although there is one commitment to do an internals inspection during the -- you know, during the renewal period, we have five to six commitments under there that calls for submitting -- you know, doing an evaluation on void swelling.

So the one-time inspections, especially the ones that don't have any clear definition right now like the internals where we're waiting on industry information with regards to void swelling and this sort of thing, are really the only thing that will be left.

The day-to-day operational programs -- you know, and my crew we all grew up in the engineering organization, and we worked in the plants. And we don't -- we didn't want to complete this project and just -- and say, "Okay, it's yours, you know, you've got it." We wanted to make sure that people understood what the commitments were, that people were taking accountability for the specific programs, and that sort of thing.

MEMBER ROSEN: Well, I think this is a lesson for the staff and for perhaps other licensees who approach us for license renewals. That there is a right way to do this, and the right way is to have a smooth transition early.

MR. KUO: This is P.T. Kuo.

CHAIRMAN BONACA: I have a question. I'm sorry.

MR. KUO: I'm sorry.

CHAIRMAN BONACA: You go ahead. No, you go ahead.

MR. KUO: This is P.T. Kuo, the Program Director for License Renewal and Environmental Impacts Program. I agree with Dr. Rosen that this is something that the licensees with renewed licenses are to do. And I believe some of them -- I may be wrong, that all of them will do it, but at least the majority of them will start doing it, because they change their aging management program procedures, actually, you know, when they get their license.

Many of them are using the existing programs to serve as the aging management program. So I think, thus, probably a lot of the licensees will do it. That helps.

CHAIRMAN BONACA: Okay. Well, I had a question just regarding in your application you had some TLAAs of half-nozzle repairs of the instrument lines, pressurizes, and hot plates. And still you are -- I mean, the conclusion was not obvious, because the TLAA had not been approved by the NRC. Is that issue closed now or --

MR. HALE: The way they -- you know, there were some relief requests that were submitted.

CHAIRMAN BONACA: That's right.

MR. HALE: The NRC only approved those relief requests for a year. So we're going to have to go back, you know, again and submit those --

CHAIRMAN BONACA: Okay.

MR. HALE: -- relief requests. In parallel with that, there is some additional analysis and evaluation going on to evaluate corrosion rates in that little space there like we talked about the last time.

CHAIRMAN BONACA: Okay.

MR. HALE: I'm hoping that through this year that we'll have enough technical where at the next relief request we'll be able to get the full period. If not, it will continue to go on a cycle-by-cycle basis.

CHAIRMAN BONACA: But you have committed to do whatever --

MR. HALE: To do that.

CHAIRMAN BONACA: -- needs to be done --

MR. HALE: Yes. Yes.

CHAIRMAN BONACA: -- to resolve that issue.

MR. HALE: Right. Right. That was, in fact, one of the added commitments to our document.

CHAIRMAN BONACA: Okay.

MEMBER LEITCH: I had a couple of questions about the consequences of the work that was done. In 1986, the major repairs of Unit 1, the removal of the thermal sleeve and repair of the core barrel, you indicated that that was going to be part of the 10-year ISI inspection program.

MR. HALE: Yes.

MEMBER LEITCH: And work was done -- performed in 1996, 10 years afterwards, and no deterioration was found. Is it the plan, then, to continue to do those kinds of inspections throughout the period of extended operation?

MR. HALE: Yes, it is. After the core support barrel repair we actually integrated that inspection into our normal 10-year Section 11 inspection.

MEMBER LEITCH: Now, just --

MR. HALE: That visual will be done each time we do our 10-year inspection.

MEMBER LEITCH: I'm just not familiar with what the status of Unit 2 is in that regard. Does it have a thermal shield?

MR. HALE: No. The event occurred on Unit 1 at a time where we were able to start up the plant without the thermal shield.

MEMBER LEITCH: Okay. So it was never installed on any --

MR. HALE: It was never installed, no.

MEMBER LEITCH: Okay. Thank you.

MR. HALE: Any other questions? Okay.

CHAIRMAN BONACA: Well, thank you.

MR. HALE: Thanks for your attention.

CHAIRMAN BONACA: Okay. Mr. Kuo?

MR. KUO: Yes. While Noel is getting ready for his presentation, let me just say a few words about the presentation arrangement. As you know, Noel Dudley is the Project Manager for this plant since the beginning, but we also put Ms. Tilda Liu as backup Project Manager. And both of them will make a joint presentation today, and all of the tech staff are in the -- sitting in the audience to -- ready to any answer technical -- detailed technical questions you may have.

I just want to say that you will see more of this type of arrangement in the future. We are trying to get our project managers ready to take on more -- future plants, future applications.

And just to give you some idea about future applications, next week we are going to get Farley applications in, and October 15th, a month later, we are going to get the ANO-2 coming in, and then we are going to get D.C. Cook applications. In December, Browns Ferry comes in, and a month later Millstone. So just to give you a heads-up.

MEMBER ROSEN: We need another ACRS --

CHAIRMAN BONACA: No. You don't have to go any further.

(Laughter.)

Now, Mr. Dudley, do we know you?

MR. DUDLEY: It feels a little awkward

being on this side of the table.

MEMBER KRESS: Shouldn't we ask Mr. Dudley to introduce himself and tell us why he's qualified to --

MEMBER APOSTOLAKIS: I second this. I think he should present his qualifications.

(Laughter.)

And speak with sufficient clarity and volume.

MEMBER KRESS: Welcome, George, by the way. Good to see you.

MEMBER APOSTOLAKIS: Thank you, Tom.

MEMBER ROSEN: Perhaps you should introduce yourself, George.

(Laughter.)

MR. DUDLEY: My name is Noel Dudley, and I am the Project Manager for the safety review of the St. Lucie license renewal application. And my qualifications was working for over eight years as an ACRS staff engineer under the tutelage of the ACRS members.

MEMBER POWERS: Now, that gives a clarification for EDO. What --

(Laughter.)

-- qualifies you to do license renewal?

MEMBER ROSEN: And it also shows you have a high tolerance for pain.

(Laughter.)

MR. DUDLEY: At the table with me is Ms. Tilda Liu who, as Project Manager, has been responsible for revising and issuing the safety evaluation report concerning the St. Lucie license renewal application.

The Florida Power and Light -- next slide. Florida Power and Light Company submitted its license renewal application for St. Lucie Units 1 and 2 on November 29, 2001. The staff issued its safety evaluation report with open items approximately 14 months later and briefed the ACRS license renewal subcommittee on April 9th.

After resolving all of the open and confirmatory items the staff issued its safety evaluation report on July 7th and provided the ACRS copies to assist the members in the presentation at today's meeting.

Next slide.

Ms. Liu will discuss differences between the present safety evaluation report and the information previously presented to the ACRS license renewal subcommittee during the April meeting. She will also present a list of the open items, all of which have been resolved and discussed with the license renewal subcommittee.

I will present the staff's position on the St. Lucie aging management program for concrete structures that are exposed to aggressive groundwater and the time-limiting aging analyses for the reactor vessel integrity and the core support barrel repairs.

So I'll turn it over to Ms. Liu.

MS. LIU: Good morning, Chairman Bonaca, and members of the ACRS. My name is Tilda Liu. I am with the license renewal environmental impacts program in the Office of Nuclear Reactor Regulations.

As they mentioned previously, I have been the backup project manager for the St. Lucie license renewal application for the last few months. I'm here to brief you this morning on the resolution of two items. These two issues came about after the last subcommittee briefing, after the open item was issued. And they have been included in the final SER.

The two issues were pressurizer surge and spray nozzle thermal sleeves, and non-segregated phase bus. There were a total of 11 open items from the draft SER. They were considered resolved and closed, as we briefed the members on the resolution of these open items during the last subcommittee briefing.

The first issue, pressurizer surge and spray nozzle thermal sleeves -- this issue came from an open item during the draft -- for the draft SER. It was again identified during the review and concurrence process of the SER issuance.

The staff and its management have specific concerns on the aging effects associated with cracking of pressurizer surge and spray nozzle thermal sleeves. The purpose of the thermal sleeve is to serve the function of protecting the pressurizer surge and spray line nozzles against the effects of thermal cycling.

The thermal sleeves are fabricated from nickel-based alloy materials. The applicable aging effect associated with these thermal sleeves is cracking, particularly fatigue and primary water stress corrosion cracking. And the applicable aging effect associated with these thermal sleeves -- oh, I apologize for that. And the potential issue that needs consideration is loss of function to protect the thermal sleeves against thermal cycling.

The applicant performed the analysis and demonstrated that although -- the growth of a potential crack into the nozzles cannot occur because the sleeves are not welded into the nozzles.

Therefore, the staff concluded that although fatigue and stress corrosion-induced cracking could occur in the thermal sleeves, aging management is not required.

MEMBER WALLIS: So this means that they can become riddled with cracks, and they're still held there, and they still perform their function?

MS. LIU: No. The reason -- go ahead, Noel.

MR. DUDLEY: That's correct.

MEMBER WALLIS: How far can this cracking progress before a piece comes off or --

MR. DUDLEY: They did an analysis. If you go back to the way it was installed, it's two different types of sleeves.

MEMBER WALLIS: Which are held between two other pieces of steel presumably, so it can deteriorate a lot before anything happens, isn't that correct?

MR. DUDLEY: That's correct.

MEMBER WALLIS: Now --

MR. DUDLEY: And it's press-fitted in at three different locations along the sleeve. And they did -- also did an analysis to the thermal stress on the nozzles without the sleeves installed and found that the nozzles would meet the required --

MEMBER WALLIS: It's the cycling that's the problem, isn't it? It's not just the stress. It's the variation that the water flows up and down and --

MR. DUDLEY: Yes. And they found even without the sleeves that it would be --

MEMBER WALLIS: I guess it's all right, but it seemed to be concluded that it can deteriorate. I just wondered how far it can go before you have to do something about it.

MR. DUDLEY: The other issue was whether it became -- the loose parts.

MEMBER WALLIS: Yes, that's right. Pieces come off it, right.

MR. DUDLEY: And there are baskets on -- for both sleeves to collect parts if they do fail.

MEMBER ROSEN: Baskets? Do you mean -- that's the nozzle?

MR. DUDLEY: It's strainers.

MEMBER ROSEN: It's strainers. But in front of the nozzles themselves, the spray nozzles in the pressurizer? I mean, where are these baskets that you referred to?

MR. DUDLEY: I believe there's a basket around the strainer, but it's --

MR. MEDOFF: Let me address this. This is Jim Medoff. I was the reviewer for the pressurizer for the license renewal application. The reason this resulted was the pressurizer -- as a result of an open item, the pressurizer thermal sleeves were brought into the scope of license renewal, and they are fabricated from nickel-based alloy materials.

There was a question -- the applicant didn't originally identify cracking as an effect, and we -- we had discussions with them, and we informed them that since they're nickel-based alloy materials we couldn't come to a conclusion that you couldn't preclude stress corrosion cracking, the components, given all of the industry experience.

In addition, we asked them whether a postulated fatigue crack could result in the thermal sleeves. The question is they concurred with us that cracking could occur, and then the question became an issue of whether, if you did initiate the crack in a thermal sleeve, whether you had to manage it.

So the applicant did a detailed analysis of not only evaluating cracking in the thermal sleeves, but also looking at the fatigue usage factors for the surge in the spray nozzles, which the thermal sleeves are designed to protect against thermal cycling.

They evaluated it from a design consideration. The surge nozzles are designed with an -- it's a rolled plate with one single axial weld. The spray nozzles are designed with full forging. And the design is different for McGuire in that the nozzles are -- I'm sorry, the thermal sleeves are not welded to the nozzles.

So the staff concurred that you couldn't grow a crack into the nozzles, because they weren't welded configurations. So, then, the second question was, okay, their -- the original design was to protect the nozzles against thermal cycling.

So if you did postulate a failure of the component of throughwall failure where you did get some leakage through the thermal sleeve, would you effect the fatigued nozzles? And their analysis demonstrated that even if you did get a throughwall failure, they wouldn't -- their fatigue usage factors for the nozzles would still be acceptable.

So, therefore, we concluded that even though cracking could -- might occur in the thermal sleeves, you didn't need the management, because the real issue was protecting the nozzles against the failure.

MEMBER POWERS: Is there a liquid between the sleeve and the nozzle?

MR. MEDOFF: Excuse me. Say that again.

MEMBER POWERS: Is there a liquid between the sleeve and the nozzle?

MR. MEDOFF: Yes. There's a small gap.

MEMBER POWERS: And is there unusual chemistry occurring in that crevice?

MR. DUDLEY: The nozzles themselves have small drilled holes in the area to allow circulation of water into the small crevices, so you do get flow through the small --

MEMBER WALLIS: I presume that it goes to and fro as the other water goes to and fro over --

MEMBER POWERS: Well, that's a nice presumption. The question is: does it?

MEMBER WALLIS: Does it?

MEMBER POWERS: And do you get aggressive chemistry in that crevice region?

MR. DUDLEY: At this point, I don't know of any reported corrosion in those areas, but I understand the question. Are we setting ourselves up for a Davis-Besse head issue?

MEMBER ROSEN: Well, I didn't hear the answer to my question. My question was: if the spray nozzle thermal sleeve breaks off, where does it go? And I heard there are baskets to catch the pieces.

MR. MEDOFF: No. What the design is on the discharge side of the thermal sleeve -- which extends beyond the nozzle into the annular region of the pressurizer. They have baskets that are tack-welded to the bottom of the thermal sleeves, which should prevent any loose parts from occurring. The applicant provided the design drawings to us to show that to us.

MEMBER WALLIS: So is this a way of then examining those baskets from time to time to find out if there's anything in them?

MR. DUDLEY: Let me ask the applicant to explain that -- their inspections of that.

MR. HALE: First, just in terms of -- in fact, I thought I had brought a drawing of these last time, last meeting. It has actually thermally expanded one area. So you've got two nozzles you're dealing with. You're dealing with the spray nozzle and the surge nozzle. Let's talk about the spray nozzle first. It is forged, like Jim said. It is expanded.

MR. DUDLEY: We're speaking specifically about the baskets now.

MR. HALE: I understand. But let me just walk through both of them. There's only one direction of flow in the spray nozzle, which is at the spray nozzle. So any parts, or whatever, the thought is you've got a prestress in this thing, and that you've got -- if I might address, you've got an expansion, and then you've got little takeoffs.

And you've got holes drilled, like Jim says, so you get a steady flow, you know, through the region around the nozzle, but -- I mean, around the thermal sleeve. And on the spray nozzle we concluded it was a forging. There was no welding involved. It's relatively low stress. You're not going to get the, you know, just complete disintegration of the thing, that you might get some small cracks.

But, again, it is fixed, such that it wouldn't go anywhere even if you were to lose the connection where it's expanded. So from the spray nozzle standpoint, the loose parts was addressed that way. On the surge nozzle, it is welded. It is a rolled plate, because it's a much bigger nozzle and it has a weld in it. So the -- and it -- but, again, it's expanded into the nozzle.

On the direction towards the reactor coolant system, the pipe is actually smaller, so the sleeve really can't go any direction towards the reactor coolant system. And, again, because it's welded, that's where you're going to see the cracking -- at the weld joint -- and the thing will tend to open up, you know, because it's prestressed and welded to fit in that pipe.

If you've got surge flow into the pressurizer, there is a basket because you have the feedwater of the pressurizer heaters, and you use this to prevent CRUD and things of that sort to reach the pressurizer heaters.

The thought there again, though, is that if this thing fails it's going to fail along the crack, it's going to tend to expand, and it can't go anywhere towards the reactor coolant system, and it can't go anywhere in terms of the pressurizer. And if you had a piece or a small piece break off, our conclusion is still that you will not get a total failure of this thing. But even if we did, we would be protected from it.

CHAIRMAN BONACA: But the question I believe was regarding inspections. Do you inspect them?

MR. HALE: You can't. That's one of the difficulties associated with these, because they're inside of an existing piece of pipe. And trying to do ultrasonics or -- you know, you just really get false reflections, images, and it's very hard to inspect these.

MEMBER ROSEN: Your description seems to occur -- it seems to me that the baskets are actually physically above --

MR. HALE: Yes.

MEMBER ROSEN: -- the nozzle in the surge line.

MR. HALE: Right, right. Or in-flow. You've got in-flow and out-flow.

MEMBER ROSEN: In-flow into the pressurizer. If the thermal sleeve in the surge line were to crack, and a piece come off -- I'm not -- I understand your argument that it would -- that in large measure it would be trapped in the line. But if a piece came off, it would flow on the in-surge. It would be trapped by these baskets.

MR. HALE: Right.

MEMBER ROSEN: Above it. In other words, it couldn't reach the pressurizer unless it was very small, I presume.

MR. HALE: Right.

MEMBER ROSEN: But on the outflow, that

same piece could go the other way, could it not?

MR. HALE: Again, the failure assumption was not individual pieces, because we didn't feel that that was, you know, an appropriate assumption in terms of how it would actually --

MEMBER ROSEN: Okay. So you're saying, yes, it could, but you don't think that pieces will form.

MR. HALE: Right. And the other issue -- and the other thing we need to discuss is from a normal operating velocity -- we have very low velocities in the surge line from a flow velocity standpoint. There's not a lot of motive force, you know, pushing things back and forth, from a normal operating standpoint.

MEMBER SHACK: Just coming back to Dr. Powers' question, you know, I'm not so much worried about the gap between the thermal sleeve and the nozzle. You know, it sort of looks like a crevice, but it's fairly big. But a pressed fit strikes me as a fairly unusual kind of construction and just says crevice all over it.

I mean, it -- you know, it's the absolute nature of a crevice that I take two things that aren't really sealed, I press them tightly together, and I've got a crevice. Is this a commonly-used kind of construction feature?

MR. HALE: Well, in fact, this was a design feature designed to get you away from cracking because the welded joints were cracking. So it was an upgrade to --

MEMBER SHACK: The good news and the bad news.

MR. HALE: Right, right. But --

MR. MEDOFF: We dealt with McGuire differently, because they had a welded thermal sleeve.

MR. HALE: And you could actually get propagation into the actual -- but let me address crevice, though. Crevice correction we have addressed in our application. It has been addressed industry-wide, especially in chemistry-controlled system.

And, you know, this isn't the only crevice in the reactor coolant system. There are crevices in various locations.

MR. MEDOFF: They have a separate -- there are separate AMR entries for the nozzles themselves as opposed to the thermal sleeves.

MR. HALE: But we have addressed crevice corrosion. I don't want you to think that that's not part of our review. We looked at it, and you credit inspections that you perform at various locations in the system to confirm whether you are seeing crevice corrosion in chemistry-controlled systems. And to date, based on the conclusion we've seen in the chemistry-controlled systems we have, we haven't had any incidents of crevice corrosion.

CHAIRMAN BONACA: How would you detect the cracking of the sleeve?

MR. HALE: You really couldn't.

MEMBER SHACK: He could see the cracking of the nozzle, though.

MR. HALE: Right.

CHAIRMAN BONACA: I understand that.

MR. HALE: Right.

CHAIRMAN BONACA: Don't want to get there.

MEMBER ROSEN: Do you have a loose parts monitoring system?

MR. HALE: Yes, we do.

MEMBER SIEBER: It seems to me there is no thermal mechanism that would create typical crevice chemistry. You know, there is no heating, there is no expansion going on. So --

MR. MEDOFF: Yes, yes. In their application they do address general corrosion, which include crevice -- you know, crevice corrosion, pitting, things like that. They do have a water chemistry program that they're implementing that the staff has found acceptable.

And I don't have them off my -- you know, in my head right now, but they do have separate AMRs for the aging effects for the surge and the spray nozzles. And I can go back and look at what the applicable aging effects are. But the conclusions were that the nozzles themselves were adequately managed for cracking and corrosion.

MR. DUDLEY: If there are no other questions, we'll move on.

MS. LIU: The second issue that I'll be discussing is non-segregated phase bus. The staff included this issue in the final SER because it was applicable to a number of plants, including Robinson, Dresden, Quad Cities, as well as St. Lucie.

Just to give you some background, non-segregated phase bus is used to connect offsite power source to safety-related buses and was considered to be within the scope of license renewal. To resolve this issue, the staff requested the applicant to verify the aging properties and insulating materials with its vendors on the system.

The applicant was not able to obtain the requested information from its vendors, and it proposed an AMP to managing the aging effects identified by the staff. This includes visual inspection and verification of crossbar bolting torque values.

For your information, this issue will be addressed in ISG-17. This proposed ISG is currently under staff development.

MEMBER LEITCH: What model of bus are we speaking of here?

MS. LIU: 4160.

MEMBER LEITCH: 4160. So is this non-segregated 4160 bus, it's not cables we're talking about then. It's --

MS. LIU: Correct.

MEMBER LEITCH: It's bus work.

MS. LIU: Correct.

MEMBER LEITCH: Yes, okay.

MS. LIU: And the ducts and all of that, yes.

MEMBER LEITCH: All right. Okay, okay. Understand.

MS. LIU: Okay? This next slide is a list of the open items. As we mentioned earlier, these items were -- we addressed these items during the last subcommittee briefing. There were 11 of them, and we resolved all of them at the time and closed them.

And this last slide is the rest of the list of the open items.

And this concludes my part of the presentation. Are there any questions?

MR. DUDLEY: So the first subject I'll talk about is groundwater, phosphates in groundwater. In a letter dated June 24, 2003, the ACRS suggested that the staff consider whether limits in guidance are needed before the phosphate ion concentration in groundwater affects concrete structures. And its response to staff stated that the additional data from research will be required to determine what, if any, limits on phosphate concentration in below-grade groundwater are necessary.

The staff intends to request the Office of Nuclear Regulatory Research to initiate a focused study to provide the Office of Nuclear Reactor Regulations with information to make this determination. That activity is still ongoing. The users need request has not formally been issued yet.

For St. Lucie, the concentration of phosphates in groundwater is insignificant. However, due to high chloride and sulfate concentrations, the groundwater is considered aggressive. The staff concluded that the visual inspections required by the systems and structures monitoring program are adequate to manage the aging effects of aggressive groundwater on concrete structures that are below ground.

I attended an international workshop concerning safety aspects and extension of nuclear powerplants at which this issue was discussed. Dr. Leslie Smith, an appointed examiner for British Energy, explained that concrete exposed to aggressive groundwater is a concern.

The British inspection program is similar to the aging management program the staff accepted for St. Lucie. The British program requires that if concrete discoloration is identified on the interior surface of concrete structures, the utility will take a core sample to confirm the condition of the structural concrete at that location.

The aging management program for St. Lucie requires the applicant use its corrective action program to address any inspection findings.

MEMBER POWERS: Mr. Dudley, when you say you are going to take a core sample to understand what the condition of the concrete is, is the concrete the sedimentaceous material itself, or does that also include the reinforcing bar?

MR. DUDLEY: I don't know the extent. The core sample is simply a single statement that there would be a core sample taken. I don't know how far through the wall it goes and whether it includes the rebar or not.

MEMBER POWERS: One of the interesting observations here is that you have reasonably concentrated solutions affecting the St. Lucie concrete. But when they inspect it, they say, "Well, there isn't anything." It seems to be peculiar. Are your limits set too tight on the chlorides and sulfates?

MR. DUDLEY: I can't answer that question. David?

MR. JENG: Dr. Powers, this is David Jeng of the UNEBEE. When you take one, nobody only covers the concrete portion. They don't try to take sample of the rebars, which is quite tough. So that's one answer.

Now, the way the staff believes the British approach is consistent with ours, when you determine there is some degradation through inspection, it needs corrective action. What appropriate corrective actions you are going to take?

General commitment on our part? Thou shall do -- take appropriate measures to correct what is discovered to be a potential concern.

Now, the British just addressed a particular approach. That could be part of our scope as needed. So the staff position is generally lower in scope.

MEMBER POWERS: When they inspect concrete that's exposed to aggressive medium, they just look at it, or do they look -- take a mineralogical analysis or --

MR. DUDLEY: I don't know what the details of the -- it calls for a visual inspection. I don't know how detailed that is and what the --

MR. HALE: Yes, I'm Steve Hale, Florida Power and Light. Yes, it is just a visual inspection. You know, you look for things that are specific criteria in our concrete inspections that look for rust bleeding, cracking. You know, there's a series of various indications that you might have a problem, but it is --

MEMBER POWERS: Do you look for exfoliation?

MR. HALE: Hmm?

MEMBER POWERS: Do you look for

exfoliation?

MR. HALE: I don't know. I'd have to -- yes, we do. My civil guy is shaking his head up and down, so --

MEMBER POWERS: Tap it with a hammer?

MR. HALE: Usually only if you see something visually.

CHAIRMAN BONACA: What about discoloration? I mean --

MR. HALE: Bruce, do you --

CHAIRMAN BONACA: But clearly, if you can ascertain that the concrete is in good condition, then you're less concerned about the rebar. So I would expect that if discoloration in fact is a potential indication of degradation of the concrete, then you have to worry about the rebar, too.

So I would like to know, you know, what are some of the criteria that you do for the observations?

MR. BEISLER: This is Bruce Beisler, Florida Power and Light. We look for any signs of degradation in the concrete visually. And with respect to, what do you do -- well, let me answer one other question that was about aggressive groundwater, and we haven't seen any degradation.

We have seen degradation at our intake structure, which is the most susceptible structure because it's basically in the seawater. So we didn't want to mislead that we hadn't seen any degradation. Certainly, we have seen degradation in that structure, and we have made structural repairs to that structure.

CHAIRMAN BONACA: But that was an accessible region, right?

MR. BEISLER: That's correct.

CHAIRMAN BONACA: If I remember, the statement was regarding inaccessible regions where you did opportunistic inspections, and they would like to confirm that in this opportunistic inspection you did not find degradation.

MR. BEISLER: That is correct.

MEMBER POWERS: Your intake structure is exposed to water having something on the order of 30,000 ppm chloride?

MR. HALE: Whatever saltwater -- it varies somewhat, but yes. We have taken salinity measurements. It's pretty close to saltwater, but it will vary with rainfall and that sort of thing, since we have a fairly long intake canal. Yes.

MEMBER POWERS: And they have a 500 ppm criterion. Maybe the criterion is just too tight on chloride.

MR. JENG: It's 1,500 for sulfate compared to about 10- to 20,000 ppm in the case of St. Lucie

MEMBER POWERS: No, no, no. They haven't got to 10- to 20,000 sulfate or they would have rocks in this water. It's 10- to 20,000 chloride.

MEMBER ROSEN: What's your point, Dana? I'm not sure I understand. I'm trying --

MEMBER POWERS: Well, I'm just wondering if the criterion is too tight.

MEMBER ROSEN: The criterion for chlorides?

CHAIRMAN BONACA: For aggressive water, do you mean?

MEMBER POWERS: Well, chlorides, sulfate, or -- if the material is exposed, they don't see anything. And, I mean, this is pristine stuff, and you do see stuff when you go up to 30,000. Maybe the criterion is too tight.

CHAIRMAN BONACA: But I believe that a presentation where you see the subcommittee, I mean, they specify the quality -- I mean, it is being addressed at the design stage by specific requirements on the concrete -- if I remember, high content of cement in it. And so that may be very reasonable.

MEMBER POWERS: Yes, it's 5,000 psi concrete. It's got a lot of cement in it.

(Laughter.)

This is serious concrete, yes. This is not sidewalk stuff.

CHAIRMAN BONACA: That's right.

MR. DUDLEY: The established limits have been established by the industry in our industry standards. At this point, we as a staff do not take the extra step to go question the industry standards and whether they provide sufficient or overly restrictive requirements on the applicants.

CHAIRMAN BONACA: But, to me, the important thing is really the characteristics of the inspections. I mean, how accurate do you look for? What kind of degradation are you looking for? Because, I mean, if in fact you can ascertain that there is no degradation of concrete, then you don't worry as much about rebar. You know, you'll get there.

And so, but we've got some indication that your program has specific requirements addressing the quality of concrete.

MR. DUDLEY: Just one other tidbit from my international workshop. Dr. Smith also discussed attempts to use radar to identify the extent of wetting of the exterior surface of concrete structures. However, the radar signals interfered with the control instrumentation at the plant, and the use of the radar as an aging management tool was abandoned.

(Laughter.)

Next slide.

MEMBER SIEBER: How fast was it going?

MR. DUDLEY: Just as a reminder, the three criteria for accepting time-limited aging analyses are that the analyses remain valid for the period of extended operation or the analyses have been projected to the end of period of operation and meet the design criteria, or the effects of aging on the intended functions of the structures and components are adequately managed for the period of extended operation.

Next slide.

The demonstration of reactor vessel integrity is provided by analyses of the reactor vessel upper shelf energy, pressurized thermal shock reference transition temperatures, and temperature pressure curves.

The staff performed independent

calculations which confirmed that the upper shelf energy of the various areas of the reactor vessel projected to the end of the period of extended operation is well below the acceptance criterion.

This is done at about a dozen different calculations for different parts and components of the reactor vessel, and the numbers that are on the slide indicate the lowest upper shelf energy.

CHAIRMAN BONACA: Why such a difference between Unit 1 and 2?

MR. DUDLEY: It has to do with the chemistry of the materials used in the construction of the reactor vessel.

MEMBER ROSEN: Can I ask you to rephrase that? You are well below the acceptance value? Do you mean above the --

MR. DUDLEY: Well above.

MEMBER ROSEN: All right.

MR. DUDLEY: What we used was the lowest upper shelf energy and compared it to --

MEMBER ROSEN: And it was well above the minimum.

MR. DUDLEY: Yes.

MEMBER ROSEN: Okay.

MEMBER WALLIS: Well above is 10 percent?

What's well above?

MR. DUDLEY: More than one or two foot pounds.

MEMBER WALLIS: That kind of precision is appropriate?

MR. MEDOFF: Noel means to say they met the acceptance criteria for upper shelf in 10 CFR Part 50, Appendix G.

MR. DUDLEY: Next slide.

The staff also performed independent calculations which confirmed the reactor vessel PTS reference transition temperatures will be below the PTS screening criterion at the end of the period of extended operation. And as you can see, again we chose the most limiting PTS reference temperature. This was taken from about a dozen or more sections of the reactor vessel.

The applicant is required to submit updated pressure temperature curves following each refueling outage, and the staff reviews and approves the curves. And that's on an ongoing basis from refueling outage to refueling outage.

MEMBER LEITCH: Noel, I'd just like to -- these two slides, I think this summarizes very nicely and highlights for us the data that is elsewhere, but it's sometimes a little difficult to find on a summary level like that. And I would hope that this kind of information is presented concisely like this in future applications as well. I think it's very helpful.

MEMBER WALLIS: However, it doesn't say what kind of degrees you are talking about.

(Laughter.)

MEMBER ROSEN: These are not academic degrees. These are degrees Fahrenheit, Celsius, or Kelvin.

SEVERAL PARTICIPANTS: Fahrenheit.

MEMBER WALLIS: Which one are they? Which one are they? You said they are one of three, and you nodded your head. Which one are they?

MR. DUDLEY: Fahrenheit.

MEMBER WALLIS: Fahrenheit.

MR. DUDLEY: Degrees Fahrenheit.

MEMBER POWERS: Those are archaic measures that was invented in England. The rest of the world has abandoned it, but --

MR. DUDLEY: The last issue is the core support barrel. During the refueling outage in March 1983, the applicant found that the thermal shield and the thermal shield support system in the St. Lucie Unit 1 reactor vessel was damaged. The applicant removed the thermal shield and repaired the core barrel -- core support barrel.

The repairs consisted of drilling holes at the crack tips, manufacturing and installing metal plates over areas where material was lost, and inserting plugs in the holes drilled in the core support barrel.

During the following refueling outage, the applicant confirmed the amount of prestress on the plugs. The applicant completed an analysis which concluded that the plugs' prestress at the end of 40 years of operation would be adequate.

MEMBER WALLIS: Plugs are just pushed in, and they expand.

MR. DUDLEY: Expanded, yes.

MEMBER WALLIS: And then they stay in by means of the prestress?

MR. DUDLEY: That's correct. And the staff reviewed and approved the applicant's conclusion. For license renewal, the applicant repeated the analysis by extending it to the end of the period of extended operation and concluded that the prestress would be adequate through the license renewal period.

MEMBER WALLIS: So presumably if they are pushing out, they actually tend to open the crack, but it doesn't go anywhere, because it has ended at the plug, right?

CHAIRMAN BONACA: And they're going to inspect these plugs periodically, right?

MR. DUDLEY: I can't remember. I don't remember that level of --

MR. HALE: What's the question?

CHAIRMAN BONACA: They're going to inspect these plugs periodically? I mean, they are --

MR. HALE: Yes. Steve Hale, Florida Power and Light. As a result of the corrective actions, we were required to include this as part of our overall Section 11 inspections, 10-year inspections, for the internals. And we do it every 10 years.

CHAIRMAN BONACA: And it will be done through the end of the life of the plant.

MR. HALE: And we're committed to Section 11 all the way through, so --

CHAIRMAN BONACA: What would be the consequence of losing one of the plugs? Assume that you lose prestress. Apart from the loose component, I mean.

MR. DUDLEY: Increased bypass flow.

CHAIRMAN BONACA: Bypass flow. So it

would be probably a significant effect on LOCA analysis or --

MR. HALE: No. We actually evaluated -- I mean, we're able to demonstrate without the -- with the bypass flow, we could still meet all our safety requirements for this --

MEMBER ROSEN: If you didn't get a loose part signal, would you know it otherwise? I mean, could you detect the change?

MR. HALE: Well, the plugs themselves are stainless steel. The aging effects -- we have no aging effects that would create a loose part. I mean, that's what we evaluated.

MEMBER ROSEN: I know. Now we'll try my question, which was, if it came out, plugs came out and you increased bypass flow, would you be able to detect the increased bypass flow from any core thermal or flow parameters?

MR. HALE: Yes, you would.

MEMBER SHACK: I mean, I do have a mechanism to lose pretension, right, with the radiation creep?

MR. HALE: Yes, and that's the calc that was done. These plugs have a bevel-like rim on them. So when they're pressed in, you -- it's a spring, basically. You press them in, and then you expand them. So it's actually the bevel -- and that's what was verified by -- we actually measured the tension after they were installed, and then at a subsequent outage, to confirm they weren't relaxing.

And an analysis was developed confirming that they would maintain their tension with the irradiation effects. The aging effects we addressed for the stainless steel components was stress corrosion cracking. We evaluated the -- you know, the effects of irradiation. The stress corrosion cracking is addressed with chemistry. It is stainless. It's not subject to PWSCC. And the irradiation effects were addressed with the TLAA, plus we're continuing to do visual inspections of the plugs.

MEMBER WALLIS: Do you have any dimensions on that thing?

MR. HALE: The plugs were three, five, and eight inch in diameter.

MEMBER WALLIS: So they're quite big.

MR. HALE: Yes.

MEMBER ROSEN: So now, if you lost the eight-inch one, say it backed out or something, and now you had a full flow hole -- see, my question was about thermal or flow parameters that would change, that were measurable in the control room or in the plant someplace.

MR. HALE: Yes. You would see it in terms of your T-hot. Your exit temperatures from the reactor vessel would drop as a result of the bypass flow.

From a safety standpoint, you know, we're okay with a bypass flow. But, you know, one of the major considerations was the efficiency of the plant and the fact that you're not heating water.

MEMBER ROSEN: So there's water coming down outside the core barrel.

MR. HALE: Right.

MEMBER ROSEN: Heading for underneath the bottom plenum. It would, in fact, go through this hole.

MR. HALE: Yes.

MEMBER ROSEN: Bypass the bottom plenum and go back out.

MR. HALE: Right. And you would see it in reduced temperature reactor coolant system outlet temperature -- reactor vessel outlet temperature, T-hot.

MEMBER SIEBER: Do you have core exit thermocouples?

MR. HALE: We have core exit thermocouples and --

MEMBER SIEBER: That's where you'll see it, and you won't see it in T-hot because the water coming out of the fuel is going to be hotter than it would have been had the bypass not been occurring. It mixes, and so you end up with the same T-hot that you would otherwise have had.

MR. HALE: Yes, you're right. I'm sorry. I'm sorry.

MEMBER SIEBER: And it's the core exit thermocouples that would show the elevation of that.

MR. HALE: Yes, I misspoke.

MEMBER ROSEN: I'm not sure I understand or agree that you would end up with the same T-hot, because you're not heating as much water, are you?

MEMBER SIEBER: Look at it from the standpoint of conservation of energy. You're making the same amount of megawatts. Okay?

MEMBER ROSEN: Right.

MEMBER SIEBER: And so the core flow, which is now smaller than it was before, will have a larger delta T.

MEMBER ROSEN: Right.

MEMBER SIEBER: Okay. And so that's why

the core exit thermocouples go up. In order to produce the megawatts, you're going to have the same delta T.

MEMBER ROSEN: Yes, the core exit thermocouples will go up. And then when the hotter water emerges from the top of the core, it will mix with this cooler water and --

MEMBER SIEBER: And end up at T-hot the way it was supposed to.

MR. HALE: He's right. I misspoke.

MEMBER ROSEN: That's right. You're exactly right.

MR. HALE: But I think -- like you say, I think you might see some things in the core exit thermocouples.

MEMBER SIEBER: Now, other than that, it's simple.

MR. DUDLEY: Well, if you do recognize these changes in the plant, in the reduction of efficiency, whether you will be able to identify the fact that it's a plug that has failed, it is going -- it would have to wait until a refueling outage.

CHAIRMAN BONACA: Okay.

MEMBER SIEBER: Well, with an eight-inch plug, I think you're going to see a --

MR. DUDLEY: Loose part monitor.

MEMBER SIEBER: Well, you're going to see a pretty good size temperature difference. I mean, it's -- it may not come out and ring a bell, but it will certainly be there to somebody who examines these things on a regular basis.

MEMBER WALLIS: This plug is put in at the end of a crack.

MR. DUDLEY: Yes.

MEMBER WALLIS: Presumably, if the crack widens, the stress holding the plug in decreases. If the crack opens up, the plug can fall out.

MR. HARTZMAN: This is Mark Hartzman from Mechanical Engineering Branch. The cracks are drilled out, so there are no cracks when they put in the plugs.

MEMBER WALLIS: You're not just stopping the end of a crack. You've actually moved the whole thing.

MR. HARTZMAN: That's correct. That's the reason for the large size of the plugs.

MEMBER WALLIS: So if you had a really big crack, you'd have a lot of trouble putting in a plug.

(Laughter.)

MR. DUDLEY: Well, that's when you put in a patch.

(Laughter.)

MEMBER SIEBER: As big as a garbage can lid.

MR. DUDLEY: Okay. That completes our presentation for this morning.

CHAIRMAN BONACA: But there's an item that you had told us you would talk about. There was -- you know, we discussed the pressurizer spray head not being in scope, although, you know, I made the comment that it was the primary means of cooling -- is to use the spray head.

And the reason why it is not in scope, if I remember, is that you do have other ways of cooling even if you lose the head. Okay? The spray head.

MR. DUDLEY: And I believe there is also --

CHAIRMAN BONACA: And I believe that I heard the commitment that you will come in and tell us about, you know, the philosophy you're using for this. You know, if you have two or three ways of cooling, the primary way is to use a pressurizer spray head. Why wouldn't you consider that primary means of cooling in scope?

The answer we got was that the licensing basis may say that -- you know, may commit some other way of doing it. And so you are adhering to this licensing basis. But if I remember, we were told that you would come and talk to us about that.

MR. KUO: Let me check. Jim?

MR. MEDOFF: This is Jim Medoff. I was a reviewer for the St. Lucie pressurizer as part of the license renewal application. I've also been the lead reviewer of WCAP-15474, which was submitted by Westinghouse on behalf of license renewal evaluations for Westinghouse pressurizers.

And the WCAP pressurizers are not in scope. However, when -- in my dealing with the reactor systems branch personnel, they have brought the pressurizer spray heads into scope if they have credited them in -- as primary means in some of their -- in their accident analyses in Chapter 15 of the FSAR.

So for the Oconee application they got brought into scope, because they credited them with the steam -- recovery following a steam generator tube rupture event. And in the McGuire application they were brought into scope because of recovery from a fire at the plant.

Now, I can't vouch for the scope being --

you know, for the reactor systems branch here, but apparently when I -- oh, Muhammad is here. Okay.

MR. RAZZAQUE: The question is on the --

MR. MEDOFF: Is when pressurizer spray heads are not in scope.

MR. RAZZAQUE: Oh, okay.

CHAIRMAN BONACA: Well, I think your question is more general than that. This is an example. The question is: if you have a primary means of operating that plant, and you use some components to support that primary means, I can understand that -- it disturbs me that it's not in scope.

I can understand the logic that says, well, the minimum requirement is anything which has been committed to for licensing basis is in scope and everything else is not. But I don't understand how this applies, and what kind of elements or components it leaves out in the plant.

MR. RAZZAQUE: I guess the general argument that was used, that even a degraded spray head --

MEMBER ROSEN: Identify yourself, please.

MR. RAZZAQUE: Pardon me? Oh. My name is Muhammad Razzaque with Reactor Systems Branch. This issue of spray head was raised right from the beginning, and the common argument that I used is that even without the spray function the three days' time is sufficient to get to the cold shutdown condition, which is the fire protection requirement.

That is basically the bottom line argument the applicants use. There are other arguments, too, like the redundancy and things like that. But the bottom line argument is that the function for this specific purpose is not reliable.

CHAIRMAN BONACA: Yes?

MR. DUDLEY: I've taken a look at the SER, and the way the SER states is that the spray nozzle is not part of the current licensing basis.

CHAIRMAN BONACA: Yes, I know.

MR. DUDLEY: The reason that the -- it's brought into scope is it's relied on by the fire protection program for plant cooldown. So it's actually -- when you go back to the regulations, it's a portion where equipment needed for the four or five regulatory requirements are also within scope. And the -- and for St. Lucie, the conclusion was that it was not part of the requirements for fire protection.

CHAIRMAN BONACA: Okay. So let me ask a question to St. Lucie, then. I mean, is this spray head ever inspected?

