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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS) 497th MEETING

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THURSDAY, NOVEMBER 7, 2002

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

GEORGE E. APOSTOLAKIS, Chairman
MARIO V. BONACA, Vice Chairman
THOMAS S. KRESS, Member
GRAHAM M. LEITCH, Member
DANA A. POWERS, Member
VICTOR N. RANSOM, Member
STEPHEN L. ROSEN, Member
WILLIAM J. SHACK, Member
JOHN D. SIEBER, Member
GRAHAM B. WALLIS, Member

ACRS STAFF PRESENT:

JOHN T. LARKINS, Executive Director

SHER BAHADUR, Associate Director

SAM DURAISWAMY

HOWARD LARSON

MAGGALEAN WESTON

C-O-N-T-E-N-T-S

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

8:33 a.m.

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

This is the first day of the 497th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting the Committee will consider the following:

One, proposed resolution of Generic Safety Issue 189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During Severe Accident."

Two, Early Site Permit Process.

Three, Peach Bottom License Renewal Application.

Four, Westinghouse AP1000 Design.

Five, Risk-Informed Improvements to Standard Technical Specifications.

Six, Report Regarding Recent Operating Events.

And, seven, Proposed ACRS Reports.

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 sessions.

A transcript 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.

I will begin now with some items of current interest. You have in front of you a handout with a pink cover. In it there are six speeches by Commissioners as well as two significant regulatory activities which have been summarized in this document.

Before I start, I would like to know if there are any remarks or comments that members would like to make.

(No response.)

If none, I would turn to Dr. Kress, who is going to lead us through the Proposed Resolution of Generic Safety Issue, GSI-189. Dr. Kress.

MEMBER KRESS: Thank you, Mr. Chairman.

Just a couple of words of reminder: We had a good Subcommittee meeting on this Tuesday. Most of the members were not there, but we should be familiar with this issue because we had a meeting and a letter back in June. So a lot has not changed.

If you will recall, we thought it would be useful if they considered some of the uncertainties in this issue having to do with whether or not to provide a back-up diesel to the igniters for ice condensers and Mark III containments. So they did some uncertainty analysis, and they are here to tell us what the results are and what their conclusions are.

With that, I will turn it over to you, Jack.

MR. ROSENTHAL: Thank you. My name is Jack Rosenthal, and I am the Branch Chief of the Safety Margins and Systems Analysis Branch in Research.

Allen Notafrancesco, from my staff, was the Project Manager. He has expertise in hydrogen. Jack Tills, sitting at the side table, is a consultant to Sandia, and he did some MELCOR calculations and some uncertainty calculations. John Lehner, from Brookhaven, did the benefit analysis, and Jim Meyer, sitting next to him, from ISL, did the cost analysis of this issue.

In the interest of time, it was decided

that I should be the principal spokesman, but surely we have all the right people here to answer questions, should they arise.

GSI-189 is the "Susceptibility of Ice Condenser and Mark IIIs to Early Failure from Hydrogen Combustion during a Severe Accident." We limit our thoughts to station blackout scenarios. The issue was raised within the context of risk-informing 50.44.

Let me just interject: We are not considering late containment failure -- I will get into it more -- because there you reach questions in non-condensable gas overpressurizing the containment. There is little benefit in terms of late containment failure, but only in terms of early containment failure.

After Three Mile Island, we had a chance to consider the issue of hydrogen random ignition, power to igniters, et cetera. The short answer post-TMI was there was plenty of power around at TMI and that the conjecture about what would happen if there wasn't power was put aside.

Then with NUREG-1150 we had a chance to reconsider the need for igniters. Then with the IPE reviews we had another chance, and there was a containment performance improvement program that was conducted in parallel with the IPE reviewers about that time.

The latest information is about the year 2000, where we completed a report on DCH, and we are revisiting it once again within the context of risk-informing 50.44. So there is quite a history of the issue.

We met with the ACRS on June 6th. You sent us a letter that said go do more uncertainty analysis, which we did, and we did it in the cost area, in the benefit area, and in the hydrogen control area. I think we did extensive analysis within the timeframes that we are trying to fast-track a decision on GSI-189. The Commission has asked us to move expeditiously.

I am going to summarize the benefit analysis, then the cost analysis, just touch on some hydrogen control, which we discussed at length with the Subcommittee, and then go to summary and recommendations. I want to allow lots of time in the summary and recommendations because there are issues of to what extent should you rely on prevention versus mitigation, et cetera. We would truly like to hear the views of the full Committee on these issues. But as I go through the presentation, I will point out where some of these come up.