MR. HALE: The spray head -- if you go into the pressurizer for any reason, it would be looked at. But the aging effect thermal embrittlement -- this is a cast part, and so it would be very difficult to verify with just a visual whether you've got a problem or not anyway.

CHAIRMAN BONACA: Now, if, you know, during the period of extended operation the spray nozzle fails, what are you going to do?

MR. HALE: If the spray nozzle fails, we would repair it and replace it. The only indication we would have, though, is a little loss of efficiency and --

MEMBER SIEBER: More than that.

MR. HALE: Well, you have to look at the heat transfer, too, just with losses through the pressurizer. And, you know, we've got a steady flow, bypass flow anyway for thermal reasons. But --

CHAIRMAN BONACA: So you really are doing this more to defend your licensing basis.

MR. HALE: Yes. Yes. And, you know, there are some questions regarding thermal embrittlement and, you know, various types of stainless and what you would see, and whether -- when it would crack, and that sort of thing. It's a very long-term effect. It's not something you would see immediately.

CHAIRMAN BONACA: Okay. Thank you.

MR. RAZZAQUE: If I may add that we had the same -- a similar argument for Fort Calhoun, and I think at the end the SER was modified to state that it is without the function. The time spent was long enough that enough with the loss of efficiency, still, the plant can be cold shutdown.

CHAIRMAN BONACA: Okay. Thank you.

Any other questions for the staff or the licensee? If there are none, then I thank you very much for your presentation. I thought that the format was very good, both from the licensee and from the staff.

I'm saying this particularly because we will have many more presentations, and I think it was very focused on the issues we discussed at the subcommittee. And it was focused on technical issues of interest to the committee rather than just, you know, a list of commitments, or whatever.

So that's a good example for what we can do in the future, too. With that, we thank also the licensee for their presentation. We will take a break now until 10:15.

(Whereupon, the proceedings in the foregoing matter went off the record at 9:58 a.m. and went back on the record at 10:18 a.m.)

CHAIRMAN BONACA: We're back in session, and the next item on the agenda is draft review Regulatory Guide DG-1122, "Determining the Technical Adequacy of PRA Results for Risk-Informed Activities." We have time until 11:30 for this, and Dr. Apostolakis will take us through this presentation.

However, I just want to mention that we have been asked by Mr. Pietrangelo of NEI to have five minutes at the end of the session to present their views on the Reg. Guide. And so, George, if you could accommodate that --

MEMBER APOSTOLAKIS: Okay.

CHAIRMAN BONACA: -- it will be helpful.

MEMBER APOSTOLAKIS: Sure.

CHAIRMAN BONACA: With that, it's your presentation.

MEMBER APOSTOLAKIS: Okay. Well, this is a major issue, as you probably have realized by seeing the various articles in Inside NRC and other trade publications. We wrote a letter, I think it was dated the 16th of May of this year

MS. DROUIN: April.

MEMBER APOSTOLAKIS: I think it was May.

MS. DROUIN: That was the second one.

MR. MARKLEY: George, we wrote a letter in April on DG-1122, and then in May it was --

MEMBER APOSTOLAKIS: And then in May it was the PRA quality, where everybody is saying that we are ratcheting up the requirements. In Inside NRC, they are saying that -- oh, no, it was not. It was at the review -- the application of the standard at San Onofre. Somebody said that the bar was raised, and I think all of this is nonsense. That's a personal opinion, of course.

So we're going to have to discuss this and see what -- where we are, how the staff is responding to our recommendations, and then we'll hear from Mr. Pietrangelo, who I'm sure is going to applaud what we wrote.

(Laughter.)

So let's start with --

MEMBER ROSEN: Could I ask a question?

MEMBER APOSTOLAKIS: Yes.

MEMBER ROSEN: Is there some regulation or law or moral imperative that we don't raise the bar?

MEMBER APOSTOLAKIS: No. I have a serious problem with these expressions. And, in fact, as you will find out later today, I intend to put something in the letter, because I think that misses the point completely. But this is not the right time.

That implies we are doing it capriciously, and I don't like that. The ultimate goal is to make sure that the decisions are not affected by your missions of poor quality. So it's the decision-making process that is really --

MEMBER ROSEN: And if something needs to be better, and the ACRS says so, I don't think we exceed our authority.

MEMBER APOSTOLAKIS: No. No. But it's not a matter of raising the bar -- I mean, doing it because just -- it's -- well, we'll come to that.

So, Ms. Drouin and Dr. Parry are going to guide us through this using old technology of overhead projectors.

Mary, avanti.

MS. DROUIN: Thank you. I'm Mary Drouin with the Office of Research, and with me is Gareth Parry from the Office of NRR.

We were here last April and gave a briefing on DG-1122. Since that time, we have made changes to the regulatory guide based on some comments, additional comments and discussions we've had with the public based on the letter we received from ACRS and their recommendations, and also based on some insights that we -- from the observations from the San Onofre peer review of their PRA.

At this point, we feel that the guide is ready to be published for trial use. So our purpose here today is to obtain ACRS approval to publish it for trial use, so we are asking for a letter.

MEMBER APOSTOLAKIS: Now, this trial use business, much to my surprise, apparently confuses other people as well. We had a discussion here, as you remember. We called you back in April, was it, to explain to us what "trial use" meant. Then I saw some stories in trade publications that other people also are a bit confused. So "trial use" means what?

MS. DROUIN: "Trial use" is more -- in my opinion, it has no true meaning in that when it's out there the guide is out there.

MEMBER APOSTOLAKIS: It's out there.

MS. DROUIN: But it gives the perception that it's easier to change. We could have issued it as just Rev. 1, and then in two months changed it. There is nothing that prevents us from changing a regulatory guide as frequently as we choose.

But when you put it out for trial use, it does sound like that it's still working out details of it. And we could work out details under a Rev. 1. But when you give the term "trial use," it gives I think a better message.

MEMBER APOSTOLAKIS: Okay. Simple enough. I thought there was -- maybe I'm wrong, but if you have a licensee working with you, you know, for the application, and you approve something, because it's a trial use issuance, you can come back later and say, "Well, we're taking it back. We don't want -- we don't like it anymore. We are going to do something else." And they cannot complain.

But if it's a Rev. 0, Rev. 1 of a regulatory guide, maybe it's not so easy to take it back. Is that correct?

MS. DROUIN: That is not my understanding from OGC. But we will get that clarified.

MEMBER APOSTOLAKIS: All right.

MS. DROUIN: Okay. We want to quickly go through the stakeholder comments that we received and how those have impacted the --

MEMBER WALLIS: Mary, I'm sorry, but you missed -- you've omitted "men" from "implementation."

Is this some kind of sexism or --

(Laughter.)

MS. DROUIN: I'm sorry? Oh. I --

MEMBER WALLIS: It's discriminatory. You've eliminated "men" from "implementation."

MEMBER ROSEN: That's the requisite typo. I'm sure that's the only one.

MEMBER WALLIS: Why is that?

MS. DROUIN: You get a star. That was the hidden typo.

(Laughter.)

MEMBER ROSEN: The one that we're supposed to find, so we can --

MS. DROUIN: That's right.

MEMBER WALLIS: This is a Freudian slip, I think.

(Laughter.)

MEMBER APOSTOLAKIS: I thought it was a new word that I didn't know.

(Laughter.)

MS. DROUIN: So much for my typing skills and proofing skills.

MEMBER SHACK: Those red wiggles do mean something on the screen.

MS. DROUIN: Those red wiggles?

MEMBER SHACK: When you're typing it.

MS. DROUIN: Oh.

(Laughter.)

Well, not when you go into -- that will do it in Word or WordPerfect, but when you're in presentations or Powerpoint it doesn't show as --

MEMBER APOSTOLAKIS: We have until 11:30, Mr. Chairman? This morning, I assume.

(Laughter.)

Not at night.

CHAIRMAN BONACA: We have some separate meetings taking place at 11:30, including --

MEMBER APOSTOLAKIS: Okay. So let's speed it up.

MS. DROUIN: Okay. Let's get right to the public comments. We did have six organizations, as you can see listed there, that responded from our public review and comment period. The majority of the comments were on Appendix A on the ASME standard.

MEMBER APOSTOLAKIS: Do the so-called public interest groups ever provide you with comments? It's only industry, isn't it?

MS. DROUIN: They are invited.

MEMBER APOSTOLAKIS: But they don't do that?

MS. DROUIN: But at least on DG-1122, we have not received any. They periodically will come to a meeting, but we have not ever received any comments from them.

MEMBER APOSTOLAKIS: Okay.

MS. DROUIN: Anyway, the majority of the comments, as I said, were on the ASME standard. I keep being surprised that we received no comments on Appendix B, which is the NEI 00-02, but includes the self-assessment process, which gives the comparison of the sub-tier criteria to the ASME standard.

And we did take objection where we don't think that things that are in the ASME standard were appropriately addressed in the peer review. And so, surprisingly enough, we have never received any comments on those.

We continued to receive consensus. Let's move forward. Let's get this out for trial use. Let's get it implemented and start working with it.

The one thing I will note is that when we do go out for trial use, there will be an attached document to it, and that's where we just literally list all of the public comments that we received and how we have dispositioned each of the comments.

So if you have an interest to see who said what and how they were dispositioned, that was documented.

But I'm just going to go through those few major comments that still remain in disagreement with the public. Oh, I shouldn't say "disagreement." I mean, how we have resolved the major comments. I apologize for that.

DR. PARRY: And emphasize the ones that we have still interest in.

MS. DROUIN: Yes. There was -- I think across all of the organizations, they didn't think that we had made it clear, Reg. Guide 1.174, so we have added verbiage to the guide making that clear, that relationship.

MEMBER ROSEN: Which is?

MS. DROUIN: Well, DG-1122 is a supporting regulatory guide, two regulatory guides. And when you look at -- I didn't make a copy of that figure, but the figure that's in here that shows that DG-1122 is just providing, you know, the answer to the question on PRA quality, and you have your application-specific regulatory guides that it feeds into, Regulatory Guide 1.174 is one of them.

MEMBER ROSEN: It's a supporting guide to 1.174.

MS. DROUIN: Yes. Yes. So Regulatory -- 1.174 when it -- at the next revision will reference this guide in that part of the guide that talks about PRA quality.

MEMBER APOSTOLAKIS: Quality, yes. And, in fact, you look out from 1.174 all of the discussion of quality.

MS. DROUIN: Right. And similar revisions will be made to the other ones. They haven't been able to reference it yet, because they didn't have a guide to reference.

MEMBER APOSTOLAKIS: Go on.

MS. DROUIN: The one area where we have disagreement on the public is the definition, you know, of the terms "significant" and "dominant." We did receive your support that we should have a definition. We felt very strongly that as we go into the trial you need something to test.

And we do recognize that this is a preliminary definition. It could very easily change as we go into the pilots and test it and see how it works. But we do hope to resolve that during the pilot applications.

I wasn't going to go through these next two. I just had them in there for your information.

MEMBER APOSTOLAKIS: Well, let's put it up.

MS. DROUIN: Oh, okay.

MEMBER APOSTOLAKIS: First of all, if you go to the actual guide on Table A-1, the left-hand side column says "Accident Sequence, Dominant." But all you are defining on the right-hand side column is "significant." Is there a definition of "dominant" anywhere?

MS. DROUIN: No.

MEMBER APOSTOLAKIS: So why do we use the term, then? I don't particularly want it there. But, I mean, if you say "dominant," and then you ignore it and you define "significant," I mean, the question is, what happened to "dominant"?

MS. DROUIN: What happened to "dominant" -- now, if you look in here on the table in A-1 --

MEMBER APOSTOLAKIS: That's page 26 for you guys who are looking for it.

MS. DROUIN: Page 26.

MEMBER APOSTOLAKIS: XXXXX-26.

MS. DROUIN: You will see that it has been lined out.

MEMBER APOSTOLAKIS: It's been lined out.

MS. DROUIN: It has been lined out. So --

MEMBER APOSTOLAKIS: Not "dominant."

MS. DROUIN: Yes.

DR. PARRY: Yes, on the right-hand column.

MS. DROUIN: On the right-hand side.

DR. PARRY: The left-hand column is what was in the ASME standard.

MEMBER APOSTOLAKIS: So all you are doing now, then, is using the term "significant."

MS. DROUIN: That is correct.

MEMBER APOSTOLAKIS: No "dominant" anymore, no -- okay. Okay.

MS. DROUIN: So when you read Table A-1, the left-hand column is just showing you the index. And then the right-hand column is showing you what our position is. So if we disagree with the words that are in the standard, they've been stricken out. And what's in bold is what we are adding.

MEMBER APOSTOLAKIS: Okay.

MS. DROUIN: We would like --

MEMBER APOSTOLAKIS: Okay. If you are -- okay. That was a misunderstanding. Now let's talk about the English. You use the expression in all of these, or most of these -- let's look at the accident sequence, okay? The one before last -- significant accident sequence. "A significant sequence is one of the set of sequences, defined at the functional or systemic level, that when ranked comprise 95 percent of the CDF." What you mean is whose aggregate frequency is 95 percent of the CDF.

DR. PARRY: Yes.

MEMBER APOSTOLAKIS: Not when raked.

DR. PARRY: Well, ranked in numerical order is really what we mean. I mean, starting from the --

MEMBER APOSTOLAKIS: Yes, and then adding the frequencies.

DR. PARRY: Adding the frequencies, right.

MEMBER APOSTOLAKIS: Ranking them by itself doesn't mean that you --

DR. PARRY: No, it's comprised --

MEMBER APOSTOLAKIS: I think you need a better expression.

CHAIRMAN BONACA: That uses the word "comprise."

MEMBER APOSTOLAKIS: Not when ranked they are --

MEMBER WALLIS: No, but you have to read the whole sentence. It's one of the set when ranked, and then they comprise. So it means the top that comprise --

MS. DROUIN: It's the top 95 percent, not just any.

MEMBER WALLIS: As opposed to a random selection.

MEMBER APOSTOLAKIS: They're a sum, though, the sum of the frequencies. That's what --

MEMBER WALLIS: That's the set, yes.

MEMBER APOSTOLAKIS: Huh? When you rank something, you don't necessarily calculate the cumulative frequency.

MEMBER WALLIS: But it's the set that comprised the 95 percent. That is the sum of --

MEMBER APOSTOLAKIS: But the set of sequences cannot be 95 percent of the frequency. It's the frequency of the set that is 95 percent of the core damage frequency. But I think we need a little better language here.

MEMBER ROSEN: It's put them in rank order -- let me see if I understood it -- the important sequence at the top.

MS. DROUIN: Correct.

MEMBER ROSEN: And then you put the next one under that, and then you add the two.

MEMBER APOSTOLAKIS: Exactly.

MEMBER ROSEN: And if you got 95 percent, that's all of the dominant sequence.

MEMBER APOSTOLAKIS: That's right. Exactly.

MS. DROUIN: That's correct.

MEMBER ROSEN: If not, you add the next one until you get to the next project.

MS. DROUIN: It's not just taking --

CHAIRMAN BONACA: Are we picking on the slide, or is this out of --

MEMBER APOSTOLAKIS: Say again?

CHAIRMAN BONACA: Are we picking on the slide, or is this --

MEMBER APOSTOLAKIS: This is from the guide. This is the guide.

MS. DROUIN: This is what we put in there.

CHAIRMAN BONACA: Then I agree that --

MEMBER APOSTOLAKIS: Now, I still need to understand why you have that "or" statement -- individually contribute more than one percent. Again, what's the issue there?

MS. DROUIN: Well, this gets into an issue where you have kind of an equal split among your dominant sequences. And so --

DR. PARRY: Significant sequences.

MS. DROUIN: Sorry, significant sequences.

Oh, slap my hand.

DR. PARRY: If you had a very well -- if you had a very even risk profile, and you had --

MEMBER ROSEN: Use the microphone, Dr. Parry.

DR. PARRY: Sorry. If you had a very even risk profile, and you had 100 sequences all at one percent, or 99 sequences at 1.01 percent, it would be hard to --

MEMBER APOSTOLAKIS: We've never seen this, have we?

MS. DROUIN: Oh, yes, you did.

DR. PARRY: You have.

MS. DROUIN: You do.

MEMBER APOSTOLAKIS: In nuclear plants?

MS. DROUIN: Yes.

DR. PARRY: It depends on the level at which you define the accident sequences. If you have functional sequences, you get --

MEMBER APOSTOLAKIS: Well, you are talking about CDF, right?

DR. PARRY: Right.

MEMBER APOSTOLAKIS: Yes, so it's functional at the system level.

DR. PARRY: Functional at all system

levels.

MEMBER APOSTOLAKIS: Is it true that about 15 to 20 sequences dominate usually?

DR. PARRY: But if they're all equally dominating, that's where the problem is. It's not the number that are dominating. It's that they're all equal. So say you come down and you have a sequence that's -- I'm trying to make this easy. One that's 50 percent, and then the rest contribute five percent. Which one of those five percent are you going to throw away?

MEMBER APOSTOLAKIS: Say again. You have what? You have --

MS. DROUIN: You have one sequence that's a 50 percent contributor.

MEMBER APOSTOLAKIS: Right.

MS. DROUIN: And all of the rest of the sequences each contribute five percent. Which one of those five percents are you going to throw away?

MEMBER APOSTOLAKIS: But you will never have that, will you?

MS. DROUIN: What I'm saying is that we have seen this.

DR. PARRY: You can in some boilers, yes, particularly. Actually, we shouldn't get too hung up on this, because in fact this --

MEMBER APOSTOLAKIS: No. But, again, let's be a little more careful here. Suppose that you have a situation that I'm talking about. You have looked at a million sequences with a computer program. The top 15 sequences give you 95 percent of a CDF. Okay?

Now I look at this, and then I have another 100,000 -- not 100,000. I have another whatever sequences, each one contributing 1.5 percent.

MEMBER WALLIS: You can't have that.

MEMBER APOSTOLAKIS: I can't have that?

MEMBER SHACK: You can only have --

MEMBER WALLIS: The problem is with number 16.

MEMBER APOSTOLAKIS: If you'll go to 95 percent --

MEMBER WALLIS: The problem is, George, number 16, the one just flow 95.

MEMBER APOSTOLAKIS: Now, let's say I have 95 percent, okay, and then I have five, each one contributing one percent. According to this, I will have to look at all of them.

DR. PARRY: Yes.

MEMBER APOSTOLAKIS: Why? What's the

point? That's not the argument you have. The argument you gave was if I can't find the 95 percent, and I have even distribution, then I look at the one percent. But now, with this "or" there, you are looking at all 100 of them.

DR. PARRY: Actually, this doesn't say what you've got to do with those sequences. I think you have to look at what the standard says you need to do with the significant sequences. And if I remember correctly, we sample them. We don't necessarily look at all of them.

So it's actually relative. It's not used very frequently in the standard, and it's to do with the interpretation of the results and the checking of the results.

MS. DROUIN: But this is why, you know, I think it's important that we're going to test this during the trial use. I mean, we need some pilots. We need to see, you know, is -- is, for example, having that one percent there going to cause a problem?

MEMBER APOSTOLAKIS: I guess my reaction to this is that this is a high level definition of significance, and this "or" there goes into detail that might be useful in rare instances, and probably doesn't belong in a general definition. But if you want to leave it there --

MS. DROUIN: And if that's the case, and it turns out to be more of a headache, then --

MEMBER APOSTOLAKIS: It's more of a headache, I think.

MS. DROUIN: -- then we will remove it.

MEMBER APOSTOLAKIS: I think putting the period after "LERF" in all of these things would be good enough. But that's okay.

MS. DROUIN: But I think we need to test it.

MEMBER ROSEN: In the first bullet -- Mary, can I switch your attention to it? Did you mean the risk achievement worth?

MEMBER APOSTOLAKIS: Yes.

DR. PARRY: Yes.

MEMBER ROSEN: Okay.

MEMBER APOSTOLAKIS: The language needs cleaning up, I think.

MEMBER ROSEN: Well, I'm assuming that just the slide was wrong. In the standard, --

MEMBER APOSTOLAKIS: No, no, no. This is the way it's --

MS. DROUIN: But I will say, we have not

done a tech editing of this yet, and we will go through here --

MEMBER ROSEN: Well, no editor would find that comment.

MS. DROUIN: No, no, but I'm saying we have not done that. I'm talking a tech editing not from, you know, commas and periods, but this sort of thing.

MEMBER APOSTOLAKIS: Now, is it clear in the guide somewhere that all of this stuff is done using mean values or point values or --

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: It is clear?

MS. DROUIN: Yes. When you get to the quantification section --

MEMBER APOSTOLAKIS: It's done in mean values?

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: In terms of mean value?

MS. DROUIN: Yes.

MEMBER WALLIS: Mary, could you take that wiggly thing out of the one percent. You're trying to be precise and clear here, and the wiggle in front of the one percent and the significant accident sequence makes it vague again.

MS. DROUIN: Oh.

MEMBER ROSEN: More than about one percent. You shouldn't be saying that in a definition. You need to say one percent, or you say 1.2 percent, or you say between -- whatever you say you say, but you don't say "about." And I agree with Graham on that.

MS. DROUIN: You know, I have no problem with taking it out. It was actually supposed to be put everywhere, and we were putting that everywhere in response to some public comments to show that we weren't being hard and fast.

MEMBER ROSEN: Well, we think you should be. You should make up your mind and say what you think.

MS. DROUIN: I agree.

MEMBER KRESS: George and Mary, did we ever resolve the question of -- with respect to the first bullet, that these fixed numbers on Fussell-Vesely and risk achievement worth treat low CDF plants differently than high CDF plants?

MEMBER APOSTOLAKIS: They do, yes.

MEMBER ROSEN: They do.

MEMBER KRESS: And we still believe this

is an acceptable approach?

MS. DROUIN: We think this is an approach to start off with in testing. Whether we end up with these definitions after the pilots, the pilots will hopefully give us some insights and lessons learned.

MEMBER KRESS: Yes. Somehow I think we need to work on that concept.

DR. PARRY: But, again, though I'd like to remind you I think the way these definitions are used in the guide is to identify, for example, the significant basic event. It determines how much -- how many of the basic events actually get looked at in more detail. So it's relative to the CDF of the particular plant that's being worked on.

MEMBER KRESS: Yes. In this case, it may be -- may be different. You're right.

DR. PARRY: Yes.

MEMBER KRESS: But somehow I still think it needs to be thought about a little. But you're right, it's relative to that --

DR. PARRY: Right.

MEMBER KRESS: -- in this case.

MEMBER APOSTOLAKIS: So we decided not to drop from the terminology "minimal cut set." When you say "cut set," you mean minimal cut set.

DR. PARRY: Yes.

MS. DROUIN: Yes. Okay. Again, I was not planning on going over the next slide. I had just had that for information purposes.

MEMBER APOSTOLAKIS: Well, it does sound, though, like it's a circular definition. A key assumption is an assumption made in response to a key source of uncertainty.

DR. PARRY: Yes. Well, it's not circular, and it leads to the next one. It leads to the key source of uncertainty. The reason that we defined these is originally I think in the guide it just said, "Look at all uncertainties and all sources of uncertainty," and that clearly is a little over the top.

So we wanted to restrict it to those things that can actually impact the insights you're getting from the PRA.

MEMBER APOSTOLAKIS: No. But, I mean, it's the language again.

MS. DROUIN: If you're getting --

MEMBER APOSTOLAKIS: An assumption made in response to a key source of uncertainty or --

DR. PARRY: Why don't we switch them around? If we put key source of uncertainty first, and then we could talk about the key assumptions, I think it makes more sense.

MEMBER APOSTOLAKIS: Okay. But then, let's go on and see -- in the knowledge that the more detailed model would produce different results, why didn't you say in the knowledge that an alternate assumption would produce different results?

DR. PARRY: Yes.

MEMBER APOSTOLAKIS: Why does it have to be more detailed?

DR. PARRY: I think there are two things that are mixed up in this definition, and we need to clean it up, because also we should be talking about approximations. This, in a sense, is -- that phrase, I think, refers more to an approximation than an alternate assumption.

MEMBER APOSTOLAKIS: Ah.

DR. PARRY: We need to --

MEMBER APOSTOLAKIS: Sort of the bounding analysis perhaps.

DR. PARRY: Yes. We need to clean up the language in that area.

MEMBER APOSTOLAKIS: All right. Key assumption one, that in essence if you change it, you are changing the results?

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: I mean, in everybody language, that's what you would mean, right?

DR. PARRY: Yes.

MS. DROUIN: That's correct.

MEMBER APOSTOLAKIS: It's a critical assumption. If I change it, I can make another assumption that some people will find equally reasonable.

DR. PARRY: Right.

MEMBER APOSTOLAKIS: My results will be different.

DR. PARRY: Right. Significantly different.

MEMBER APOSTOLAKIS: Yes.

CHAIRMAN BONACA: Now, this is a draft final, but I notice that you're talking about the notes. And these are just on examples, so --

MEMBER APOSTOLAKIS: There's a lot of language here that needs to be changed.

CHAIRMAN BONACA: It has to be reviewed. What does it mean?

MEMBER APOSTOLAKIS: Okay.

MS. DROUIN: Again, to me these are working definitions.

MEMBER ROSEN: Trial use.

MS. DROUIN: Trial use. I think in all of our minds that when the pilots were going to -- as we move through the pilots, these definitions would probably change.

MEMBER ROSEN: Well, I think you have a lot of risk in here on the key source of uncertainty, that using something like "no consensus approach" -- that's fraught with all sorts of difficulty. To me, it is not a good choice.

MS. DROUIN: What is not a good choice and not --

MEMBER ROSEN: A good choice of how to define "key source of uncertainty." It's -- your words say a source of uncertainty related to an issue where there was no consensus approach. I would say whether -- a key source of -- maybe you're trying to get away from the circularity, but it's a key source of uncertainty. It's an uncertainty which is, you know, large, where there is many possible different answers. You know, where the -- both where the uncertainty is systemic or a large systemic uncertainty or large aleatory uncertainty.

DR. PARRY: But I think, again, the thought behind this is that the way you deal with uncertainties, at least the modeling level, is to make assumptions. So I think what we're trying to get across here is that these are things where different people have made different assumptions, that there is no consensus.

And the example could be the RCP seal LOCA model. If we all used the same RCP seal LOCA model, it's probably still a source of uncertainty. But it's been generally agreed that this is the model we will use. And, therefore, it's sort of removed out of the consideration from decision-making, because it's the accepted approximation or assumption for that particular issue. That's what I think we're trying to get at here.

MEMBER ROSEN: You're relating source of uncertainty to the state of the art thing. If the state of the art is agreed to, even though it's uncertain, then it's no longer a source of uncertainty. I think that's what happened here. I don't think that's --

MEMBER APOSTOLAKIS: In other words, if we all agree that this is the model to use, but the uncertainty is large, that's not a key source.

CHAIRMAN BONACA: Exactly. You can still have a very large --

MEMBER APOSTOLAKIS: It's really a key source of uncertainty.

DR. PARRY: That's my point. Yes, but you've agreed, though, that that is what we shall use in the model. Therefore, it doesn't need to be quantified in that sense.

MEMBER APOSTOLAKIS: Why not?

DR. PARRY: Well, how can you?

MEMBER APOSTOLAKIS: You can quantify it.

MEMBER ROSEN: Well, let's say three wise men decide that this one approach is what we'll use, and yet the three wise men -- two wise men and a wise woman decide that this is -- has a distribution that's very wide, very uncertain. You're saying that that makes it no longer uncertain.

DR. PARRY: No. If you've got a distribution, that -- that means you are characterizing the uncertainty. What we're contrasting here --

MEMBER ROSEN: Characterized uncertainty doesn't mean there is no uncertainty.

DR. PARRY: No.

MEMBER ROSEN: It just means it's --

DR. PARRY: Exactly. And that's not what I'm saying. What we're saying is if you have alternate models, each of those models might have its own uncertainty in an aleatory sense -- no, epistemic sense. But it's -- rather than deal with a selection -- a collection of models that could be used, and addressing that uncertainty by feeding in the different models, we're just going to choose the one.

MEMBER ROSEN: No, I don't think I agree with that.

MEMBER APOSTOLAKIS: That's a key model uncertainty.

MEMBER ROSEN: I think we have --

MEMBER APOSTOLAKIS: Which is a subset of --

MEMBER ROSEN: As a committee, we've taken the position --

MEMBER APOSTOLAKIS: Which is a subset of the sources of uncertainty.

MEMBER ROSEN: -- that model uncertainty needs to be discussed.

MEMBER APOSTOLAKIS: Yes. But that's a subset of what they have there.

DR. PARRY: We're not saying that it shouldn't be discussed. What we're saying is that there are certain model uncertainties that we know are out there, but we have chosen as an industry to adopt a particular model to address it. At least as a potential.

MEMBER APOSTOLAKIS: As a general comment, though, I think a lot of this stuff is more elaborate than it should be, like key source of uncertainty. Go through this and the key assumption and all of that, the one percent earlier. Why can't we use just straight definitions like "95 percent of frequency," "key source of uncertainty," "it's a major contributor to uncertainty"?

DR. PARRY: Somehow what we're trying to do is to come up with something that's a little more objective than subjective.

MEMBER ROSEN: But you're trying to --

DR. PARRY: Which has been the whole problem. So we've tried to relate it back to how it affects the significant sequence.

MEMBER ROSEN: But you see, what you've done in this key source of uncertainty is said whatever the state of the art is, presumably that the consensus is around the state of the art, is not -- is, therefore, not uncertain, which is not true.

MS. DROUIN: I don't think -- no, no. We're not saying it's not uncertain. We're saying that you don't need to evaluate the uncertainty of it.

We already know it's uncertain.

But it -- I think going back and using Gareth's example of the RCP seal model, if everybody adopts the same model, and say it's the Rhodes model, we know the uncertainty there. We know its impact. We don't now need to go and require everybody to do a sensitivity analysis on that model that they've used. That's what we're trying to get to. We're not saying that there's not uncertainty associated with it.

MEMBER SHACK: But they've agreed on the uncertainty that's associated with it.

MS. DROUIN: That's right.

CHAIRMAN BONACA: Right. I understand where you're going, and just the words are a source of confusion.

MEMBER APOSTOLAKIS: Also, changing the relative significance of sequence is not important. Why don't we call them "significant"? We are only using "significant" now? So this leads to sensitivity analysis. That's the idea.

MS. DROUIN: That's right.

DR. PARRY: Effectively, yes. That's right. These are the things that you need to do sensitivity studies.

MEMBER APOSTOLAKIS: I thought the

sensitivity analysis would actually identify the key sources, not the other way.

DR. PARRY: No. I think the way that the standard has it is that you look at the results, and based on an assessment of -- well, I mean, you might do sensitivity studies to identify the key sources. That's true. But then, where you go from there is that when you are performing an application, then you do additional sensitivity studies to demonstrate that the decision you're making is robust, which is outside the scope of this guide.

What the ASME standard says is that you need to identify the key sources of uncertainty, those that affect the results.

MEMBER APOSTOLAKIS: Well, this brings up another thing.

MEMBER ROSEN: Well, can we stay on this subject for one moment? Just the way this is written, even if I accept your description of what consensus approach is, it says, "A source of uncertainty -- a key source of uncertainty is a source of uncertainty related to an issue where there is no consensus approach."

And then you say, "For example, RCP seal LOCA." But you just told me there is a consensus approach.

DR. PARRY: No, I didn't. What I said was if --

MS. DROUIN: If.

DR. PARRY: -- if we were to adopt, as an industry, a single model, but currently in all of the PRAs out there there is not a single model used, there is a variety of models used.

MEMBER ROSEN: It's not my favorite way to do it. It seems like we need a more fundamental --

MEMBER APOSTOLAKIS: It's too convoluted.

MEMBER ROSEN: Pardon me?

MEMBER APOSTOLAKIS: The ideas really are simple, but I guess if you guys are trying to be --

DR. PARRY: They're simple in a gut-feel, colloquial sense. But to try and put something into standard language, it becomes complicated, if you're trying to create something that's objective.

MEMBER APOSTOLAKIS: Why isn't the key source of uncertainty -- I mean, you identified or you defined the concept of significance in terms of contributions to the mean values. Why can't you define a corresponding concept of significant source of uncertainty in terms of contribution to the uncertainty, not to the variance?

DR. PARRY: Now you're getting really complicated.

MEMBER APOSTOLAKIS: But that's really what you want to do.

DR. PARRY: Yes. But it's --

MEMBER APOSTOLAKIS: Because otherwise you are confusing the state of the art with the agreements we have made, and all of that. You are bringing a lot of stuff in here, and I'm not sure that's better.

DR. PARRY: But I don't think that's the case anyway, George. I think what happens with some of these sources of uncertainty -- seal LOCAs, let's pick on that one again. If you adopt one model, you might get one ranking of sequences. If you use a different model, you get a totally different ranking of sequences.

MEMBER APOSTOLAKIS: Right. And the same with HRA.

DR. PARRY: So it has nothing to do with variance. That's actually to do with changing the risk profile of the model. And that's really what we're trying to get at; the same with HRA.

MEMBER APOSTOLAKIS: So essentially what you are saying -- implying here is that for it to be a key source it's really model uncertainty. That's really what you're saying.

DR. PARRY: Yes.

MEMBER APOSTOLAKIS: Okay.

DR. PARRY: That's typically right.

MEMBER ROSEN: Well, it's the choice of data source, too.

MEMBER APOSTOLAKIS: It's the models, really, that matter.

MEMBER ROSEN: Well, he's focusing on the model, but his words right there say "choice of data source." That's not model; that's data. So it could be --

MEMBER APOSTOLAKIS: Where is that now? Where is that?

DR. PARRY: It's the first one in the parens.

MEMBER SHACK: It's the first e.g.

MEMBER APOSTOLAKIS: Oh.

MEMBER ROSEN: It could arise either as data or modeling. Typically, such a thing arises in modeling, not data, because data you can argue with -- about more --

MEMBER APOSTOLAKIS: Well, data source I guess they mean the distribution. Somebody has already produced distributions, right?

DR. PARRY: Yes.

MEMBER APOSTOLAKIS: Not raw data.

MEMBER ROSEN: Well, I think it's -- it makes me uncomfortable.

MEMBER APOSTOLAKIS: Okay. Let's go on.

MS. DROUIN: The only thing I'd just begin to add, these are working definitions, and I'm sure we'll be coming back --

MEMBER APOSTOLAKIS: Let me ask -- we have until 11:30, right?

CHAIRMAN BONACA: Right.

MEMBER APOSTOLAKIS: Tony, you need five minutes only, or maybe 10?

MR. PIETRANGELO: Five.

MEMBER APOSTOLAKIS: Five. So we have to finish by 11:24, because he needs a minute to come up there.

MEMBER WALLIS: George, can we keep the big picture somehow in --

MEMBER APOSTOLAKIS: That's what I'm trying to do. Now, I don't know that this committee really cares about the public comments.

MS. DROUIN: We can skip those.

MEMBER APOSTOLAKIS: I mean, we care about the public comments. I don't think they are significant, though.

MEMBER KRESS: No. I have a question about the next slide.

MEMBER APOSTOLAKIS: I would like to cover first their response to our comments.

MEMBER KRESS: Well, I'd like to ask her about the next slide first.

MEMBER APOSTOLAKIS: Okay.

MEMBER KRESS: The second bullet.

MEMBER APOSTOLAKIS: Okay.

MEMBER KRESS: It's related to the second bullet. You have a statement in the text of the thing that says that CDF and LERF are the metrics, and that they are surrogates for, respectively, latent and early fatalities.

Now, I can see how CDF possibly could be a surrogate for latent fatalities. I've never seen the math. You know, what we did for LERF is we took the early fatality safety goal, and we looked at a lot of plants and backed out what LERF would have as a mean equivalent to that at the population in plants.

Now, we've got a CDF value -- I think it's 10^{-4} I've never seen the equivalent of that exercise done. You end up with 10^{-4} as a surrogate for the latent fatality safety goal. Now, it could be -- some number of CDF could be a surrogate, but I've never seen that exercised. And my question is: does it exist? And is that what you meant?

MS. DROUIN: It does exist, and that was -- that appendix that goes through the math that I gave you.

MEMBER KRESS: Oh, it's in the appendix.

MS. DROUIN: That appendix that I gave you that goes through the math that shows how the CDF of 1E-4, and the LERF value of 1E-5, how it is derived from the QHOs.

MEMBER KRESS: Okay. I can find that in the appendix, then.

MS. DROUIN: No, no, no. It's not in the appendix of this. It's in the appendix to the option 3 framework that I gave you a copy of.

MEMBER KRESS: Yes. I remember you gave me a copy of that. I'll have to go back and look for it.

MS. DROUIN: That just systematically goes through the math.

MEMBER KRESS: It goes through that math.

MS. DROUIN: It goes through that math.

MEMBER KRESS: Thank you. That's all I would --

MEMBER ROSEN: I disagree with George and agree with him. We do care about the public comments, but we care about ours first.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: Well, see, I had --

MEMBER APOSTOLAKIS: I corrected myself.

MS. DROUIN: -- saved the best for last, so --

MEMBER APOSTOLAKIS: I corrected myself. Well, and now -- so let me tell you what I propose, and see if everybody agrees. Let's go over the ACRS comments first, slide 15. Then, depending on how much time we have, we either go over the public comments, or you tell us where there is disagreement with the public.

CHAIRMAN BONACA: Well, in fact, pages 11 and 12 have the sources of major disagreements. That would be a good summary of that point.

MEMBER APOSTOLAKIS: Okay. So --

CHAIRMAN BONACA: I agree with the order. That's fine.

MEMBER APOSTOLAKIS: Let's do ours first.

MS. DROUIN: Okay. Fifteen. Well, I think we can skip this one. We've done that one.

(Laughter.)

MEMBER ROSEN: Noting the discomfort of certain, then.

MS. DROUIN: And I will note that we will, as we do our tech editing, to go and look at the language more carefully.

Okay. Comment number 2 was the peer review of the PRA should include an assessment of the uncertainties and the validity of key assumptions. And as you can see here on the slide, what's --

MEMBER APOSTOLAKIS: Well, we agreed with you there, right?

DR. PARRY: Yes.

MS. DROUIN: Correct.

MEMBER APOSTOLAKIS: So you are not coming back now and disagreeing with us.

MS. DROUIN: No.

DR. PARRY: Oh, no, no.

MEMBER APOSTOLAKIS: Okay. Comment 3.

MS. DROUIN: Comment 3 was it should include guidance on how to perform sensitivity and uncertainty analyses.

MEMBER APOSTOLAKIS: Right.

MS. DROUIN: To some extent we thought that the -- what is in the ASME standard is adequate in terms of dealing with the issue of PRA quality. In terms of a detailed guidance for sensitivity uncertainty analysis, we felt that belonged in its own regulatory guide. And as we said in our letter back to the committee, and as we have also committed to the Commission, is to develop this new regulatory guide, which we've started on.

MEMBER ROSEN: This is mainly about model uncertainty, isn't it?

DR. PARRY: Primarily.

MEMBER APOSTOLAKIS: Primarily.

DR. PARRY: Yes.

MEMBER ROSEN: That was the thrust of the committee's comment.

DR. PARRY: Right.

MEMBER ROSEN: We need to work on, you know, a way to enforce is the word that was used, the need to deal with model uncertainty.

MS. DROUIN: Yes.

DR. PARRY: But Mary left out an important phrase, though, when you said that. When you're talking about the performance of sensitivity uncertainty analysis in the context of applications, that's what we're going to deal with in the separate regulatory guide.

MS. DROUIN: That's true.

DR. PARRY: Because that's not the purpose of DG-1122.

MEMBER APOSTOLAKIS: What's the distinction?

DR. PARRY: Well, this is how you take account of uncertainties and sensitivities when making decisions, when comparing with acceptance guidelines.

MEMBER APOSTOLAKIS: Right.

DR. PARRY: That's not the function of DG-1122.

MEMBER APOSTOLAKIS: No. But if DG, whatever, guide becomes -- you see, the problem, as I see it, is that in the past sensitivity analyses have been used as substitutes of uncertainty analysis. We are going to do a point estimate, and then, you know, okay, we are going to change the failure rates by a factor of three. What do you want? It doesn't affect anything. So we've done it.

Well, that is not the way to do it. So somewhere we have to make it clear that this is what sensitivity analysis means. This is what uncertainty analysis means.

MS. DROUIN: Right. We totally agree with you. We totally agree. There's not disagreement. We just don't think it belongs in this guide.

MEMBER APOSTOLAKIS: Okay. So my next question is: this separate regulatory guide, what is the timetable there? When do you think you are going to have something?

MS. DROUIN: As soon as possible.

MEMBER APOSTOLAKIS: You see, that's what we got from the EDO's response, which I think some of you had something to do with it. I think it's, in my mind at least, it's important for us to know when you're going to have that. Otherwise, you know, we make a comment and you say, "We're going to think about it. We're going to issue something" --

MS. DROUIN: You know, I apologize for my --

MEMBER APOSTOLAKIS: You said you started already, actually.

MS. DROUIN: Yes. I have not sat down and laid down a schedule for the guide.

MEMBER APOSTOLAKIS: But, I mean --

MS. DROUIN: But it's not something that's on a back burner.

MEMBER ROSEN: How about a schedule for the schedule, then? When will you be able to tell us?

MS. DROUIN: I mean, I'm more than willing to commit to come back to you in the very near future and give you a schedule. I just haven't laid it out.

MEMBER APOSTOLAKIS: And that will be fine, Mary. But I guess my question is: is this something that will take six months? Or it will take four or five years?

MS. DROUIN: No, no, no.

MEMBER ROSEN: "Very near future," just define that.

MEMBER APOSTOLAKIS: Yes. What is the near future?

MS. DROUIN: The near future -- I mean, I would like to see a draft of this guide in early next year.

MEMBER APOSTOLAKIS: Okay. And you will come to us I assume before then to discuss progress or whatever?

MS. DROUIN: Absolutely.

MEMBER APOSTOLAKIS: So is this something now that's sufficient -- I mean, that we know --

MEMBER ROSEN: Yes. We now can tell our staff that sometime before the end of this year please ask Mary to come back and tell us how she's doing.

MEMBER APOSTOLAKIS: Or she may come on her own free will.

MEMBER ROSEN: She may come of her own

free will.

(Laughter.)

MEMBER APOSTOLAKIS: Okay. Roman number four. I'm sorry. Gary?

DR. PARRY: Yes. Again, to come back to this issue, that when we looked at the guide -- at the ASME standard, we felt that in the way that the standard is written, which is a what to do rather than a how to do standard --

MEMBER APOSTOLAKIS: Right.

DR. PARRY: -- it has sufficient in there to identify -- in the sense that it has a requirement to identify the key sources of uncertainty, which is really the focus of what the guide should be doing.

And then, what we do with those is we're going to deal with in another document. Just to make that clear.

MEMBER APOSTOLAKIS: Yes. And my question was, what's the timeframe?

DR. PARRY: Okay.

MEMBER APOSTOLAKIS: We agree that should be a separate document, but --

DR. PARRY: Right. Okay.

MEMBER APOSTOLAKIS: -- I don't want it to be just, you know, we're going to look into it.

DR. PARRY: Right.

MS. DROUIN: No. Okay. Comment number 4 --

MEMBER APOSTOLAKIS: Well, we supported that, didn't we?

MS. DROUIN: Yes. You all agreed with us.

MEMBER APOSTOLAKIS: Yes, we supported it.

MS. DROUIN: Okay.

MEMBER APOSTOLAKIS: Five?

MEMBER ROSEN: When you said staff has taken objection in Appendix A, do you mean they have taken objection to not having such a list? And you agree with our comment?

MS. DROUIN: We agree with your comment.

MEMBER ROSEN: And you've taken objection in Appendix A, Section 6.3 --

MS. DROUIN: Correct.

MEMBER ROSEN: -- to the fact that it's not required.

MS. DROUIN: Correct.

MEMBER ROSEN: Okay.

MS. DROUIN: Okay. On this one it -- it seemed to me that when you looked at the guide, there were a couple of words that, from our understanding at the last meeting, and then going back and reading the transcript in addition to your letter, that it was some specific wording that was causing the confusion.

And so this is what we had proposed in trying to relieve your concern that even if you're in a capability category 1, it's still going to deal with, you know, as appropriately the operating history and experience of the plant as well as applicable generic experience.

And we had proposed taking out the words -- now these are in the guide. These are not words that are in the standard. These were our words in the main body of the guide.

But also, when you go into the standard and you look at those three examples in particular, we think those also were enough, we felt, to alleviate the concern.

MEMBER APOSTOLAKIS: There are a couple of comments here. Category 1 now -- category 1, that was the lowest bullet, right?

MS. DROUIN: Right.

MEMBER APOSTOLAKIS: Which is basically sequences, right? You are relying a lot on generic information, is that correct?

DR. PARRY: Generic data maybe, but you -- the sequences still have to be --

MEMBER APOSTOLAKIS: Plant-specific.

DR. PARRY: -- plant-specific.

MS. DROUIN: Plant-specific. I mean, you're drawing plant-specific fault trees.

MEMBER APOSTOLAKIS: right.

MS. DROUIN: Plant-specific initiating event identification.

MEMBER APOSTOLAKIS: But if in that particular plant, for example, some component has a high failure rate, that will not show up in a category 1 PRA.

MS. DROUIN: No. Yes, it will.

MEMBER APOSTOLAKIS: How?

MS. DROUIN: It will.

MEMBER APOSTOLAKIS: When you are using generic data?

MS. DROUIN: No, no, no, no. You are allowed to use generic data.

MEMBER APOSTOLAKIS: Well, then, I'm going to use generic data if I'm allowed.

MS. DROUIN: Okay. Right. But there is a requirement when you go into the supporting requirements -- I don't remember whether it's under DA-C or DA-D, that requires you when you have that kind of unique situation to take that into account.

There is a specific supporting requirement imposed for a category 1.

MEMBER APOSTOLAKIS: And then I'm moving to category 2, am I?

MS. DROUIN: No.

DR. PARRY: No, because it's only for things that are known to be different from general industry experience. Where you don't think there's a significant difference, then you're allowed to use generic.

MEMBER APOSTOLAKIS: I don't know what kind of public confidence we are getting with all of this. But anyway, these words "when it is of sufficient quality," why do we need that? I mean, what does that mean? You made a big deal in other instances that unless you quantify things they don't mean much, and now you say when it's -- when does experience become of sufficient quality? What do you mean?

DR. PARRY: When you can actually do something with it. If there is very --

MEMBER APOSTOLAKIS: Zero failures in 50 tests. I mean, is there something -- I can do something with it?

DR. PARRY: Sure, you can do something

with that. But --

MEMBER APOSTOLAKIS: Yes.

MEMBER ROSEN: How about failures in two tests? Is that --

MEMBER APOSTOLAKIS: So all of it, then, is of sufficient quality.

DR. PARRY: No. You don't know how many failures in how many tests. I mean, that would be an example of --

MEMBER APOSTOLAKIS: But that's what you mean?

DR. PARRY: Well, I mean, it's one example.

MEMBER APOSTOLAKIS: Because you know how people are going to interpret this. We're going to do classical statistics if we have a lot of data. We're going to do Bayesian statistics if we have weak data. That's what they're going to -- how they've going to go with this.

DR. PARRY: This is category 1, in any case. I mean, this is just --

MEMBER APOSTOLAKIS: No, this is general.

DR. PARRY: No. But this is just our --

MEMBER APOSTOLAKIS: This is not category 1. It is parameter estimation analysis.

DR. PARRY: That's true, but that's a general statement of what the test is. If you want to understand what we mean by that, you really have to transition into the ASME standard and look at the requirements for that. That would be --

MEMBER APOSTOLAKIS: Why didn't you take that out? I mean, you --

DR. PARRY: Take what out?

MEMBER APOSTOLAKIS: Well, the words of "when it is of sufficient quality." And then if they want to understand better what you mean by including the actual operating history and experience, they will go wherever you send them. This sufficient quality, you know, it's a red flag, because I've seen it.

As you know, in many IPEs people did that. They did arbitrary things. Here we have lots of data. Why? Because we say so. So here's the number of trials, and this is good enough. Over there we don't, so we're going to do something else.

Does it help any to have those words there, "when it is of sufficient quality"?

DR. PARRY: It helps me, but --

MEMBER APOSTOLAKIS: You don't need those, I don't think. I don't think anybody is going to do anything using this paragraph to begin with. They're going to go into the actual requirements.

MEMBER WALLIS: Maybe you want the sufficient quality to qualify the word "data," rather than "history."

MEMBER ROSEN: Well, it's a set of weasel words that someone can point to later on to justify doing almost anything. And I think that's George's point.

MEMBER APOSTOLAKIS: That's my point, that it's unnecessary. I mean, this is just a general statement here, you know, you quantify parameters. The estimation process includes a mechanism for addressing uncertainties. It has the ability to combine different sources of data, including operating history and experience, and applicable generic experience. I mean, you know, it's a general statement of what you are expected to do.

MEMBER WALLIS: It sounds okay. Why don't you agree with that, Mary, and move on?

MS. DROUIN: That's fine.

(Laughter.)

We will agree to that.

MEMBER APOSTOLAKIS: Okay. Good. And, okay, next?

MS. DROUIN: Comment number 6. This was

providing guidance on acceptable qualitative characterization.

MEMBER APOSTOLAKIS: You say --

MS. DROUIN: We fixed the wording in the guide --

MEMBER APOSTOLAKIS: -- it's bounding.

MS. DROUIN: -- to clarify that. But we've also agreed that, you know, guidance is needed here, and this will go in this new regulatory guide.

MEMBER APOSTOLAKIS: So what you mean is bounding analysis.

MS. DROUIN: That's one example.

MEMBER APOSTOLAKIS: Oh. There could be another --

MS. DROUIN: There could be others. But we took those words out that talked about are qualitative or quantitative.

MEMBER APOSTOLAKIS: Okay. So essentially you agree with us.

MS. DROUIN: Yes, we agreed with you.

MEMBER APOSTOLAKIS: Okay. Let's go -- if there are no questions, let's go to the -- your slide 11, you said? Major areas of disagreement?

MEMBER ROSEN: With the public comments.

MEMBER APOSTOLAKIS: With the public.

Okay.

DR. PARRY: The second one --

MEMBER APOSTOLAKIS: Yes. The first one I think we did.

MS. DROUIN: Yes. We've kind of beaten that first one to death at this point I think on significant and dominant.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: This one -- I don't think it's big. I think we're going to come to a resolution on this very quickly. In the ASME standard, repair is defined as a subset of recovery. We don't think it's a subset. When you talk about recovery, you're using your HRA techniques, because you're not trying to correct the exact fault or the failure mechanism.

And when you go to repair, you're actually trying to correct, and you need to know what that actual failure was. And so it's -- you're not going to use the same thing, and so we're just trying to provide some clarification there.

I don't think we're in a big disagreement, but this has not been showing up in the agenda at this point.

MEMBER APOSTOLAKIS: How does this work by the way? If you disagree with the public comments, you state your argument and that's it? Then you go ahead with what you wanted to do, right? Is that it?

DR. PARRY: That's what will be in Appendix A.

MS. DROUIN: That's what will be in Appendix A.

MEMBER APOSTOLAKIS: And that's it?

DR. PARRY: Yes.

MS. DROUIN: Well, I mean, in many cases --

MEMBER APOSTOLAKIS: And then they can take you to some higher authority and say --

MEMBER ROSEN: Well --

MS. DROUIN: No, no, no, no.

MEMBER ROSEN: -- in trial use here. So if it turns out that when -- when it comes out, it turns out that that's a major source of difficulty, ACRS, as well as other people, can weigh in on the subject, and I'm sure they'll take it into account. Is that correct?

MEMBER APOSTOLAKIS: Yes, but that's what I'm saying. That essentially it's up to them to decide whether to accept the comment.

MEMBER ROSEN: Now, right. But the -- yes, of course, but then there's other ways to have influence on what they do.

MEMBER APOSTOLAKIS: I mean, let's say the industry really disagrees with something. These guys ignore their comments.

MEMBER SIEBER: They are still the ultimate authority.

MEMBER APOSTOLAKIS: They can go to the Commission.

MEMBER KRESS: They can write their Congressman.

MEMBER APOSTOLAKIS: That's really what it is. They could.

MEMBER ROSEN: They can complain to the Federal Government.

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: No. The ultimate authority here is the Commission.

MS. DROUIN: We try very hard to come to an agreement of the minds.

MEMBER APOSTOLAKIS: I know, but it's --

MS. DROUIN: These I think we do ultimately have resolution. It's just not showing up yet.

MEMBER APOSTOLAKIS: It's just a general question I had, not --

MS. DROUIN: But from the objections we had, in the version that went out in November to the version we're going to publish, tremendous advancement in coming to resolution on areas of disagreement.

And when I -- these were -- they were technical but not huge things. They just want editorial -- that's what I meant by "major." I probably shouldn't have used the word "major" there.

MEMBER APOSTOLAKIS: So they are major but not significant.

MS. DROUIN: Yes.

(Laughter.)

MEMBER ROSEN: Mary, help me understand the format here. The top blue line is what the comment was, right?

MEMBER APOSTOLAKIS: On ASME.

MS. DROUIN: Yes.

MEMBER ROSEN: No, no.

MS. DROUIN: No, no, no.

MEMBER ROSEN: That's the public comment that says that there are insufficient factors in crediting recovery.

MS. DROUIN: That's our comment.

MEMBER ROSEN: Your comment?

DR. PARRY: Yes.

MS. DROUIN: We think --

MEMBER ROSEN: Where is the public comment?

MS. DROUIN: We think there is --

MEMBER ROSEN: We are reviewing public comments, right, on the standard?

DR. PARRY: These are specifically ASME comments.

MS. DROUIN: right.

DR. PARRY: And I think they are -- what they really represent is areas where ASME did not accept some of the comments, and the comments that we made are in the blue.

MEMBER APOSTOLAKIS: So you commented on the ASME standard, and they didn't accept --

DR. PARRY: Right.

MEMBER APOSTOLAKIS: -- your comments.

DR. PARRY: That's what these --

MS. DROUIN: Correct.

DR. PARRY: -- interpret these viewgraphs, right.

MEMBER APOSTOLAKIS: Okay.

MEMBER ROSEN: You say there are insufficient factors in crediting recovery.

DR. PARRY: Right. They didn't agree.

MS. DROUIN: They did not agree with us.

MEMBER ROSEN: The staff does not -- what's that second line, then? It's just sort of like a --

MS. DROUIN: The second line were examples of the factors that we thought were equally important, that did not show up.

MEMBER ROSEN: So it's supporting to your blue line.

DR. PARRY: Yes.

MEMBER ROSEN: Okay. And then, what's the third line, then? More support? This is all your view on recovery, crediting recovery.

DR. PARRY: Right.

MS. DROUIN: This first one.

MEMBER ROSEN: Yes.

MS. DROUIN: Okay. Then, we have the next one where we felt --

MEMBER ROSEN: No, I know. Just focusing on the first one, I'm just saying what -- I'm trying to understand the format here. Whose comments is this? These are your comments on the ASME standard.

MS. DROUIN: And where ASME did not agree -- in a public comment, they did not agree with our objection.

MEMBER ROSEN: Okay.

MEMBER APOSTOLAKIS: And now you may come back and put those things in DG-1122.

DR. PARRY: Right.

MS. DROUIN: Correct.

MEMBER APOSTOLAKIS: Because the ASME standard did not agree with them, and they are the ultimate authority. They say, "We'll show you. We'll put it in the regulatory guide." That's really what is happening.

MEMBER ROSEN: And now -- and what we should be doing here is to see whether or not the staff is being reasonable.

MEMBER APOSTOLAKIS: That's right. T hat's right. But this is really the thinking here. We told them we didn't like something that was not in the guide, in the standard, and they disagreed with us. So we're coming back now, and we're taking exception.

DR. PARRY: And there are relatively few of these things.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: You are seeing them. These are them. All the others we've worked out a resolution.

MEMBER ROSEN: Okay. And the second one is?

MS. DROUIN: These next two we have discussed.

MEMBER APOSTOLAKIS: I think we did, yes.

MS. DROUIN: This was ACRS comment number 2 and ACRS comment number 4.

Then we get to the SONGS peer review. There were several observations that came out of that. But one of the more significant ones was additional guidance did need -- is needed in interpretation of the requirements.

And there were two major areas where this was seen. The first one is the one you see here, was on the supporting requirements and were the same across all categories. How do you interpret that? There was some view that, you know, they are trying to look at what was done and assign a grade to it, whether they met category 1, 2, or 3.

In writing that, our view was that that's just a yes or no. You either did it or you did not do it, and you aren't assigning a capability category. I tried to give some examples here. For example, when you are identifying your initiating events, whether you're category 1, 2, or 3, you need to identify all of your initiating events.

Subsequently, how they get treated, that level of detail will vary depending on what capability category you are. But in terms of identifying, we had to identify them all. So you're not in a capability category 1, 2, or 3. You just did it or you didn't do it.

So you can see here is the language that we are proposing. We did not go through all of the places in the ASME standard where you see this and try and work that out. We felt that was better left to the trial use period, and for ASME to do that. And that was one of the feedbacks we did get at the public workshop. They were in agreement with that approach.

DR. PARRY: And to add to that, during the SONGS review, there were some of the requirements which stretched across categories. There was some concern that perhaps they really did cry out for a distinction between the categories.

MEMBER APOSTOLAKIS: Correct.

DR. PARRY: The internal flooding is a good example of that. And ASME has taken note of that and will be looking at that in a future addendum.

MEMBER APOSTOLAKIS: The only PRA where the standard was used in the peer review was SONGS, which is a category 2 or 3? In between? It's certainly not 1. They have a whole monitor based on that.

DR. PARRY: Well, I'm not sure that we should --

MS. DROUIN: Let me try and answer it a different way.

DR. PARRY: I'm not sure I should discuss that.

MEMBER APOSTOLAKIS: Why not?

DR. PARRY: Well --

MS. DROUIN: No PRA -- there is NO PRA that will ever be across the board a category 1, a category 2, or a category 3.

MEMBER APOSTOLAKIS: I understand that, right.

MS. DROUIN: You're always going to have a mixture.

MEMBER APOSTOLAKIS: But I thought that the San Onofre one was one of the better ones.

DR. PARRY: But there were some category 1 observations.

MEMBER APOSTOLAKIS: Even 1.

DR. PARRY: Yes. Now, let me come back to your statement earlier about raising the bar, because that was a statement you brought up. And that was a statement that was made at that peer review, but it was stated in the following context.

They said it's raising the bar in the sense that no PRA is going to be given a category 2 or 3 across all of the requirements. It was in that sense that I believe that the statements were made -- and Gareth and Steve can help me out on that, if -- because they were there, too.

So, and there was another statement that was made by one of the industry people that he said that he didn't think that was necessarily a bad idea.

MEMBER APOSTOLAKIS: Yes.

DR. PARRY: But it's not the -- but I think it's a realization that there are always going to be some elements for which some people have done not as good a job as others.

MEMBER APOSTOLAKIS: And then, what does that mean? I mean, what is the actual --

DR. PARRY: Then you have to find out whether that allocation is significant for the application that's being used.

MEMBER ROSEN: That's the point. It only matters if you're going to use -- if you're going to apply it, and it has important ramifications.

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MEMBER APOSTOLAKIS: So the whole business of categories is really useless.

MEMBER ROSEN: No.

MEMBER APOSTOLAKIS: Because you would be doing that anyway. You would look at the PRA and say, "Well, gee, you know, in this case smoke is very important." And you haven't included smoke, so you have to do something about it. I don't have to call it first, but this is a category minus three, and everybody says, "Oh, it is minus three? No, it's minus three and a half." And then we'd do something.

There is no reason for that, because you are saying for this decision you have this deficiency. But anyway, since you've done it, now you've done it.

MS. DROUIN: I don't think people should be surprised that if somebody -- any -- a PRA that is done to a large scope and a lot of detail should not be surprised that it's going to have some category 1 stuff in it.

MEMBER APOSTOLAKIS: And I absolutely agree with you.

MS. DROUIN: Because you are always going to -- particularly when you get into like your systems analysis, you are not going to go build detailed fault trees on every system. Some of your systems you're going to black box. Some you're going to do in great detail.

MEMBER APOSTOLAKIS: Yes.

MS. DROUIN: So even the most gold-plated PRA, I would not be surprised to find some category 1 stuff in it every -- in places.

MEMBER APOSTOLAKIS: Yes. My point is that the words category 1, 2, 3, are really useless. But anyway, I mean, we -- you are ultimately doing what I would like to see done, so it's okay.

DR. PARRY: I think the general trend seems to be that, at least particularly if you read 50.69, for example, what the people would like to see is that they need category 2.

MEMBER APOSTOLAKIS: Yes. I know. Everybody says that. And even then, I think Mary's comment still applies. I mean, it's not going to be category 2 at every --

DR. PARRY: Right.

MEMBER APOSTOLAKIS: Some parts will be category 3. Some parts will be category 1.

DR. PARRY: Right.

MEMBER APOSTOLAKIS: In everyday language, some parts will be better than others. Depending on the decision I have to make, I'll have to make a judgment.

MS. DROUIN: I'd like us to stop using the words "more detail," because I don't think it's a case of more better -- or better. It's more detail that you go into.

MEMBER APOSTOLAKIS: Well, detail usually implies better, but that's okay.

MS. DROUIN: But then people extrapolate that to mean, well, it has higher quality. You either do it correctly or you don't do it correct to the level of detail you do it to.

MEMBER APOSTOLAKIS: That's right. Exactly. And the ultimate criterion is its relevance to the decision.

MS. DROUIN: Correct.

MEMBER APOSTOLAKIS: It has nothing to do with raising or lowering bars. If I'm about to make a decision, and one particular point bothers me because I may make a different decision, I don't care what you call it -- raising or lowering. I want to see something on that point. If it's irrelevant to this, I don't care.

DR. PARRY: But the point is if any --

MEMBER APOSTOLAKIS: You see, in our business, this particular business, there are no experiments like Professor Wallis can go and collect fluids there and temperatures. We don't have that. The only thing that matters to us is how things affect the decision. That's the only connection with the real world.

MEMBER WALLIS: Well, the decisions are, in a way, experiments. Except it's a very long time before you --

MEMBER APOSTOLAKIS: Okay.

MEMBER KRESS: I still get hung up, George, on the fact that -- if I look at Reg. Guide 1.174, it's got absolute values of CDF and LERF in it. And so everything in the PRA, all of the dominant sequences, affect that. And I don't see how you can make a judgment as to which parts to leave out for particular decisions when you really have to have a good value for the CDF and LERF if you're going to make decisions. That has always bothered me about this.

MEMBER APOSTOLAKIS: As a practical matter, though, we have a pretty good idea of what are the major drivers that are missing. But in principle you are right. You have to do it right first.

MEMBER KRESS: You have to do it right.

DR. PARRY: Except that in Reg.

Guide 1.174, remember that the absolute value of CDF and LERF are not really called into question if you're in Region 3 of the diagram, which means that the --

MEMBER KRESS: Yes. But I have to know I'm in Region 3. That's the --

DR. PARRY: Well, which is based on the delta CDF.

MEMBER APOSTOLAKIS: I think it's a professional judgment coming from experience.

And you have two minutes.

MS. DROUIN: Okay. I'm just going to jump --

MEMBER APOSTOLAKIS: I think you are done, actually. Aren't you done?

MS. DROUIN: -- to the very last slide.

MEMBER APOSTOLAKIS: Yes. The next steps.

MS. DROUIN: Next steps. We would really like to publish this for trial use and get moving and start the pilots.

MEMBER APOSTOLAKIS: Do you have candidates for pilots?

MS. DROUIN: We do have one formal.

MEMBER APOSTOLAKIS: South Texas?

MS. DROUIN: South Texas.

MEMBER APOSTOLAKIS: Okay.

MS. DROUIN: At the public meeting, Tony felt that there might be another six more that he might be able to bring to the table, and he was going to follow up with this on that.

MEMBER APOSTOLAKIS: Okay.

MS. DROUIN: And --

MEMBER APOSTOLAKIS: All right.

MEMBER ROSEN: Now that you've said you have pilots, you didn't say what's actually going to be done in the pilots. I'd like to hear a little bit about that.

MS. DROUIN: Well, what we're going to do in the pilots is test the regulatory guide.

MEMBER ROSEN: In what way, though?

MS. DROUIN: Well, these are all things that --

MEMBER ROSEN: I feel like I'm pulling on a string here.

MEMBER APOSTOLAKIS: You going to review their PRAs?

DR. PARRY: I think you have to.

MS. DROUIN: We're going to have to review them.

DR. PARRY: Sure.

MS. DROUIN: We did say at the public

meeting that the pilots, in terms of truly testing the regulatory guide, we're going to have to go into some detail on the review process.

MEMBER ROSEN: You're going to do a peer review at these pilots, at these plants, is that what we're going to do?

DR. PARRY: NRC will have to do a review of the PRA to see whether we agree with the peer review comments on the PRA.

MEMBER ROSEN: Ah. Okay.

MEMBER KRESS: So you'll review it in the -- with respect to some application that they --

DR. PARRY: Yes.

MS. DROUIN: Yes.

MEMBER ROSEN: So you're going to do effectively a V&V, for instance, the -- well, for pilot A's existing peer review, you're going to do a V&V of that peer review.

DR. PARRY: Well, I think it's basically to see whether the interpretation of the standard and the exceptions in Appendix A are the way we would interpret them.

MEMBER APOSTOLAKIS: I don't understand. I thought you were going to do what that team did to the San Onofre PRA.

DR. PARRY: No, we're not. We're not the peer reviewers. The peer reviewers are --

MEMBER APOSTOLAKIS: So I don't understand. Who is going to use the regulatory guide?

DR. PARRY: It's the industry.

MEMBER APOSTOLAKIS: The industry.

DR. PARRY: Sure.

MEMBER APOSTOLAKIS: And then, where do you come in?

DR. PARRY: We review it. I mean, we review the application.

MEMBER APOSTOLAKIS: So now, let's say, you have South Texas.

DR. PARRY: Right.

MEMBER APOSTOLAKIS: As a pilot.

DR. PARRY: Right.

MEMBER APOSTOLAKIS: What happens next?

DR. PARRY: Well, I think what they will do -- this is my guess --

MEMBER APOSTOLAKIS: Yes.

DR. PARRY: -- is they should use the NEI 00-02 self-assessment process --

MEMBER APOSTOLAKIS: Right.

DR. PARRY: -- right, to see whether taking into account our comments in Appendix B --

MEMBER APOSTOLAKIS: They will use DG-1122, right?

DR. PARRY: Right. And our comments in Appendix B, incorporate our comments on the standard through Appendix A.

MEMBER APOSTOLAKIS: Right.

DR. PARRY: So they will use that. They will write and document their assessment of the -- that the PRA is sufficient -- of sufficient quality to support the application.

MEMBER APOSTOLAKIS: So they will do a peer review, then.

DR. PARRY: No.

MS. DROUIN: They are doing a self-assessment, and they are in the midst of doing that self-assessment now.

MEMBER ROSEN: South Texas has had a peer review already.

MS. DROUIN: But the thing is --

MEMBER APOSTOLAKIS: Where do you come in? And then you come in and review that thing.

MS. DROUIN: We would be interested to know, how did they interpret the stuff in the regulatory guide, such that we have confidence that the preliminary results that they are using in the decision-making, you know, are of adequate technical acceptability.

DR. PARRY: And that we have a common understanding of the standard.

MEMBER APOSTOLAKIS: But you would also have to look at the PRA.

MS. DROUIN: Yes.

DR. PARRY: We will have to look at that.

MS. DROUIN: We will have to look at the PRA.

MR. JOHNSON: Can I just say a couple of words? This is an area where our thinking is evolving, and Mary and Gareth are sort of describing how that thinking is evolving.

Remember, we're shifting from a guidance development stage to a guidance implementation or a guidance trial implementation stage. And so we recognize that the industry is going to be trying to use the guide. We want to use them on a limited number of applications.

We want the staff -- our folks -- to be able to try to use that guide in terms of looking at a specific application that has come in, documented as provided for in the guide, and exercise that -- the guide in terms of looking at that specific application, and what does it mean in terms of how we change our reviews based on the fact that we now have this quality guide.

So that's what we're going to be exercising in this trial period. And as I guess Tony will tell you, we are interested in it. The industry is interested in it. And we are building a plan, and what we want to do is come together at some point and talk about lessons learned from that -- from looking at those specific applications using this pilot and make revisions, or maybe no revisions if it's perfect.

MEMBER APOSTOLAKIS: So you will actually be using the standard review plan, 19.1.

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: Okay.

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: Okay. Shall we go to Tony?

MEMBER WALLIS: Do you want to say that the staff did a good job?

MEMBER APOSTOLAKIS: Not now. Not yet.

MEMBER WALLIS: Okay.

(Laughter.)

MEMBER SIEBER: That would break with tradition.

(Laughter.)

MEMBER WALLIS: Are you going to wait for Tony first or --

MEMBER APOSTOLAKIS: He's going to say it.

MEMBER WALLIS: Oh, he's going to say it. Yes, right.

MR. PIETRANGELO: I applaud the efforts of Mary and Gareth in their development of the regulatory guide, as well as the ACRS comments.

In the few minutes we have, the objective of the reg. guide is really to make the review of applications more focused and consistent. We've already got a lot of history with the review of applications, but there hasn't been a lot of guidance out there. So we see the development of this reg. guide and the standards supporting that as a major step in the evolution that we've come from from the early '90s and beyond.

So this is an important effort. We need to get something out there. I mean, we've been noodling this thing since the standards started being developed several years ago. We've been working with the staff on the reg. guide and comments for about a year and half now. We've got to get a target out there that people can at least use for trial use.

We mentioned last week at the end of the meeting on this reg. guide that we think this effort would benefit from a pilot program before trying to apply this industry-wide for any risk-informed application that would be submitted. We still think that's a good idea. I think the staff thinks it's a good idea.

I've got on my blackboard in my office about six plants. They don't know who they are yet.

(Laughter.)

That would be good pilots for this that are planning applications.

MEMBER ROSEN: Oh. You mean South Texas doesn't know they're --

MR. PIETRANGELO: No, they know they're one. They know they're one. But what we want is a mix of kind of applications that have already been through the old process, like a typical allowed outage time extension and technical specifications, as well as some of the newer applications we're working on, like option 2, like surveillance test intervals, and there's one other. Which one am I forgetting?

MEMBER ROSEN: Tech specs?

MR. PIETRANGELO: Yes. The South Texas --

MEMBER APOSTOLAKIS: So the pilot

applications will be regulatory applications.

MR. PIETRANGELO: Absolutely.

MEMBER APOSTOLAKIS: Okay.

MR. PIETRANGELO: They will be submittals to the staff, and the technical adequacy part they would use --

MEMBER APOSTOLAKIS: Okay.

MR. PIETRANGELO: -- whatever RG DG-1122.

MEMBER APOSTOLAKIS: That's good.

MR. PIETRANGELO: And we think we need X time for the staff to go over that. We would have -- we would probably form a task force of these six plants and bring them in, so we could interact with the staff as we go through this. Obviously, the AOT extensions are the kind of -- we have a lot of experience with that.

They don't exercise the whole model, so they are very focused, narrow applications, versus something like option 2 that would be a very, very broad application, as well as the South Texas flexible completion time.

So we're trying to get that together, so that we can bring that to the staff and suggest, here's a plan for getting from A to B here with the reg. guide.

This is too important an effort, I think, to just try to apply industry-wide. You had a lot of questions today. We still have a lot of questions with it. But we think it's time -- we agree with the staff's recommendation to issue it now for trial use, so we can have a target. I mean, that's not the question.

MEMBER APOSTOLAKIS: How long will this period be?

MR. PIETRANGELO: I'm thinking on the order of six months, but for some of the bigger applications, like for an option 2 or the South Texas thing, those are probably longer term. But certainly these AOT extension things could be done in a fairly short period of time, yes.

MEMBER ROSEN: But this goes -- let me put some words in your mouth and see if you agree. This goes very much to the question of: how do we get more industry implementation of risk-informed measures? Well, one answer is to get some regulatory framework in place that people can use.

And one of the key questions a long -- for a long time has been: well, is my PRA good enough? And here is the method for saying, yes, it probably is for some things and probably not for others. And here is the way to sort that out.

So in a sense this goes to the question of moving the wavefront, moving it through the industry, getting more implementation. This is a step in the right direction.

MR. PIETRANGELO: It is, but I would argue the point that there already has been broad industry-wide implementation of several of the risk-informed applications.

MEMBER ROSEN: But I would agree that --

MR. PIETRANGELO: Just about every plant in the country has an AOT extension. Just about every plant in the country has done risk-informed ISI. I think every plant in the country has taken advantage of the ILRT, Appendix J option.

MEMBER ROSEN: So to some extent, it's a bad rap to say that there hasn't been much risk-informed implementation.

MR. PIETRANGELO: That is a bad rap.

MEMBER ROSEN: So, but here -- so I'll withdraw that. I'll say, in reality, although some people don't seem to know it, or don't want to acknowledge it, there has been a lot of implementation. But nevertheless, this is still a step -- a good step --

MR. PIETRANGELO: A good step.

MEMBER ROSEN: -- to further --

MR. PIETRANGELO: To me, my analogy is we're on kind of an evolutionary curve with this. Clearly, the applications we're working on now are more challenging than some of these ones that we've done in the past. Okay? And then, therefore, I think the requisite PRA technical adequacy has to be there to support that.

And that's what we've been trying to do with our input to the standards development process, as well as the reg. guide. So, you know, we've got a long way to go yet, but I think at this point we need to get it out there and get some use with it. And we've noodled on it enough, and I think people are starting to get a little impatient with the time this is taking. Okay?

Every plant in the country except one now has been peer reviewed. So the staff is not going to re-peer review any of the PRAs. They're really going to look at how the reg. guide was used to support that application. That's what these pilots are going to be about. And as part of -- obviously, as part of that, they're going to get into some of the details of the PRA that were relevant to that application.

So we hope the committee will agree with the staff's recommendation to issue this now. We're going to come -- we'll be back here again in six months to a year with another revision to this thing, and it will continue to evolve as ASME revises the standard, as the other elements on external events and fire and shutdown get folded into this standard. We're going to be here for a while.

MEMBER APOSTOLAKIS: What is the staff going to do with some of the language recommendations we made today? Are you going to change the language or --

MS. DROUIN: We're going to try and fix it.

MEMBER APOSTOLAKIS: Okay. Especially the frequency stuff.

MS. DROUIN: Yes.

MEMBER APOSTOLAKIS: Yes.

MEMBER ROSEN: And make sure you say "risk achievement worth." Now, what I think -- the safeguard for that is even if they don't fix it the way we like it, it's trial use. It's part of this evolution we're buying into.

MEMBER APOSTOLAKIS: Yes. Okay. So anything else?

MR. PIETRANGELO: There was one question about public participation. Mr. Lockbaum from UCS did participate in a peer review at North Anna I think two years ago.

MEMBER APOSTOLAKIS: I remember. I read about it, yes.

MR. PIETRANGELO: Not that long ago. And I don't want to put words in his mouth -- he wrote a letter to the staff -- but I think one of his recommendations was to expand the review -- the use of the process. So I think that meant he thought it was a good process.

MEMBER APOSTOLAKIS: Well, one of our guys went there, too.

MR. PIETRANGELO: Right.

MEMBER APOSTOLAKIS: Mike Markley, and he also liked what he saw.

MR. PIETRANGELO: That's it.

MEMBER APOSTOLAKIS: Thank you very much.

MR. PIETRANGELO: Okay.

MEMBER ROSEN: Thank you, Tony.

MEMBER APOSTOLAKIS: The staff also did a good job.

(Laughter.)

So back to you, Mr. Chairman.

CHAIRMAN BONACA: Okay. Thank you. And we'll take a break now for lunch until 12:45.

MEMBER APOSTOLAKIS: Very good.

(Whereupon, at 11:37 a.m., the proceedings in the foregoing matter recessed for lunch.)

CHAIRMAN BONACA: Let's get back into the meeting and next item on the agenda is Technical Assessment to Propose Recommendations for Resolving GSI-186 Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants. And Jack Sieber is going to walk us through this presentation.

MEMBER SIEBER: Thank you, Mr. Chairman. I would direct the attention of the Committee Members to Tab 6 of your book. There are several documents including the standard summary that our staff prepares, plus a letter from Farouk Eltawila to John Larkins where he summarizes the recommendations that came out of this look at the issue of heavy loads. And I understand the staff expects or would like a letter from us which would comment on those recommendations and I'm prepared to do that when the time comes.

I would point out that that is interesting reading, but there is a NUREG which is a survey of crane operating experience at U.S. nuclear power plants from 1968 to until 2002 which I read in its entirety, 329 pages in PDF Form F. And it tells me that the issues of crane operations at power plants and this covers not only NRC licensees, but the Navy and DOE, as far as nuclear is concerned, in the period 1968 through 2002.

There is roughly 54,000 lifts made in this category and interestingly, if you look at the percentage of them where the load was dropped or lost control of it, it's very few. About a third of the U.S. nuclear power plants have not had a crane event in their whole history. About two thirds have and I think the winner is one facility with 11 and there's another one that we are familiar with in northwestern Ohio that had three in one month in 1999, so I considered that noteworthy.

And also one of the early ones at Turkey Point 4 resulted in a fatality and that fatality happened to be my former boss. So I'm personally very sensitive to fatalities and injuries, property damage. And the risk to the reactor, if you were to drop a heavy load on safety- related equipment as the study points out, BWRs are a little more susceptible than PWRs in that instance.

So rather than me take away all of the thunder of the staff, I will just say that the work that's been done and the author is here and will present that work, has been well done. It's easy to understand and apparently since events are increasing and most of them are due to human error, additional attention needs to be given by the Agency to these events and practices in the industry.

So with that, I'd like to ask John Flack to introduce the members of the staff who are here and proceed with the presentation.

MR. FLACK: Thank you. My name is John Flack. I am the Branch Chief of the Regulatory Effectiveness. Within that branch, there are three teams, one of which is the Generic Issue Team and Howard Vandermolen to your left is the team leader of that team. The responsibility of that group is to orchestrate generic issue resolutions and the process itself.

One of the generic issues, 186, is the one that this is a technical assessment that Ron Lloyd, to your right, had worked on extensively and as was mentioned, there is a NUREG 1774 that documents that work and Ron will present you that, those insights and the study itself over the next hour and a half.

We appreciate your comments and on completion of this phase we will transmit that document to NRR who is present also to answer also questions in the audience with recommendations that are coming from that site.

So if there's no other questions, I'll just turn it over to Ron.

MEMBER SIEBER: Thanks, John.

MR. LLOYD: I think Jack has already done a real good job of kind of an executive summary of what is here. In fact, we could probably quit after that, everything you've already cited, very good job.

I think there are three objectives that we have in meeting with the ACRS at this time. The first one would be to present the observations that are in the NUREG 1774 which forms the technical basis for the technical assessment of the generic issue. At the back end of the observation presentation, we'll go through and cover proposed recommendations to address some of the more significant issues. And then, of course, as John has already mentioned and that would be to request a response from the Committee by a letter regarding the proposed recommendations whether you would like to add any, subtract any, change anything, whatever you feelings might be on that topic.

If we could go to the next slide, please.

(Slide change.)

MR. LLOYD: This one shows various cranes. The three top photographs are from SONGS-1 decomissioning activities. There's a large mobile crane as you see on the upper left. This is a Lampson 1200 ton crane that was used to take out several components outside of the containment, or bringing outside of the containment. The center one shows a steam generator being removed by that same crane. There's a polar crane that you can see on the upper right which is removing a head. And there's a brand new crane in the lower left. This was installed at Clinton for the turbine building crane. And if you're wondering what is hanging from that, those are bags of water. So if there would be some sort of a failure, you would just have to clean up the water, rather than do damage to the turbine building.

The one that's on the lower right is a recent drop that occurred also at SONGS and they were lifting a 75,000 pound mobile crane from the turbine deck, lowering it down to the entryway when the rigging came apart and the crane dropped and this is a photograph from one of the levels in the floor itself.

MEMBER WALLIS: How did the rigging come apart?

MR. LLOYD: Once again, it was human error. They didn't follow proper procedure as far as having softeners on the corner. It tore a little bit of the Kevlar, once you get a little bit of a tear in the Kevlar and it goes. It did go and then the crane dropped about 40 feet.

MEMBER WALLIS: So it was stress concentration and the Kevlar caused it to --

MR. LLOYD: Right. And it will just kind of disintegrate. It's kind of a binary system.

MEMBER SHACK: And what were they supposed to do that they didn't do?

MR. LLOYD: They should have put some, what is called softeners on the corners to -- at the bend points to keep any kind of cutting or sharp corners from affecting the rigging and they didn't do that.

MEMBER APOSTOLAKIS: So the human errors are primary errors of omission. They didn't do something?

MR. LLOYD: Right. They just didn't do what they should have done.

MEMBER WALLIS: This is an experienced operator?

MR. LLOYD: They've been around for quite a while, yes.

MEMBER APOSTOLAKIS: Now this thing with the water. You said that instead of something hitting something, you're going to have a lot of water.

MR. LLOYD: Yes, these are several bags and they just fill them with water.

MEMBER SHACK: It's a new crane.

MR. LLOYD: You do a test on the crane.

MEMBER SHACK: It's an initial test.

MR. LLOYD: An initial test on a brand new crane.

MEMBER APOSTOLAKIS: Oh.

MR. LLOYD: If they did have a failure, all they'd have to do is clean up the water as opposed to something a little more catastrophic.

MEMBER APOSTOLAKIS: All right.

MEMBER SHACK: It's not a new way to get coolant from one place to another.

(Laughter.)

MR. LLOYD: Yes, this isn't a decay heat removal system. Next slide, please.

(Slide change.)

MR. LLOYD: This is a little bit of background on Generic Issue 186. If you go back in time, a lot of this began with Unresolved Safety Issue A-86 which is in the 1970s which had to do with heavy load drops on fuel assemblies.

MEMBER APOSTOLAKIS: So this issue has been there since the 1970s?

MR. LLOYD: It's connected to this issue.

MEMBER APOSTOLAKIS: But as an unresolved safety issue.

MR. LLOYD: Yes, but this was resolved by bullet number 2, the resolution to A-36 was NUREG-0612. And NUREG-0612 had a whole lot of guidance put in there that talked about human factors issues, good practices and it also had on the back end of this, had a lot of design, calc-related issues, load drop consequence analysis and things like that.

The other NUREG that's associated with that and came out about the same time, around 1979, 1980 was 0554. This NUREG specifies the requirements, design requirements for a single-failure-proof crane that would be utilized in nuclear power plants.

The third bullet is --

MEMBER SHACK: When was 0612 issued?

MR. LLOYD: That was 1980.

MEMBER SIEBER: Yes. There's a Generic Letter.

MR. LLOYD: The third bullet, Generic Letter 8511 was issued by the Agency to eliminate certain things that were required in NUREG 0612 and the things that were eliminated there were requirements to have single-failure-proof cranes in certain situations, requirements for stops or interlocks on the cranes.

MEMBER APOSTOLAKIS: What's a single failure in this case?

MR. LLOYD: Single failure here, they have dual components in the crane hoisting mechanism itself. You have dual drums, fuel lines --

MEMBER APOSTOLAKIS: So it's hardware. Single human error --

MR. LLOYD: It attempts to overcome some of the human error issues.

MEMBER APOSTOLAKIS: But human errors formally is not part of the single failure definition?

MR. LLOYD: No. The Generic Letter said that basically the Phase 2 of this NUREG-0612 was eliminated because of the Agency’s thought that there was a significant improvement in crane performance and therefore the licensees were now required to do those kind of things.

Bulletin 9602 came out. This was as a result of Oyster Creek wanting to move the bigger cask while we were at power and then there were some concerns by the Agency whether or not this was a problem, what would be the risk consequences of moving heavy casks at power and so on.