There are nine ice condensers, four dual-unit sites and four Mark IIIs at single-unit sites. So let's get into it.

The first thing on the benefits side is to estimate the benefit of enhancing the gas control system during a station blackout and to address the ACRS's comments on uncertainty. Now we are following the NRC's cost/benefit guidelines. Sid Feld is an economist in our Division, and he is, in fact, the author and tells us that we are doing this right.

There is reasonably recent threshold legislation on data quality and consideration of uncertainties in the decision. We think that we are doing it right within that context also.

We are looking at averted risk to the public, and it is in terms of man-rem or property damage. The numbers are about equal for these two aspects.

So what we do for risk reduction or averted risk is to look at the increment attributable to the enhancement. So we are only looking at station blackout because in other scenarios, of course, the igniters would already be powered. We are mindful that this will affect early but not late containment failure.

By early, I mean you have a station blackout, and if you don't have auxiliary steam-driven aux. feedwater and batteries, and things like that, then you go to core damage in two, three, or four hours. If you have the steam-driven aux. feedwater, you've got your batteries, you go maybe eight hours. Ultimately, either you restore power or the plant will go.

That is what I mean by an early failure as distinct from post-progression in the accident sometime later, where you ultimately have a core melt, vessel failure, core on the floor, non-condensable gas production due to melting core concrete interactions and then a late failure 12 or more hours in the event. So we are thinking in terms of the earlier event.

MEMBER KRESS: I think it is important for the Committee to understand the sequences we are dealing with here. You gave a pretty good description.

Now for station blackout sequences, and I presume there are several of them, but you lose offsite power coming in.

MR. ROSENTHAL: You lose offsite power.

MEMBER KRESS: Your diesels, which there's two or three of them, fail to start.

MR. ROSENTHAL: Typically, fail to start. The fail to run probability is very good. If they start, they are likely to run. So failure to start would dominate.

MEMBER KRESS: And the batteries aren't hooked to the igniters?

MR. ROSENTHAL: At this point you are living on your station batteries, but you are --

MEMBER KRESS: Yes, but that is for the other safety --

MR. ROSENTHAL: For other safety equipment. The igniters are not connected, are powered off the emergency diesel buses, but not off the station batteries. They would have to be manually connected anyway from the control room.

You are sitting there with injection to the steam generators, no ultimate decay heat removal because you've lost everything but your batteries. You have your instrumentation. You have the lights, and now it is a great race: Are you going to restore AC power offsite or repair onsite before you deplete the batteries, the station batteries, and go to core melt.

The station blackout frequency is

dominated by very short loss of offsite power events. However, we did have Hurricane Andrew in which Turkey was without power for days. So it is the long, weather-induced station blackouts that should give you some worry.

This is a mitigative fix. It does not affect the --

MEMBER KRESS: When we talk about the frequency and the initiating event in this study here, does that just look at frequencies of long blackouts or of all blackouts?

MR. ROSENTHAL: John?

MR. LEHNER: John Lehner from Brookhaven National Lab.

We are looking at both fast and slow station blackouts.

MEMBER KRESS: In other words, it is all station blackouts?

MR. ROSENTHAL: All station blackouts, yes.

It is mitigative effects, so we are not changing the frequency of occurrence. The change is in the conditional core damage probability, the conditional containment failure probability due to the fix, due to the change.

What we did was, in order to do cost/benefit analysis, of course, you have to go to a Level 3 PRA. This is somewhat problematic for us, as I will discuss.

The approach really, given the timing, was to use available information. Since we are putting together station blackout frequencies, containment failure probabilities, and consequence analysis from various studies, we are not able to do a holistic, full sensitivity study.

What you are going to see is a combination of uncertainty analysis that was done for things like the core damage frequency, along with some sensitivity studies. I just take it as a whole. For perspective, we try to show you some industry results, some IPE results, some SPAR results, which are somewhat later.

In the study we assume that the igniters would be 100 percent effective. I will get into that when I talk about the cost side.

In terms of late containment failure, although we are not taking credit for late containment, for changing late containment failure, in fact, if you can control the hydrogen, you buy yourself time. You got farther out on the sequence, so there is some time to recover and there is some likelihood that you are going to repair equipment onsite or, more likely, if you have gone eight hours, you are going to recover offsite power.

So if you delay things, you do get some improvement. There is also some small probability that, all else happening, that to the extent that you burnt off the hydrogen, there's less non-condensables. So there is less overpressurization.