MEMBER APOSTOLAKIS: Did Oyster Creek have a PRA?

MR. LLOYD: I'm sure they did, yes.

MEMBER APOSTOLAKIS: Was this part of their PRA? Did they evaluate --

MR. LLOYD: That question has been brought up by a lot of people, whether a lot of these issues would be covered in an IPE or did it get missed in the IPE. I'm not certain. I didn't go back and look to see in what detail load drops would have been covered in their IPE.

MEMBER APOSTOLAKIS: Now when the Agency though issues a Generic Letter like 85-11 that says further actions to reduce risk, ah, not necessary.

MR. LLOYD: Not necessary.

MEMBER APOSTOLAKIS: Okay.

MR. LLOYD: Next bullet, in 1999, NRR became concerned, I think, because the heavier casks that were out there decommissioning, more efforts in that area going on. ISFSIs were certainly being established at a lot of facilities and we would have an increase in the number of heavy load movements and so if we've got an increase in heavy load movements, we've got casks that are quite a bit heavier than what they used to be, a lot of these were like 35 or 40 tons in the olden days and now they're around 100 tons or more today.

MEMBER APOSTOLAKIS: Again, when NRR expresses concern regarding the consequences of something, are there any event trees somewhere that can make a case? I looked at the report and it seems to me this would be a good and fairly limited bounded problem where one can go to a PRA with event trees and fault trees and see how dropping a heavy load may affect these event trees because otherwise --

MR. LLOYD: Some of these questions, I think they'll get answered as we go along.

MEMBER APOSTOLAKIS: You're going to show an event tree?

MR. LLOYD: I'll show -- I'll talk about it and we'll see what the connection is. There is an event tree.

CHAIRMAN BONACA: Page 28, since you're so anxious.

MR. LLOYD: We're going to get there.

MEMBER APOSTOLAKIS: I saw it. I'm going to frame it.

MR. LLOYD: So they were concerned about larger capacity casks. Like I said, in the neighborhood of a 100 tons and what that might cause. Because of that, they basically submitted the candidate Generic Issue. That came over to the Office of Research. We had a panel. This got started and in 1999 we started to figure out what needed to be done to address the issues.

Some of the issues that NRR had at the time, in addition to the increase in the number of casks that would be moved would be to develop some kind of a fault tree to establish crane failure probabilities based on real data, recommend whatever changes needed to be changed because of the -- whatever probability failures that we come up with. And then also, to take a look at the impact of single failure cranes versus non-single failure cranes.

For the licensees, a heavy load is basically something that's on the order of one fuel assembly. That varies, but it's somewhere around 2,000 pounds plus or minus a couple of hundred depending on where you are.

For the purpose of this Generic Issue, we looked at not only those kinds of load drops and operating history with those lower weights, but we also tried to emphasize on some of the heavier weights and we called that a very heavy load drop and defined that as a load that was approximately 30 tons or greater. And so we've got kind of two different categories of heavy load weights.

Next slide.

(Slide change.)

MR. LLOYD: As I mentioned as an intro we've got observations and we also would like to propose some recommendations at the closure of this. The technical assessment that contains the basic technical background which is in 1774 has many observations in it and based on those observations we tried to look at the ones that were the most significant from a licensee standpoint and then came up with various recommendations.

The recommendations as John mentioned also will be in a separate document which will follow this presentation and once we get your comments, well, then we can factor those in. We'll come up with actual set of recommendations which then would be cleared through

NRR and then it would be up to NRR then to propose whatever corrective actions would be required to address those issues.

Next slide.

(Slide change.)

MR. LLOYD: The Generic Issue process by way of a little bit of introduction hereto is controlled in Management Directive 6.4 which is the Generic Issues Programs. Stage 1 is the identification which NRR provided this piece of paper to initiate. Because this was kind of at a transition phase between the old system and research used and the management directive which was implemented about that time, Stage 2 and Stage 3 have been basically combined and so these two stages have been completed then by the Office of Research.

MEMBER SIEBER: It was my -- when I looked at the flow chart for processing these, I got the feeling that we're still on this Generic Issue in the screening stage. Is that correct?

MR. LLOYD: We would be at the technical assessment stage. Like I said, we kind of basically combined the two and because of the amount of data that is provided in the NUREG, we felt that we had all these bases covered that could be covered. And then we could propose recommendations then for Stage 4.

Stage 4 would be done by, in this case, by NRR, once we would send a memo with the recommendations in it.

Stage 5 would be NRR once again, we would actually produce any regulation and guidance and issue that to licensees.

Stage 6 would be basically the implementation by licensees of whatever those corrective actions might be.

And then Stage 7 is a verification on at least of a sample auditing basis that would go through and verify that adequate corrective actions were actually implemented and that they were not only implemented, but they were effective.

So it's a seven stage process and in many cases can be quite time consuming.

Next slide, please.

(Slide change.)

MR. LLOYD: What we did here was we chose 19 individual units at these various facilities to go and get actual operating data, failure data from the licensees. We picked them because most of these represent different kinds of designs. They're BWRs, Mark Is, Mark IIs, Mark IIIs, thereby various AE firms. Some of them are in-house like TVA or PG&E. We've got also Gibson Hill, Sergeant Lundy, Bechtel and Brown and Root and so the designs, although the basic design of these plants are similar, a lot of the specifics are a fair amount different.

We also tried to get a spread of PWRs, both CE and Westinghouse and B&W to get a good spread. So we got the failure data going back as far as we could. It either came out from the licensees, it came from NUDOCS, it came from ADAMS. It came from industry people who also sent events to me. And so we tried to get as much of that information as we could.

Then based on the sample size of 19 plants, it was extrapolated with those same design types and then we could get a complete picture for the entire set of plants that exist here in the United States.

Next slide.

(Slide change.)

MR. LLOYD: The database had several categories as you can see here and then also had subcategories that we could sort on to pull up and check for any trends and patterns of problems with either design types, plant types, crane types, age of the plant, how long it had been operating, what caused the problem, what was the implication of the event, what happened because of the drop, or the slip and so on.

The database had 49 individual columns and then, of course, it was many, many rows of entry for those.

Next slide.

(Slide change.)

MR. LLOYD: There were also crane operating experience studies that were looked at. There were a few at least done. The first five that you see there, NUREG 612, a DOE study that was done in 1996, Navy crane data, 1999; an OSHA study which was actually quite good. It was done in 2000. An EEG report which was the Waste Isolation Pilot Plant in New Mexico and so on.

Each of these used a combination of odds and ends failure data. None of these, of the first five had any denominator, so they knew how many problems they had, but they didn't know how many lifts, so you couldn't really come up with a defined frequency.

So each of these studies took their best guess at how many lists there would have been in certain periods of times and at certain plants in order to get the failure data.

The NUREG actually gets a denominator in it and adds some additional clarity to some of the failure probabilities.

Next slide.

(Slide change.)

MR. LLOYD: This one represents all of the reported crane issues and we certainly recognize that things aren't going to be reported all the time at every single facility, but we're working with the assumption here that any kind of a major drop at the facilities would either be picked up by the facility and some sort of report will be fixed up by the resident staff or other operating groups and it would get documented some place.

And so with that in mind we certainly hope that we picked up the major events that are out there.

Out of those, there are 430 that actually had crane issues so you can see the best fit curve shows an increasing trend. A lot of that has to do with the number of events that came out in 1997 and 1998 which maybe the stars were aligned wrong at that time.

Question?

MEMBER KRESS: I don't like your trend

curve. It mixes up construction with operating. So if I were to take a line around 1989 where the number of plants is relatively constant and actually decreasing a little and if I throw out that something was wrong in that year, if I throw that out, I see it as a flat trend.

MR. LLOYD: Yes, you would see pretty much a flat trend in the last decade or so.

MEMBER KRESS: Yes.

MR. LLOYD: This is true.

MEMBER KRESS: Okay, so that would be my assessment of what the trend is. It's probably not getting worse, but that doesn't say that 40 events a year is acceptable, it doesn't say that at all.

MR. LLOYD: If you look at the dotted bars, that actually shows those events that occurred during construction and the cross hatched are operating facilities. It kind of goes away.

If you took just that last decade or so and threw out that one outlier, it would probably be fairly constant, given the number of operating plants.

MEMBER KRESS: Do you have any idea of that outlier other than the alignment of the stars?

MR. LLOYD: I don't know, these are all good events. I would guess that this trend that was seen during the 1997-1998 time period was also the reason, or at least some sort of a background reason why NRR decided in 1999 --

MEMBER KRESS: That might have had an impact on the next year or something.

MR. LLOYD: Yes.

MEMBER WALLIS: The interesting thing is did they learn anything. Are these the same events occurring year after year after year or are they different kinds of events?

MR. LLOYD: They're very similar.

MEMBER WALLIS: So they didn't learn anything?

The rate at the plant is about the same over all this time?

MR. LLOYD: Yes. If you go on to the next slide, number 10 --

(Slide change.)

MR. LLOYD: This one shows the effect of human error and how it's changed over the years. If you go back into the early years, as you can see by the dots there, it's somewhere between 25 and 40 percent of the crane issues were reported to be caused by human deficiencies, somebody either didn't follow procedure, ignored the procedure, did what they wanted to or whatever the case might be.

MEMBER KRESS: Once again, this may be mixing up construction with operation --

MR. LLOYD: It is.

MEMBER KRESS: Because during construction you really didn't have the procedures.

MR. LLOYD: As you go through the years you get up to the last part and it shows somewhere around in the mid-1970s to mid-1980s to where we are today as far as the impact of human error.

The latest study that was done by DOE in 1996 at DOE facilities showed a human error rate of 94 percent and a hardware error rate at 6 percent. So it's even higher than what we saw here with the U.S. utilities.

Next slide.

(Slide change.)

MEMBER POWERS: DOE has gone through quite an elaborate effort to assure things like slings and equipment and what not get tested and checked and monitored, so that the rate of a hardware failure has fallen to zip, but the mistakes are human and they're always the same mistakes.

MR. LLOYD: A lot of them are the same mistakes, that's true.

This slide, number 11, shows crane issue distribution by crane type. If you start over on the right hand side, power cranes, like the one that you see as you look out of the NRC building across at the construction going on, tower crane. The next one down is an auxiliary building crane. MC is a manipulator crane, reactor building crane, mobile cranes, polar cranes and then other. The other category where those cranes obviously didn't fit into these, the ones that are already listed. The main player there is the turbine building crane, but there are others one like rad waste building cranes, fuel building cranes and odds and ends, jib cranes that are out there and some of them that a document was issued and said hey, something broke, something didn't happen as it should have, but it wasn't identified as to what the crane was, but it did occur at the nuclear plant. So that got thrown into the other category.

MEMBER KRESS: When they move fuel out of the spent fuel pool, put it into these dry storage casks, is that accomplished by lifting it out with the crane and --

MR. LLOYD: Right.

MEMBER KRESS: And is the cask --

MR. LLOYD: It's in the pool.

MEMBER KRESS: It's in the pool. You lift the whole thing out?

MR. LLOYD: Uh-huh.

MEMBER KRESS: That's a pretty heavy load.

MR. LLOYD: That's a very heavy load. Most of those, if you get the big ones today are in excess of 100 tons and that would be then lifted, once it was loaded in the pool, it would be lifted out of the pool over the edge, down to a decon area where it would be cleaned off. The top would be seal welded and then it would be moved by -- generally by another crane. It would transport it out of the building.

MEMBER WALLIS: The chances of human error are much less. You have a proper hook and a proper device, as long as someone is wrapping it with a sling and all this, the chances for human error would be much less when you're handling casks.

MR. LLOYD: Yes, that's one of the findings of the report too. We looked at the failure rate for handling very heavy loads versus failure rate for handling all kinds of loads. And I think any kind of a job if it's bigger, if there's a greater consequence of some bad thing happening, well, then --

MEMBER WALLIS: That wasn't the point. In the case of fuel pool, you've got devices which are less likely to be misapplied by human beings.

MEMBER KRESS: Because the cask is made to be lifted.

MEMBER WALLIS: Right, it's made to be lifted.

MR. LLOYD: Right.

MEMBER WALLIS: If he hasn't lifted before, he has to figure out to how do it.

MR. LLOYD: How to do it.

MEMBER WALLIS: And there are ways to do it wrong.

MR. LLOYD: Right. With a cask also, you've got a nice cylindrical geometry. You don't have something that's shaped funny where you're trying to figure out where the center of gravity is.

MEMBER KRESS: You know what the load is.

MR. LLOYD: Exactly.

MEMBER SIEBER: Of course, NUREG 612 put a lot of restrictions on the jigs and fixtures that are -- the companion to whatever it is you're lifting such as a nondisruptive examination and so forth because these things do get damaged from time to time as they're being lifted, so that you have to inspect them to make sure that they continue to be suitable and then they're load tested in a lot of cases.

MR. LLOYD: Some of the fixtures, events in here too have come apart because when they put the fixtures together they didn't really assemble it right. And some of the fasteners that held different parts together then came apart and had either slipped or dropped or it cocked and caused the problem. So yes, there's -- 612 does mention the lifting devices. There's an ANSI standard N14.6 that specifies how those things should go.

Next slide, please.

(Slide change.)

MEMBER LEITCH: This data, I take it does not include smaller things like chain falls.

MR. LLOYD: Right, it does not.

MEMBER LEITCH: It does not.

MR. LLOYD: We're looking at least the heavier loads, something on the order of 2,000 pounds or more, so your smaller I-beam kinds of hoists, that kind of stuff, that you would see like in a diesel generator building or other places where you would move pumps or motors around, yes, wouldn't generally include those.

MEMBER APOSTOLAKIS: And why is that so?

MR. LLOYD: Because the data on those are real fuzzy, a lot of those are in areas where you're just lifting up things like moving scaffolding around, moving odds and ends, equipment from one little place to another place. A lot of that is just kind of good shop practice stuff.

MEMBER APOSTOLAKIS: So there are no locations where dropping something that weighs 1,000 pounds can do damage?

MR. LLOYD: You could, but generally the damage wouldn't be nearly as significant as dropping something that would weigh many tons.

MEMBER LEITCH: Those things would probably not present a clear safety problem, but many times there are industrial safety problems associated with that as kind of --

MR. LLOYD: But you would have injuries that would be associated with those kinds of things. You can also break equipment or smash equipment, but it wouldn't be catastrophic.

MEMBER POWERS: Could you go back one slide, because I thought you were about to make a point and you either forgot to -- SFP, that thing which is over a quarter of it?

MR. LLOYD: That's the spent fuel pool. I didn't mention that one. There's -- depending on the plant design that could be a bridge crane, it could be some sort of monorail crane. There's two or three it could be, a gantry type crane. It could be the reactor building crane. There's several things that could move fuel within the spent fuel, so if it was moving things in the pool, well, then it was categorized as spent fuel pool.

MEMBER POWERS: So that's an issue because it's a piece of the pie.

MR. LLOYD: Right.

MEMBER LEITCH: I'm surprised that mobile is not a bigger piece of the pie. I mean my experience would seem to suggest that mobile cranes were in the operation phase, particularly where involved in more of these episodes than the permanently installed.

MR. LLOYD: Not as many. There are obviously a number of issues associated with mobile cranes. Most of the mobile crane things are done outside of safety-related areas. There are a few times where it would be -- a mobile crane would be brought inside the facility some place, but it's limited. The number of lifts that would actually be done, like during a refueling outage would be a much smaller fraction say than what we would lift with the polar crane or reactor polar crane or a turbine building crane.

MEMBER LEITCH: So this data is related is -- is limited to safety-related areas?

MR. LLOYD: No, it's not. It would be just the larger weights, lifts at power plants.

MEMBER SHACK: But if I looked at problems per lift, would I get a different looking distribution here? Would mobile suddenly pop up?

MR. LLOYD: No.

MEMBER SHACK: No?

MR. LLOYD: No.

MEMBER SIEBER: Mobiles quite often show up as switch yard problems. They're the only --

MR. LLOYD: We'll look at mobile in a couple more slides, we'll talk about mobile cranes.

MEMBER ROSEN: It's not necessarily just dropping things, but running into things but hitting power lines with a boom.

MR. LLOYD: Exactly.

MEMBER SIEBER: You can kill people that way.

MR. LLOYD: Yes. Mobile cranes are -- I don't think I'd want to be a mobile crane operator.

Next slide.

(Slide change.)

MR. LLOYD: This one shows the types of cranes involved in drops and slips. If you look at the one on the left, load drop. The load drop we defined as an uncontrolled lowering of a load that also created an impact with some other component, the deck or whatever, so you actually had some damage done and there would be a load drop.

A load slip is just where you had a lowering, some kind of a failure.

MEMBER ROSEN: But it was arrested.

MR. LLOYD: But it was arrested before it actually hit anything and it came to a halt.

The crane component drop, the one over on the right hand side is kind of interesting. This is caused by cranes colliding with other components, knocking things off of the crane, either I-beam parts, miscellaneous parts that fell off, a pendant that would get ripped off of like a polar crane and drop.

MEMBER ROSEN: Where would you put a jib crane operating in a containment smacking into the polar crane?

MR. LLOYD: That's happened.

MEMBER ROSEN: I know that, but where would you put it on your chart?

MR. LLOYD: Where would we put it? It

would be the perpetrator on most of those and like we've got one where there was a death that was related to that.

MEMBER ROSEN: You're trying to answer a very different question. Just look over your shoulder and tell me which of the three things on the screen now, where would you put that event?

MR. LLOYD: Most of these, if they were similar events would have affected more than one thing, well, then it got double hits. So there's not a one to one relationship.

So one event might create a jib crane problem --

MEMBER ROSEN: Maybe you don't have the standard or maybe you're trying to duck my question, but I wouldn't know where to put a crane impact on another crane on this chart.

MR. LLOYD: If the one crane were stationary and just sitting there and an operator had another crane, was moving a load and ran into it, that would be just a crane collision on the part of the crane that was moving.

MEMBER ROSEN: Right, and where would you put that on your chart?

MR. LLOYD: That would be just the one

event on the crane that was moving the load.

MEMBER APOSTOLAKIS: So there's no category there?

MR. LLOYD: No. That would go on whatever crane that happened to be moving. So if that was a polar crane that was moving a load across and slammed into a jib crane, well then the polar crane took the hit.

MEMBER APOSTOLAKIS: So once they collide and there is a drop, it's a load drop, right?

MR. LLOYD: Then it would be a load drop.

MEMBER APOSTOLAKIS: I see.

MEMBER SIEBER: I'm familiar with an event where they had bypassed the upper limits on the crane, the operating, whatever he was doing, raised the hook and tube locked it which separated the cables and the hook and the bottom sheaths fell into the spent fuel pool. Would that be in that far right circle there?

MR. LLOYD: That would be a -- it would not be in the far right. This was just to encompass odds and ends parts that came off of a crane.

MEMBER SIEBER: As opposed to a major thing which is the hook.

MR. LLOYD: Right, the hook itself, the block assembly or the load that it's carrying.

MEMBER SIEBER: Once you drop the hook, you've got nothing to pick the hook up with.

MR. LLOYD: It makes it a little --

MEMBER ROSEN: Hard to recover.

MR. LLOYD: Right, hard to recover. Next slide, please.

(Slide change.)

MR. LLOYD: This one shows the crane events that were actually due to hardware deficiencies. As you can see over 50 percent of these were rated in the category of none. These included programmatic issues, testing issues, administrative issues, procedural compliance problems, load path noncompliance and tech spec kinds of issues, so if they failed to do any of those kind of things, but it didn't result in any kind of a hardware problem, well, then it got thrown into the "none" category.

If you look at the various components, you start with -- you know that there was a problem, but nobody specified exactly what broke, but obviously something did break, well, then it went into the unknown category and there are only seven of those. You had brakes, rails, the number of polar crane rails that have had problems, a number of bridge type cranes have also had problems, the rails. Fasteners, most of these fastener problems that are shown here have to do with anchor bolts for odds and ends parts, also fasteners that would actually hold the various bridge components together.

The structure category related to the actual structural problems and in a few cases they have dented the structure, ground stuff into it, tube locked it, pressure test inside containment, and ended up damaging the bridge components.

If there are weld deficiencies, cracks in welds and there have been a number of cracks in welds in polar cranes and other bridge type cranes, then well, it got in the structure category.

Components would be miscellaneous type components that were there. Below the hook category, as you can see here is basically any kind of a deficiency below the hook and you're looking at rigging problems, lifting device problems, things like that, things coming apart and there's a number of below the hook issues.

The control system would be anything related to the control panel on the crane or a pendant for the crane itself and there have been a number of issues there.

MEMBER SHACK: But the below the hook

wouldn't include the Kevlar where the guy didn't put the load shifter in?

MR. LLOYD: That is below the hook.

MEMBER ROSEN: But is that a hardware deficiency or a human error?

MR. LLOYD: That would get classified as both.

MEMBER ROSEN: It's human error below the hook.

MR. LLOYD: It's human error below the hook is the area that's affected.

Next slide.

(Slide change.)

MR. LLOYD: These are the principal reasons that came out for the various events that were recorded. The bigger category, not following procedures. We've already mentioned there are several kinds of things that might go into that, not performing tests, not doing the procedure, all those kinds of things.

Operator errors, there are a few of those where the crane operators are actually moving things and then the operators in the control room decided to change system alignment that caused problems. And so the two weren't talking to each other.

The -- poor procedures, they actually had a procedure, and followed the procedure, but it got them in trouble.

Engineering design, this would be outside the scope of the crane operator himself, but certainly there are several design issues associated with their crane problems.

There was a notice that came out this morning, in fact, on Itera cranes, having to do with wire rope and evidently a part 21, so there are odds and ends design things that do come up.

The next category, ventilation, each time you move fuel, you have to have your ventilation so you have a negative pressure inside the area in case you did have some kind of an accident where you dropped fuel and had a radiation type accident.

And so there are many times when they are actually moving fuel and they had inadequate ventilation.

MEMBER ROSEN: So how is that a crane event?

MR. LLOYD: It's a crane event in that the crane operating procedures requires to go through those steps to make sure that you have done this and this and this as part of operating the crane, whether it be surveillance test operations, it's just simply to operate the crane you have to go through a number of wickets and one of those, if you're in the fuel area, you would have to make sure that you had adequate ventilation. So it's a crane operator screw up.

The "did not test", this would be refer to doing surveillance tests on the crane. The vast majority of the cranes require several different kinds of tests before you would actually lift the load and so there's a number of tests that should be done and in a lot of cases weren't done and they were on their way.

The load path issue is -- each of the crane operating procedures will have load paths specified where you can lift how far up off the deck or where are you going to go with that load and it's a very defined kind of a process. And in some cases that just gets violated. People think they've got a better idea on how it should be or they just didn't read it right, didn't understand what the procedure was. And it went on a path that was not specified by the procedure.

MEMBER SIEBER: Would that include being in excess of your calculated height?

MR. LLOYD: Yes, it would.

MEMBER SIEBER: Okay.

MR. LLOYD: Right, so if you had a procedure that said I can lift this 24 inches off the deck and in some cases the licensees have violated that by not only inches but feet, they've obviously violated the procedure and the load path.

MEMBER SIEBER: If you drop it, it goes through the floor.

MR. LLOYD: It could very well go through the floor and we'll talk about that one in a minute too.

MEMBER LEITCH: Ron, should this slide -- I'm just trying to understand. Should this slide be properly titled "Principal Reasons for Non-Hardware Crane Events"? In other words, is this a breakdown of the 235 events on the previous slide?

MR. LLOYD: It would be for any kind of event. If you have a hardware event, if you drop a load, what is the cause of that? Did you violate the load path? Did you not test it? Did maintenance screw up something? Did you have ventilation problem in design? Poor procedure. Maybe the procedure got you down that path or maybe you didn't follow the procedure and you dropped that load. That one specifically, if you had a load drop, then the reason for that -- assuming it was just a failure that occurred, then it would be outside the scope of the operator and it wouldn't fit into this kind of situation. So you're correct on that.

MEMBER LEITCH: So this is a breakdown of non-hardware related events?

MR. LLOYD: Right.

MEMBER LEITCH: Okay.

MR. LLOYD: Next slide.

(Slide change.)

MR. LLOYD: This one shows the impact of the various crane events and once again, you've got about 50 percent of these crane events that were documented that had no impact on anything, so there is basically no safety significance. There was a violation of some sort, but it didn't result in a major problem, so you're looking at programmatic issues, once again, procedural noncompliance, but nothing broke, not really affected.

Going around to the left, equipment issue refers to where you either damage the crane, if there was a problem with the crane, the crane ran into something, the crane dropped something. There was an equipment damage issue, whether it was with the crane or caused by the crane.

Load drop, 57 of those events that actually occurred, so you'd obviously damaged the load that you had when you dropped it, and you probably damaged whatever it hit.

Fuel drop damage, about 30 of those kind of events. There had been a number of injuries. It shows 16. These are 16 events, not 16 injuries. A bunch of those injuries were multiple people were injured, same thing with the death. In a couple of cases, I think there were three or four people died in one event. So there were 10 events that had to deal with death.

The loss of power part of the pie shows 10 there. Out of those 10 loss of power, 9 of them were caused by mobile cranes. There's your impact with mobile cranes.

The radiation section there where it says 3, these weren't areas where you violated a safety boundary, but it was where you lost radiation shielding. Either a component was coming out of the spent fuel pool or it was coming out of some other sort of a storage pool. It was raised up too far, i.e., they violated the procedure again and there was an increase in the radiation exposure. So it wasn't caused by damage to some kind of a component.

Next slide.

(Slide change.)

MR. LLOYD: This one shows the slip distribution over time and most of these slides also show the number of plants, so you can kind of normalize your own feelings there. If you look at the first decade there were a couple of events. Second day, there are a couple of events. The third decade there were eight events. So there certainly has been increase in the slip, but it's not a lot. If you look at the last decade and a half or so where we've had kind of a constant number of power plants that have been operated, they appear to happen every couple of years.

Next slide.

(Slide change.)

MR. LLOYD: This is the load drop distribution and it shows the dotted ones on the bar charts that are for construction. Then you can see the operating load drop. The line there shows it's pretty much flat. If you take into account the large increase in the number of operating units, the performance obviously has improved with time. And over the last several years, it's actually been not too bad.

MEMBER POWERS: Do I know that? I mean the number of events, load drops is okay roughly constant, but do I know the number of lifts?

MR. LLOYD: I know the number of lifts in there too and that has certainly been figured in. So here for load drops there's been 57 load drops and once again we're looking at the weights that are on the order of 2000 pounds or more.

The next slide --

MEMBER LEITCH: I suspect some of the earlier years in the construction phase particularly, your data may be quite incomplete.

MR. LLOYD: Right, exactly.

MEMBER LEITCH: Okay.

(Slide change.)

MR. LLOYD: Load drop incident rate. Ended up plotting two curves here. One shows the upper curve, shows all load drops and then that is divided by the number of cumulative reactor years of operation. And as you go along, you can see how that works.

As you get out into the 1998-1999 time period when things started to go back up again because we did have some events within, we also got a number of additional plants that were operating in that time period, so it stayed kind of level out there.

MEMBER RANSOM: You didn't differentiate between the decommissioning accidents and the operating plants accidents.

MR. LLOYD: I didn't go into decommissioning accidents. These were basically operating units.

MEMBER RANSOM: Okay. I mean but there are accidents associated with decommissioning in this declining period?

MR. LLOYD: This does not show the -- I don't believe -- there may be one or two in there, but it's basically insignificant.

MEMBER RANSOM: Oh really?

MR. LLOYD: Yes.

MEMBER RANSOM: I thought your first slide seemed to indicate that a number of decommissioning examples.

MR. LLOYD: No. The lower curve shows only the very heavy loads, so this is the number of load drops divided by the cumulative operating time and we're only looking here at those loads that would be 30,000 or 30 tons apiece and so there's been a declining trend there too.

Next slide.

(Slide change.)

MR. LLOYD: This is kind of an OSHA basic slide. It talks about deaths. It's a little bit of a rehash of previous slides, so you can see the cranes that would actually be involved on the death events. Three of those have been mobile. Five others, which would include the turbine building cranes and a few deaths that were associated with them, tower cranes, and then a manipulator crane. If you go to the injuries, there have been more injuries and there have been some injury events associated with the -- like the reactor building crane, the bigger cranes and also the polar crane. But mostly it's the other category which would be outside of safe related areas.

Next slide.

(Slide change.)

MR. LLOYD: There's been a number of fuel assembly events over the years. If you look at the trend here, it's easy enough to see that there is an improving trend, particularly within the last couple of decades. A lot of fuel events occurred earlier on. I would assume you had start up issues, moving things around, unfamiliarities and so on. So on a percentage basis, on the number of plants and number of fuel assembly problems, you've got a higher incident rate in the beginning and it drops off with time.

Next slide.

(Slide change.)

MR. LLOYD: Here's the one that was kind of referred to earlier and has to do with the mobile crane issues. Once again the dotted bars show mobile cranes during construction period which died off by the time we got out to about 1990 and then you've got the last decade and a half or so which are predominantly operated facilities.

If you look at the first decade there were six events in there. During the second decade there were about 17 events and during the third decade there were 15 events. So if you look at the number of operating units, once again, the number of lists that would be done there seems to be at least some sort of improving trend, if slight, for mobile cranes.

Next slide.

(Slide change.)

MR. LLOYD: These are the loss of power events. As I mentioned earlier, there have been 10 total that were caused by crane operation. Nine of those were caused by mobile cranes. They either fell over, tipped over, ran into lines. Once again, almost all of these were because of human error. A lot of times the boom was left up and they drove into a line. There are a lot of varying kinds of combinations of what they did with the mobile crane, but 9 of the 10 were caused by mobile cranes. There was one bridge crane and not all that significant.

There were a couple of these mobile crane issues here that ended up resulting in AITs at Diablo Canyon and Palo Verde.

MEMBER ROSEN: Was this the one in the switch yard? What plant was that? Vogel.

MR. LLOYD: At Vogel, it wasn't a crane, it was actually a truck backed into a piece of equipment and caused a trip, so it wasn't a crane, but it was a truck running around, once again, not following procedure.

MEMBER ROSEN: But that wouldn't show up in your data base because it wasn't a crane?

MR. LLOYD: Right. The one crane that was a little bit humorous, I won't mention the plant, but they moved the mobile crane up into position, the operator got out, failed to secure the boom and wind came up and ran it into a line and then it acted as the ground, had the stabilizer bars out and it was on an asphalt road and the current going through that down to ground got hot enough to where it lit the asphalt road on fire and burned the crane.

(Laughter.)

Sometimes things don't turn out the way they should.

MEMBER POWERS: This is the one the PRA tells us is 10^{-9}, George?

MEMBER ROSEN: It's model uncertainty.

MR. LLOYD: Next slide, please.

(Slide change.)

MR. LLOYD: This one is the below-the-hook, so this would be anything that would be connected to the hook, whether it's some sort of sling affair, lifting device, whatever you might have, that would be connecting that in. There's been an increasing trend, obviously, that's fairly disturbing over the last decade, as you can see. Some of this has to do with just increased use of synthetic materials for rigging and as you can see, too, by the way the cross hatching is here, there's been a number of these that have been load slips where part of the rigging has come apart and it's actually slipped. Some of them are drops where it totally disintegrated and the load came to a drop and caused equipment damage. Some of them were just administrative. But nonetheless, there's been a significant increase.

MEMBER POWERS: It seems to parallel the number of notices that OSHA sends out on rigging errors and what not, so is that telling us that the OSHA program is causing --

MR. LLOYD: I wouldn't want to speculate.

(Laughter.)

MEMBER LEITCH: I would say below-the-hook events, rather than being crane events in the classical sense of the word are almost by definition rigging errors.

MR. LLOYD: Right.

MEMBER LEITCH: And I think one of the things that may be related to this is there used to be a trade or craft called a rigger. And many utilities in an effort to try to minimize the number of specialties are going to a more general craft training and one of the things that is of some concern to me and this data would seem to support it is there is some specialty kind of training required and rigging is one of those trades or crafts that I think that's important and you can't just be a generalist and go do that, but I think in some cases that effort is being made to just -- anybody can figure out how to rig something, just go do it.

MEMBER POWERS: Graham, I believe that under OSHA rules you have to be trained to rig.

MEMBER LEITCH: Yes.

MEMBER POWERS: Now, it's not a craft. It's like you say, anybody can go take the training. In fact, I had the training, but --

MR. LLOYD: Did you ever have any load drops?

MEMBER POWERS: Say that again?

MR. LLOYD: Did you ever have any load drops?

MEMBER POWERS: No, but they do make you do tests and what not and the only reason I took it is I was requiring all my people to take it and so I could show them this is good for them because the reaction was, yeah, I know how to rig this thing and you don't, you really don't. And more important is just what he said. They have so many different things out there for slings and rigs and what not that you see them, and you say well, I can use this for everything, but you can't. It's meant for some particular situations and not for other situations. And so you have to -- but I think according to the OSHA rules, you have to have had the training. It's about a 4-hour course.

MEMBER LEITCH: Yes, but what I'm saying is there used to be a set of folks that made their life work out of doing this kind of thing and we've kind of lost that, generally, at most of the plants I'm familiar with.

I agree there's some minimal training that you get, but --

MEMBER SIEBER: Let me ask a question of the plant guys. When we made heavy load lifts, we hired a company which are a bunch of them that do rigging and bring their own cranes and everything. And you know main unit transformer, stuff like that. I sort of thought that was the general practice because we would trade transformers with other plants and things like that and they had the same companies do that work.

Did you --

MEMBER LEITCH: If you're lifting something like a main transformer, absolutely.

MR. LLOYD: You can't afford a problem.

MEMBER LEITCH: You would use a contractor for that.

MEMBER SIEBER: Anything other than a station crane, we used to take our own turbines apart, but the big loads we always hired folks.

But these loads are not necessarily -- I mean they're more than 2000 pounds.

MEMBER SIEBER: A thousand kilograms.

MEMBER LEITCH: Yes, but we would lift stuff like that with our own guys.

MR. LLOYD: The lighter weights would generally be lifted by in-house people, a lot of the heavier stuff.

MEMBER LEITCH: Yes, the heavier stuff like the main transformer unit, you'd use a contractor.

MEMBER SIEBER: Motors and pumps and things like that that you're doing maintenance on, you do in-house.

MEMBER POWERS: Do you separate out in-house crane problems versus contractor crane problems on the site?

MR. LLOYD: Not really, a lot of the documentation isn't that specific that you could do that with any real -- without just going into each incident.

There was one rigging situation where rather than put the softeners on the corners for the Kevlar which is definite that you have certain kind of foam pieces that would actually fit in there, there are specific thicknesses and so on. They wanted to hurry up and do the job, so somebody had a leather glove and they just stuffed their glove in there and of course, it went through the glove and then the load dropped and that was one of the problems.

The one down at Turkey Point where they dropped -- most of this stuff is really related to human errors and the need, I guess, to hurry up and do the job and if you think you're a little bit smarter than the procedure, well then that's what you do. You try to bypass that and get the job done. And sometimes that backfires.

Next slide.

(Slide change.)

MR. LLOYD: This one shows the very heavy load slip distribution over time and most of these are very big. Starting from the left one, heading over to the right, the first one is Dresden. This was the reactor pressure vessel head that slipped about a foot and a half or so when they lifted it with their quote unquote single failure proof crane.

The next one over was an upper guide structure at St. Lucie 1, same kind of thing. It slipped about a foot or so.

The next one beyond that was the reactor pressure vessel head at Fort Calhoun that slipped.

Next one over is ANO-1 and that was the reactor pressure vessel head that slipped.

Next one over is Byron and this was a steam generator runway piece that was a specialty item that ended up slipping.

The next two that are 1999 and 2000, one was at Crystal River and that was the reactor plenum which was a below-the-hook issue here rather than the crane itself and the most significant one out here and most exciting is the last one here and that's Comanche Peak which occurred in 1999. At this point they were removing a reactor coolant pump motor, bringing it up through the room that it was in. They had to use a specialty small crane that was kind of a modified crane. That was then hooked to the overhead polar crane. That went down inside, picked up the motor. There were a couple of riggers that were actually on the motor and rode the thing up as it was going up and as it went up a ways got outside of the enclosure. At that point the gear box and everything on the smaller crane came apart and basically disintegrated and it started to unravel.

A couple of the operators which were interviewed jumped off just at the right time as the thing was going down. It was a total luck-out in that one of the chain links on a modified crane jammed and stopped it and that's how it stopped. If it wouldn't have been for the fact that you had a chain link that got jammed in the system, it would have gone all the way down and crashed into the reactor coolant line.

MEMBER WALLIS: Bent the frame of the crane when it came to rest?

MEMBER POWERS: No, it would have bent the reactor coolant system --

MR. LLOYD: It would have slammed right into the pump.

MEMBER WALLIS: So what was the chain attached to it that stopped that?

MR. LLOYD: The chain was attached to the hoist which was a modified hoist and then that was attached farther up to the polar crane. The hook on the polar crane was too big. It couldn't go down into the enclosure, so they had to use a smaller --

MEMBER WALLIS: That hook stopped it. That hook took the load of the chain?

MR. LLOYD: That was the chain that was actually ran through the gear drive on the hoist. It wasn't a rigging chain.

MEMBER WALLIS: Known as the holy chain.

MR. LLOYD: That one was fairly interesting and certainly scary for the people that were there.

Next slide, please.

(Slide change.)

MR. LLOYD: This one shows the very heavy load drop distribution. Once again, 30 tons or greater. Going from left to right, some of these are fairly spectacular. The first few were at construction sites. The one is the statter at Turkey Point 3 that got dropped. You've got Ginae. These were miscellaneous reactor components. They weren't actually installed yet, but they got dropped.

The one over 7172 block is IP-3 where they dropped the entire pressure vessel when it was being set up inside of --

MEMBER WALLIS: When you say dropped, most of these were just slips, where it dropped a little bit and nothing happened?

MR. LLOYD: This is a drop.

MEMBER WALLIS: A real drop onto the --

MR. LLOYD: Yes. Every one of these are drop on the floor, right.

And so this was the actual pressure vessel that had been uprighted and then the wire rope disintegrated and the whole pressure vessel fell over on its side. So IP-3.

Next one over in the middle is River Bend. They were putting the dome on the reactor building and this was a form that was used where you would then pour the concrete in it. This weighed over 400 tons and it was being lifted by a mobile crane and it got up part way and then the crane collapsed and everything fell down and it dropped about 30 feet and slammed into the ground. So that's River Bend.

Next one over is Byron and that's some steam generator replacement parts. Once again, by a mobile crane.

The last two on the right are turbine building cranes where they actually dropped a mobile crane and these two were done within about a week of each other. San Onofre, the photo that I showed you right at the very beginning, that was at SONGS and people down at Turkey Point said hey, I think something happened at SONGS, we ought to find out about it before we go move our mobile crane and they tried a couple of times to make phone calls and get information on what really went wrong when the mobile crane dropped and was dropped by the turbine building crane and they couldn't get through to the right people and time was running out so they decided they needed to hurry up and do what they were going to do. And so they did it anyway and exactly the same thing happened and they dropped their mobile crane, although it only dropped about a foot. And so it wasn't catastrophic as the San Onofre one.

So as you can see there, these are the very heavy load drops. Most of these occurred during construction periods at sites. The later ones from the time that we actually had any real direction on how to do load movements and so on. You end up with the three that occurred within the last few years. All three of those were failures of the rigging and not the crane and I think it was mentioned over here that you don't really have a crane problem per se. So you need to look at it that way. It was actually rigging failures. So all three of these that occurred within the last little bit were all caused by human error and rigging problems.

MEMBER WALLIS: Is this because the device doesn't have a proper protocol for rigging it? It doesn't have the lifting lips and things to -- you know exactly where to attach your slings, so therefore they get wrapped around corners and put on in some ad hoc way, is that a lot of the problem?

MR. LLOYD: It's not like a lifting device like you would lift a head or some other -- like lifting a cast out of the spent fuel pool. You've got a very definite lifting device that attaches in very specific locations.

MEMBER WALLIS: That would seem to be much more foolproof.

MR. LLOYD: Right, and that's much more foolproof.

MEMBER WALLIS: And then you have to swing around some odd-shaped object and I'm not quite sure where its center of gravity is and that it might slope.

MR. LLOYD: Exactly. Those are the ones where you get problems.

Next slide, please.

(Slide change.)

MR. LLOYD: One thing that I did, as I went around to all the different utilities, those 19 individual units was to not only gather operating data, failure data, how many lifts they actually did on a refueling basis during the year, previous years, what they lifted, how much it weighed and so on. I gathered all that information.

In addition to that, I gathered the load drop calculations that they had that were heavy loads to see the degree of rigor in the calculations and to see what their actual results were. Because the load drop calculations are used to, as input to their load control programs, it would say here are my load paths. Here are my load restriction heights. Here are my restricted areas for various kinds of loads. So load calculations have a lot to play and there were several things that were very interesting to me and to others as I started gathering this data. The load drop calculation assumptions varied quite a bit on how they did it, depending on the date of the calculations. If you go back into the 1970s, a lot of the load drop calculations were ballistics kinds of equations that were really meant for high velocity, low mass situations and then like bullets and other things, missiles. And they were being applied to situations of low velocity and high mass. And so that certainly caused problems.

Other utilities made comparisons with ductility ratios. Some of the later ones looked at kinetic energy developed in strain energy that would have to be absorbed by whatever got hit by the load.

Load drop consequences. As you can imagine, there was a huge disparity, very similar scenarios with similar weights, with similar targets. Most of the targets for these heavy loads are floors that are approximately two feet thick with rebar, heavily rebarred and you just have an incredible range of what the outcome was, all the way from it goes through the floor at a few inches to it won't go through the floor at 6 to 7 feet. So big differences in the consequences.

The load path controls, I already mentioned that. There's been a wide range of how licensees control their load paths.

Next slide, please.

(Slide change.)