MEMBER WALLIS: Jack, if the containment is going to fail anyway, why isn't the offsite property damage the same whether or not it is early or late? People you can evacuate, but the property damage I would think would be the same.

MR. ROSENTHAL: Right. In your modeling, buried in the assumptions of the MACCS code, you really end up trading off person-rem and offsite consequence. To the degree that you evacuate, you reduce the person-rem, you run up the offsite consequence cost for relocation, for moving people, et cetera. So really it doesn't change.

MEMBER KRESS: And to some extent, the late containment failure has a different source term also.

MR. ROSENTHAL: And a different --

MEMBER WALLIS: Is that what changes the

property damage? What changes the property damage between the two, between early and late?

MEMBER KRESS: Well, you get a lot of cesium coming out early and that can do a lot of property damage.

MEMBER WALLIS: It is the source term that is different, that makes the difference?

MEMBER KRESS: More or less, it is going to be the source term, yes.

MEMBER WALLIS: Explain to me why there was this much averted risk from averting offsite property damage if the containment failed a few hours later.

MR. LEHNER: This is John Lehner from Brookhaven.

The source term is usually quite different from a late failure because you have had more attenuation inside the containment, more weight out, et cetera.

MEMBER WALLIS: Okay, so that's the reason?

MR. LEHNER: Yes.

MEMBER WALLIS: It is not the time; it is the source term?

MEMBER KRESS: But you have a good point.

I don't think this is considered. I don't think they calculate the late containment failure and then subtract that out of this number.

MEMBER WALLIS: So they may be giving themselves more credit than they should?

MEMBER KRESS: We will ask them to answer.

MR. LEHNER: No, we did include late containment failure. As a matter of fact, for the ice condenser we ran a sensitivity case where we assumed no containment failure, but we are not showing those results. We are showing the results where there is late containment failure.

MEMBER KRESS: Yes, but what you do is you add again the benefits rather than subtract them.

MR. LEHNER: No, we did a case where you, without the igniters, where you fail the containment early and look at those consequences; then do a case where you fail the containment late and look at those consequences and subtract the two.

MEMBER KRESS: That was the question.

MEMBER WALLIS: Yes, I understand they did that. I just wanted to know why it was different. It is the source term difference. Thank you.

MR. ROSENTHAL: Which I want to touch on in a moment.

Let me just point out that you do cost/benefit within a set of prescribed guidelines. For example, discount rates, et cetera, come from the Office of Management and Budget. So they are standard for government work.

We did a 7 percent discount, is the numbers you are going to see. If you go to a 3 percent -- this is a sensitivity study -- then the benefits would be 1.75 higher, about three-quarters higher because your --

MEMBER KRESS: That is the guidelines in the Regulatory Analysis Guidelines book. It came out because historically the rate of inflation was about 7 percent, but for the last four or five years it has been more like 3 percent. But you are using 7 percent as your base and 3 percent as your sensitivity?

MR. ROSENTHAL: Right. So the numbers you are going to see are 7 percent. Just keep in the back of your mind that, if it would be 3 percent, that is not quite twice the benefit because benefits out in the future are worth more if the interest rate is lower.

MEMBER KRESS: That's right.

MR. ROSENTHAL: But factors of two are not -- our factors are two. We took a 40-year plant life, assuming that everyone would go to life extension. If you assume 20 years, there is about a 30 percent difference again, because things out in the future are just worth less than things that are more current. So those are just things to keep in the back of your mind, but I don't think that they sway the decision.

Let's get into 1150 a little bit more. I am talking about internal events now. The mean core damage frequency due to station blackout is about 10 to the minus 5. Let me point out that the 95th percentile, 5 minus 5, the mean actually is closer to the 95th than to the 5.

At the time that work was done there was an expert elicitation --

MEMBER KRESS: In some of those 1150 cases the mean turned out to be higher than the 95, which is interesting, which means it is driven by the tails.

MEMBER WALLIS: I see. It is further from the 5th than from the 95th on a linear scale. It is just when you think logarithmically that it looks a long way from the 5th.

MR. ROSENTHAL: Yes, when you look at the distributions.

Eleven-fifty took credit for random ignition. Clearly, if you are a full believer that random ignition will always take place because there is always some hot pipe or a spark, even though we are in a blackout scenario, but if random ignition is 100 percent, then this proposed fix is worth nothing because you burn off the hydrogen anyway.

There was an expert elicitation that took place. It was documented in a separate report, which is a back-up report for 1150. The experts came up with a mean value of 15 percent. This is critical in our thinking.

MEMBER ROSEN: Fifteen percent of the time you will get random ignition?

MR. ROSENTHAL: I'm sorry, 15 percent of the time that you have a station blackout, core damaging event, you will have early containment failure. That is dominated in an ice condenser by the hydrogen.

I want to dwell on two slides which I am going to show you twice. I know it is a busy slide, but we are trying to spell our full understanding in a tight place.

MEMBER KRESS: It might be useful to the Committee to let them know that this is basically the uncertainty part of the benefits in the equation. That is why it is so busy. That is why there is so much on there.

MR. ROSENTHAL: Going across this way, we could look at changes in the station blackout core damage frequency. Coming down this way, we can look at differences in our understanding of a level of containment phenomenology. I will get into the source term in a minute.

Here we have the 1150 mean value, the 1150 95th percentile, and then from the DCH report, which took no credit for random ignition and thought that hydrogen would overwhelm direct containment heating, they thought that early failure of containment would be about .97.

Eleven fifty was done in 1985 and represented the state of knowledge then. The DCH report was completed in the year 2000, 15 years later, and in some sense captures 15 years of further understanding.

What you see in these boxes is the incremental person-rem averted converted to dollars in 2000 dollars man-rem, plus the offsite cost. So that what you are looking at is thousands of dollars.

Now I will get into the cost analysis later, but what I would like you to think of, when you are looking at this slide, is that we think that fixes would be two, three, four hundred thousand dollars. So anything that is around $300,000 would have a cost/benefit ratio of 1. Things that are less than $300,000 are just simply not cost beneficial of themselves.

MEMBER WALLIS: Jack, could you point out to the Committee which is, of the base -- 320 is the base value before you -- based on the mean, right?

MR. ROSENTHAL: Three twenty is the mean in NUREG-1150 based on assumptions where I am asking you to just remember that there are some terms about random ignition buried there.

MEMBER WALLIS: It is taking both means. It is taking both means, a mean of probability of event and containment failure?

MR. ROSENTHAL: Right.

MEMBER WALLIS: Three twenty is of the base case there?

MR. ROSENTHAL: Yes, sir.

MEMBER WALLIS: Right.

MR. ROSENTHAL: But at least in my mind one should not dismiss the direct containment heating worth, which may be an equally credible representation of reality.

MEMBER KRESS: To get that .96, .97, they included pressurization due to DCH?

MR. ROSENTHAL: Right.

MEMBER KRESS: And then added hydrogen combustion on top of that? Is that why it is so high?

MR. ROSENTHAL: Yes. Well, at the time of vessel failure you have a lot of hydrogen that is --

MEMBER KRESS: That is secure inside the vessel.

MR. ROSENTHAL: That is put out, and you've got the hot --

MEMBER KRESS: So to believe that number, you have to believe pretty heavily in the DCH syndrome?

MR. ROSENTHAL: Yes. No. I'm sorry, no. No, no, no. You believe that the hydrogen overwhelms the DCH. The result of the report was that the real risk is due to hydrogen --

MEMBER KRESS: I see. Okay.

MR. ROSENTHAL: -- and not due to DCH. That is why DCH was dismissed in the report. I'm sorry, I didn't say that as clearly as I should have.

MEMBER KRESS: Thank you for that correction.

MR. ROSENTHAL: Okay, that is the random ignition.

MEMBER KRESS: Now but in that case they must have had a lot more hydrogen for some reason than the NUREG-1150 people thought you had?

MR. ROSENTHAL: That I don't know. I don't know. John, do you?

MR. LEHNER: I think one difference is that there was no random ignition considered in that at all. In other words, none of the hydrogen was burned off. It just kept accumulating until it ignited at vessel failure, whereas in 1150 --

MEMBER KRESS: So it was a high concentration --

MR. LEHNER: It was a high concentration.

MEMBER KRESS: -- burning off ahead of time?

MR. LEHNER: Yes.

MEMBER KRESS: Plus, they probably did have more hydrogen, too. I could see how that --

MR. LEHNER: Yes.

MEMBER WALLIS: A kind of worst case. You build it up and build it up and build it up until you've got the maximum run and then you let it off?

MR. LEHNER: Yes.

MR. ROSENTHAL: Okay. Just going down this line, we really had no way of taking a 95th on the Level 2 and a 95th on a Level 1 because we weren't involving a whole, entire analysis. But people suggested that 10 times might be some sort of upper boundary. And these are internal events.

Now Duke Power has been very cooperative with us in providing information on what is in their PRA. I wanted to give you a full picture.