MR. LLOYD: One of the things we were trying to do here too was to look at single-failure-proof cranes and what the impact was on risk and safety and so on. What we did find out was that the guidance information, as already been mentioned by a few of you, the NUREG 0612 and 0554 is fuzzy in a lot of areas and it's left up to a lot of interpretation. So it's vague. This has been a complaint by the industry. It's certainly been a complaint by manufacturers, crane manufacturers.

Crane classification issues, there's certainly a concern whether or not I have a single-failure-proof crane or I don't have a single-failure-proof crane. If my crane is 99 percent single-failure-proof, what does that buy me? Is there any kind of an advantage that I get from the Agency? And if you wanted to upgrade a crane from non-single-failure-proof to single-failure-proof, then what do you actually have to do. And those things are really indeterminate and a lot of it is left up to interpretation. And it certainly causes problems, obviously in trying to work with that.

MEMBER LEITCH: Is there any clarity as far as the single-failure-proof imply redundant up limit switches?

MR. LLOYD: You'd got redundant parts. All your critical parts with a single-failure-proof crane with the redundant, you'd have two drums, for example. The rigging system would be doubled. Some of the switches would be doubled. The hook has a double hook on it as opposed to a single hook, so there are a lot of things that are doubled.

The actual bridge itself that would carry the hoist is basically the same.

MEMBER LEITCH: I was concerned about up limit switches. It seems to me reading through your stuff and my experience in several tube locking situations. Now Jack mentioned one that he knew of where the switch was just tampered with and intentionally defeated, but I mean I've seen a couple cases where the up limit switch fails.

MR. LLOYD: Right, this is one of the big advantages between a single-failure-proof and a non-single-failure-proof. To be a single-failure-proof crane, you have to be able to test it and show that you can run the crane up and tube lock it and that you're not going to break things. You will not result in a drop load.

MEMBER LEITCH: Okay.

MR. LLOYD: You will not result in pieces coming apart, or if they do, you have the redundancy to take care of it. And so like the manufacturers of single-failure-proof cranes today have to generally show, provide an affidavit that they did that test, that they did tube lock it and it survived.

MEMBER LEITCH: Okay.

MR. LLOYD: So that's obviously the real big advantage to a single-failure-proof crane is you do have those redundancies that take care of at least some of the human error that might occur if a crane operator is not watching what they're doing.

So that's the advantages to a single-failure-proof crane. You obviously can overcome some of the human error issues and you have that additional redundancy.

The downside, if you look at all of the statistics and say well, out of all the very heavy loads that were out there, would it have made a difference if this crane would have been single-failure-proof? And the answer is no, because they've occurred because of other problems, right? There have been rigging problems, other problems that had nothing to do with the fact you got a single-failure-proof crane. And so human error in a sense defeated the purpose of a single-failure-proof crane.

Next slide.

(Slide change.)

MR. LLOYD: This one shows a generic load event drop tree. Once again, it is generic. It just kind of goes through the various steps that could occur, if you have a various load drop.

MEMBER ROSEN: What's SSE in this context?

MR. LLOYD: It's not an earthquake. That's safe shutdown equipment. And so starting with the left hand side what we have on a reactor basis is right now at our operating facility you're looking at around 20 to 25 lifts per reactor 80 tons or greater.

And so you've got a certain error rate which is that next slot, next gate. If you include all three very heavy load lifts which were all outside of safety-related areas, and had to do with rigging problems, but if we stuck them in there anyway and we had 54,000 lifts during that time period, then you end up with the 5.6 E-5.

MEMBER WALLIS: This drop over SSE, isn't the rigger going to not pick up the thing and maneuver it over an SSE?

MR. LLOYD: You would hope that they wouldn't. That's why the probability for that next slot is less than 1 percent. So once again, you'd have to have a human error. You basically have to violate the procedure in the load path in order to make that kind of a thing happen.

MEMBER SIEBER: A crane operator ordinarily wouldn't intuitively know that, because they're an operator. And so unless you mark on the floor where the lift pads are --

MR. LLOYD: Yes, some licensees have a horrendous paint budget and you'll go out and look at their place and they've got their load paths marked not only interior, but exterior to the building where you may have underground lines like service water, other kinds of lines. And so those would be marked also, so it would keep people from having to drop something in a critical area whether it's underground or what not.

MEMBER APOSTOLAKIS: Who is going to use this event tree?

MR. LLOYD: The event tree was just -- it's a -- like I said it's a generic event tree. It's not specific to any one plant, but it just kind of gives the overall idea as to what might happen.

MEMBER APOSTOLAKIS: So you are giving this to a utility to do something with it?

MR. LLOYD: It's just to look into be sensitized to where things might really fail.

MEMBER APOSTOLAKIS: So you're not asking them to do anything specific.

MR. LLOYD: No.

MEMBER APOSTOLAKIS: Why not?

MR. LLOYD: They certainly could, sure, yes.

MEMBER APOSTOLAKIS: For example, one could use something like this to screen locations where --

MR. LLOYD: Exactly. You could use the tree --

MEMBER APOSTOLAKIS: You could be challenged.

MR. LLOYD: You could be challenged. And that's the end result over there at the end state.

MEMBER APOSTOLAKIS: Because I think if you try -- have you tried to apply this to a natural plant?

MR. LLOYD: No.

MEMBER APOSTOLAKIS: Because it seems to me this could only be the starting point and I see these load drop events as being very serial to what we call external events. So you are really building on the existing baseline PRA.

So, for example, you would be asking questions, can I have a load drop that at the same time would cause an initiating event and fail some of the systems? And unless you really tried, you can't appreciate that.

MR. LLOYD: Right.

MEMBER APOSTOLAKIS: That's why I asked you the question earlier. I saw these recommendations or proposed recommendations that you have there. None of them refer to this kind of analysis or PRA-based analysis. Why is that?

MR. LLOYD: I think the ones we came up

with were the bigger hitters. And of course, this is why we're presenting this to you, to see if you have any additional items that would like to -- you'd like to throw out for --

MEMBER APOSTOLAKIS: So this is actually a red flag for the ACRS?

MR. LLOYD: Right. But no, you could use this --

MEMBER APOSTOLAKIS: Harold wants to say something.

MR. VANDERMOLEN: I'm Harold Vandermolen, the Generic Issues Program Manager. And we did indeed consider doing exactly that and actually did do some lock downs in some of the plants that we went around and visited. We concluded that it was just not practical to do so for the purposes of the generic issue program. Any results we would get would be so highly site-specific that it would be essentially meaningless to try to apply to plants across the board.

This is not to say that it could not be done. The sort of spatial analysis that you are speaking of is indeed very similar to what you might do flying various things within the codes for fire.

Well, we did find in the lock downs was

that it was very difficult to ascertain what was -- just by looking, what was in danger as we looked at the floors below. Obviously, large components, we could tell, but when you see cables going everywhere and racks of switch gear not knowing necessarily what it was controlling and so forth, it was pretty difficult for us to do.

MEMBER ROSEN: Well, we're hardly suggesting you do it by looking.

MR. VANDERMOLEN: I would hardly do that, no, but the difficulty. But the other thing that I wanted to bring out was that unless you know the likelihood of the heavy load penetrating the floor, which is one of the things that Ron had alluded to before, and where there is certainly room for improvement in how calculations are done, it is also possible to do a PRA style calculation, but it did give us an idea of the difficulty.

MEMBER APOSTOLAKIS: Well, Harold, I'm having difficulty with your argument because basically what you're saying is yes, I know what is the right thing to do, but it's too difficult. So how are you going to resolve this generic issue by avoiding doing the difficult thing? And the other thing you said, it's highly site specific, so we couldn't see any generic -- well, the generic thing would be to say you go ahead and do it, do it for your facility. Do something --

MR. VANDERMOLEN: I'm not arguing with that, it's just that at this stage of the process what we're basically making recommendations to NRR for whether or not things should be followed up, we saw no point in going further.

MEMBER ROSEN: Let me give you an analogy with PWR, sump blockage issue. This is also at GSR. After much study in the national labs, the conclusion was generically this could be a big problem and therefore -- but we can't apply this knowledge base to site specific situations because they're all different.

MR. VANDERMOLEN: That's correct.

MEMBER ROSEN: So where we're headed there is understand the knowledge base and provide to the licensees and get them involved and have them develop a protocol for doing the calculation and have them do it for their own sites.

MEMBER APOSTOLAKIS: We can do the same thing here. It could be done.

MEMBER SIEBER: It seems that all the recommendations that you actually are making are deterministic in nature as opposed to saying shall I obey NUREG 612 or should I calculate how risky it would be not to do it? You just say you've got do this and you've got to do that and make these calculations in the right way and then the risk is small. That's how I interpreted what you did.

MR. LLOYD: That's true. You can minimize that. I think until the last couple of years, I think, licensees really didn't think that you could penetrate a floor and go all the way to the basement and it should have been more obvious than that and licensees really didn't pick up on it.

MEMBER ROSEN: Let me see if you really are saying what you're saying. You say that licensees believe that, for example, in a BWR where you take a heavy cask off the fuel handling deck and swing it out over that long space where you lower it all the way down and I don't know how many hundreds of feed to the grave on to a truck, if you dropped it when you had it up high that it would simply bounce off the truck or something, through the truck like it wasn't there and then through the floor, like it wasn't there and then through the top of the torus like it wasn't there. And at the bottom of the torus, like it wasn't there.

MR. LLOYD: That one people obviously

looked at just because of the drop high distance, but what I was referring to was dropping something that some licensees calculated like you could drop something that's very heavy from six or seven feet and it's not going to go through the deck and because of that, they didn't worry about what was located on lower decks. So that was kind of out of their purview.

I think within the last couple of years, there have been more refined calculations that showed that that's in gross error.

Also, once you've gone through a deck, it was also -- if you go through and read 612, for example, and other documents, you will see that there was sort of a feeling that even if you did go through one deck, it might be stopped and come to a halt and will not continue penetrating decks and that's a total policy.

So I think there's been a better understanding. I think the calculations have been a lot better and I think a lot of the load height restrictions, because of that, need to be reset and that would be done by redoing calculations based on what you're actually going to be lifting over certain areas and what also might be on the lower floors of what you might damage during that drop.

MEMBER ROSEN: There are two likelihoods in the near future, in the future, that would make -- it would seem to me to make this problem quite a bit worse. One of them is the need in many PWRs to replace the head as a result of the problems with Alloy 600 penetrations. So there are going to be a lot more heavy lifts, I think, moving heads around in ways that -- and places that typically haven't been moved since construction.

MR. LLOYD: Exactly.

MEMBER ROSEN: That's one set. The other one is if we ever got to Nirvana and actually started moving fuel to Yucca Mountain or any place like that, then we would have a whole lot of lift. So extract that into your thinking that the frequency of heavy lifts could go up, could go up a lot.

MR. LLOYD: Right. Right now it's at 25. It could certainly easily be up around the 100 level without too much of a problem which would change a lot of the statistics.

MEMBER APOSTOLAKIS: Again, why did you develop the generic load event tree?

MR. LLOYD: The event tree?

MEMBER APOSTOLAKIS: Did you try to do

something with it?

MR. LLOYD: Yes. It was obviously -- this is in a public document and it can go out and from a generic standpoint it would kind of sensitize, I think, people who would deal with these issues to the fact that there may be a potential to not only drop over something, but to drop through the floor and to also take out equipment that's located on lower floors where they really haven't been sensitized to that at all.

MEMBER APOSTOLAKIS: If it doesn't go through the floor, there's no possibility of serious consequences?

MR. LLOYD: In most cases, that's true.

MEMBER APOSTOLAKIS: So there must be a few cases where probably it does make a difference.

MEMBER POWERS: That's really not the way I read the chart. I read the chart as saying that when you have a drop event, you can damage systems that's on the level you're working on or you can go through and damage things below or you can do both.

MR. LLOYD: Exactly.

MEMBER POWERS: And when I look at the chart, I wondered why you did that, other than just to fit everything on one page.

MR. LLOYD: It was kind of fitted on a page. If you -- on level, if you drop something most likely you're going to be taking out a train as opposed to an entire system. So the consequence isn't going to be as much. If you actually drop it to the point where it would go through a floor, well, then you have multiple opportunities to take out equipment that's located on several floors.

MEMBER POWERS: See, that's why I wondered why you didn't separate, in the lower group of "challenged", other than just fitting it on one page, it seems to me it's a far more consequential thing -- some of those things that are just labeled "challenged" or more challenged than some of the higher things labeled challenge.

MR. LLOYD: Exactly.

MEMBER ROSEN: Let me ask a question. I didn't read this as carefully as I maybe should have. But is there an example calculation that shows how it goes through -- how a heavy load goes through the floor, how to do it right and makes the point that with a fairly -- not a giant load, but a heavy load and not too far off the floor, when it drops, it goes right through. Is that sort of calculation in the report?

MR. LLOYD: The calculation, that would be in one of the appendices of the report, so it is there.

MEMBER ROSEN: It is there already?

MR. LLOYD: Right. You'd have to go back and take a look at the appendix. Some of the better calculations that have been done by an organization called EQE and others that really do a lot of these -- earthquake guys -- that do a lot of these things, and you can see those. So those calculations and the results of dropping from various locations on various floors shows up in the appendix.

MEMBER APOSTOLAKIS: They are not EQE anymore, are they?

MR. LLOYD: They are -- they were as of a little while ago. I don't know the name has changed.

MEMBER APOSTOLAKIS: ADS.

MR. LLOYD: ADS? Yes, those calculations are shown and the more definitive kinds of calculations would show that there should be bore restrictions on the load test.

MEMBER APOSTOLAKIS: It would be interesting though to actually try to use this idea in the actual PRA and try to see if there is a critical location where dropping the load can create a challenging situation.

You will always have, I assume, a transient. If you don't have a LOCA, you will have a transient.

MR. LLOYD: Right.

MEMBER APOSTOLAKIS: So the question is what else are you knocking off?

MR. LLOYD: Right.

MEMBER APOSTOLAKIS: And what happens then.

MR. LLOYD: Right.

MEMBER APOSTOLAKIS: It would be a nice exercise.

MR. LLOYD: Yes, there was another problem. We're really out of time, but there was another issue, 0612, the NUREG, initially indicated that when you had a heavy load going across a refueling floor or other places that you should go down a beam and to a lot of people that made sense, that that would appear to be the strongest part of the floor if you followed the beam.

However, better calculations would indicate that you ended up with some horrendous shearing forces, so anybody that's worked on a broaching machine when you were younger and you would actually end up with a punching shear that would, if you dropped the load near a beam, you would have a much higher likelihood that you would go through that floor rather than if you dropped it at mid-stand.

So there's a lot of different thoughts about how things work that have really come up in the last few years. Better calculations.

MEMBER LEITCH: Before we run totally out of time, I'd like to jump to the last line if we could and talk about the recommendations.

MR. LLOYD: Sure.

MEMBER LEITCH: And I guess none of this seems to address training and qualification issues. And I'm a little surprised at that.

MR. LLOYD: Yes. Let me go through the recommendations. Over on slide 31, the basic observations, I think you could draw those same set of observations without any trouble. So if we look at slide 31 there were four of them that we came up with and once again these were just proposed recommendations and they're not set in concrete. We would like certainly your input as to what should be added or deleted. We will then come up with a document that would have those recommendations in it and then it would get submitted into NRR for whatever guidance or regulation changes and corrective actions should be initiated.

So let me go through the four. The first one is the obvious one on the rigging issue, the materials. There had been a concern about the materials, how they might be changed, Kevlar versus nylon. They have different properties. Other rigging devices, same kind of situation, you know, should we want to change something, should we want to add additional requirements on licensees beyond what's already out there. We have a device, ANSI Standard, it's 14.6 that talks about a lot of these things, but it's not necessarily followed all of the time and because of where the loads might be. So there's those kind of issues surrounding the rigging area.

For the second bullet, right now, as I mentioned earlier, the NUREG 0612 and 0554 talk about single-failure-proof cranes and talks about good practices, talks about a lot of things, but a lot of it is fairly general in nature.

Endorsing the ASME standard, the NOG 1, that stands for Nuclear Overhead Gantry, for single-failure-proof criteria. It's very definite. It's specific. It has a lot of design criteria in it. It would take a lot of the interpretation out of what really constitutes a single-failure-proof crane and what would need to be done in order to upgrade a crane to make it single-failure-proof. And since it's already an accepted standard it was initiated and accepted in 1998. Generally, it's NRC policy. If there is a standard out there, we would adopt that standard. So this would be an opportunity to add additional specificity to what really is a single-failure-proof crane and what are the design requirements.

For the third bullet, what it says here is re-emphasize NUREG 0612 Phase 1 guidelines. Phase 1 guidelines talks about all of the issues that you were talking about here. It talks about all of the training issues, having adequate procedures. It goes on and on about good practices that should be developed and implemented in a crane program. So re-emphasizing the Phase 1 guidelines would take care of the lion's share of human factors issues that is really the bane to the crane industry.

MEMBER ROSEN: I'm not sure it would. Just because you say it doesn't mean anything. It would have to be put into the oversight program, the inspection program.

MR. LLOYD: Right, exactly. And that's

what we expect to happen in talking with NRR. So this inspection too would be part of the role and so we could actually see if licensees do have those kinds of attributes in their crane programs and that they're following those kinds of things in their crane program.

MEMBER ROSEN: As long as that's what you mean by "reemphasizing."

MEMBER ROSEN: Right.

MEMBER ROSEN: As long as that's what you mean, then I agree that it might have an impact. If you just say well, you must have forgotten to read NUREG 0612.

MR. LLOYD: Right. Yes. NUREG 0612 is out there and everybody refers to it, all the licensees refer to it. At the present time would not go out and inspect to verify that all these things are being accomplished as they should. It's basically outside of the basic role.

So the fix here would be here to add that in to ensure the NRC that those kinds of things are being adhered to.

MR. JONES: This is Steve Jones at the Plan Systems Branch of NRR. I do want to mention a little bit of operating experience that has come up to identify what's coming in through the reactor oversight process. One of the events Ron mentioned earlier was a dropped reactor coolant pump at one unit that was fortuitously caught. Recently, Region IV identified an issue at another plant involving a similar reactor coolant pump lift. Only this time there was -- the fuel only a few days decayed and still in the reactor vessel and obviously a 50-ton load is right over a portion of the RCS and also is planned to be carried over segments of RHR piping. The residents did raise that issue as part of the refueling inspection module, as part of the oversight process.

MEMBER ROSEN: Did they raise during the planning of the refueling or when the refueling was done? I mean did they prevent it is the question really.

MR. JONES: No, they didn't prevent the actual load lift from occurring and actually our rules don't prevent it. It's more a matter of managing the risk and in accordance with A4, the maintenance rule in that case because you're dealing with maintenance activities of replacing the reactor coolant pump and you can deal with the increased risk by ensuring that containment sump recirculation capability is available to re-inject water into the core and things like that.

I just wanted to highlight that we do have some lifts going on over significant components and the oversight process is picking that up.

CHAIRMAN BONACA: One thing that puzzles me, I mean there is a lot of good information in this report and what you have presented today and I guess I'm struggling with what should NRL do with it. And I think we are all struggling with this. That's what I sense in the committee here. And we don't know because this information is not going to NRR and we haven't got a decision on their part. So are we going to provide a recommendation of whether or not what we should do with this? I mean we all have ideas, but I'm not sure that it's our role at this stage. Or should we wait and ask NRR what they're going to do with it.

MEMBER APOSTOLAKIS: And all these refer to the initiating event.

MR. LLOYD: Trying to minimize the probability of having the initiating event which is a load drop in this case.

MEMBER APOSTOLAKIS: But if you did this risk evaluation, you may come up with something else that would complement this. So -- yes, it's an unusual request, Mario, I agree. Are we asking us to come up with recommendations ourselves?

MR. FLACK: No, I think -- if I could just jump in for a minute. What Ron has done is really did a thorough investigation of the data that was out there and he consolidated it into a report and we, of course, interacted with NRR on a number of occasions and so there's no surprises here.

What we could see that what needed to be done and made sense to do is what Ron has put on the board, I guess at this point. The question that we're asking the Committee is saying we're going forward with this. This is what we see from all of this information. Is there anything else that comes across based on your own experience and your expertise that suggests that we should add something to the recommendations that we have to come across and if we have to re-emphasize and go back and visit another part of the report, gather that information to make a stronger basis, we can go ahead and do that.

I guess it's in that kind of light. We're given an opportunity for the Committee to comment on that and to provide a recommendation.

CHAIRMAN BONACA: I guess this is a generic issue.

MR. FLACK: Right.

CHAIRMAN BONACA: And there is information being developed and provided to us and to the licensees. I'm not sure that that in and of itself will solve the issue for three reasons. One is really from just looking at the simple event tree, you can see conditions under which you would have a very challenging situation, but we don't have an appreciation for is this the absolute risk for any one given scenario. And so one is reminded of the question what else should we be doing? Maybe more should be done to resolve the issue, rather than just leaving it to improvement in procedures or training or whatever, because it hasn't seemed to have worked completely in the past. The situation has not degraded, but has not improved either. I mean there's a trend there saying you keep having drops.

MEMBER ROSEN: It's the likelihood of more shots on goal.

CHAIRMAN BONACA: So we could communicate that, that's one possibility.

MEMBER SIEBER: Other than the deterministic things of endorsing 0612 and maintaining your crane and equipment, there isn't much you can do short of modifying the plant, moving equipment around to lower the risk once all these deterministic things are done. And so the fact that none of these events of literally hundreds that have occurred have ever made it to the ASP program. They're all, at one time very minimal or lower. Maybe the risk really isn't there, but clearly people are getting killed. Equipment is getting damaged and there is some level of low level of risk there that at least in my mind says the Agency ought to do something. There is a Memorandum of Understanding, as I understand it, between the Agency and OSHA where NRC inspectors are OSHA inspectors under certain conditions and one of those conditions would be a crane event in containment.

CHAIRMAN BONACA: Maybe we have to ask how is this information going to resolve GSI-168? That's really what we would like to know and I haven't heard convincingly that it does.

MEMBER SIEBER: Well, it's not going to eliminate the problem, that's for sure, because it's dominated by human error. Unless you get rid of human beings, I'm not exactly sure how you get rid of human error.

MEMBER LEITCH: I don't know all that is in that -- implied in that third bullet, but I think we have to be real clear about training and qualification issues and there are a number of different kinds of folks that do rigging in a power plant. One is the power plant's own crew. Another is contractors that come in, often do some rigging. A third one is when you hire Joe's Mobile Crane, Joe -- it usually comes with a crane operator and Joe does the job. And so are all those people properly trained and qualified for working in a nuclear power plant environment? I think we need to be sure that they are.

The other thing is when you bring in a mobile crane, is the crane itself properly qualified. Has it been inspected and does it pass all its qualifications? I don't know whether that's -- I'm sorry, I'm just not familiar with what you mean what is all included in that third bullet there. But I think it relates to the training and qualification issues is the biggest impact we can make for improving the safety, rather than the hardware kind of issues and the calculations and so forth. I mean they're all fine, but I think --

MR. LLOYD: The human --

MEMBER LEITCH: The real impact we can make is in training and qualification, the people involved.

MEMBER ROSEN: I agree with you, Graham, but I think the business of calculation, although you've framed it very narrowly that this could be important in this sense. Hundreds of lifts are being done every day in the industry, maybe thousands. Which of those lifts really matter from a safe shutdown point of view? Which lifts should not be done in the mode they're being done in? And that's -- the answer to that question is probably a small number, 10 percent of them should be done differently or done different modes or -- and it seems to me important to find out which ones and have the licensees know that and to have special attention on it. That situation is entirely analogous, in my view, to when we started doing detailed shutdown risk assessments. We realized, oh, my goodness. This is a period of time when we really ought to not being working on the ultimate train during hot early midloop, for instance, conditions in the PWR. That risk is simply avoided by better planning.

MEMBER APOSTOLAKIS: And if it's human error that is a dominant contributor, maybe for those few instances you can have checks and double checks.

MEMBER ROSEN: Just as we do at shutdown.

MEMBER APOSTOLAKIS: To make sure that the rate is lower.

CHAIRMAN BONACA: I think clearly we've been running out of time, almost half an hour ago. And we need to come to conclusion about what is the Committee going to do with this information.

MEMBER APOSTOLAKIS: Well, are we going to discuss this this evening?

CHAIRMAN BONACA: At some point, yes.

MEMBER APOSTOLAKIS: The staff told us what they expect us to do.

CHAIRMAN BONACA: What?

MEMBER APOSTOLAKIS: The staff has told us what they would like us to do. And then we have a discussion this evening?

They said these are the recommendations, what do you think? Do you have any other ideas? That's what John said.

CHAIRMAN BONACA: These are the recommendations that would resolve the Generic Issues 186.

MR. FLACK: Well, you have to look at the whole process and what's being implemented as a follow-on to these recommendations, but certainly if there was areas that needed to be re-emphasized or areas that needed to be brought forward as part of this, at this point in time --

CHAIRMAN BONACA: The reason why I'm asking the question is this has been brought to us as a survey of a crane operating experience and that's what it was. And not as a recommendation on how to close Generic Issue 186. I didn't sense it that way. I didn't see that this was the focus, that's a problem and that's how this is going to improve the situation to the point it's Generic Issue 186 is resolved. So I'm troubled by that. We can try to comment but it seems as if we need to see if we feel this is an adequate resolution of the issue. Is it the question?

MR. FLACK: Well, it's one point in a phase that's taken place and that phase was the data analysis, the understanding of the data, the generation of the recommendations.

The second phase will be implementation and then the implementation phase which as Ron had pointed out would be NRR's phase would then go forward and decide to do something and constitute resolution of this issue.

I guess the question then would be does it look like based on these recommendations there's a success pass there or is there something else that we should be considering in this process?

MEMBER SIEBER: The interesting thing though is that you've made four recommendations to NRR or suggesting them where you are right now. The question is when NRR takes those recommendations and says okay, I think we'll do these, do you believe in your heart that doing just what you said you would do on that slide will result in reducing or eliminating crane errors and crane risk?

MR. LLOYD: What has been done so far is we've proposed the four recommendations, certainly for you to take a look at. It's already been discussed with NRR as areas that would certainly minimize risk and reduce the number of events that could cause some damage to the plant and certainly affect the health and safety of the public.

Now how NRR would implement those. They would have to take these generic kinds of recommendations that we have proposed and NRR then as part of Stage 4 would have to come back and say here specifically is what we plan to do and here's the vehicles, i.e., we're going to come up with new guidelines. We're going to change the inspection program so we can verify that people are doing things. We may right some kind of a generic communication of risk, a generic letter, a bulletin. We may gather additional information. We may go to the point where additional rules or regulations that NRR may feel would be necessary. Basically, it's up to NRR at that point to come up with the specifics as part of Stage 4. Those specifics then would have to get approved, basically, before they could go on and actually get issued.

MEMBER SIEBER: One of the interesting things though is that where you stand right now, the force of regulation happens to be a 20-year-old NUREG and a generic order, neither one of which are regulation.

MR. LLOYD: Right.

MEMBER SIEBER: And so licensees --

MR. LLOYD: They're guidelines.

MEMBER SIEBER: Yes, they're guidelines and licensees have this moral obligation to follow the guidelines but they don't have a legal obligation to do any of it.

MR. LLOYD: Exactly.

MEMBER ROSEN: I have another thought also which is that on your Slide 29, your summary of the observations that the human error rate is increased and major load drops are occurring outside safety related areas, mobile cranes and loss of power events have occurred and no ASP crane events. It seems to me you haven't made a nexus to risk. In other words, you haven't made the risk argument that says if you do this, you have to say and therefore, the risks are increased beyond what we consider to be within the design envelope and something needs to be done.

MEMBER SIEBER: I think they have made the connection but the risk, the way I read it is pretty small.

MR. FLACK: That's what I think it's leading to. I mean we are looking for that smoking gun, you might say, through this process, and I think what Jack said is quite correct. It's that we're looking at some level of error, some operation that has this experience. We thoroughly went through it looking for that type of connection, that nexus and because we didn't find it, it doesn't necessarily mean we're down the wrong path. I think there are things that are going to need changing. We have to be careful about that, but I think the answer is yes, from what we could see and the time we really looked at this issue hard and it's been a hard look. There's a lot that went into it. We have come forth and said yes, if they need these kinds of things that we've written down here, we feel that that's the best we can do right now and that we should go forward with that. We didn't see that we could see that connection which you would want to tie it to something, where the risk is that big.

MEMBER ROSEN: But someone could come back to you and say I have a lot of risks around my plant. This is one of them. And I've assumed that risk and we're trying to do the best we can, but I'm not going to put a lot more resources on this because it's not -- I don't have the clear understanding that this is one of the higher risk items. I don't think we have the data in front of us to address that.

MR. FLACK: But at a generic level now as well. There could be very specific issues that one would have to look at specifically, but at the generic level which is where we're looking at it now, we cannot move on that.

CHAIRMAN BONACA: I think we have enough information --

MEMBER SIEBER: Let me ask one tiny question since I've got to write the letter. It will take less than 60 seconds.

MEMBER APOSTOLAKIS: You can write letters in 60 seconds?

MEMBER SIEBER: No, I can ask the question in 60 seconds. The question is you talk about the ASME standard for single failure cranes. It seems to me the only place where a licensee is required to have a single-failure-proof crane is when he is committed to the FSAR, no other way. And so I can't envision somebody modifying a crane since it makes no risk difference to make it single-failure-proof unless they're already committed. So this is just an enforcement tool, right, when you endorse the standard and say this is what this really means?

MR. LLOYD: Yes. If we endorse the standard, this would clarify what a single-failure-proof crane is, either upgraded or purchased new. What a single-failure-proof crane does get for you, you can move it. Move objects, move loads over safety-related equipment because you have a redundancy and so it allows more operational freedom for licensees. Most of the ISFSIs are going to single-failure-proof cranes, so they can do that. If you don't go to a single-failure-proof crane, well, then you're into the load consequence analysis. Am I operating? Well, maybe I shouldn't do this at operations. I should do it at shutdown or I shouldn't do it in this area of the plant. I can do it in this area of the plant.

Going to a single-failure-proof crane gives licensees more flexibility in what they can do.

MEMBER SIEBER: Thank you. The question was 60 seconds. The answer was longer.

(Laughter.)

I'll turn it back to you, Mr. Chairman.

CHAIRMAN BONACA: Okay, thank you very much. I think we have enough information to discuss later on, if we are going to write a letter and what kind of a letter we're going to write. And with that I think taking a 15-minute break until quarter of 3?

(Off the record.)

CHAIRMAN BONACA: All right, we will resume the meeting now. And the next item on the agenda is draft final review standard for reviewing core power uprate applications.

And Vic Ransom is going to walk us through this presentation.

MEMBER RANSOM: Well, the review standard for extended power uprates dates backs to some discussion, I guess, between the staff and the ACRS in the 2000-2001 timeframe, when quite a number of applications for power uprates were going through.

And, the ACRS had suggested considering --

issuing a standard. Or, I guess, discussions went on between the staff and the ACRS. And, at that time, the ACRS -- I mean, the staff didn't feel a standard review plan was really necessary, but they agreed to revisit that later.

And, in a meeting on December 5th, 2001, the ACRS did suggest to the Commissioners that a review plan be developed and the Commission issued an SRM to the staff.

The staff responded to that, saying they would look into it. And then in March 2002, the staff held a public workshop. The response to that workshop was that there was general agreement that a standard would be helpful to submitting uprate reviews.

Then in June of 2002, SECY 02-0106 was issued, which laid out the plans for such a review. I might mention that the ACRS' main concerns originally were that synergistic effects, possible interaction between other licensing issues and the uprate licensing and margin reduction, and then the adequacy and consistency of the uprate reviews thought could be improved.

Then the staff actually held this workshop, then they came back to the ACRS in December, when they issued the first draft. And, well I guess the first time you discussed it was July 2002.

You actually came and showed us the outline and told us what you were planning to do. Then in December, the revised review standard was -- or the review standard, draft review standard, was issued for review.

And, more recently, the Thermal Hydraulics Sub-Committee of the ADCRS met and spent a full day going over this with Mohammed Shuaibi and his staff. And this is more or less a summary that came out of that.

Generally, the review standard was well-accepted by that committee, and they thought it would be good to go ahead. There were some concerns which came through.

The two immediate concerns that kind of resonated through the committee was their -- some variation from section to section, relative to the -- whether or not independent calculations were required or not.

Some sections went so far as to even suggest that they were not required, and the committee had some difficulty with that. The second concern related to the criterion for determining when integral system transient tests would be expected or required.

This also was a concern expressed by industry stakeholders, but somewhat from the extent from their perspective, I guess, the costs associated with that.

Whereas I think the committee felt that some testing certainly could be carried out and would be beneficial. The committee has also expressed concern about synergistic effects from the outset.

And I don't believe this is an area that's explicitly covered in the review standard as it is right now, but it may be a point of discussion. So, with that, I'd like Mohammed to proceed.

MR. MARSH: Great, may I have a couple of introductory comments? Good afternoon, my name is Tad Marsh, Director of the Division of Licensing Project Management.

And before I begin, I want to introduce Eric Leeds, who's our new deputy, the Division of License and Project Management. We welcome him. I welcome him. I'm glad he's here every day, so…

You've given most of the introductory material that I wanted to begin with, so I've got a couple more things to add, but it's going to be a lot shorter than all these papers.

So, the main purpose for today's briefing is to present to the full Committee the review standard, what we have done in order to develop it, some of the significant comments that we have received and we want to address some of the Sub-Committee's concerns.

I just want to re-emphasize the purpose for the review standard - I think that's important. As you recall, we undertook this initiative to provide a mechanism for retaining institutional knowledge before it is lost, in terms of retirements and staff moving on.

We also believe that the review standard will provide a better structure for our reviews. As you recall in some of the earlier power uprate reviews, you were concerned with the documentation of our reviews.

You were concerned about the thoroughness of some of our evaluations. You were concerned about the variance that we had from one review to the other. And as you pointed out, you commented that a review standard of some sort may be beneficial.

This -- you put it in the terms of a standard review plan. This is more than a standard review plan. Just for minute - standard review plans are normally associated with individual program areas, individual systems or structures or components or branch orientation.

This standard is beyond that. This standard incorporates the full scope and the full breadth of branches and topics and issues that need to be reviewed, in order for our uprates to be efficiently reviewed.

It also brings an operational experience, it brings in resources - it's a tool that we think is going to be very helpful for us, in adding efficiency to our review.

Carrying forth information from one generation to the next is a very important part for us too - we have a lot of new staff at the agency. NRR has about 50-60 interns every year that come through.

So teaching and training and capsulizing this process is important to us. And I will also mention -- I mentioned to you, Mr. Chairman, we're going to be briefing the Commission October 15th, on power uprate reviews.

They've asked for that as a part of our presentation, so we'll be talking about the review standard in that context too. I'd also like to mention that Vermont Yankee has submitted their power uprate for 20 percent.

Although it is not yet received, it is in the mail and on it's way. So, Mohammed, let me go to slide two, please. Slide two is the agenda for today's meeting.

And, as you can see from this agenda, we're going to try to cover the comments that we received from the Committee in previous meetings, including the ones we received during last month's Sub-Committee meeting.

Based on the feedback that we received during this meeting, we will be addressing the guidance for the independent calculations. And we'll show you a set of new guidance that we developed for use by all the reviewers.

We understand the Committee was concerned that he guidance, including the draft review standard that we sent to you, could have been perceived to limit the scope of analysis a reviewer can independently perform.

That was not our intent, that was merely an effort to provide circumstances where it would be warranted to do independent work, as opposed to a full articulation of the circumstances.

It was meant to be a jumping off point. We'll also discuss comments we've received from the

Committee on the way we perform our risk evaluations. And, in addition, we will discuss the guidance we've developed for power uprate testing, and the rationale we use when we developed this guidance.

We also have staff available here to discuss any other areas and answer any questions that you may have. With that, I'd like to turn the presentation over to Mohammed and his staff.

MR. SHUAIBI: Thanks Tad. Good afternoon. My name, for the record, is Mohammed Shuaibi. I'm the lead project manager for power uprates at NRR. To my left, I have Kevin Coyne.

Kevin Coyne is our operations engineer, and he was one of the leads in developing the standard review plan section for power uprate testing. To my right, I have Donnie Harrison.

Donnie is the senior reliability and risk analyst, and you've seen him before - he usually performs reviews in the risk area for power uprates. What I'd like to do -- I have a few slides in the beginning of my presentation that go over how we came up with the new review standard, and what it contains.

And we've done this three times with the Committee, so if you'd like, if it's okay with you, I'd like to move on to the comments. Is that okay?

Okay.

So, starting on slide number six, there are several slides that are inserted without numbers - that's part of an animation, the slide that's numbered on the bottom right, number six.

We issued the review standard in December of 2002 for a three-month public comment period. We issued it for interim use and public comment. The public comment period closed on March 31st of 2003, and we received three comment letters, all from industry.

We received a comment letter from the STARS Alliance - it's an alliance of six nuclear power plants. Actually, 11 units - six plants, 11 units. We received a letter from the Nuclear Energy Institute, and we also received a letter from Framatome ANP.

In total, I think we had about 22 comments. Okay, on this slide, I have a summary of the public comments that we received. And I'll talk to every one of these briefly, and then we'll move on to the ACRS comments.

We had comments related to the backfit -- the potential backfit that could happen, as a result of this review standard. As you've seen in the review standard, we referenced their review plans, general design criteria, other generic communications that may not be part of the licensing basis of a plant.

And there was a concern that we would be imposing those on the plants, as a result of a power uprate. And that wasn't our intent, so we clarified that in the review standard.

We received comments on the burden of completing matrices. I'm sure you've read in the review standard, we've requested that licensees go through the matrices that we have in section 2 of the review standard, and complete those to provide their plant-specific licensing basis and as part of their application.

And there were concerns with the burden associated with that on the licensee. And we believe that that is important for them to do that, when they submit their applications, to improve the efficiency of our review.

So, we've kept that in there. There was a comment about independent calculations. The comment talked about the staff's ability to always perform independent calculations, or audits, if it needed to.

Therefore, we didn't need guidance in that area. We disagree with that - we believe it's appropriate to have guidance in that area for people to know that they could --

MEMBER WALLIS: We said we liked the guidance.

MR. SHUAIBI: I'm sorry?

MEMBER WALLIS: We said we liked the guidance, when you gave it. What we didn't like, was the kind of guidance which said these calculations are not done. We liked the guidance when we saw it in some of the sections where it seemed to give very good reasons for doing these calculations.

MR. SHUAIBI: Right.

MEMBER WALLIS: But we didn't say we didn't like having guidance.

MR. SHUAIBI: Right, Doctor Wallace, I'm addressing the comments that we received from the public --

MEMBER WALLIS: Oh, from the public…

MR. SHUAIBI: -- first, right.

MEMBER WALLIS: Oh, we're not the public, okay, I see.

MR. SHUAIBI: Your comments are a little bit later.

MEMBER WALLIS: I'm sorry, I'm sorry, I thought you were covering all the comments in one.

MR. SHUAIBI: No.

MEMBER ROSEN: He wasn't a member of the public who commented?

MR. SHUAIBI: I don't know.

MEMBER RANSOM: What was their concern about need for independent calculations? That they would have to supply my data? What's that?

MR. SHUAIBI: They talked about the extent of work that would be required to do independent calculations. But, really, the comment was more towards, well you don't really need criteria for determining when you needed independent calculations - the staff always has that ability.

The staff can decide to do independent calculations, come out and do audits whenever they want to. So you don't need criteria for that. But we thought it would be -- it's useful to have that guidance in there, to tell the staff that -- you know, don't hesitate to go out and do independent calculations, if you feel it's needed.

And, initially, we did start. We did have specific criteria. We kind of backed off, and I'll discuss that a little bit when we get to the ACRS comments that we received last time.

MEMBER RANSOM: But this part you've left alone?

MR. SHUAIBI: Independent criteria?

MEMBER RANSOM: Right.

MR. SHUAIBI: The calculations? No, we have actually changed that, based on the comments we received from the Sub-Committee. We still have -- we will still have guidance for independent calculations and all of that.

But it's different than what we had last time, based on the comments that we received. And they will be applicable to everybody. It'll be one set of independent calculations - guidance.

But we've got another set of comments on the use of precedence. They felt it was important to identify precedence where it exists, and we agreed with that and referenced the --

MEMBER WALLIS: Mohammed, I'm sorry to keep on with this. Are you going to give us the list of what these criteria are then? Instead of saying, there will be these criteria --

MR. SHUAIBI: Yes.

MEMBER WALLIS: You will, okay.

MR. SHUAIBI: Yes, I could --

MEMBER WALLIS: That's okay, I just wanted to be aware - I didn't see it here, but maybe I missed something.

MR. SHUAIBI: It's third slide from the back.

MEMBER WALLIS: We'll get to it, good, thank you.

MR. SHUAIBI: All right. Use of precedence, we had comments that indicated it was important to have precedence, previous power uprates that we've done - and we agree with that, and included that in the review standard.

We included a reference to our website. Our website includes a lot of precedence references to where REI's -- what REI's were issued on previous power uprates, so we included a reference to our power uprate website.

There were comments about the impact of this review standard, on topical reports. And the Committee's aware that vendors have topical reports for power uprates, particularly General Electric.

And the concern was, well could there be inconsistencies between the review standard and the topical reports, and what does that mean in terms of the topical being approved.

We don't believe that we would have inconsistencies. A lot what the topical does -- the topical reports do, is they provide generic analysis in some cases, or provide a, kind of a, scope of what is included or not included.

And this should be consistent with the topical reports. And we expect that anywhere where there has been generic analysis, that show that an area is not important, that an applicant could use a review standard and reference those topical reports to show that those areas don't need to -- we don't need to focus a whole lot of attention -- don't need to spend a whole lot of resources reviewing that, if those are applicable.

Of course, they would have to demonstrate that that's applicable to their point. We got comments saying that we went through a thorough process in coming up with this review standard.

We went out to, for public comment, we got comments from industry on the review standards so they were comfortable with the way we did this. But they're not sure how we would make changes to it, or how we would develop other review standards.