So Duke starts with a mean early failure of .29, which isn't that different than the .15. Their mean value before plant mods is the 220,000. We took their value and we said, well, what happens if you use the 1150 source term? Duke and the NRC both use MACCS, but Duke uses MAPP and 1150 used what was the source code suite at the time.

I looked up -- 1150 at 29 percent of the iodine released to the environment, and MAPP calculation has 5 percent of the iodine released to the environment. Because iodine and cesium just dominate the health effects, that is enough to explain the differences between the Duke and the NRC calculation, is the assumptions buried inside of the phenomenology and the progression and the retention of just how much iodine is going to come out.

I can't stand here and say that the 1150 number is the right number, nor can I sit here and say that the MAPP is the right number. But the spectrum going between, let's say, the 220 and 790, a factor of four, is attributable to alternate understandings of that accident progression.

Then the last thing, which is really an easy adjustment, if you adjust Catawba to the Sequoyah site, you would end up with a multiplier of 1.8 just on the population.

Okay, so then we go to look at Duke has changed out their Westinghouse seals for the better RCP seals. That buys you time. In the station blackout scenario buying you time allows you time to recover. They end up with a lower core damage frequency.

There is an issue of a flood wall which is important in their PRA. When they install that flood wall -- I am sure that they will shortly -- they end up with a mean value of 31,000.

What you see here is that you can drive down the averted risk by driving down the core damage frequency without doing the mitigation. So one of the questions, one of the issues that we would like to hear from you on is, to what extent should one endlessly take credit for prevention, which is in some ways preferred, over mitigation? We would like to hear you on that.

MEMBER WALLIS: Now the flood wall has such a big effect because the flood is the cause of the core damage?

MR. ROSENTHAL: Yes.

MEMBER ROSEN: That is a very site-specific consideration.

MR. ROSENTHAL: It is site-specific, but some other plant could add a third diesel, add a fourth diesel, ultimately end up dominated by common-mode failure, but you can prevent -- conceptually, one can make an endless round of preventive fixes.

MEMBER WALLIS: But the flood at Catawba is a little unusual. I mean it doesn't presume this is flood-sensitive. So it has about the same number as Duke, as Catawba with the flood wall installed.

It is just that it seems to me that Catawba is a little high because of the flood sensitivity. When you remove that, then the core damage frequency goes down significantly.

MR. ROSENTHAL: John?

MR. LEHNER: Yes. In Catawba most of the station blackout frequency comes from the floods in the area. By the way, that is an internal floods scenario. That is not a hurricane-induced flood or something like that. It is an internal flood scenario.

But you're right, in Catawba it is a site-specific situation where most of the station blackout frequency comes from internal flood.

MEMBER WALLIS: Once you fix that, the number looks much more modest than 31, and even 110 or 150 is still small compared with the 300 that you started with.

MR. ROSENTHAL: Yes. I don't have DC Cook numbers to show you, but conceptually DC Cook could make those plant changes on the prevention side. That would drive its number down also from wherever it is.

So I just look at this as some representative cases. At least the issue in my mind is you can drive down the risk by driving down the prevention side, and what is this balance of prevention and mitigation?

Okay, I am going to get back to this slide in just a moment.

For Mark III, I assume that everybody has this mental picture of a Mark III with a wetwell and a drywell. In order to get a big release, you've got to fail the wetwell. The drywell, our understanding, our year 2000 understanding, is that if you are at high pressure and you fail the vessel, the lower head, that between steam and you would discharge so much hydrogen that you would overwhelm even if you had igniters powered. You will fail the drywell, and then there is some probability, if you fail the drywell, that you do the structural matters; you fail the wetwell.

But the point is that the mitigative fix here of putting back-up power on the igniters is not going to work for high-pressure sequences. It will work for low-pressure sequences.

MEMBER RANSOM: Jack, could I go back? What is the reactor coolant pump seal? Why is that effective?

MR. ROSENTHAL: Okay. In the station blackout scenario, without pump seal cooling, you ultimately assume that you give yourself a LOCA, which could range from 30 gpm to -- I forgot what the numbers are -- maybe 400 gpm, depending on who assumed what.

Westinghouse came up with an improved pump seal package, and as plants worked on their plants over a period of time they changed out the seals for better seals, RCP seals. Changing out for better RCP seals reduced the likelihood of getting a small break

LOCA or a LOCA in the costly event. What you are doing is you are buying time because you can recover offsite or repair your diesels.