And that's a valid comment, and we will be developing an office instruction - we've committed to develop an office instruction on how we would update it, and provide thresholds for when it would be appropriate to go out for public comment, or come to the ACRS or engage any of our other stakeholders.

We got comments indicating that it would be a good idea to use the review standard as a pilot for the first few applications, or the first application. We agree with that, but we like to think of this review standard, and we want it to be a living document that gets updated with every application, if you will.

So, we don't want to call it a pilot. We'll use it on Vermont Yankee, as Tad mentioned earlier. And if we learn anything, we'll come back and update it.

If we need to include more, or take things out, we'll come back and make those changes. We received comments that it would be appropriate to include information related to management oversight of a power uprate review in the review standard.

We don't think it's appropriate to include that in the review standard. We have an effectiveness and efficiency plan, which the review standard is only one part of, or one piece of, for power uprates.

That effectiveness and efficiency plan, as part of that we send out reports to our supervisors and managers on status of power uprates. We also engage our management when we need to, when issues come up.

And as part of that, we believe it's appropriate to include that kind of guidance, but not as part of the review standard. We got comments indicating that we need better criteria for what an acceptance review is, what level of detail are we looking for.

We, in the review standard, indicated that the reviewer would look at the application, and see if there is sufficient detail - and that's why I have that in quotes, to continue the review.

I want to say, we haven't had problems in these areas in the past, so we don't think it's necessary to change what we have right now. But if we have problems in the future, we can always go back and look at that.

We got comments that wanted us to go back and evaluate the resulting review costs, or REI savings, in the future as a result of this effort. What I want to note here is, we expect that if licensees follow this review standard, that REIs will go down.

In terms of cost, I can't say that this review standard is going to reduce the cost. We have a lot of things covered in this review standard, it's very broad, as you can see.

Again, we have the effectiveness and efficiency program, which we will monitor the reviews and see how we're doing REIs or cost. But issuing this review standard isn't -- wasn't necessarily to reduce costs.

We had a lot of things on the table, we wanted to make sure we had a comprehensive, complete review, a thorough review. So, there's a lot of things that we considered when we put this thing together.

But I do expect that REIs would go down, if it is followed. There were comments -- a specific comment related to the need for the staff to review training of non-licensed print staff.

And the comment suggested that we shouldn't do that, and we disagreed with that. We believe it's important that we look at the impact of power uprate, not only on the operators, but also on non-licensed plant staff and what they have to do - modifications or system lineups or whatever it is that they usually do at the plant.

There was a comment that recommended that we have a stand-alone references section in the review standard. The review standard itself is a document that references documents.

It is not a technical document, per se, it doesn't have technical information in it that says, here's how you would review a local, or here's how you would review anything else.

So, being that it's a reference document itself, we didn't think it was necessary to include a references section in the review standard - it's already that kind of document.

We received a comment that suggested that more important than a review standard, is establishing a standard application format. That would mean our licensees would be using a standard format in submitting their applications to us.

And we agree with that comment, and we hope that the industry will take on that initiative. And they could use the review standard as a starting point in putting one together.

But we believe that that is something for them to do though. We received one comment, and it talked about NRC fee billing practices. It talked about a break-down of the billing associated with reviews.

But it also acknowledged that this is being pursued separately with a different group. And we believe that that is the right group to address that, so we didn't do anything with that comment.

MEMBER WALLIS: Mohammed, the standard that we've reviewed, the draft that we've reviewed at the Sub-Committee meeting, had everything in it that you just discussed, is that correct?

MR. SHUAIBI: The draft review standard that was sent prior to the Sub-Committee meeting addressed all of the public comments that we received.

MEMBER WALLIS: Okay, yes.

MR. SHUAIBI: Right.

MEMBER WALLIS: Okay, thank you.

MR. SHUAIBI: We had, I believe, sent a copy of the original draft that went out to the public for comment, before that, but it was different.

MEMBER WALLIS: Yes.

MR. SHUAIBI: Yes.

MEMBER WALLIS: You'd have to look pretty hard to find the difference, though, sometimes.

MR. SHUAIBI: Well, the comments were not that significant, I don't think. I mean, I've just run through all of the comments that we received. And, other than changes due to organizational changes that we've had, you've seen some matrices that were split a little differently.

Containment came out of plant systems, and now they've got their own section - that's because we had an organizational change and a few paragraphs that were added to the purpose section of the review standard - there wasn't really a whole lot of changes.

Moving on to ACRS comments… I have a set of slides on the ACRS comments that we received during review -- during your review of the previous power uprates.

And then following that, I'll talk about the ACRS comments we received from the Sub-Committee. In terms of comments that we received on prior -- previous power uprates, we received six letters.

And I have the reviews associated with those -- those letters were associated to, here on this slide: Duane Arnold, Dresden, Quad Cities, Clinton, ANO-2, the GE Constant Power Uprate topical report, and Brunswick.

So, we went back, looked at those letters, extracted the comments from those letters and tried to address those - and I'll go over those here. On the first page, I have a list of items that the ACRS had indicated were important for power uprate review.

And we believe that the review standard addresses these. On the next slide, I have other specific comments that we received from the committee. They were comments related to documentation of our reviews.

You were concerned about how much we were writing, and I guess the level of justification we were providing for finding something acceptable. And the review standard now contains two template safety evaluations.

One for pressurized water reactors, and one for boiling water reactors. And the intent there was to clarify what we're reviewing it, and come up with standard language for a regulatory evaluation section, which is why we review it.

A conclusion section, which is a finding that the reviewer has to make. And then we leave a technical evaluation section for the technical reviewer that performs a review, to focus on.

So, now they don't have to bother with the other two sections - they could focus on the technical reasons for why something is acceptable. And that's why we did that.

We're hoping that that will improve the documentation of the reviews.

MEMBER POWERS: That makes it a much more readable and understandable document.

MR. SHUAIBI: We're hoping that that's what will happen. And we're hoping it'll also standardize our safety evaluations. I believe we even have guidance in there that says, if an area is not important, don't delete the topic - just say it's not important.

If it's not relevant, don't delete that section. So we could stay with the standard format.

MEMBER POWERS: It gets all legalize out of the way, and you can focus on the technical stuff.

MR. SHUAIBI: Right.

MEMBER POWERS: And still claim you have a comprehensive -- a complete document. That's all, very good.

MR. SHUAIBI: Right. The second bullet on this slide talks about communication with the inspection staff. There are two things that we did in the review standard to address inspections.

One is section four of the review standard, includes a reference to an inspection procedure that we developed for power uprates, actually large power uprates.

And the other thing is we included a section in the template safety evaluation, where reviewers can indicate areas that they believed were important, as part of their review, so that the inspector at the site could identify those and sample from those if they believe it's important to do that, or if they --

In other words, the inspector at the plant could understand what went through our minds back here when we did the review, and they could have a better feel for what's important and what to look for.

MEMBER WALLIS: The example you came up with in the first -- at looking at the various reviews that have been done, I mean there were a couple them where it was clear that there was an assumption and a prejudice built in.

It was just necessary to flag it. What you've done is gone beyond flagging it, to say why you came to the conclusion that those assumptions or predications on the conclusion were so important.

MR. SHUAIBI: As part of the documentation for the inspection, or as part of the technical evaluation?

MEMBER WALLIS: The technical evaluation.

MR. SHUAIBI: The technical evaluation, we would want to identify the importance and why it's important. In the inspection, I have to go back and look, but I believe it's provide the areas that you believed were important.

Okay, the next bullet, again, this is your recommendation to develop a standard review plan. It came up in several letters, and we've developed a review standard.

So we believe we've done that, and even more, in providing process guidance. You had comments related to reviewing, or focusing on, transition reload safety analysis.

And we are looking at that. We've actually issued a letter to GE recently, that said that we expect analysis to be bounding. And we are now -- every time we meet with a licensee, we talk about a plant that wants to go through two or more steps -- more than one step, and this issue comes up every time.

So, we are focusing on what the differences would be, or what the impacts would be. There were comments related to need for more detail for hydraulic models.

And this is an area where as a regulator we struggle. We would love to have the most up to date models, realistic models. But where we come out, as long as the model that they're using is conservative and acceptable, that's what we look for.

If it's acceptable, we can do our review based on that, even though we would like to have the more realistic model.

MEMBER WALLIS: I think that it applies in with your fourth bullet, of course, that if you're going to have all these really complicated load patterns, then you have the ability to analyze those.

MR. SHUAIBI: Yes.

MEMBER WALLIS: When you don't have the ability to follow the thermo-hydraulics or the complicated load patterns, then I agree that it's hard to do today, but it really ought to be -- they ought to be consistent.

It's hard to tell just how hard conservative something is, when you've got these really complicated tailor-made reload patterns.

MR. SHUAIBI: Well, our review is to determine whether we can make the finding that it's still applicable or not, or if it's still good or not. And if we can reach that conclusion, of course, we would then, based on that, find it acceptable.

But I'll also add that plants and licensees are going to more detailed models anyway. I think we touched on that a little bit. For their own reasons, because margins and because they need to go to more realistic models and better models to get larger power uprates or other things that they're planning at their plants.

The last three bullets, I'd like to touch on a little bit later, because we've got comments on those from the Sub-Committee. We did develop guidance for all three of those.

We came to the Sub-Committee and we got comments on the guidance that we developed. What I'd like to do is defer these until later. I have three slides - one each for each of these topics.

Again, we presented the review standard to a Sub-Committee on August 19^{th}, and we received several comments from the members. And on the following slide, starting with slide 13, I have a listing of the comments that we received during that meeting.

The first bullets talks about the dryer failure at Quad Cities. We had quite a bit of discussion on that failure. And where we are today, is we're looking at -- actually, we did send out an inspection team, to the site, to look at the licensees' corrective actions and the changes that they're making to their dryers.

Quad Cities was actually held down for

some time, until they volunteered to stay down at the old power level until they've resolved this issue that's since come up.

We had a team out there that looked at the corrective actions, the changes that they've made. We've had a meeting with Exelon and General Electric to discuss this dryer failure.

Where we are right now, is we're following the General Electric and industry actions, whatever actions they're going to take to evaluate. If there's anything in addition to that, that we would need to take as a regulator.

So we're evaluating our options, in terms of what we need to do. In other words, to make sure that these things don't happen again. We're getting an application, or we should have an application here from Vermont Yankee, shortly, and they have told us that they're going to address this dryer failure on their application.

So we'll be looking hard at that, to make sure that we understand what happened, and how they addressed it for their plant. We're looking broader than dryers.

We're not just looking at dryers, we're looking at other areas that are effected by higher flows. As you recall, this was a flow-induced vibration issue.

We're looking at other compliments and boilers. We're looking at PWRs, we're not ruling out PWRs, if there is a reason for us to go and look at PWRs and issue guidance there, we of course would do that.

The next bullet is the effects of increased flow on effectiveness of noble chem applications. That came up during the Sub-Committee meeting. And I'm not an expert in this area, but I did consult with our experts.

And I think I have people here to address that. Licensees have programs to address inter-granule stress corrosion cracking. And the way that, I understand, this works is it includes periodic electro-chemical potential measurements, or secondary parameter measurements.

It includes monitoring a surveillance specimen for noble chem film integrity, and component inspections. And, as a result of monitoring, licensees will make adjustments to the hydrogen addition, or the re-application of noble chem, if it's necessary.

Based on our understanding of those

programs, we don't believe that anything more needs to be done, or that we need to do any more in terms of our review of this area -- in this area.

And, like I said, I'm not an expert in this area. But if you have any questions, I believe I have someone here that could address that.

MEMBER WALLIS: I think our previous concern was particularly about the noble chem feature.

MEMBER POWERS: I'm not 100 percent sure. I would suspect that part of it is that there's a relationship between the critical ECP that you have to get, in order to get protection and the flow rate.

And so, although I would somehow think that -- I just don't know how much the flow -- what the flow-in velocity increase in the core is, to know whether it's almost within the noise of the correlation that one has.

I mean, the flow rate does go up. How much does it go up?

MEMBER SHACK: It does not go up so much, they just boil more.

MR. SHUAIBI: There are increases in steam flow and feed flow.

MEMBER SHACK: Well, the steam flow, I don't think is a particular concern. I'm not quite sure what Peter's really worried about there.

MR. SHUAIBI: Well, I checked back with our experts, and based on the way that this program works, we don't believe that there is a reason for us to do more than -- any more than rely on those programs.

MR. MARSH: Based on the comments that we heard -- this is Tad Marsh. Based on the comments that we heard from the Sub-Committee, we felt like their may be some more data that Doctor Ford may have, of which we were unaware.

MEMBER SHACK: GE has measurements of the protection ECP versus flow-rate.

MR. MARSH: Right.

MEMBER POWERS: That are proprietary, and NRC certainly has access to them.

MR. MARSH: Right, I don't know whether we have seen that data and can respond cogently to the comment. If we could have a separate discussion to make sure we understand the concern, make sure we've seen the data that drives him to have the thought, then we'd be glad to do that.

MEMBER WALLIS: I'm sure the appropriate person to have the conversation with is Peter Ford.

MR. MARSH: Right, right, sure we

understand.

MR. SHUAIBI: The second comment, I'm also not an expert in this area. But the comment is related to the combined effects of flow-induced vibration and increased flux or fluence on radiation-assisted stress corrosion cracking.

Again, looking back when we looked at that, and based on the thresholds that we have for dealing with integrated radiation-assisted stress corrosion cracking, we didn't believe that we needed to do any more than what we do.

This is another area, I guess like Tad said, if there's specific information out there, we would certainly like to talk to Doctor Ford and get more information on it.

MEMBER SHACK: Well, again, as your fluence go up, your susceptibility is going to go up. So, you know, it is something that's not an instantaneous problem, but over the long run, yes it will increase the susceptibility by SCC.

MR. SHUAIBI: Right, the comment was more towards the combined effects of flow-induced vibration influence, as opposed to just fluence and just flow-induced vibration.

We have staff that looks at flow-induced vibration, and we have staff that look at the effect of fluence. And those are two different people in two different groups.

And I believe the concern was, well are we looking at, when we go back to an ACRS term, the synergistic effect of both of those combined. Is the effect of both of those combined different than looking at them separately.

MEMBER POWERS: My recollection was not that we had any particular insight that there was a thing, it was a question of, is there, not is the magnitude different than you thought? Does it exist or not?

MR. SHUAIBI: Right, well we went back and discussed this with -- actually, since I'm not an expert in this area, let me turn it over to Barry Elliot, who is an expert in this area, and let him address that.

MR. ELLIOT: This is Barry Elliot. I can give you some of our experience in this area. The Quad Cities failure was evaluated, and it had flow-induced vibration.

And they evaluated it and it had no stress corrosion cracking associated with it. This is two separate distinct mechanisms. One is a design problem due to resonance.

And the other one is a long-term aging effect resulting from neutron fluence. Now, can you get a high fluence plant that has radiation-assisted stress corrosion cracking?

Well, yes you can. And we have criteria that, once you reach the fluence, you start inspecting for this. Can you get a flow-induced vibration after a plant has already gone through a high enough fluence?

If you make a design change, and after you reach that fluence, you could possibly get both mechanisms. But there are two separate, distinct mechanisms and there's two separate evaluations we do.

And as long as each one is evaluated correctly, this should not be a problem.

MEMBER POWERS: I mean, you labeled them distinctly. You think about them distinctly. Are they, in fact, totally de-coupled mechanistically?

MR. ELLIOT: I can just tell you, the experience that we have, I don't have that much experience with flow-induced vibration, but it's a residence problem.

And radiation-assisted stress corrosion cracking is a fluence problem. And there's a change in the micro-structure of the material. And the other is just a vibration problem, a mechanical vibration problem.

MEMBER POWERS: Which causes a change in the micro-structure of the material?

MR. ELLIOT: Well, what one -- the short-term problem, I don't think that if a problem occurs in a year, like what happened at Quad Cities, is going to change the micro-structure.

MEMBER POWERS: I'm sure it must.

MR. ELLIOT: It's just a mechanical --

MEMBER POWERS: Yes, but why is it mechanical? I mean, what's happening mechanically when you get a vibration-induced fatigue on a material?

MR. ELLIOT: What happens is that you initiate a crack, and then the frequency of the vibration is so high that you get a high-cycle fatigue failure.

MEMBER POWERS: Yes.

MR. ELLIOT: Which is an entirely different thing than causing a radiation-assisted stress corrosion cracking.

MEMBER SHACK: I mean, we do have lots of laboratory data that says cyclic loading aggravates stress corrosion cracking. But that's typically at low frequencies.

And as you go to the frequencies that we're interested in here, that synergistic interaction does, in fact, seem to disappear in the laboratory tests, so.

At the high frequencies, it would seem like they are, in fact, relatively independent phenomena. And at low frequencies, they are synergistic. But I don't know of any data at the kind of frequencies that we're talking about here, that would indicate an interaction.

MEMBER WALLIS: But if there's cracks from stress corrosion, and then you vibrate it with a bigger amplitude and a higher velocity and put bigger stresses on it, it might be more likely to fail.

MEMBER SHACK: Yes, if you -- in any fatigue problem, if you get rid of the initiation stage by generating a crack somehow, things are going to go a lot faster.

MR. ELLIOT: I just want to point out, we do have a criteria for radiation-assisted stress corrosion cracking - it's a fluence criteria, and that's based on our tests.

MR. SHUAIBI: Again, I guess the point I want to make is we did go back and discuss this. And this is what we have right now, but if we could have it separate meeting or call with Doctor Ford, maybe we can get a little more information.

MEMBER POWERS: I don't think you've closed this one. It's not a very satisfactory closure, because they're both micro-structure phenomena. And they're both crack propagation phenomena.

And just because you labeled them differently, you think about them differently in isolation, does not mean there's not a synergistic effect in there.

I think you're going to have to get his data and say, yes, there's an effect at this frequency and there's not effect at this frequency, and so we say there's half an effect in-between at the average of these frequencies.

MEMBER WALLIS: It's something to look into, but I don't think it changes your standard.

MR. SHUAIBI: Right, we would like to look into that, to see if there is something that we should change in the way that we do these reviews.

MEMBER WALLIS: Certainly if something turns out to break --

MR. SHUAIBI: Right.

MEMBER WALLIS: -- and this is a possible mechanism.

MR. SHUAIBI: Okay, so the next bullet is, I believe, another one that Doctor Ford mentioned during the Sub-Committee, and it is the need for us the staff to be aware of new information out there in the materials area, and update our guidance as necessary.

We do, to the best of our ability, try to keep track of what's going on out in this area. We consult with our office of research. We do attend conferences and participate in those.

We get information from our counter-parts in other countries. We do attend ASME code meetings and are actually actively involved in ASME code work. And we also rely on operational experience in a lot of places.

So, we believe that we do go out and look for any new phenomena or any new information that would maybe change the way, or lead us to change the way, that we do reviews.

Based on what we learned from those different sources, we have a lot of options to us. We could issue bulletins - we've seen many of those. We could issue other forms of generic communications.

We could change our guidance. As I've said earlier, we do intend to keep this review standard as much of a living document as we can. What I mean by that is, once we develop our office instruction for updating it, we might need to go through public comment periods and things like that, which may be a periodic review, as opposed to a living document

But we do get information and we do plan on keeping this review standard up to date with that information.

MR. MARSH: Well, I guess -- Tad Marsh again. From the standpoint of the Sub-Committee meeting, we're wondering, here again, if there's data that we've missed from Doctor Ford's concern, and if there's something that we should be considering explicitly.

We've given you kind of a generic answer for how we review data and how we stay aware and how we roll it into the regulatory process, but --

MEMBER WALLIS: I think it's a generic point he's making here really, rather than a specific one.

MEMBER POWERS: I'm pretty sure that Doctor Ford was asking, is there, not I know of one --

MEMBER WALLIS: Okay.

MEMBER POWERS: -- and let's see if you guys can find it.

MEMBER WALLIS: Okay.

MR. MARSH: Well, we didn't mean that, but you know our processes. And this is the way it's done - We just want to make sure we're not missing something, some phenomena or some other source that we wanted to be more mindful of.

MEMBER WALLIS: Of course, it's not really a test the materials area, this is a generic --

MR. SHUAIBI: True. It came up in the text of materials, but I agree - I think this is broader than materials. And we --

MEMBER WALLIS: This is one of your difficulties, I think, is that you have enough work already, trying to review these. But if new information is out there, how do you get a hold of it and know if it applies or not - to anything, not just materials?

MR. SHUAIBI: Right. Well, the things that I talked about, office of research and what they have -- in a little bit, I'll be talking about a program that the office of research has underway that'll address one of your other concerns, hopefully, in terms of conferences and their foreign counterparts.

I think a lot of our groups are tied into that - it's not specific to materials. Maybe ASME code is specific to the mechanical engineers or materials engineers, but we have a lot of people that do follow these things.

And that's -- these are our sources. ACRS is a source. I mean, if --

MEMBER WALLIS: Oh God, you're in trouble then.

MR. SHUAIBI: You have discussions here on things where we've gone back and looked at. And like we said, we'd like to talk to Doctor Ford if he has anything specific.

Any of the other members, if you have anything specific. I mean, we're always looking for information. And if there's anything that invalidates guidance that we have, we would like to know that and we can go back and look at it.

MR. MARSH: Operational experience and the derivation of it, and folding it into the review, is part of the lesson learned coming out of Davis-Besse. And that's a major task action plan that we've got. So that's very important to us.

MR. SHUAIBI: Okay, the last bullet on this slide, I do want to defer - it's actually in the wrong order. The effect of EPU on consequences of severe accidents, I believe Doctor Kress brought this up during the Sub-Committee.

And the interest here, I believe, was could we run some codes and find out what the impact of an EPU would be on source term. And I'm going to talk about a program that research has underway that's probably going to address that.

Another question that came up during the Sub-Committee, again it was recognized as not a review standard specific question, but something that would be nice to have, is what limits power uprates at the plants, and how will large break LOCAs re-definition effect these limiting factors.

What types of uprates can a plant get if we were to re-define large break LOCAs. And the answer to that is very plant-specific. Large break LOCAs may be limiting for some plants, but they probably will not be limiting -- I know they're not limiting for all plants.

There are other things that could be limiting at the different plants that are out there. So, it's kind of hard to do an analysis and come back and say, well I know that if I re-define what large break LOCAs and bring it down to something smaller than a double-ended guillotine break, that I will have a 50 percent uprate or a 30 percent uprate.

For some plants, it might, for other plants, it might not gain anything. If you remember during the review of the constant pressure power uprate topical report, there were discussions about the impact of a power uprate, a 20 percent power uprate, on peak cladding temperature.

And without getting into the proprietary information, and the sensitivity there, it didn't really make much of a difference, so… The next bullet, synergistic effects, something that keeps on coming up.

And what I'd like to do here, and the reason I put this bullet in the way that I did, is because we took this back from an ACRS comment, and the office of research started a synergistic effects program.

They were going to look at synergistic effects, power uprates, license renewal and whatever else plants are doing out there. Well, that's been -- that title has been changed.

It's no longer called synergistic effects.

The program that research is undertaking, it's actually an international program, not just us here in the NRC.

It's called `Safety Margins and Impacts of Plant Changes on Margins.' And what they're doing here, and I'm not sure if the Committee has received a briefing, if you got a briefing on this or not, but what they're doing here is they're taking the risk analysis and deterministic analysis and they're trying to marry them in a way that would allow us to look at things like, how does aging effect the results of PRAs?

Could aging result in a success path becoming a failure path? Could other things -- and one of the things that I had some discussion with our office of research on, is will this address, for example, things like source term?

And the indications I get right now is, yes that's intended to do that as well. And I have, in this room, Mr. John Kauffman, from the Office of Research.

If you have any questions, he could address those. The next bullet talks about guidance for independent calculations. And let me go on to the next slide. The next three bullets are addressed by the next three slides.

MEMBER LEITCH: I'm not sure that that last effort did describe quite -- it's the target there though. It talked about the network as being impact of plant changes on margins.

I think our concern is a little more than that. It's are there -- I mean, it seems like the thought of synergistic has disappeared from that effort.

I think what we're really saying is, are there cases where 1+1 doesn't equal 2, but equals 2.1 or something?

MR. SHUAIBI: Right, and when I read the title I thought the same thing. When I first heard that this was called safety margins, I thought is this the kind of program that's going to tell me that with this change I'm going to go from having 100 pounds of margin to 90 pounds of margin?

And then with this different change, it goes from 100 to 95. And then I'll take those two, and now it's 15 instead of 10 or 5. The way it was described to me, and again I have the -- I have John Kauffman here from the Office of Research, and he can talk about this -- is it will actually take changes or combinations of changes and give you the final impact.

If synergy exists, if putting two together, putting 1+1 together doesn't end up with 2, it ends up with 3, this program is intended to cover that as well.

Even though the title doesn't say synergistic effects, for whatever reason, we went away from synergistic effects as a title. But the program, the way I understand it, will cover synergistic effects.

Again, I think -- I do have Mr. Kauffman here, and if you have any questions on that program, we can try to answer those. Or maybe it'd be appropriate if you want to hear about the programs in a separate meeting, that's something that Mr. Kauffman said they can come to the Committee and talk to you about it.

MR. MARSH: I assume that the types of changes that would be evaluated are those that will be power uprate related as well?

MR. SHUAIBI: They're starting with power uprate. License renewal will be a part of it, I believe. I see Mr. Kauffman coming to the mic, so that's good news.

MR. MARSH: Great, yes that is.

MR. KAUFFMAN: Thanks, I appreciate it.

MR. SHUAIBI: Let me turn it over to Mr. Kauffman, and let him talk about the program.

MR. KAUFFMAN: I'm John Kauffman, from the Office of Research. This is a project that was begun, actually over two years ago. And Jack Rosenthal has briefed the Committee on this about two years ago.

And it's the simple question about the name change, is when work was discussed by Farouk Eltawila over at NEA/CSNI, it turns out some of the European countries were -- maybe synergy doesn't translate, but they were much more comfortable understanding it as the effects on margins, and that can be combined effects on margins.

I would say it's basically a name change, but the project is pretty much headed where it was. This project is looking at BWRs. The international cooperative research will be looking at PWRs.

And the four factors this program is looking at, are the effects of uprate, longer cycles, higher burnup and aging. And, as Mohammed said, we'll be glad to give an update on where this research stands.

MEMBER POWERS: Does the program plan exist?

MR. KAUFFMAN: Yes, we have a program

plan. And, in fact, we've recently put in place a new contract to convert this from the synergy to the margins.

And this is quite an ambitious product -- or project. We're really, right now, trying to, as Mohammed described, marry these synergistic and deterministic worlds, such that we can look at timing issues, changes in mission, mission times and, again, fluence.

This is a very big, broad project though. It will not be easily done, and it will not have results in the near term.

MEMBER POWERS: Could we get a copy of your program plan?

MR. KAUFFMAN: Yes.

MEMBER POWERS: Thanks.

MR. SHUAIBI: Thanks, John. Okay, on slide 15 in the presentation, and this talks about the guidance for independent calculations. When we came to the Sub-Committee, we had different guidance in each of the matrices, meaning different guidance applying to each of the different groups that do reviews for power uprates.

Some guidance provided was very specific in saying that you will do an independent analysis for this and that, maybe two areas. Other guidance was more general, saying you will do independent calculations if you run into these types of things like new codes, or things that you're not familiar with or that you're not comfortable with.

In other areas, we said no independent calculations. And the concern was that, with guidance that says no independent calculations or guidance that says you will do it only in one or two areas, their reviewer could perceive that as limiting their ability to do independent calculations.

That this is a management direction to not do any more than what's in there. So we went back and looked at the guidance that we had. And what we wanted to do is come up with one set of guidance that doesn't do that.

That wasn't our intent, like Tad said earlier. Our intend is, if we need to do independent calculations, we should do them. And if that sent the wrong message, or the Committee felt like it sent the wrong message, we wanted to make sure it was corrected.

So, what we did is we came up with new guidance. We needed to come up with new guidance because we needed it to work for everybody. It's really the way that people determine they need to do independent calculations varies from a mechanical engineer to a thermo-hydraulics reviewer.

And so, what we came up with, were criteria that go to the confidence of the reviewer and the methods that we used, and the results that were used, familiarity of the reviewer or the organization with the models and methods that are used, prior use of these models by licensees for similar power levels, if you will, or similar plant designs.

Our experience, based on our knowledge or past reviews, and available margin versus uncertainty, this may be qualitative instead of quantitative in some areas.

There's not a threshold that says, if you've got this much uncertain or this much margin, the reviewer believes that the - there's not going to be enough margin to cover the uncertainty, then maybe they would determine that they need an independent calculation.

And, lastly, if an independent calculation or an audit would improve the efficiency of the review. In other words, if actually doing the calculation would result in us having to spend less resources in doing the review.

MEMBER WALLIS: First, it's doing a simple bounding calculation that shows you didn't have to worry about something.

MR. SHUAIBI: Right.

MEMBER WALLIS: Right.

MR. SHUAIBI: Right. And our guidance, although in bullet form, is going to be just like you have on this slide. And we can send you the actual words, if you'd like to see the actual words.

But they're going to be these things that are on this slide. And it puts it on the reviewer to say, I don't have the confidence in what I have in front of me.

And this will apply to everybody. So, this will be generic guidance, just like the Sub-Committee recommended.

MEMBER WALLIS: This actually was very similar to the list that you had to one or two of the areas?

MR. SHUAIBI: Right, very similar to -- I believe we had it in containment systems, and those consequence analysis, and in reactor systems, yes.

MEMBER WALLIS: I think it's good to help the reviewer, particularly if it was a management pressure to get on with the job. Then the reviewer can say, look, I don't really have confidence in the results, I've got to do some checking here.

MR. SHUAIBI: Right. And we sensed that that was the concern, and really that wasn't what we wanted to do. So, we went back and looked at it, and this will apply to everybody.

The next area are the comments that we received in past power uprates in the risk evaluations that we performed. And I'm going to turn it over to Donnie Harrison.

Again, he's the senior reliability and risk analyst that has done all of our power uprates, or extended power uprates that have come to the Committee here recently.

So, let me turn it over to him, and he'll talk to the points on this slide.

MR. HARRISON: Thanks, Mohammed. I'll start with actually bullet three, because that kind of gives a lead-in to what we -- what our reviews involve. We need to first recognize that these submittals are not submitted as risk-informed applications.

They're standard applications, and so our risk review is focused really on identifying the issues that might raise questions about adequate protection.

Some might look at that and think therefore we don't do a detailed review. And I would think it's just -- in reality, it becomes just the opposite. We actually have to do a fairly thorough review to determine that we don't have questions that would result in rebutting the presumption of adequate protection.

Because of that, we do a review that's fairly broad. It covers the internal events, external events and shutdown. The uniqueness of our review, it was felt that --

MEMBER POWERS: Will you fire PRA?

MR. HARRISON: We will look at the fire area. If they've done a PRA, that would be nice. If they haven't, we look at the five analysis and make a determination on that.

What we usually do on the external events, is actually go all the way back to the IPEEE's and start looking there, see if there's any holes in the analysis, and then start moving forward from there to try to get an idea of what the baseline risk values really are for those areas.

What it results in, is a review that is broad in scope. But again, it's focus is mainly on adequate protections. So we're really looking at the base risk values.

We do some shortcut approaches, to try to get a ballpark figure of what the risk is from say external events like earthquakes. When it's done by a seismic margins analysis and there is no PRA, all of that's geared towards the idea of having confidence that we can truly say there is no adequate protection question.

MEMBER POWERS: Maybe you can help me a little bit. I'm worried about seismic at a site that's asking for a power uprate. Power uprate didn't effect the seismicity of things.

MR. HARRISON: Right.

MEMBER POWERS: You're looking for some increased fragility of the plant?

MR. HARRISON: No, what you're looking for in a situation like that would be if they have vulnerabilities that a seismic event would make worse. Or if there's a susceptibility like -- just as an example, on Dresden.

They had recognized in their IPEEE that there were -- I'm trying to think of what it was. Some analysis -- LOCA analysis that they hadn't completed, but they were pretty confident they were going to get good results.

And, based on that, they said they didn't have a vulnerability. Through our review, we had them do the analysis and they found out that they were good through 24 hours.

But somewhere around 25 hours, things started to go bad. And because of that, then they had to -- we then asked them to do a, if you will, a mini risk analysis of that vulnerability.

Again, with the goal being, what is the risk of the plant. With that existing vulnerability, they were able to satisfy and say it was a small enough risk that we could go forward.

So, that's what we're looking for. We're not saying because you went up in power by 20 percent, all of a sudden your diesel's going to shake more. That's not what we're saying.

So, for the most part, plants will have a .3 GE review level earthquake, or a .5 GE review level earthquake. And it's a matter of just making sure there's no holes.

And then using, again, it's a Bob Kennedy approach to come up with a simplified estimate of what that risk value is, so that we can integrate that into the total review.

With that comment, we'll move to the first bullet. We've received comments from the ACRS on just about every review we've done dealing with human reliability models.

MEMBER APOSTOLAKIS: Did you do it the same way in just about every review you've done?

MR. HARRISON: Yes.

MEMBER APOSTOLAKIS: So, you were consistent?

MR. HARRISON: We've been consistent and you've been consistent in response, yes.

(Laughter.)

MR. HARRISON: The real recognition there, though, is the NRC has not reviewed and approved, per se, formally any method in the HRA area. However, you know, you heard from Doctor Parry this morning.

He's an HRA person. We do talk to him when we do these reviews, and make sure that we're not getting results that are off the wall. The HRA information is not being used to accept the review.

Again, we have to stay focused on what our review is trying to do. But it just gives us some insights.

MEMBER APOSTOLAKIS: I think the comment that was made in the letter essentially said that for your purposes, you really didn't need any numbers. You didn't need to state explicitly that this is a human error or probability that went from here to there.

What you are doing is what you just said. You're looking for vulnerabilities. You're looking for something unreasonable. So, you know, then you find that the available time went down from 42 minutes to 38 minutes.

It would be good enough to say this is a small change and we don't expect the numbers to change much, period, thank you very much. The problem with going beyond that and start putting human liability more than results there, is that pretty soon people don't think this is an issue.

Why should the Office of Research spend any money developing these models when NRR really doesn't need them? Either there is a need or there isn't. Now, for your purposes in this particular action, we don't need the numbers.

MR. Harrison: Right.

MEMBER APOSTOLAKIS: All you need to know is that the change is small.

MR. HARRISON: Right, and I'll take the full blame for the fact that we put in information that --

MEMBER APOSTOLAKIS: It's redundant, it hurts you.

MR. HARRISON: -- that ends up making it look like we're approving the methods and the model.

MEMBER APOSTOLAKIS: Yes, exactly. And I think it's all Gareth Parry's fault.

(Laughter.)

MR. HARRISON: Well, actually, I'm the one that did the writing, so I have to take the blame.

MEMBER APOSTOLAKIS: No, but you understand how the standards -- the comment was made?

MR. HARRISON: I understand. And it's --

MEMBER WALLIS: And just say it's small, it doesn't help because people ask you what's the change in CDF? It turns out that it's all due to human action.

MR. HARRISON: Right.

MEMBER APOSTOLAKIS: Yes.

MEMBER WALLIS: And, therefore, you give us a number. And the number must come from some model.

MR. HARRISON: Right, and --

MEMBER WALLIS: But you can't avoid that modeling, if you're going to give --

MEMBER APOSTOLAKIS: Then I hope -- then I would be very happy if this kind of thing created pressure on research to actually develop the model.

MR. HARRISON: Well --

MEMBER WALLIS: But you can't have it both ways. You can't have it so that it faults it and then ask for a number for the CDF.

MR. HARRISON: Well, but the --

MEMBER APOSTOLAKIS: I'm sorry, but you know, if we don't have the model, we don't have the model. We can't just say critical applications, well we don't have it but it's good enough.

MEMBER WALLIS: But you see the point that --

MEMBER APOSTOLAKIS: Because then you never have any of the -

MEMBER WALLIS: We're going to ask them two questions. Is it a big effect on it? They'd say, no it's a small effect. What's the change in CDF. Gee whiz, I don't know because Apostolakis won't welt me make that consideration.

MEMBER APOSTOLAKIS: Yes, because it would be wrong. It's a small change, that's all they need to know.

MR. HARRISON: And -

MEMBER WALLIS: But, George, you do something --

MEMBER APOSTOLAKIS: I mean, it's not the first time they make judgments like that.

MEMBER WALLIS: -- make an adequate analysis.

MEMBER KRESS: When does it become a large change or a significant change?

MEMBER APOSTOLAKIS: Then there should be, as I said, urgency in developing the model.

DR KRESS: But how do we know, though, without a model --

MEMBER APOSTOLAKIS: Well, surely, we'll take action then. We can't just go around --

MEMBER WALLIS: It has to be adequate. If you need to just make a guess, then you do it. But you still make a quantitative analysis.

MEMBER APOSTOLAKIS: Put pressure on research for them to develop the mode. You can't say I don't have the model, therefore I'm going to do this, because then you undermine any research effort to do any decent job. You have to draw the line somewhere.

MEMBER WALLIS: But they're, of course, trying to answer our question.

MEMBER APOSTOLAKIS: Our question --

MEMBER WALLIS: What's a small change, what's --

MEMBER APOSTOLAKIS: Make a deterministic judgment.

MR. HARRISON: Yes, I think really where we started to get a lot of feedback on the HRA was on the Arkansas submittal, where I actually put in a table that listed all of the Arkansas operator action HRA values and what their changes were.

And that made it, I mean, painfully obvious that we were only getting four minute changes --

MEMBER APOSTOLAKIS: Right.

MR. HARRISON: -- and we were getting little tweak values in the HRA.

MEMBER WALLIS: The problem is, we ask them what the change is in risk. The risk is measured by CDF. It turns out that these issues of human reliability are the biggest effect on this.

So, they have to be quantified if we're going to ask what is the change in --

MEMBER APOSTOLAKIS: Therefore --

MEMBER WALLIS: If you want to put it on the Reg Guide 1.174 picture, sometimes it matters.

MEMBER APOSTOLAKIS: And I agree with you, therefore there is urgency for research to develop the appropriate model.

MEMBER WALLIS: That doesn't help these guys right now.

MEMBER APOSTOLAKIS: The conclusion is not to use the wrong one.

MEMBER WALLIS: It doesn't help these guys right now. So if you want to keep beating on them exactly the same way when we have the next presentation.

MEMBER APOSTOLAKIS: We will never have the model, as long as NRR --

MEMBER ROSEN: We have a human factor sub-committee and it is having a meeting in October with these people. And I hope that they will get into some of this discussion.

MEMBER APOSTOLAKIS: Another way of doing it, Graham, is to -- this is a true model uncertainty issue. Take the six or seven models that are out there and use every single one of them. And these guys are not going to like it.

MR. HARRISON: Actually, that would be a complaint. I think the licensees would come back to -- I would love that, because it would answer my question upfront.

But that's a research effort, not an application effort.

MEMBER KRESS: Just get a bunch of experts together and then --

MEMBER APOSTOLAKIS: Sure.

MEMBER WALLIS: So, you guys are going to resolve --

MEMBER KRESS: Quantify the change in time with the change in --

Dr. APOSTOLAKIS: But this Committee -- in fact, I think it was Dana that raised the issue a few years ago, he said as long as NRR makes decisions without the need of research, research will never happen.

MEMBER KRESS: That's true.

MEMBER APOSTOLAKIS: That's the truth.

MEMBER KRESS: That's the truth.

MEMBER APOSTOLAKIS: So, as long as these guys make the major decisions like power uprate, license renewal, ignoring risk, then I don't see why people are complaining that we are not making progress in risk in forming the regulations.

MEMBER KRESS: Now, so far --

MEMBER APOSTOLAKIS: This is not the

research -- This shouldn't be a research issue --

MEMBER KRESS: So far, it appears that almost conclusively you don't have much of a change in the operator response time required for power uprates. You can almost make a decision now that the human error is not going to have a big effect on it.

MEMBER APOSTOLAKIS: And that's my argument. But you can stop there.

MEMBER KRESS: Yes, but in order to say all right we really need these models to research, we've got to have a case for where it does make a difference.

And it's not going to be power uprates, where is it going to be?

MEMBER APOSTOLAKIS: We don't know. We suspect there might be a difference, but we don't know. But this is how -- I mean, this is all the user's request, isn't it?

These guys, the real decision-makers, they'll research that we need this model.

MEMBER KRESS: Right --

MEMBER APOSTOLAKIS: If they never say that, then…

MEMBER KRESS: Well, you know, what I would be tempted to do is try to get a particular model on these and get some expert judgment as to what the uncertainty is on there.

MEMBER APOSTOLAKIS: That's fine.

MEMBER KRESS: And then say, given this range of uncertainty, I can't properly make my decision.

MEMBER APOSTOLAKIS: I would be in support of that. There are several other out there. You have seen the pictures from Ispry. We can't ignore that fact. So, either we use all the models and see which one gives the worst result and then pass judgment, or we call experts just like --

MEMBER KRESS: And that's still not necessarily the uncertainty. The worst result of that is that it's still not the --

MEMBER APOSTOLAKIS: I don't think that's the most appropriate way of doing it, but still, you would like to know.

MEMBER KRESS: Yes, I'd support that.

MEMBER APOSTOLAKIS: But my fundamental thesis is that as long as the important decisions of the agency are being made, ignoring certain needs, these needs will never be satisfied.

MEMBER WALLIS: Yes, but these guys -

MEMBER APOSTOLAKIS: This is where the

real decision-making takes place.

MEMBER WALLIS: These guys still have to come up with something in their statements --

MEMBER APOSTOLAKIS: And I gave them a way out. If you want to see numbers, then they should put pressure on research to accelerate the development of the model.

MEMBER WALLIS: But they have to give us numbers for Vermont Yankee before that's happened.

MEMBER APOSTOLAKIS: I've made my case.

MEMBER WALLIS: You made your case --

MEMBER KRESS: I'm still struggling with how you make the decision that it's a small effect. See, that was --

MEMBER APOSTOLAKIS: Well, I mean, look… if the available time goes down by two or three minutes - if the original was six, and it goes down by three, I understand that it's different.

MEMBER KRESS: Yes.

MEMBER APOSTOLAKIS: But if it's 42 and it goes down to 39, I'm willing to go along --

MEMBER ROSEN: What is the job performance measure that says you need 40 minutes to do it?

MR. HARRISON: Well, and --

MEMBER APOSTOLAKIS: That's from thermo-hydraulics.

MR. HARRISON: Right, and we have had that case.

MEMBER ROSEN: It might not be unimportant. I mean, it may be a break point. Do you see what I'm saying?

MEMBER APOSTOLAKIS: Oh, you mean the --

MEMBER ROSEN: You need 40 minutes to do this. they've gone through it, and they've diagramed it and they've tested it out and they've simulated it. They need 40 minutes.

And now, we're going to uprate the plant and there's only 39 left. It used to be 42 or 43.

MEMBER APOSTOLAKIS: What you are arguing for, is for the development of the model. I'm not going to say, no.

MEMBER WALLIS: No, it seems to me, George, this is where the staff uses its judgment. It may have to do some independent analysis and say that we estimate the uncertainty in this to be such and such.

Therefore, this time could have this much influence and still it's small. And therefore, it's acceptable. They may have to go beyond --

MEMBER APOSTOLAKIS: If they go through it in a reasonable way, but not picking one of the available models. And then we ask why, and the answer is a lot of utilities use them.

MEMBER WALLIS: No, but then if they understand the model, they know something about the uncertainties in the model, they can probably explain to you why this model, even with its uncertainty, gives an okay.

MEMBER APOSTOLAKIS: If they are willing to do a model on certainty analysis, I would be more than happy to applaud.

MR. HARRISON: If I can address part of that though, is that on one of the plants, I know there was a concern about the early initiation of SLC. And the question was, how much confidence do you have that the fact went from about six minute initiation to a four minute.

MEMBER APOSTOLAKIS: That's more significant.

MR. HARRISON: That's a significant impact. And -- but, at the same time, six minutes is already going to have a high error probability associated with it.

So, you're going from a high number to a higher number.

MEMBER ROSEN: Why would six minutes have a higher probability when it depends on what the action is.

MR. HARRISON: It depends, and the controls.

MEMBER ROSEN: It's more than what -- You can't just take one error of force in context to draw a conclusion.

MR. HARRISON: That is correct. And I don't want you to side-track on that. Yes, that is true.

MEMBER APOSTOLAKIS: Let me make a more general statement here, because every time we write a research report, we get a message from the Commission: remember, this is not the National Science Foundation. This is a regulatory agency. Research should help regulation.

Well, if this is not a good example of that, I don't know what is. They have a need. Make a regulatory decision. The state of the art does not give them the tools. Ergo, develop the tools.

MR. HARRISON: Let me give you a practical response that we did on that particular situation. We went back to the licensee and they've done, you know, operator simulated training. And they were able to show to the Human Factors folks that in 68, I think it was, simulator runs, they never missed. They always did it on time.

MEMBER POWERS: And in fact they did it within 30 seconds.

MR. HARRISON: Right, which then had us ask some other questions. But the point was they gave us confidence that the values they were using as human error probabilities that went from about 0.1 to 0.18 due to the power uprate, that gave us confidence that we were pretty much, you know.

MEMBER POWERS: 0.01 to 0.018, wasn't it?

MR. HARRISON: It went from 10 percent to 18 percent.

MEMBER POWERS: Really?

MR. HARRISON: Was the failure rate.

MEMBER POWERS: And they never observed one in the simulator.

MR. HARRISON: Right. So that gave us confidence that our number was high.

MEMBER POWERS: It's a very strange world these Human Factor people live in.

MR. HARRISON: But that's a practical answer.

MEMBER APOSTOLAKIS: I don't think we're

going to resolve that issue right now.

MR. HARRISON: No.

MEMBER APOSTOLAKIS: In that case, if the decision-maker doesn't drive the researcher, I don't know what does. And this is an excellent example where there is a research need.

MEMBER ROSEN: May we go on?

MR. HARRISON: Okay. I'll try to make the next couple of points quick. The one question we had dealt with the fact that it would be nice to have PRAs that could model the actual margin reduction from these power uprates.

And at the subcommittee I made the pitch that when we do success criteria, we're basically making a judgmental margins reduction. If you can reduce your margins and not impact your success criteria and your PRA, then you've effectively shown there's no impact.

We are seeing some impacts -

MEMBER WALLIS: There's not no impact, because you're getting closer to something.

MR. HARRISON: You're getting closer.

MEMBER WALLIS: Just because you haven't got there doesn't mean there's no impact.

MR. HARRISON: Right. Right. But from a

PRA standpoint, that's binary.

MEMBER WALLIS: That's one of the problems.

MR. HARRISON: Right. Yes. It's a modeling approach.

MEMBER APOSTOLAKIS: The fundamental problem here, it has nothing do with science. The fundamental problem is that the submittal is not -- there is no form. And yet the staff is trying to use risk information.

So whenever we hit on a difficulty, we say well, but it's not risk informed.

MEMBER WALLIS: So you want to make it risk informed?

MEMBER ROSEN: Require it be risk informed.

MEMBER APOSTOLAKIS: It should be. Come on.

MEMBER KRESS: I think the proper thing is to require the staff to do a risk informed decision-making where they can take the risk information. It doesn't have to be a risk submittal, but they can use the risk information to make their decision.

We stick to the deterministic.

MEMBER APOSTOLAKIS: I think they are.

MEMBER KRESS: No, he just said if the risk information calls into question.

MEMBER APOSTOLAKIS: There's an issue of adequate protection.

MEMBER KRESS: Yes. Well, but what they do is look at 1.174. If you exceed some of those criteria, then that's enough to call into question adequate protection.

MEMBER WALLIS: These are special circumstance?

MEMBER KRESS: Yes.

MEMBER APOSTOLAKIS: If you exceed the 1.174 delta CDF criterion, that's not an issue of adequate protection.

MR. HARRISON: Right.

MEMBER KRESS: It calls into question, makes him dig further into it.

MR. HARRISON: Right, the Reg Guide 1.174 is a starting point.

MEMBER APOSTOLAKIS: It's a legalistic problem. It has nothing to do with technical.

MR. HARRISON: Right. And I would agree with you, George.

MEMBER SHACK: I was going to ask what base probability is for detection.

MR. HARRISON: Well, again.

(Laughter.)

MEMBER SHACK: You're the one who said you're adding them up.

MEMBER KRESS: Why don't you ask him, Bill.

MR. HARRISON: And that's a good question. What you do know from the Reg Guide 1.174 is a plant with a number less than 10 to the -4 is not adequate protection. You know if a plant's above 10 to the -3, it's probably adequate protection questions.

The problem becomes in the gray zone, between 10 to the -3 and 10 to the -4. If you just look at the seismic risk from some plants, they're up in the 2 times to the -4 already. And that's not called into question as adequate protection. So you know it's somewhere beyond 2 times to the -4.

MEMBER APOSTOLAKIS: If it's greater than 10 to the -3, it is.

MR. HARRISON: Oh, clearly. Clearly. So you could start to narrow in to where you're going to start to question adequate protection. And again, it becomes a legalistic response. And it becomes a management piece of information. And that point, if we ever went into adequate protection, we would be stopping the review.

MEMBER APOSTOLAKIS: Right.

MR. HARRISON: Because you would have a massive amount of information needed.

MEMBER WALLIS: But if this were risk informed, then you could use 1.174. You could say there's a change happening here, and is this change consistent with what's allowable under 1.174.

MR. HARRISON: Right. And clearly if the change is within Reg Guide 1.174 criteria to start with, then -

MEMBER WALLIS: Well, I think you have difficulty when it's not within the criteria of 1.174. But it still doesn't really put in question adequate protection.

MEMBER APOSTOLAKIS: Last time we reviewed ATHEANA we found that after eight or nine years of effort, they still hadn't even tried to quantify probabilities. You think that would have been the case if NRR had been complaining all along we need a model? No. But NRR makes its decisions. There is no pressure on us. You know, let's move on.

MEMBER WALLIS: Can we move on, then?

MEMBER APOSTOLAKIS: Yes.

MR. HARRISON: And I'll just note the last bullet there is Reg Guide 1.174 interpretation issues. A lot of those deal with the LERF criteria, and multiple plants at a site and how you use LERF. And I would say that that's something that should probably be included in Mary Drouin's new Reg Guide that she's wanting to work on as issues for bounding analysis.

MEMBER KRESS: That was my comment. Let me make it clear what our concerns were. They were a little more than just what you said, but that was part of it.

I had basically three concerns. One of them is that LERF is a site characteristic. So if there's more than one plant on there, it changes the LERF value that you get out of the site.

But I also have concerns about the 10 to the -5 surrogate for the prompt fatality safety goal. And my concerns are like this. Actually, that was a mean line through a bunch of plants where they back calculated what LERF would give them, the prompt fatality safety goal.

So I would like to see things like where does this specific plant inside fall on a curve? Is it above it or below it? I'd like to get that into the system some way. Because it was just a mean guidance line.

The other thing that worries me about it is when they made this back calculation of the LERF from the prompt fatality safety goal, they used a source term. Now, the question is you've got a 20 percent power increase. You've got a 20 percent increase in inventory. The prompt fatalities are not linear with the release of fission products.

So the prompt fatality LERF surrogate is going to change just because you changed the inventory. And we never change it. We just change the effect of that on the LERF, which it doesn't take much because the fission products don't change the LERF very much.

MR. HARRISON: And I'm not sure when they -

MEMBER POWERS: They don't change it at all.

MEMBER KRESS: Well, they have a little bit of heating effect, and you can calculate some minor changes in LERF. But what it really affects is the surrogate that you should be using for the prompt fatality safety goal. And that's never factored into this.

So it's those three concerns, basically, I have on how we deal with it in risk informed space.

MR. HARRISON: Right. And I'm not familiar with it, actually how they derive the LERF from the prompt fatality. I don't know if they used a bounding source term to try to do that where if they did, then you could argue as long as your 20 percent increase is still within that source term, you're still okay.

But to be honest with you, I don't know how that calculation was done, or how it was derived.

MEMBER RANSOM: We're running way over time. So I think we're going to have to limit this. And there's one more issue, I think, to take up and try to get over that fairly quickly.

MR. SHUAIBI: Okay, then. The next slide talks about SRP 14.21, the guidance for power uprate testing. And let me turn it over to Kevin Coyne who's going to talk to the SRP.

MR. COYNE: Thanks, Mohammed. Okay, we just wanted to make a couple of brief points about the transient testing guidance contained in SRP 14.2.1. Actually, that SRP covers the whole EPU power ascension test program.

The first point is that the guidance calls for performance of transient testing. We use transient testing because that has been the focus of

ACRS concern in the past with previous EPU reviews.

The scope of testing that's considered in the SRP is based on the plant-specific licensing basis, and considers the original power ascension test performed for the plant, and focuses on EPU-related modifications.

In short, the scope of the consideration includes all original testing that was done in greater than 80 percent power for the plant. And the SRP also contains some screening criteria to identify EPU-related modifications that should be considered for testing.

The guidance does acknowledge that licensees may propose alternative approaches, specifically to performing the transient test. Contained in the SRP is some supplemental guidance to aid the reviewer for evaluating licensee-proposed alternative approaches.

We provided this in the SRP based on an understanding from previous EPU submittals that licensees have typically provided a justification for not performing certain transient tests as part of their power ascension for the EPU. Typical examples are MSIV closure testing, or load rejection testing.

Throughout the SRP, the guidance places

the responsibility on the licensee to justify their proposed alternative approaches. In essence, the default position of the SRP is the call for performance of the power ascension tests does acknowledge that the licensees could propose alternative approaches. But the responsibility is on the licensee to provide an adequate justification for what those approaches would be.

MR. SHUAIBI: I want to say a couple of things about this guidance. Usually when we put out generic communications in guidance, or regulatory guides, or anything else, we say plants do this. And usually there is boilerplate language that says, `If you decide to deviate from this, justify it.' That's what we normally do.

So we could have just as easily in this case said, `Plants, go back to your original licensing basis, and anything over 80 percent, do that test. Or anything that's invalidated, do it.'

But knowing that plants were going to be submitting applications that said, `We don't want to do this,' we provided guidance to our staff, to us, that would say, `Here's how you would evaluate it.'

So this is not different from the way that we do -- It's not different in the way that it places burden on licensees in the way that we do other guidance. It says licensees do these tests.

Actually, we went beyond the original two tests that brought up this issue. We went beyond the MSIV closure test and the load rejection test. We said look at all the tests that were done over 80 percent. Look at all the tests that were done under 80 percent that are invalidated by the EPU. Go back and look at all that. All that is on the table. All that is going to be evaluated. Do those. Or justify not doing them.

And what's really important here is in the past reviews, it was perceived that we put the burden on us to justify the need for the test, instead of on the licensee to justify the need to not do the test, or no need for doing the test. And what we did here is we put the burden on the licensees. And I've been promised, I haven't seen the application, but I will be looking at VY's application here shortly, that they've gone through and done that.

So that's what we tried to do here, is we tried to put it on them. It is on them. We said, `Do these tests, or justify.' And then we provided some guidance. But we went beyond the normal way of doing business as we provided guidance for ourselves to evaluate deviation.

MEMBER POWERS: The other thing we've got here is that you look at tests more holistically than just the two that were the focus of attention in the past.

MR. SHUAIBI: That's right.

MEMBER POWERS: I think just in doing that you've justified one of the reasons we were motivated to ask for this standard review plan.

MR. SHUAIBI: I guess the concern is going back to the basis for those two tests. And the intent here is go back to your original test and look at the basis.

I think when we came to the Subcommittee with this, we focused on how not to do the test, instead of what we would be looking for.

MEMBER ROSEN: Well, you know I had some interest in this.

MR. SHUAIBI: Right. I understand.

MEMBER ROSEN: And having this dialogue with you has clarified my thoughts on the subject. And where I am now, I still maintain the position that these tests ought to be done, but now I go back to my rather extensive experience in plants doing start-up testing and recall that the reason we did full power transient testing was we wanted to see what the plant did at full power. I mean, that was the whole question. We had predictions and all of that. We had a start-up test group, and we would do a trip at full power and compare it to the analysis of the calculation to make sure the plant behaved the way we predicted it would. It gave confidence across the board if it did, and usually we did.

So now we have a new full power.

MR. SHUAIBI: Right.

MEMBER ROSEN: And it's substantially different than the previous full power for an EPU. Well, it seems to me the rationale for doing full power testing originally was valid. Why isn't it now valid is the question.

MR. SHUAIBI: And the SRP also covers this, and I believe the words it uses is this is an extension of your original test program. In other words, the original test program didn't stop at 80 percent. So if you're going 20 percent more, we see this as being an extension of -- it's the old test program, it's just you're going up to a higher power level, just like you just said.

MEMBER ROSEN: In other words, you could reformat this question as if the licensee on original licensing has come in after you gave himm a license and said I think I'm only going to go to 80 percent power and do this test. I'm going to do this test for my original 80 percent power. Would you have agreed to it?

MR. SHUAIBI: And that's what's on the table here is you want to do that? Well then justify it. And we don't expect for this to be an easy justification if that's the path that they're going to go down.

We do expect for them to go back to their original testing that was done. Look at it. Look at the reasons for why it was done. Look at this power uprate and justify to us why it wouldn't be necessary.

Again, we wanted to put the burden back on the plants.

MEMBER LEITCH: There's a difference, though, between doing the original test and doing the original test in the manner in which it was done originally.

For example, originally when you start up the plant and do some of the tests, there's a lot of temporary test equipment. I mean, you're checking all kinds of things dynamically, movement of pipes, and so forth.

So I guess this guidance is broad enough that it would allow someone to say, for example, well maybe we should do a trip from the new 100 percent power, but we might not get all the data that we got at the original test. In other words, there's enough flexibility in the exceptions that they may take, or the alternative approaches. Maybe we'll do some of this, get some data, but maybe not every last bit of data that we got in the original test.

Because re-installing that test equipment is a very, very significant work load.

MR. SHUAIBI: Right. But we would expect for them to justify that statement.

MEMBER ROSEN: By going back to the original start-up testing --

MR. SHUAIBI: That's correct.

MEMBER ROSEN: -- expectations, and showing that this new test, that the new 100 percent power doesn't need to be done to provide the data required by the original start-up test program.

MR. SHUAIBI: That's correct.

MEMBER ROSEN: Because it will be the same and for engineering reasons that we can all agree to.

MR. COYNE: For tests that would be done, we'd expect a test abstract to be included with the submittal that would lay out the objectives of the testing, and the acceptance criteria, and how the applicant would go about ensuring that the objectives were met.

MEMBER ROSEN: And what you have very clearly laid out is you're going to want to see that test abstract versus the one they did at the original full power operation, and see what the differences are, and have the differences explained.

MR. SHUAIBI: Correct.

MEMBER RANSOM: I think we're out of time. We need to wind this up. I'd just like to thank the staff. I think you've been very responsive originally.

MEMBER WALLIS: Can I ask something, though?

MEMBER RANSOM: Pardon?

MEMBER WALLIS: Before we wind this up? This is a review standard.

MR. SHUAIBI: Right.

MEMBER WALLIS: We had some comments, and there were comments from the public. I think the public comments were answered, then you gave us a new draft, right? Then you answered our comments.

Now it's clear to me what you've done

about independent calculation because I see words here. I assume they're going to be in the standard.

MR. SHUAIBI: Right.

MEMBER WALLIS: I think perhaps we'll trust you on the transient testing to put the right words in now. Right? Because I haven't seen the words yet. I have no idea what you're going to put in on the PRA issue. So how do we sort of sign off on something when we haven't seen the final words?

MR. SHUAIBI: On the PRA issue?

MEMBER WALLIS: Well.

MR. MARSH: Well, normally we describe to you what we're going to do. And if that sounds satisfactory, that's the basis for you writing your letter. If you'd like to see the words that are written, you can make the letter subject to the words.

MR. HARRISON: But if I can interrupt, at least on the PRA side, the guidance that's in Attachment 13, I believe it is, isn't going to change.

MEMBER WALLIS: It's not going to change.

MR. SHUAIBI: Right. The SRP, I think what we were talking about here on 14.2.1 is a clarification of what it is not. Not a change to the SRP itself.

What we're saying is that is the way that the SRP is written. The SRP is written to put the burden on the plants, not on us.

MEMBER WALLIS: Okay, so you're clarifying.

MR. SHUAIBI: I'm clarifying.

MEMBER WALLIS: The only thing you're changing is independent calculation.

MR. SHUAIBI: And if there are items that the Committee would like to see, I mean I'd be more than happy to send Ralph, send something to the Committee through Ralph.

MEMBER ROSEN: I will opine, though, that having read 14.2.1 on testing, I didn't get the warm feeling that I now have from having talked to you about, and seeing this slide.

MR. SHUAIBI: That was our intent in putting together 14.2.1. If there are specific areas that are weak, I guess, or that need to be, we could certainly clarify those.

I mean, but I think that in 14.2.1 we do say that the scope of tests that we're looking at are those over 80 percent. And you either do them, or you justify not doing them. We do say that in the SRP.

MR. MARSH: Can I propose this? Can I propose that you take a look at the words that we have there now? And if you still think that it doesn't have the right emphasis… We'll do the same thing. We'll look at the words to make sure it reflects the emphasis we're trying to portray.

MEMBER ROSEN: I will. I'll be happy to look at anything you give me, but I think I looked at the words that are there now.

MR. MARSH: Okay. But after having heard this, see whether --

MEMBER ROSEN: Oh, I see.

MR. MARSH: -- it should be read, it's not being read that way. It can't be read the way we've conveyed it. It needs to be changed to give the right emphasis. And we'll look at the words again, too, after the discussion.

MEMBER WALLIS: See, we have to write a letter. We can either say it's fine, wonderful two lines.

MR. MARSH: That would be good.

MEMBER WALLIS: Or we can say it's fine, except in certain areas it needs clarification. If we don't quite know what that clarification is going to be, it's rather hard to know what to put in the letter.

MEMBER APOSTOLAKIS: One last question.

When did you say that users need to research that you need the model for -

CHAIRMAN BONACA: We need to bring this to conclusion. We're really running late. And you're opening up another issue.

MR. HARRISON: I have no idea. You're asking a past date?

MEMBER APOSTOLAKIS: Yes.

MR. HARRISON: I'm not sure if there was a user need written. A long time ago, I don't know.

MR. MARSH: Can't say. I don't know. Mark, maybe? No? Sorry. We'll have to get that for you.

MEMBER POWERS: I think you're reading the slide incorrectly, George. I think he was right. He says use of Human Factors models is not allowed.

MEMBER RANSOM: Thank you.

CHAIRMAN BONACA: Thank you for the presentation. We are running behind and we need to at least discuss two letters tonight. So my sense is that we should just proceed and whoever wants to have a break, who has a need, then go ahead.

MR. MARSH: Mr. Chairman? I'd like to thank you very much for the opportunity to address you, and to give you the thoughts that we've gotten from the Subcommittee meetings. We do value the comments that you've got and hope we can end up at the right place. So thank you very much.

CHAIRMAN BONACA: Thank you. Okay, the next item on the agenda is draft final revision 3 to Regulatory Guide 1.82 Water Sources for Long-Term Recirculation Cooling Following a LOCA. And Dr. Wallace will take us through this presentation.

MEMBER WALLIS: This is an interesting and important issue for almost 30 years. It's been revived at various times when various events occurred which changed people's view of what might happen. It was tackled for the BWRs, and after a lot of activity in the 1990s the owner's group got together, the staff made it clear what had to be done. And all the BWRs changed by sump screens. Sometimes by making a large area of change in the sump screen.

We have recent work at Los Alamos which showed pretty clearly that there was an issue for PWRs. And so we're here to hear what the staff is doing in terms of a regulatory guide to resolve this issue.

This doesn't put to rest the TSI, which is associated with this problem. And we have both the staff and Los Alamos here today. I'd like to ask Mike

Mayfield to get us started.

MR. MAYFIELD: Thank you. We're here this afternoon to present to you and seek Committee endorsement of the publication of the final revision three to Regulatory Guide 1.82. We met with the Committee when we had the draft to put out for comment. We've been out. Gotten the comments. Have addressed those comments. And we believe that we have addressed them in such a way that we're ready to go final with the guide.

This is important for us to move forward on because it is, first of all, and important issue. But secondly, the staff has put out a bulletin to have licensees take certain actions. And to some degree, the licensees are looking towards this draft regulatory guide to provide guidance on how to address the bulletin, or at least as they begin to structure their responses.

In response to the public comments, we did make some changes to the guide that we believe are important to have on the street in the final form so that licensees are dealing with the staff's latest thinking, as opposed to the draft that was put out for comment. So we are hoping to get the Committee's endorsement so that we can move forward and publish this document.

NEI is preparing guidance that's more detailed than what you'll find in this regulatory guide. The staff will review that guidance, and we have yet to -- we and NRR will review that guidance document once NEI has it. And the decision will be made at that time, what vehicle to use to endorse that guidance, assuming that that's the direction we go.

But in the interim, we felt like it was important to finalize this guide and get it on the street. I have with me this afternoon Michele Evans, who is the chief of the Engineering Research Applications Branch in Research, and Michael Johnson, who is the deputy director of DSSA in NRR. Tony Hsia and his team will make the presentation on the guide and answer your questions.

MEMBER WALLIS: Mike, I forget exactly what words you used about the guide, but you're viewed to say it was going to get the utilities going and responding to this issue.

Now, if you read the guide, it seems to me it very clearly tries to cover all the gamut of phenomena which are likely to happen which influence all these events. But it doesn't say much at all about what's an acceptable way to analyze those phenomena. Many guides go further in terms of saying we'll accept this method, that method, or something.

And I think the Committee's going to ask you about whether the methods for analyzing these phenomena are available, and how good they are.

MR. MAYFIELD: Okay.

MEMBER WALLIS: Because that's not really tackled in the guide at all.

MR. MAYFIELD: That's correct, it is not tackled in the guide. There is some technical background information. And I think perhaps the best thing I can do is let Tony and his team try to address that.

MEMBER WALLIS: Well, I want to say at the outset, I think it's going to be one of the questions we have.

MR. MAYFIELD: I understand.

MEMBER ROSEN: Right around that question also, I'd like to ask the question of have you seen the draft NEI guide? Is there such a thing that you've looked at?

MR. MAYFIELD: I have not. Bruce is shaking his head yes. So perhaps they have. I think it is a fair statement that we have not officially reviewed and taken a position on that guidance.

DR. LETELLIER: That is correct. We don't have an official position. But we've been interviewing interim appendices of this draft. We have not viewed it in its integrated whole.

MEMBER ROSEN: So there is some work that you've already looked at, and it's moving.

DR. LETELLIER: It is mmoving.

MEMBER ROSEN: Okay. That's good.

DR. LETELLIER: And they are still committed to their September deadline, I believe.

MEMBER WALLIS: So let's proceed now. Tony?

MR. HSIA: My name is Tony Hsia. I'm the Assistant Branch Chief in ERAB in Research. Thanks for this opportunity to be in front of you and present to you our Regulatory Guide 1.82 revision three.

To my right is Bruce Letellier, our contractor from Los Alamos National Lab. To his right is Dr. T.Y. Chang, staff with the ERAB in Research. What we plan to do this afternoon is I'll go over the overview and the background of this issue which some of you are very familiar with. Then I'll turn over to T.Y. He will continue to go into more detail of the Reg Guide. And if any other technical details, both T.Y. and Bruce will be able to pick that up.

At the outset, I would like to say this Reg Guide is the same as any other Reg Guide. We may not have said specifically we will accept this model, we will accept that model. But by definition we do say in the beginning of this Reg Guide say Reg Guide will describe acceptable methods to the staff in evaluating your vulnerability to the debris impact on the sump performance.

MEMBER WALLIS: Perhaps it's what we mean by "methods" that's at stake here. I mean, it says you must consider debris formation, debris transport, and all that, but it doesn't say what methods you use to consider those things.

MR. HSIA: Correct. This Reg Guide is not a prescriptive Reg Guide that lays out the methods in detail because as you all know this issue is an extended issue for many years. We have many, many NUREG reports in there that are much more detailed are described in there.

So I believe during the Subcommittee briefing we did attempt to refer to those references. But this afternoon we'll try to address those specific questions also.

If I may have viewgraph number 2. Okay, this is the structure of this afternoon's briefing.

I'll cover the background, the reasons for issuing this Reg Guide, and the use of the Reg Guide, and Reg Guide 1.82 activities associated with Revision 3 of this Reg Guide. And then T.Y. will pick up with the remaining of the presentation this afternoon.

Viewgraph 3. As you know, this issue started almost 30 years ago when Revision 0 was issued in June of 1974. At that time, the whole industry as well as us knew little about the impact of debris on the sump. So the best thing we could do at that time was make a conservative assumption. So we assumed 50 percent blockage of the sump screen. And when you calculate the net positive suction head for your recirculation flow.

And then after that, we realized we need to do better. We start to cnduct research, and also the NRC issued USI-A 43 in January of '79. That USI is focused on containment emergency sump performance.

Shortly after that, Revision 1 of this Reg Guide was issued that provided guidance. The guidance was based on USI-A 43 resolution. In early 1990s, several nuclear power plants, starting with Barsebaeck in Sweden, and then followed by several BWRs in this country, including Perry, Limerick, Grand Gulf, and Browns Ferry had experienced suction strain or blockage events that in some cases demonstrated the recirculation flow was negatively impacted because of the blockage of the sump screen.

And we realize we need to do more. We need to have more knowledge. Therefore, more research was conducted starting at that time. We issued Revision 2 in 1996. That was a revised guidance with the focus on BWRs.

Also, NRC issued Bulletin 96-03. That's to specifically focus on the potential plugging of strainers and BWRs. And that bulleting requested licensees to implement measures to ensure ECCS functions following a loss of coolant accident.

And also for that revision, instead of using the old 50 percent blockage, we recommended that the licensee during their evaluation to assume 100 percent debris transport from the break location to the sump. That's a conservative assumption. Unless they can justify otherwise. Again, that's a conservative assumption.

Come to this point. Today we're ready to present to you and seek your endorsement of Revision 3. This Reg Guide, like Mike said earlier, and our colleagues at NRR would like to use this also as a guidance toward contributing to the resolution of GSI-

191. That is a BWR sump performance. Next viewgraph, please.

The reason for issuing this Reg Guide, as I said earlier, is to contribute to the resolution of GSI-191, and also to provide an enhanced debris blockage evaluation guidance for PWRs and methods that's acceptable to the staff.

As all Reg Guides, I said earlier, they are not substitutes for regulations. Therefore, compliance is not required. But those are the acceptable methods to the staff for evaluation of the debris impact on sump performance.

Of course the other methods the licensee would like to propose we certainly will consider, and will review individually for acceptance at that time. Viewgraph 5.

Earlier this year, in February, we came in front of the ACRS, briefed the ACRS. At that time it was DG-1107. That also included with NRR presentation on GSI-191, also their plans for the generic letter. At this moment, I understand the generic letter is planned to be, the draft is to be going out for public comment toward the end of this year. And the final generic letter is expected spring of next year.

Back in, I believe in June or earlier,

there was a Bulletin 2003-01 issued by NRR. That bulletin requested the licensees to either demonstrate they satisfied the requirements in 50.46 on long-term cooling, or they had to take an interim compensatory measure to ensure ECCS performance.

I understand that we have received responses from licensees on that bulletin. The majority of them chose to use compensatory measures.

So the public comments on this version of Reg Guide was received after April of this year. We have addressed those public comments. And T.Y. will discuss all of that in more detail later.

And that will bring us to today. As we said earlier, we did brief the Subcommittee in August, and we have gone to CRGR, also in August. And that leads us to where we are today. T.Y.?

DR. CHANG: My name is T.Y. Chang, Office of Research. Slide number 6. There are a lot of key revisions in this version of the Reg Guide. The majority of the modifications of this revision was focused on the pressurized water reactor section in order to enhance guidance on how to evaluate debris blockage issue.

And we tried to utilize the information from the prior Revision 2 version for the boilers.

Wherever applicable, we tried to use those information. And also, in addition, we added inside scan from the research and the GSI-191.

After the revision of the PWR sections, then we turn our attention to BWR sections as well, trying to make sure that the two sections are consistent to each other. Also, in the BWR sections, we also added the staff's position on the evaluation of BWR owner's groups URG. That's a Utility Resolution Guidance for the ECCS suction strainer blockage. That's for the PWR plants.

Finally, within this version of the Reg Guide, another Reg Guide is subsumed into this one. That is Reg Guide 1.1, the net positive suction head for ECCS and containment heat removal system pumps. So Reg Guide 1.1 will no longer be in existence. It will be part of Appendix A of this Reg Guide.

MEMBER LEITCH: Some of this work, as I understand it, is based on recent testing that was done. Recent test results at Los Alamos, was it?

DR. CHANG: Yes.

MEMBER LEITCH: My question really is does any of that test data invalidate the work that was done on BWRs?

DR. CHANG: Maybe Bruce?

DR. LETELLIER: Not that we're aware of. There haven't been any apparent contradictions at this time. In fact, much of the guidance is based on the same guidance that was issued for the BWRs, as far as methodology.

MEMBER LEITCH: But this recent test data was done after the changes were made to the BWR suction screens.

DR. LETELLIER: That's correct. I think the focus of the research program under GSI-191 was to increase the depth of the database on debris transport properties.

And also we had hoped to do some two-phase debris generation tests because that was not part of the BWR study. We had more success on the transport and head loss characterization than we have on the two-phase debris generation.

But we were focused on the unique aspects of the PWRs, and so none of the research that's come to light has contradicted those earlier results.

MEMBER WALLIS: Well, I wonder if that's true. I mean, I've been reading your reports. There are many statements of this type, about larger quantities of fibrous debris could reach the strainers.

That being predicted by models and analysis, this is from the Barsebaeck event, that being predicted and methods being developed for resolution of USI A-43.

And then when you're talking about the presents state, you say preliminary findings suggest two phase jets can inflict significant damage at distances much further away than those measured either in USI A-83 studies or BWR earned-impact test program.

There are lots of statements like this in your document. Now, if the new tests show that things can happen further away and more bigger effects and all that than predicted before, this would seem to have some effect on the BWRs too.

DR. LETELLIER: Of course it would. And there are statements to that effect, that they need to be applied with full understanding of that phenomenology and adjusted appropriately.

And we tried to provide, in every case, examples of how to do that scaling where it was appropriate. The first citation that you quoted, the difference between the initial debris generation in the three-zone cone model, that was actually addressed by the BWR work.

And if additional conservatism and test

data were provided to cover that.

MEMBER WALLIS: So they did provide additional conservatisms?

DR. LETELLIER: Certainly.

MEMBER WALLIS: So it might be expected that the PWR would do the same thing?

DR. LETELLIER: That's our hope, yes.

MEMBER WALLIS: Okay.

DR. LETELLIER: But the recent bulletin was just to PWRs, not to all the science.

MEMBER WALLIS: Correct.

DR. LETELLIER: Okay.

DR. CHANG: The next slide is about the resolution of the public comments. The draft Reg Guide that was called DG 1107 was issued in February of this year, and there's a two-month period for the public to send in their comments.

And up to about 90 comments were received from seven commentors, including four utilities: Westinghouse, NEI and the one individual. In descending order of number of comments received, here is a list of the most raised comments.

The first one is a comment about a conformance issue for current plans. Our response is that this Reg Guide is generic in nature, and it may go beyond current designs.

The intent is that this Reg Guide will be useful for future plans as well.

MEMBER WALLIS: Was that the issue that they raised? I thought the issue was --

DR. CHANG: The issue is that some of the other conformance --

MEMBER WALLIS: They will find themselves out of conformance if they do the analysis. What are they expected to do?

DR. Chang: This is -- most of the comments is that the current plan designs, in certain cases, are different from what's described in the Reg Guide. For instance, I think we mentioned that it's -- people should have two sumps in the PWR plant.

And some of the plants, they don't have two sumps. So, this is just to state the staff's position and give out acceptable methods to treat this ECCS problem.

Then, the next most asked issue is about--

CHAIRMAN BONACA: Now, just a question on that.

DR. CHANG: Yes.

CHAIRMAN BONACA: This is a Reg Guide, so this provides a means of addressing the issue. But when you say that they should have two sumps, that's prescriptive.

I mean, it's not an option immediately, so what would be the approach for those plants that don't have two sumps. They'll have to make modifications, I guess, to --

DR. CHANG: Well, the Reg Guide, it is not a requirement.

CHAIRMAN BONACA: Right.

DR. CHANG: This is not a regulation.

CHAIRMAN BONACA: Yes.

DR. CHANG: So it just simply states the staff's position, and also the acceptable methods. Anything different than that is okay, if --

CHAIRMAN BONACA: I guess what I'm talking about is that -- I mean, if you establish some functional requirement of some type, then you can suggest ways to fulfill that requirement, to meet it.

And then you can leave it to the licensee to meet that requirement however he can do it. But if you prescribe two sumps, I mean that's not --

DR. CHANG: The intent is for the future plants.

CHAIRMAN BONACA: Okay.

DR. CHANG: It's desirable to have two

independent sumps.

MEMBER WALLIS: Is that only for future plants?

DR. CHANG: Pardon?

MEMBER WALLIS: Those are conformance issues for current plants. I mean, that's the whole question, isn't it? If they do this analysis based on the guide, they may well find they can't meet the long-term cooling criteria. What are they supposed to do then?

MR. HSIA: The real test -- the real test is whether you do have enough water to be fed into the reactor system during long-term cooling. The ultimate test is your net positive suction head.

Whether you have one or two or three sumps, if you can demonstrate -- let's say I only have one, but I can demonstrate what debris --

CHAIRMAN BONACA: Okay.

MR. HSIA: I can still meet the net positive suction head, then I'm establishing that I have no problem.

CHAIRMAN BONACA: So you're establishing a functional demand?

MR. HSIA: Yes.

CHAIRMAN BONACA: And you're suggesting a way in which it can be done? All right.

DR. CHANG: And also, it's a function of the size of the screens, and so forth. There are a lot of different parameters you have to look into.

CHAIRMAN BONACA: Yes.

MR. HSIA: One of the complications of this issue for these B's or P's, is particularly for the P's, is very much plant-specific. And as a matter of fact, BWRs are simpler, because they are designed -- they are more or les similar.

And P's could have very different design compartments and so on.

MR. MAYFIELD: Mr. Chairman, this is Mike Mayfield. When you look at, under regulatory positions 1.1, the first sentence says ECCS stumps, which are the source of water, and so on, should contain an appropriate combination of the following features and capabilities.

And then the notion of having two sumps is one of those. It's not a mandate that you have to have two sumps.

CHAIRMAN BONACA: It's a way to fulfill --

MR. MAYFIELD: It's one way. And again, there's a fairly lengthy list of those kinds of things that would be desirable features. And you're looking for some combination, so that you don't lose net positive suction.

CHAIRMAN BONACA: Sure.

MEMBER WALLIS: I still think the issue here was the plants anticipated, as a result of this, they would have to make changes. Even though you claim that no backfit is implied, they probably will, just as the BWR's made all these changes.

So there will be a lot of conformance issues for the current plants.

DR. CHANG: This issue came up in the CRGR discussion, the briefing we had with them, and we -- our position is that this is a conformance type of a backfit.

MEMBER WALLIS: Right.

MR. MAYFIELD: It's a compliance backfit.

MEMBER WALLIS: I think our overview of this is problem is that probably all the PWRs, as the BWRs, will make changes in the plant - most likely as a result of this issue being resolved.

MR. MAYFIELD: That could be an outcome.

MR. HSIA: In my opinion, it's really hard to say. It depends on the evaluation.

MR. MAYFIELD: Again, Doctor Wallis, I wouldn't want to presume that they're all going to have to make changes. But the notion is that it could -- your statement could be an outcome of licensees evaluating this.

The BWR licensees evaluating their ECCS systems, that's possible.

DR. LETELLIER: I would further add that if changes are necessary, they will likely be in compliance with the Reg Guide. One before the other. If their individual vulnerability assessment warrants, they will make improvements along these guidelines.

MR. HSIA: As well as the coming NEI guidance -- industry guidance, so…

DR. CHANG: I don't know -- should I go on with --

MEMBER WALLIS: I'm not sure you need to go through all of these comments.

DR. CHANG: Okay, I can -- some of them -- some of the comments raised, I discuss them in the later slides as well.

MEMBER WALLIS: Yes.

DR. LETELLIER: Could you just discuss -- clarify what is meant by leak before break for debris source? I'm not quite sure what that means.

DR. CHANG: Well, this is the position that we responded to from a Westinghouse letter, we stated that position. What it means is that the leak before break is not applicable when you try to consider how many amount of the re-generation can be created from pipe break.

So, for the purpose of estimating the amount of debris generation, the leak before break criteria cannot be used. This is in line with the 10 CFR 50.46 position.

That section is on the ECCS cooling. There, it says, in order to calculate the function of an ECCS, you have potentially many different locations of break, and try to find the most severe pace in order to design your ECCS system.

So this is in line with what is the position in the 10 CFR 50.46.

DR. LETELLIER: So, when you're looking at debris generation, you have to consider the instantaneous guillotine break of the largest pipe? Is that correct?

In other words, you cannot assume that there's a leak and you detect the leak and are able to shut it down. In other words, you have to assume that the line breaks and the debris is going to be generated as a result of that.

DR. CHANG: Well, people are considering

the double-ended guillotine break, middle sized break LOCA or small sized LOCA. But I think the position of the staff is leak before break is not acceptable for this purpose.

MR. HSIA: If I may jump in, the current agency position is leak before break and it can only be used for certain specific applications, such as pipe whip.

MR. MAYFIELD: This is Mike Mayfield. The change that we made to GDC 4, which is the one that deals with the pipe whip restraints and jet impingement barriers.

That allowed the elimination of those. The notion was that that change was adequate for eliminating the dynamic effects associated with such pipe breaks.

Then you get tied up with was this the dynamic effect or not. And my contention is that this is not a dynamic effect, this is an impingement effect.

And the notion of instantaneous double-ended, the notion is that you've got a jet that's potentially moving around. One of the other things to keep in mind is the leak before break size crack that we'll talk about for GDC 4, and that's been analyzed as people have sought relief from having pipe whip restraints and impingement barriers.

That's a big hole in the side of the pipe. This is not weeping water. We had briefed the Committee several years ago. We would be happy to come back in and show you what that really means.

This is a significant leak. It is a -- in the large pipe, it is a very big hole in the side of the pipe. And, analytically, you'd have to move that around the pipe's circumference, to make sure you've captured the appropriate potential debris source.

So it actually complicates the analysis. Would it reduce the amount of debris generated? I think that almost certainly the answer to that is yes. Now you're left with, okay what's the trade-off.

The view that we've had is that one, you're hard put to really argue this is a dynamic effect. To include it at this stage would significantly -- would cause us to have to go back and revisit things that are in 50.46 and the change we made to GDC 4.

And we, at this stage, we were having some difficulty justifying making those changes for this specific application. My understanding is that the industry is making some overtures and pursuing that line of discussion.

It's a policy issue that we'll be happy to entertain. But to move forward at this time, with this guide, we felt it was more appropriate to move forward, making the assumption of the double-ended break and deal with the debris generation on that basis.

MEMBER WALLIS: Can we move on?

DR. CHANG: Yes, the next slide, number eight. Here's a summary of Reg Guide 1.82, in terms of accident sequences. When a LOCA happens, the initial shockwave and blowdown jets impinging on the insulations will create the most amount of debris.

That usually happens in the first minute or so. So, we, in this Reg Guide, we are going to talk about our position, how we are going to partially the break location and what kind of sources should be looked at as a debris potential source.

And once you have those debris generated, in order to estimate how much of the debris will end up at the sump screen, the next step is to do the debris transport analysis.

That includes three types of transport. First is airborne debris transport. Right after the pipe break and blowdown, the air velocity in the contaminant could reach 300 feet per second, according to some of the analysis.