So that is why the pump seals, which dominated -- it would be 23 or something, a very early Generic Issue that took also decades to resolve, until the better seals were taken credit for. So that is, again, on the prevention side.

Now I don't have the equivalent of the industry numbers to put up. So I am more reliant on 1150 for Grand Gulf. Ultimately, under the severe action management process that NRR has undertaken in the SAMDA, which is required as part of life extension, the agency would learn more information.

Grand Gulf has a low internal core damage frequency. At least in my own mind you have your diesels, your normal big diesels. You have high-pressure core spray with a diverse diesel, and it is another way of putting water in the core. It is something you can walk up and kick. So I don't think it is an artifact of the numerical analysis, but it is something you could reach out and touch.

Very similarly, the Mark IIIs have a very deep suppression pool. At one time both GE and the NRC independently bubbled fission gases through a pool, and pool scrubbing really does work. So it is a real feature.

So it is not surprising that the Mark IIIs would come up with low consequences. I think that some of that is truly real.

On the other hand, let me just point out that the conditional probability of early failure is like .5. You see low core damage frequency and weaker containment.

Just to get some perspective, the NRC has developed these so-called SPAR models. The Grand Gulf number from SPAR is similar to the 1150 model, the River Bend numbers, an order of magnitude higher -- I'm sorry, five times higher. That is not a QA'd number, but it just gives you some perspective on the way you have it.

MEMBER KRESS: Just a quick question on the PWR results, just for my information. You noted where the Duke plants had better CDF per station blackout than 1150. If you go back to Sequoyah, if you were to go to the Sequoyah people now and say, "What does your current PRA tell us is your condition of core damage frequency on station blackout," would you get something different than, I think you said it was, 1.5 times 10 to the minus 5? Would they tell you some different number now, do you think?

MR. ROSENTHAL: Yes.

MEMBER KRESS: It would be more like 1 times 10 to the minus 6 or something? Maybe a factor of 10 lower than what NUREG-1150 --

MR. ROSENTHAL: Everybody was in the process of putting in the better seals, looking for things that they could do.

MEMBER KRESS: What I am searching for is another sensitivity input. That would be another one, going to the actual plant and saying, "What's your CDF condition on core damage on station blackout?"

MEMBER WALLIS: What you are saying is that with the more recent CDF from the plant, that number 320 would decrease? You would expect it to decrease?

MEMBER KRESS: That was my implication, yes.

MR. ROSENTHAL: It would decrease.

I just want to make the point that, if you fail the wetwell and you scrub for the pool, you still have low releases. So you are really concerned about containment and drywell failure.

I told you, I explained why it doesn't affect the high-pressure sequences. You overwhelm and you fail anyway. But if you have igniters powered, and here's a scenario where they would be continuously powered, then it is believed that the igniters would be effective.

MEMBER WALLIS: Those numbers of about a half look to me like expert judgments.

MR. ROSENTHAL: They were. Well, all I can say is this is my state of knowledge after --

MEMBER WALLIS: It just seems to me strange that these containment failure numbers are so much subject to expert judgment and estimate. You've got these .5 and .2, .01. I mean pick your number, either 1 percent, 20 percent, 50 percent. So they are not based on a more thorough analysis.

MR. ROSENTHAL: Now the expert elicitations that were done at the time of 1150 were based on -- they just weren't guesses. I mean people were provided with information, with the hydrogen concentration as a function of position. There were questions about -- they were very informed expert judgments. But that is the state of it.

As a total aside, it would not be bad to go back now, 15 years, 17 years after 1150, with a fair amount of money and do an update once again, but that is a programmatic issue. I have to deal with the information I have before me.

Here is the averted person-rem. I'm sorry, the averted cost/benefit in thousands of dollars. You have to compare this to fixes that would cost, two, three, to four hundred thousand dollars.

There is an issue here of, what's the proper split between high-pressure and low-pressure scenarios? If you say that all scenarios are low-pressure -- okay, it is just a function of you open up the SRVs. Can you keep the SRVs over it? You ultimately run out of air and battery, and it already closed. Or do you have some other failure of the system that causes you to keep it open? But if you would say that everything is at low pressure, then the 170 becomes 340, which is of the order.

What else did I want to say? In my own mind if you are going to believe these numbers, then what you have to say is you understand the initiating event frequency and you understand the phenomenology to the degree that I portrayed a little bit earlier.

Let's go to the next slide. So if you look at Sequoyah and Grand Gulf and say, what's the difference, Grand Gulf has got a lower CDF. The containment accounts -- this is scrubbed release, and the population accounts for a factor of five.