So it's a very fast velocity within the turbulent situation in the contaminant. And the debris can be blown to the dome area of the contaminant. So this is the airborne debris transportation.

Of course, eventually most of it will settle down and come down. The next is after the --

MEMBER WALLIS: So, this 300 feet per second, do you have an idea what a stagnation pressure is for that?

DR. CHANG: I just read in the report that 200-300 feet per second velocity can be expected.

DR. LETELLIER: He's saying the displacement velocity, as the fluid stayed in -

MEMBER WALLIS: I'm saying that as a debris model for your Figure A-2, that says that after you get to a seven or something, the stagnation pressure's only half the psi.

It seems to me that 300 feet per second is a bigger stagnation, and you say it's all over the whole containment. That doesn't seem to be consistent.

MR. HSIA: Excuse me, I missed -- what figure are you referring to, Doctor Wallis?

MEMBER WALLIS: Figure A-2, the somewhat

notorious Figure A-2. It says that there isn't a L over D number on there, I think it's about seven is down to a half a psi.

I just brought that up because I think there are a lot of inconsistencies about this zone of influence on the velocities and the pressures that need to be sorted out. So, please go on…

DR. CHANG: Yes, this figure actually is a carryover from the A-43 document. We didn't put down the L over D numbers in the regions one, two and three here. But the --

MEMBER WALLIS: They are in your report. And I can see that seven is the L over D number that's out --

DR. CHANG: Yes, this is just a conception to show that --

MEMBER WALLIS: Well, this is not a conception, this comes from work done by Sandia.

DR. LETELLIER: No, the intent of the figure in the Reg Guide is conceptual.

MEMBER WALLIS: Yes, but the figure in the -- now, come on, this is an exact copy of the figure that's in the basis.

DR. CHANG: We deleted the L over D numbers there, within the three regions.

DR. LETELLIER: It's intended to show the --

MEMBER WALLIS: You see the problem I have, is that I look at this, I see that everything gets exhausted by a certain distance. And then here's someone telling me that I've got velocities in the whole containment, which are bigger than I see from this figure.

You know, that's at a much lower distance. That's why I brought this up, that's all. Let's move on.

DR. CHANG: Later on, Bruce has some view graphs to talk about the ZOI, so -

MEMBER WALLIS: No, I want to talk about ZOI too.

DR. CHANG: We can go into that later on.

MEMBER WALLIS: Okay, so lets move on. Can we get the next slide?

DR. CHANG: Okay, then it's washed down. After the containments sprayed and then the debris was sent up at the basement of the containment and get washed, some of them --

MEMBER WALLIS: Okay, so it says here that ZOI can be used. The zone of influence is the zone in which the destruction occurs, right?

DR. CHANG: That's correct.

MEMBER WALLIS: And if I look at this figure I mentioned, I see that it says that after about five L over D's, there's limited damage. And then in another report from Los Alamos, the parametric study, it says that it's able to use a 12 diameter sphere.

Now, there's a different number, all right? And in other places I hear that the zone of influence, in oral presentations, can be as big as a third or half of the whole containment.

This just doesn't seem consistent with this figure which says that everything gets tired after about five L over D's.

DR. LETELLIER: This figure is intended to be conceptual, and I've suggested that --

MEMBER WALLIS: It's not, it's a guidance. I mean, it refers to -- this is conceptual in the guide, but if you look in the guide that you've put out as the technical basis, which I think is the basis suggested for use in all of these analysis, it has numbers on it.

DR. LETELLIER: This is the knowledge base you're referring to --

MEMBER WALLIS: If I pick and choose in

these knowledge bases, I can get a lot of different numbers.

MR. MARSHALL: Excuse me, my name is Michael Marshall, I'm a former project manager for this project. One reason those numbers vary is based on the type of insulation.

So, I think that's one reason why they probably removed the numbers from the graph. The larger one's for, let's say, an encapsulated fiberglass would carry out to that 30 or that larger L over D.

MEMBER WALLIS: 30 L over D?

MR. MARSHALL: Yes, a larger distance. Your metallic insulation, depending on the type of clap, again you get --

MEMBER WALLIS: Well, I agree with that. I agree with that. I agree with all of that. It's just that if I look at different parts of these reports, I sometimes see five, I sometimes see 12, I can even see 60 in one of these parts of the report.

And therefore, there's a great variability here. And, you know, it seems to me that different people can pick different numbers and use them in their analysis.

DR. LETELLIER: They can pick numbers and use them inappropriately, certainly. The knowledge base presents a variety of models that provides a survey of historical development for the problem.

And Michael raises a very important point, that the damage pressure's very specific to the insulation type, so the damage pressure distances will vary according to what your targets of interest are.

And it's important that the licensees understand that.

MEMBER WALLIS: Oh, we know that. We know that. But --

DR. LETELLIER: The use of these figures, and I should apologize for borrowing old graphics, but they are intended to be conceptual, and I've recommended that --

MEMBER WALLIS: They can't be conceptual if they're going to be used in analysis. You've got to put numbers in.

CHAIRMAN BONACA: But, I mean, do you think that it's clear to a licensee, for example, based on the guidance you provide in the Reg Guide and the supporting information, if he would understand what numbers to use for what material?

DR. LETELLIER: There are supporting documents that recommend damage pressures for specific insulation types.

MR. HSIA: If I may read, Bruce, the section in the current Reg Guide that refers to the figure you're pointing to. And I'll quote…

CHAIRMAN BONACA: What page are you at?

MR. HSIA: I'm at page 1.8-2.

CHAIRMAN BONACA: Okay.

MR. HSIA: Figure 8-2 provides a conceptual three-region model that has been developed from an analytical a fair amount of consideration as --

MEMBER WALLIS: The conceptual isn't much help when you're actually making a calculation.

MR. HSIA: Yes, I understand. Let me finish the sentence, then I'll see if I can understand what this is trying to say. As identified, region one of new reg and two new reg reports, the destructive results example volume instruction of insulation and other debris generated, the size of debris off the break jet force will be considerably different for different types of insulation. Again, Figure A-2 --

MEMBER WALLIS: We know that. We know that.

MR. HSIA: So, this is saying clearly it's conceptual. All we're trying --

MEMBER WALLIS: It's even more confusing, because then you have to give actual numbers for all of these things and you have to show how the zone of influence varies depending on the jet stream --

MR. HSIA: That is the method we are trying to describe in this Reg Guide, saying if you have different insulation, there are different damage pressures for those insulation materials.

Therefore, you need to consider at different distances. Like you quoted, Doctor Wallis, maybe 6 L over D or 20 L over D, that's exactly right. So you cannot just say for my plant I'm going to assume the zone of influence is 20 or 5.

That is not the correct method we're trying to describe here.

CHAIRMAN BONACA: So you have a number of zones of influences, which are material dependent?

MR. HSIA: Correct.

DR. CHANG: Very much so, for the 20 L over D, damage pressure, that is for a much weaker insulation compared to a 5 L over D, such as the so-called --

MR. HSIA: For example, Barsbaeck has, based on our reading, Barsbaeck has one of the worst kind of insulation. At that time, it was just fiberglass without a very strong jacket.

On the other hand, the reflective metallic insulation would steal a jacket with bindings on it, it would be very strong. So you really need to look at your location and your insulation before you start to go use the zone of influence, whether it's spherical or conical.

CHAIRMAN BONACA: I must say, as I read it, I did not understand that either.

MEMBER WALLIS: I think we need to move on, but we'll come back to this perhaps -- we may not have time, and we just have to be in the letter. I think that even if you can know the damage pressure, then I think you'll find there are inconsistent values from different kinds of research from different places.

And calculate from the damage pressure itself is not something which I'm at all happy about, from your three-region model. So it just changes the devil.

Instead of having spheres that you don't have the size of, it changes the pressures you don't know the value of. So, it's --

DR. LETELLIER: Damage pressure's clearly have to be based on experimentation.

MEMBER WALLIS: Experimentation?

DR. LETELLIER: Yes. And for the database that exists, we have very definite recommendations.

MEMBER WALLIS: The jet pressures? The pressures that are in the two-phase jet?

DR. LETELLIER: Yes.

MEMBER WALLIS: Are based on experimentation, not --

MR. HSIA: That's pressure that can damage the insulation.

DR. LETELLIER: Our recommendations for damage pressure for specific insulation types are based on the record and the data that exist in the data.

There's been extensive testing, and we'd be happy to review that.

MEMBER WALLIS: You measured the pressure on the target?

MR. HSIA: That's correct. That's the pressure on the target.

MEMBER WALLIS: Because you know the pressure in the containment environment?

MR. HSIA: Yes.

MEMBER WALLIS: That's where I have great difficulty with your three-region two-phase conical jet model. But let's move on. I don't know if you know where it came from.

But if you look at where it came from, you too would have some doubts, I think. Let's move on.

DR. CHANG: Okay, the end consideration of causes is the performance of the ECCS sump - whether the head loss has caused the sump screen will impede the operation of the pump or not for longtime cooling. So that's the bottom line.

MEMBER WALLIS: Okay, they need to calculate that too, don't they?

DR. CHANG: Oh, yes. As a matter of fact, partially the worst break location has very much to do with the head loss across the sump screen.

MEMBER WALLIS: Okay, so in the guidance document that the base is talking about, we have this new Reg CR6224 correlation --

DR. CHANG: Head loss correlation has --

MEMBER WALLIS: One study, which is said to be within 25 percent of the test data. So it looks like a good correlation. Another study, the conclusion was they needed considerable modification.

So, what are you recommending? It's good or it's bad?

DR. LETELLIER: We're recommending it's

application with appropriate parameters based on data. And where --

MEMBER WALLIS: So the licensee has to go through all the database, do his own research, figure out which of these various models and things are appropriate in his plant?

Unless NEI comes up with a very comprehensive analysis of all this somewhat confusing database.

MR. HSIA: It's a fact this is a very complicated and plant-specific issue. We were trying to do a good job throughout the years, trying to cover the bases.

Therefore, we have different data for different applications. We try to test different jets to see which one will be the best one for us to -- for anyone to use to model.

And what NEI will describe remains to be seen. But if they can come out with one generic method, everybody's just going to go with that page so on and so on and come up with the equation, more power to them.

Now, I wish we could do that, but at this moment we're not able to do that.

MEMBER WALLIS: So expecting them to do

research and analysis, which is above a level that you're now capable of doing?

MR. HSIA: If they can do it, yes I'll pass to them.

MEMBER WALLIS: That is a big load for NEI to bear.

MR. MAYFIELD: Let's back up, because that's not what we're saying.

MEMBER WALLIS: Thank you.

MR. MAYFIELD: Go ahead, Bruce.

DR. LETELLIER: Well, I think that we have established a template for quality and standard for experimentation. We have provided the necessary examples for a limited number of insulation types and head loss conditions.

If they're willing to invest the research resources, they certainly know how to proceed. And that's been the intent of our research program, is to establish a minimum level of concern and provide information that's sufficient for us to evaluate the licensee's responses.

We need to have a minimal database for our own needs. And we've focused on the predominant insulation types and the predominant conditions.

MR. MAYFIELD: And the guidance is

structured in that way - it's not a practical matter.

MEMBER WALLIS: The guidance says nothing about the difficulty of making calculations, in fact they don't do it.

DR. LETELLIER: If I can point out, there is a precedent in the BWR resolution, where the guidance was similarly generic and the utilities provided a quite comprehensive --

MEMBER WALLIS: That took a long time.

DR. LETELLIER: It did take a long time.

MEMBER WALLIS: It took ten years, or something like that.

MR. MARSHALL: Again, Michael Marshall, I was the project manager during the BWRs. The BWRs didn't take 10 years to develop that document. It was done in approximately about 18 months or so.

MEMBER WALLIS: But the whole point of the presentation and the resolution of things took quite a long time.

MR. MARSHALL: Right. But as far as coming up with the solutions, the equations and stuff, and the testing and everything they did, it was done on approximately - if I remember correctly, about 18 months.

And again, that facility was done with the proper testing as such. And again, we provided a template that they've followed and were able to implement using their plant-specific considerations.

MEMBER WALLIS: Thank you, so that's what we're waiting for from NEI?

MR. HSIA: Yes, sir.

MEMBER WALLIS: Okay. Then we need to move on, I think in the instance of time. I don't want to restrict your presentation in anyway.

DR. CHANG: So, I think I can skip maybe -- I sort of described, generally, how the --

MEMBER WALLIS: And there's always an out - if you can't do the analysis, you've assumed 100 percent and that sort of thing.

MR. MARSHALL: Right.

MEMBER WALLIS: And I understand that for many of the Los Alamos studies, a pretty large percentage of the debris actually ended up on the screen for the big breaks.

DR. CHANG: Let me go to the last -- the second to the last view. Graph 13 is on sump screen head loss. Because the sump design of PWRs is very different from the BWRs, so we tried to look at the failure criteria for the ECCS pumps.

And the research showed that for fully

submerged sump screens, the NPSH available in the plant's licensing basis should be the governing criterion for failure.

But for the partially submerged sumps, as I understand, there are a number of plants with only partially submerged sumps. I should call it partially submerged sump screens.

Then NPSH margin may not be the only failure criterion. You have to look at two possibilities. The failure to have enough NPSH margin, will result in the cavitation of the pump.

But another failure mode is the so-called starvation mode. If you have enough head loss across the sump screen, such that the head loss is greater than half of the submerged screen's height, then in that case you will have enough water going into the pump.

MEMBER WALLIS: I think we agreed with that.

DR. CHANG: Right.

MEMBER WALLIS: If I could anticipate your next slide, the problem the Sub-Committee had was that the new research has shown that combinations of fibers and particles can be very effective and very small amounts of debris can block a screen.

And there's a very unexpected, sort of, pressure drop versus stuff calculation where more fibers actually make less pressure drop if you have particular --

MR. HSIA: That's right.

MEMBER WALLIS: Now, this is sort of a new understanding. And in our discussions with you, it turned out that there were certain chemical reactions that hadn't been considered, which could also produce substances which could have an effect on this pressure topic, which might be considerable.

MR. HSIA: Right.

MEMBER WALLIS: Then this doesn't seem to be in the knowledge base, so no NRC reports, and it's only peripherally sort of hinted at in the guide.

And we felt that the chemical effects you bring out, boric acid onto paints, we're putting a lot of material in the pool to raise the pH, and this produces hydrogen and the hydrogen might float debris and so on.

The chemical effects need consideration, and there's some rumor that NEI may not want to proceed until they get better information on some of this chemistry.

DR. LETELLIER: Tony, do --

MR. HSIA: Yesterday, we had a meeting with NRR and NEI. NRR has made it very clear that they would like to continue on current pays -- for the industry to continue on current pays towards resolution of GSI 191.

They would ask the industry to address the issue of chemical effects. The industry at this time is doing a scooping study. Probably, in a matter of a month or so, they will decide whether or not they want to do any additional tests towards that. So, as far as chemical effects, it's --

MEMBER WALLIS: So, one of the things to do, for instance, to improve the situation is to replace all fibrous insulation with reflective foil, which I understand had some fine foil aluminum - lots of fine stuff which in an accident can get blasted out and dumped down into the sump.

Now, I don't know what the reactions are of fine foil aluminum and a large surface area in this kind of environment with very significantly high pH.

MR. HSIA: They certainly, in effect, they would have to consider. They're also stainless steel varieties.

MEMBER WALLIS: Are they going to do the research to find out what happened?

DR. CHANG: As you know, Doctor Wallis, we had a very limited scope on the chemical effect done by LANL and the preliminary tests are completed and we're in the midst of having that report being reviewed by a panel.

As a matter of fact, next Monday we are going to have that review meeting. And we are interested to hear what kind of comments we are going to get from them.

And once we receive that comment, then we will decide what the next step should do.

MR. MAYFIELD: This is Mike Mayfield. Doctor Wallis, you raise an interesting dilemma that we face regularly in research. And that's what's the limit of our responsibility versus responsibility for the industry.

In fact, we get this question regularly from our senior management, from the Commission, and frankly we've gotten it from the Committee over time. I think that Doctor Powers and I have exchanged discussions on this matter.

This is an area where we believe that we have done enough research to show that is, in effect, and while we have not done enough research to say this is how you should -- or one recommended way to deal with it, we believe that the sum of the feedback we've heard from the utility management is we'd really only like to fix the screens once.

We believe the evidence for this, in effect -- and frankly, it was in effect that Dr. Rosen and Dr. Powers flagged to us sometime back. We believe there's enough evidence to show this is a real effect.

Now, how significant is it --

MEMBER WALLIS: The chemical effect is real?

MR. MAYFIELD: The chemical effect is real. Now, how significant is it depends on very plant-specific details. And that's beyond the level of information we have available to us to sort out on a plant-specific basis.

We felt it was important to flag it in this regulatory guide. And your observation of, well are we putting the onus on the licensees to do the research to develop it?

In part, the answer to that is yes. We have had some discussion, I'm sure we will continue to have some discussions with NRR about how much more do they need to see, in terms of data, to support their evaluations.

MEMBER WALLIS: The concern that I have is that you'll put out the Reg Guide, which I think is the right thing to do, get things moving, put out this Reg Guide and say, thou shalt evaluate all of these things.

My concern is there are so many things which there isn't much of a technical basis for.

MR. MAYFIELD: Yes, sir.

MEMBER WALLIS: That these folks may come back with some half-baked --

MR. MAYFIELD: Yes, sir.

MEMBER WALLIS: -- analysis, which gets accepted.

MR. MAYFIELD: Well, that's why I --

MEMBER WALLIS: Because nobody knows. And then further research now in progress reveals that it shouldn't have been accepted.

MR. MAYFIELD: Well, that's why -- that is one of the downsides of confirmatory research where I live. The other thing I had said was that we have had, and continue to have, some discussions with NRR about how much more do they need to be comfortable to assess what the licensees are going to bring in the door.

The reason for pushing it forward at this time, to include that loosely worded caveat or flag, is frankly let's put everything on the table at this time to what level of information we have.

And so we felt like the itch is real, and we needed to flag it in this to the level of detail we can support today, which is to say this is something that should be evaluated.

We will continue to work with NRR, looking at how much more information they need to support an evaluation. But today, we felt like we needed to at least flag the issue in the guide.

MEMBER WALLIS: I think that actually the chemistry is very slightly touched on in the guide, so it parenthetically is that you have to consider environmental and chemical factors.

It doesn't point out that --

MR. MAYFIELD: No, we did put --

DR. CHANG: The debris generated by chemical effects, they are very much like that.

MEMBER WALLIS: It is touched on, but in that sort of parenthetic sort of way, instead of saying this is something important and here are some of the considerations.

And there's nothing about gas evolution and the buoyancy and so on.

MR. MAYFIELD: The level of detail that we put in this is admittedly sparce.

MEMBER WALLIS: So would it be reasonable for us to write a letter that says, yes this thing should go out?

MR. MAYFIELD: Yes.

MEMBER WALLIS: If it gets things moving. And it lays out, although without enough detail on the chemistry, lots of things that need to be considered.

That we have this concern about the knowledge base. Would that be a reasonable thing to say?

CHAIRMAN BONACA: That we've --

MEMBER WALLIS: It might actually help you, knowing that we support what you know to be absent in the knowledge base might help indicate where efforts should be put.

CHAIRMAN BONACA: That's how I think the issue of chemical, for example, concerns may be --

MEMBER WALLIS: Well, we don't know. I mean, Bruce has done tests where it showed that it might well be a concern. And certainly, there's some sort of gelatinous precipate, it's going to effect the screen.

MR. MAYFIELD: Yes. If it manages to come loose, and if it manages to transport, it would be a problem. Those ifs are important. Now, the challenge, of course, is to figure out exactly how much potentially reactive material is inside containment, and how much of it would actually be exposed to an aqueous environment.

That's a challenge. That's a very plant-specific kind of evaluation. And we felt like, at this stage, it was incumbent on us to at least flag the issue and then let people that have access to the information, meaning the licensees, take a look at it.

MEMBER WALLIS: Your flag is very small.

MR. MAYFIELD: It is a small flag.

MEMBER WALLIS: So we might actually suggest it be bigger. I'm sorry to have picked on these issues, but I think they are the ones that we should focus on in our letter.

Are there other points you want to make? I don't want to limit your presentation, but I think you were moving along anyway.

DR. CHANG: Yes, the last slide is about future research activities. In the near term, we have some calcium silicate head loss test reports. And this is not covered by the new regs 6224 head loss correlation, so we feel that it's appropriate to have some additional testing on this.

MEMBER WALLIS: So the statement in here

that he 6224 needs significant modification is correct. And the other statement that it fits a lot of the data is not really correct?

DR. CHANG: Yes, 6224, that doesn't have the data for all the insulations. And calcium silicate turns out to be -- from a head loss point of view, it's a concern.

And so we think some additional tests should be needed.

DR. LETELLIER: But we are issuing an advisory document at the end of this fiscal year on the head loss properties of calcium-silicate. At a minimum, we'll provide the data that were observed.

And our best recommendations at this time for treating the head loss.

MEMBER WALLIS: This three-region two-phase conical jet model, with numbers on it Figure 17, comes from -- doesn't come from the Sandia work. It doesn't come from the one you referenced.

The only place that I could find it was in a later new Reg that the agency prepared.

DR. CHANG: I think it's in the resolution of USI A-43 documents, is a new Reg report.

MEMBER WALLIS: Right, and my personal view is that it's a complete misapplication of the

Sandia work. Maybe, if my colleagues give me permission, I might actually make a presentation to them on that.

But I just wanted to warn you -- I don't know if you've looked at its origin and seen if you believe it or not.

DR. LETELLIER: That model has been discredited by the Barsebaeck event.

MEMBER WALLIS: Right, it has been.

DR. LETELLIER: In fact --

MEMBER WALLIS: And by practice it's been. But it's in your documents that you've accepted it.

DR. LETELLIER: Are you referring to the knowledge base? Please interpret --

MEMBER WALLIS: But it's there, as being authoritative.

DR. CHANG: The knowledge base report is trying to document order information and pass --

MEMBER WALLIS: But without the critical evaluation, you know, leaves it up to the utilities or NEI to select what's suitable for their purposes.

DR. LETELLIER: Well, that's a fair criticism, that it is presented as authoritative. But it's also intended to be historical. And members of the community that have followed this safety concern are aware of the improvement in the models.

The Barsebaeck event, we have looked at. And incidentally, we have compared our spherical zone model against that, and shown that it's adequately conservative.

The Barsebaeck event highlighted the fact that material damage is very insulation-type specific. They had -- in fact, it was mineral wall of an aged variety that's very fragile, and not typically used in the United States.

Based on the research work that was implemented for the BWR study, that three-zone model, at least in specifics, with the numbers associated, was discredited and replaced by a better methodology, based on data where you're actually measuring the damage pressures and relating those.

MEMBER WALLIS: But you still have to calculate those damage pressures from a jet model.

DR. LETELLIER: Correct.

MEMBER WALLIS: This discredited model is a jet model, or pretends to be or claims to be.

DR. LETELLIER: The difficulty - particular difficulty with that model is more the qualitative definition of damage, than the calculation of --

MEMBER WALLIS: We'll have to sort this conversation out.

DR. LETELLIER: There's an evolution in thermo-hydraulic modeling as well. And there are a number of alternative models that can be compared and contrasted.

That's an academic exercise it's been ongoing for many years and continues.

MEMBER WALLIS: I don't think it's academic at all to calculate the pressure you need to put into your formula to calculate whether or not insulation is damaged.

DR. LETELLIER: My point is that there are a number of competing models.

MEMBER WALLIS: Yes.

DR. LETELLIER: And they agree to a better or lesser extent to the data, and that's a challenge for numerical modeling.

MEMBER WALLIS: Okay, thank you.

DR. LETELLIER: That continues.

DR. CHANG: Maybe at this point, I think --

MEMBER ROSEN: Let me ask a question about that slide.

DR. CHANG: Yes.

MEMBER ROSEN: The one that's behind you. It says there's a chemical test report due before 10/03. I assume that's 10/31/03?

DR. CHANG: Right.

MEMBER ROSEN: So, we will have -- will we have, when that report's in hand, the answer as to what chemical species are formed, and how -- and what kind of head losses they create in various materials?

The point of this question is, listening to what Mike said about the utility managers, they say they want to fix this once. Well they'll need to know what the effects of the chemicals are.

And if this is the information they need, I think there's no reason for them to have to do it more than once.

MR. MAYFIELD: I'll let Bruce speak to it, but before I do, I would not want to characterize this report that's coming out as the definitive piece of work on chemical effects.

It is not, it was intended to, frankly, build on the issue that you raised, from the TMI experience, and to go back and to say, okay we have the TMI observation.

What do we do with that? How can we recreate that? Can we demonstrate that this sort of thing can be developed? And, if it's developed, how serious an issue is it, in terms of screen plugging?

The answer is, yes it can be developed. And if it's developed in a sufficient quantity, that's a problem. So, I wouldn't want to oversell what you're going to find in that October report.

MEMBER ROSEN: So, you're suggesting, perhaps, that there will be more chemical work done after October?

MR. MAYFIELD: I'm suggesting that somebody's going to have to do a lot more chemical work. And the discussion we've had about it, is who's going to do it and how much more is really needed.

MEMBER WALLIS: So when can you decide what the utilities should do?

MR. MAYFIELD: Well, Doctor Wallis, that's -- again, the problem that I face in managing work, confirmatory research, is that I'm constantly running behind when my colleagues at NRR have to make a decision.

MEMBER WALLIS: So, it's not your -- it's the NRR folks, it isn't you.

MR. MAYFIELD: No, sir, well, they're the ones that find themselves having to ultimately take a deep breath and make a decision. And they look to us to provide them additional information to support that. But that's the nature of where we are.

CHAIRMAN BONACA: I had a question, with regards to this near-term and long-term work. I mean, now if we publish this Reg Guide 1.82, how are you going to document this new information?

Is it going to be purely knowledge, added knowledge?

MR. MAYFIELD: It would be added knowledge. And if we find something that we believe takes -- makes sort of the next major step in either, oh by the way there was an error in this guide, or here's some additional information, we'll revise the guide again.

Obviously, we've been willing to revise it in the past. This is a --

CHAIRMAN BONACA: So, basically, you're planning to have a second document? This is --

MR. MAYFIELD: We would almost certainly publish additional new reg reports to document this as we go along. And, frankly, we can get that information out through the publication of a new reg and then through various generic communications that NRR has.

So the information can be made available fairly quickly. To modify a Reg Guide obviously is a more time-consuming process.

MR. JOHNSON: Yes, Mike Johnson, just to add… You know, we are anxious, obviously, anxiously awaiting what the report says, what the peer review thinks of the report, what the final report says, as is the industry.

One of the things that he industry raised at the meeting that we had with them, where they committed to continue to pursue resolution of GSI 191, and to also look at this issue once it becomes more well-defined.

We're all anxious to see what comes out, to make sure that we can approach both of these issues and not delay resolution GSI 191 while we, again, figure out what's going on with the chemical effects precipitation.

And again, hopefully the industry can take only one fix. They would like to, obviously they've told us they'd like only to make one fix. But they also recognize that, as we figure out what we have to do to get our hands around this issue, they might actually have to do more than one fix.

MEMBER WALLIS: With regards to the chemistry, we saw some preliminary results of chemical work, which were very interesting. And the comment of the Sub-Committee was these were very interesting, but they don't really duplicate the chemistry in the plant.

Yes, there's zinc in the paint, but it's not elemental zinc, it's probably zinc chromate or something - it's a zinc in some form other than disks of zinc.

And if you do an experiment with disks of zinc, you're not really duplicating what happens to paint, that the temperatures, the pH, the chemical constituents and so on, should be realistic, as far as the plant goes.

And the constituent, you're likely to find there. And that sounds like a fairly extensive program.

MR. MAYFIELD: I agree. To really pin this down and develop all of the data that you would like to have, is a significant undertaking.

MEMBER WALLIS: Thank you. Yes.

DR. CHANG: In the long-term, we're talking about up to September of next year, we are going to do some additional test, such as latent debris collected from volunteer plants, such as dirt, dust, rust, all those things you can gather from operating debris.

MEMBER WALLIS: And that's going to be put into the chemical test too?

DR. LETELLIER: The primary objective is to characterize the hydraulic properties of this debris, as a particular. In the BWRs, we had iron oxide as a predominant particular source.

And we would like to characterize the P's in a similar way.

DR. CHANG: And we are going to do a head loss test on those debris.

DR. LETELLIER: The hope of the characterization is to come up with a recipe for screening, sieving, mixing up additional quantities that are useful for head loss testing.

The reason this research was started in the beginning is one of our early attempts at creating dust was to screen -- sweep up the concrete lab at the University of New Mexico and dump that into the bed.

And people criticized - the industry, in particular, was not pleased with that, so… We're going back to look at the composition of actual resident material.

DR. CHANG: And it's possible that we're going to do some HPSI frontal valve plugging tests. And in the February/March timeframe next year, there will be an international workshop, in Albuquerque, New Mexico, on the PWR clogging issue, right?

DR. LETELLIER: Correct.

MEMBER WALLIS: Are you going to do any internal clogging tests? I mean, none of this debris -- there's a pretty course screen and a big pump and a big HPSI valve and all.

It gets into the radi-coolant system, some particles. And the clogging of the spaces and the fuel and the flakes, and so on…

DR. LETELLIER: I think the high pressure safety injection, the throttle valve has been identified as one of the smallest internal gap tolerances, that's why we're --

MEMBER WALLIS: But the fluid's whipping through there, isn't it? It's going to carry -- there are pure fluids whipping through there?

DR. LETELLIER: It is.

MEMBER WALLIS: Right, so… it's not just a question of size, it's a hydraulic conditions.

MEMBER ROSEN: But I don't think you answered Doctor Wallis' question about the fuel.

MR. MAYFIELD: I was just going to jump on that. One of the -- this international workshop, I'm probably at the bottom of. I met with the Germans about a year ago to talk about a range of issues and the sump blockage issue was one of them.

They discussed in exactly this issue, and they've concluded that that's something that they are concerned about for their configurations. The potential for debris to pass through the system and lodge in various places, as you go through the core.

And that's an issue that they have been actively pursuing. And our intent is to build on the work that they have been doing. But we also know that there has been other bits of work done by very competent laboratories around the world, and we wanted to capitalize on that work, rather than re-invent the wheel every time.

So, we have had, and continue to have, a dialogue with those organizations to build on their knowledge and understanding. And this international workshop is one that we pushed for, to try to get all of the people, or at least the major players together, at one time to discuss in detail the work they're doing and they're finding.

And then we'll roll that information into the next steps that we're taking. We had frankly -- I'd been pushing T.Y.'s predecessor, who had mysteriously shows up down here with the staff now -

I'd been pushing him to have this workshop significantly earlier.

And just the logistics, it wasn't a practical matter. So, we have this thing scheduled now. We know there's a lot of interest in pursuing it. And for our application, we'll see how significant the fuel issue really is.

It is something we are aware of, and we're looking to capitalize on that international data to pursue it.

MR. ARCHITZEL: This is Ralph Architzel, from NRR, if I can just interject for a second. Separate from GSI 191, downstream blockage issues have been raised in the bulletin, and are planned to be raised on generic letter, so that it's not a part of GSI 191 per se, but it is part of the documentation going with the bulletin.

Those licensees -- that one licensee that gave us category one response did address the fuel blockage inside the vessel. That's one of the examples listed.

The other plants will be asked to address that. It's not part of the NEI guidance document, it's considered an engineering issue that should be addressed by licensees with a resolution of the future generic letter, not GSI 191.

But I wanted to point that out that that's an issue.

MEMBER ROSEN: It's not in the NEI document because there are so many different fuel types?

MR. ARCHITZEL: It's not in the NEI document because NEI had a scope. And their scope was to address GSI 191 and they chose not to address downstream blockage, upstream blockage, structural integrity of the screens.

Things like that are considered engineering issues.

MEMBER ROSEN: How could they -- if their scope was GSI 191, why isn't this part of it?

MR. ARCHITZEL: This isn't part of GSI 191, GSI 191 was not blockage inside the fuel channels and things like that. I'm saying that's not what GSI -- some performances what GSI 191 was.

MR. MAYFIELD: One of the issues that we struggle with in managing the generic safety issue program is what we call scope creep. And the issues simply never go away, because there's always the next piece.

So we've chosen to go at this in a

somewhat different way. And one of the discussions I've had with Mr. Thadani, goes to why aren't we opening yet another generic safety issue?

And that's an open discussion that we'll take on.

MEMBER ROSEN: That's perfectly acceptable. It was just a question of definition. I mean, the physical world doesn't know that these effects have separated.

MR. MAYFIELD: That's exactly correct. This is a bureaucratic issue.

DR. CHANG: At this point, may I suggest that let Bruce present his slice on the ZOI. Hopefully that will answer some of your questions.

MR. MAYFIELD: Let me ask this somewhat differently. Does the Committee wish to pursue the technical details on the zone of influence?

MEMBER WALLIS: I don't think this is the place to do it.

DR. LETELLIER: We would be happy to meet with you privately, or teleconference.

MR. MAYFIELD: Or we can do it through another Sub-Committee meeting - however the Committee would choose to go at that. I go the distinct impression from the earlier discussion that there are some substantive technical questions at a fairly low level of detail, or high level, however you want to look at that.

MEMBER WALLIS: Yes, but we have to write the letter, rather than engage in consulting with you guys. So, I think we're going to have to put some of these technical questions in the letter.

MR. MAYFIELD: That's obviously a fair approach. We do continue to believe it's important to get this guide on the street. I understand your concern.

MEMBER WALLIS: That's the key issue, I think. Get it out there, in spite of the fact that it's tremendous amount of work needed to be done to really meet the requirements of it.

MR. MAYFIELD: Right, and we continue to believe that's important and we would hope to get a letter from the Committee that would support moving forward.

MEMBER POWERS: Let me ask, Mike, just a question a little bit about the chemistry issues that have come up in regards to what's in the sump and what can produce and things like that.

You kind of have a Duke's mixture of junk, potentially present here. You've got some plans to try to limit that somewhat below 92 possible elements, I take it.

MR. MAYFIELD: That'd be nice.

MEMBER POWERS: Yes, have you taken something like YQ or some of their aqueous equilibrium code and said, okay I don't know that I have equilibrium but what do I have if I put this junk into a hot sodium hydroxide solution, maybe with sodium phosphate in it, or potassium phosphate in it in some cases.

MR. MAYFIELD: The answer to that is, no we have not pursued that. The one issue, and the Committee had raised this, that the observation from TMI, which obviously is something we hadn't picked up.

We went back, did enough testing to convince ourselves no we can't quite make it go away. And then the next question is, well how much more do we need to do, in responding to Doctor Wallis.

It's a big undertaking to really get your arms all of the way around it. The approach you're proposing is one of the things, whether it's that particular code or another approach, that's one of the things that you would have to pursue, it seems to me.

But it's -- the exact structure of the research program that you'd put together to take that on, is plainly something we haven't worked all the way through.

MEMBER POWERS: Sure. One of the things that I would tend to push back on, is when somebody tells me, oh the chemicals that you put into this are not exactly precisely the same particle size, method of manufacture or chemical form, of the chemicals that I think I have in plants.

For instance, I think particularly the zinc that may come from a paint that by the time you take your zinc disk and put it into sodium hydroxide solution, it's pretty warm.

The zirconium oxide, hydroxide that you get off that, pretty well can't tell where it came from. And --

MEMBER WALLIS: Zinc hydroxide, right?

MEMBER POWERS: Zinc oxy-hydroxide. It's an interesting material because it's transient in nature. And it even gets modified further if pour boric in there, it's more gelatinous material.

MEMBER ROSEN: I guarantee you that the boric acid erodes.

MEMBER POWERS: And, I mean, those kinds of things would make your chore, characterizing the chemistry, impossible, okay? So you need -- whether you do the experimental work yourself, or you are in the position of evaluating the product or the licensee's work on the chemistry, you need some sort of a computational vehicle to say, is this in the realm of reasonableness, from a chemical point of view?

Or, is this something very strange and weird? It might be worthwhile to look into that.

MEMBER KRESS: You have to be a little careful to interpret the equilibrium quotes at like -- if you can get a kinetics code, it'd be a lot better.

MEMBER POWERS: Tom, quite frankly, in the history of looking at these things, what I know is it's really easy to get heterogeneous things that are weird, in reality, that you don't get equilibrium on solution kinetics, and these things are pretty fast. But the precipitates can be weird on you.

MEMBER KRESS: That's the sort of thing I was worried about. You'd get an intermediate reaction that precipitates, and you won't know that with an equilibrium code.

MEMBER POWERS: I mean the world, in this computational modeling, has undergone some substantial evolution, largely because of places like WIPP and Yucca Mountain, because they have the same problem.

They have to predict what's in these rock pores, precipitates out and blocks them and absorbs things and stuff like that. And at least it gives you a shot at understanding.

MEMBER KRESS: I agree, it'd be a good way to start, the easiest way to start.

MEMBER POWERS: It's the cheapest and easiest way to start, especially if you're starting off well I've go 92 elements.

MR. MAYFIELD: We would certainly be willing to talk with the Committee about the approach that we would take a look at. Again, this has been an open dialogue with NRR about how much further they would like to see us go, to be able to support them and their reading.

MEMBER POWERS: I guess I have two points here. One of which is, I don't think you're going to be able to wash your hands completely of the chemistry problem, just because you're going to have to review what somebody does.

MR. MAYFIELD: I don't think we can walk away from it. The question is, how clean can I get my hands?

MEMBER POWERS: I guess I would side with you. I'd keep myself as far out of the laboratory as

I could.

MR. MAYFIELD: They don't keep me very close anymore.

(Laughter.)

MEMBER POWERS: Why? I understand that, but just because I suspect you will find that plants differ in the junk that's on the floor.

MR. MAYFIELD: Yes.

MEMBER WALLIS: I guess the Sub-Committee felt the opposite way, that you had to be in the lab, you had to do some tests with some real paint and some real temperatures and pH's and things, and get some idea of what these things might do.

MEMBER POWERS: I mean, quite frankly, that research on paint, the NRC has been intimately involved in pretty extensive. I mean, we know a lot about how paint behaves, because in these accident environments, simply because it also tends to be a pretty good absorber of iodine.

And I think there's a lot you can get, without actually going and putting salts in solutions.

MR. MAYFIELD: I would also suggest that it's not just paint. There's all manner of conduits and cable trays and other bits and pieces that could be of concern.

MEMBER POWERS: And you've got some real amazing things when you throw a little boric acid into a little concrete dust. Because then you get this calcium borate - I think it's called whistlelight, or something like that, that's just amazing stuff.

MEMBER WALLIS: Why is it amazing?

MEMBER POWERS: Oh, it's long strings.

MEMBER WALLIS: So it clogs, then? The long strings would tend to clog things.

MEMBER POWERS: It makes -- it's weird stuff.

DR. LETELLIER: In fact, we did add calcium to our basic stock solution, to account for concrete ablation.

MEMBER POWERS: You should have gotten a little bit of nice gelatinous precipitate out of it.

DR. LETELLIER: Indeed, we did.

MEMBER POWERS: Yes, you got whistlelight.

DR. LETELLIER: I'd like to correct a couple of misperceptions of Doctor Wallis. In fact, we did test zinc paint chips, which is a representative material.

I think the biggest deficiency of our quiescent immersion test is the fact that it's not a turbulent flowing solution. I think we may be seeing some surface crystallization that might not occur.

MEMBER WALLIS: This was, I think, my colleague who isn't here, Doctor Ford said that the zinc that you tested wasn't quite the same as the chromate primers and things that you find in the real plants.

DR. LETELLIER: That is a fact that we're testing --

MEMBER WALLIS: All right, so it wasn't the same.

DR. LETELLIER: But we're testing metallic zinc granules.

MEMBER WALLIS: Right, it's not the same thing.

DR. LETELLIER: That's correct. We did our best effort at reproducing the pH conditions. The temperature is a little bit low, thinking that if we can induce this, or establish this as a concern at low temperature, then certainly it is a concern at higher temperature.

MEMBER POWERS: Warm that solution up in zinc chromate, it turns into oxy carbonate in a thrice plus a little chromus oxide.

MEMBER WALLIS: Can we wrap this thing up? I'd be very happy to meet with you folks in the office here. Anybody else?

MR. MAYFIELD: Let me try to close it out, then, Doctor Wallis. Again, we appreciate the opportunity to come before the Committee again this afternoon.

We would welcome your insights, both individually and whether it's through the Sub-Committee or the full Committee, we would very much appreciate a letter that would endorse moving forward on this.

And we would be interested in the list of issues that you believe we need to work more on. And with that, unless you have further questions, that concludes our presentation.

MEMBER WALLIS: Does anyone on the Committee want to speak up? Then I hand it back to you, Mr. Chairman.

CHAIRMAN BONACA: Okay, well thank you. I thank you very much for the presentation. And I think what we're going to do now is take a break - some of us have been at it since 2:30 p.m.

And then I think we will have the presentation from Nourbakhsh should be tomorrow, because we really don't have time today. What I would like to do is go down the table and discuss at least two letters for which I think we need to provide the writers with inputs from the Committee. One is the one on -

MEMBER POWERS: The alpha and the omega.

CHAIRMAN BONACA: They may be.

(Laughter.)

CHAIRMAN BONACA: One is the one on heavy loads. I think one is on the PRA. Okay, so you already knew what we have in mind? Okay, all right, and is there any other letter for which you believe we need to provide some input?

MEMBER SIEBER: They're printing the one on 186.

CHAIRMAN BONACA: Yours?

MEMBER SIEBER: Yes.

CHAIRMAN BONACA: Okay, what about the one on--

MEMBER KRESS: I already got --

CHAIRMAN BONACA: You already got feedback yesterday, I thought. So I was worrying about mostly the one from Jack, the one from George and the one from Vic. We'll be back in here in 15 minutes, 10 after 6:00 p.m. Thank you.

(Whereupon, the foregoing matter went off the record at 5:48 p.m.)