If you would go to Perry as another site, that is a much higher population site than Grand Gulf. So the multiplier, instead of five, would be one. So you would say that Perry would be, let's say, six times better than the equivalent at Sequoyah rather than thirty times better. But that is sort of like, how do you get to where you think that the total factor difference is a factor of thirty?

Okay, I want to go even faster on the cost side, if I may. I was an advocate of you could go down to Trac Auto, you buy yourself a diesel, you throw it on the back of the truck. You bounce it around all the time, so it is by use seismically qualified. You get some cables, you know, like jump-start cables, and you run in and you connect up a plant. In fact, it is far likely that they have some sort of power source on a site like this. So the costs were going to be very low, in my mind and in the mind of others, that we would be really talking about very, very small cost.

We asked ISL to do a legitimate cost/benefit analysis. They correctly told us any engineering is going to cost you 50 grand. Any sort of training, put some procedures in place, is another 50 grand, some up to 100 grand. The equipment is another 50 grand. So let's not quibble about, is it a little bigger diesel or a little bit smaller diesel, because the whole hardware is another 50 grand.

You can't just go touch your 1E electrical circuits with impunity, so you need some sort of scheme where you shed -- open up a breaker, open up an existing breaker that connects the igniters to what is now an unpowered switch gear and close some other sort of breaker for some sort of isolation. You've got to install some sort of panel.

They go through all the relevant costs, and they come up with numbers that are of the order of two, three, four hundred thousand. They have done a sensitivity study, but the decision doesn't really rest on the details.

MEMBER LEITCH: Jack, the last time we talked there was a question about whether the fans also had to be powered or not.

MR. ROSENTHAL: We believe that they don't --

MEMBER LEITCH: They do not?

MR. ROSENTHAL: -- and I will get into that in just a moment.

MEMBER LEITCH: Okay, okay. So diesel sizing, the price, and all is based on just powering the igniters, not the fans?

MR. ROSENTHAL: Yes, sir.

MEMBER LEITCH: Right.

MR. ROSENTHAL: Yes, sir.

MEMBER ROSEN: But the key point is, no matter what you do, the size of the diesel is irrelevant. You've got to do those other things if you are going to tap into a safety-related bus. It is going to be 150, 250, 300 thousand dollars by the time you are getting this really in place.

MR. ROSENTHAL: Yes. So I stand corrected. I mean, think in terms of like 300K --

MEMBER ROSEN: Yes.

MR. ROSENTHAL: -- not in terms of 30K.

We spoke about a portable diesel as a sort of base case. We realized that it is better to think in terms of pre-staged as the base case. These wouldn't require the air returns to be -- we also looked at passive autocatalytic converters, recombiners. There are small differences due to single-unit/dual-unit sites, common engineering, et cetera.

But I think that we did our homework, and then having done our homework, I realized it really doesn't matter to the decision process. I think the details don't because, when I look at these, which, as I say, are based on sound -- it is sound work that they did. You have to scope out some sort of scheme in order to do a cost/benefit analysis. We recognize this is nobody's final design.

It is likely that NRC requirements would be in terms of performance requirements. Nobody is going to say go buy a specific piece of equipment.

I see all these numbers for the ice condenser and the Mark III are about 300K except for the passive autocatalytic recombiners, which are quite more expensive. That is the sort of message I wanted to leave you with.

I am going to need more help. We are doing good on time, because I want to just speak to the hydrogen control issues for just a moment, and then go to, how do we make a decision? That will be the last half-hour.

MEMBER KRESS: That sounds good.

MR. ROSENTHAL: Dr. Kress advised me that that really is the crux of the matter.

For the hydrogen assessment, we did two things. One, as part of the 50.44 work, we had used our latest version of MELCOR, did sensitivity studies, and thought we were coming up with our best shot of hydrogen source terms, which are of the order of 50 to 60 percent of the zirc-water interaction. You actually don't get up to the 75 until you throw in an ex-vessel. By the time you add any ex-vessel, maybe you are up at a hundred, or actually a little bit lower.

But that was to do our best shot on MELCOR, and then we were able to do a number of calculations of what would go on inside containment using MELCOR. Then Tuesday there was a fair amount of discussion about MELCOR would seem fine for diffusion, but MELCOR doesn't really handle DDT, and there were other insights. We can get into that.

They did a formal uncertainty assessment with this. We have a range of hydrogen sources to containment. I do want to point out that you are talking about three hours or more into the event when you start failing the core and oxidizing the core on the MELCOR side.

So here was pressure. The red line goes up to seven atmospheres. The containment -- I'm sorry, this is absolutes. So then the containment is minus 15. So it would be two atmospheres.

What this says is that there is a very high belief that, if you don't have the igniters powered and you do have a hydrogen burn, you will fail containment. This is like the 95th, 99th percentile. You know, seven atmospheres design, and what have you, you're going to fail containment.

MEMBER WALLIS: What initiates the burn here?

MR. ROSENTHAL: Excuse me?

MEMBER WALLIS: What initiates the burn? It seems to me important when it burns.

MEMBER KRESS: Vessel breach.

MEMBER WALLIS: What?

MEMBER KRESS: Vessel breach blows out hot metal.

MEMBER WALLIS: Vessel breach initiates the burn, okay.

MEMBER KRESS: Is this static overpressure?

MR. ROSENTHAL: This is static, and this came up at the Subcommittee meeting. On a timescale of hours, it looks like a spike, but on a timescale of milliseconds this is a quasi-static burn.

MEMBER LEITCH: Would I then be correct to say that, if you had an alternate power supply, if it wasn't permanently hooked up but something you had to work a little bit to get powered --

MR. ROSENTHAL: Right.

MEMBER LEITCH: -- that if you didn't power it up within about three hours --

MR. ROSENTHAL: Two or three hours.

MEMBER LEITCH: -- it is not going to do you any good? In fact, you're going to --

MR. ROSENTHAL: In fact, back in 1150 there were even considerations about the operators making a mistake. Will they do it late? This is a certain probability, in which case you are in deep trouble.

MEMBER ROSEN: Yes, but, Graham, in free states diesel and all those other things he showed us, it seems to me capable of being powered up within three hours. Is that your view?

MEMBER LEITCH: I would think so. It depends on -- I mean, you've got a pretty bad event going on and operator distractions and everything else. But, I mean, I would think you could get it powered up certainly before that -- remember that was two-and-a-half hours or something before the hydrogen really starts taking off there.

MEMBER WALLIS: Why are these igniters so complex? Couldn't you just fire off one -- why work in --

MR. ROSENTHAL: There are GM glow plugs --

MEMBER WALLIS: Yes, couldn't you fire off a charge of some sort, a firework, launch a rocket into the containment?

MR. ROSENTHAL: One, you need to have enough dispersed sources so that you are burning off the concentration -- you are keeping the concentration in all the subcompartments small. So you wouldn't want one spark plug, glow plug, but rather you needed a dispersed set.

We also concluded that one train, one full train, was adequate in terms of powering this, but you need the full train and that you wouldn't want just a single spot.

MEMBER WALLIS: That's the whole basis of the .15 average containment failure estimate, is that those experts considered that some sources, hot places in the building, would set off fires before the big burn. That's the whole basis of it, isn't it? So anything that sets off a little fire earlier helps you.

MR. LEHNER: Could I just interject? Some of those premature burns actually led to containment failure of themselves. So it is not necessarily always helpful.

MR. ROSENTHAL: There's a phenomenon called deflagration to detonation, which I was hoping not to get into.

My other point was simply, and this is just a representative case, is that we thought that if you can control the hydrogen, which is the blue line, then you would keep the mole fraction reasonably small and avoid -- you would burn it off.

Then we looked at what the air return fans might be worth, and that is the green line.

MEMBER ROSEN: I'm puzzled by that curve a lot. I mean, why is kind of -- it is not bad, but why is it a little worse with fans than without? Am I seeing the colors wrong?

MEMBER WALLIS: Well, it is the upper containment hydrogen control. It depends on the hydrogen. The hydrogen varies throughout the containment. You are looking at a particular place here.

MEMBER ROSEN: Oh, okay. So in the upper containment it is worse with igniters and fans?

MR. ROSENTHAL: Overall, what you have to do is look at what you think would be the mass flow rate due to just natural phenomena and circulation in the containment. Then you add on -- if you add the air return fans on, what is the change in the mass flow rate and the velocity through the whole system? It is a reasonably small change with the air return fans.

Let me point out, though, the air return fans were originally there for design basis events. They are long before the --

MEMBER KRESS: They were there to enhance the ice condenser's capability to commence steam.

MR. ROSENTHAL: The bottom line, we did discuss at the Subcommittee the likelihood of detonation or deflagration to detonation as distinct from hydrogen burn. But my bottom line is that you need to control the hydrogen control to keep the containment. That is really the bottom line.

I am going to slow down now. Dr. Kress suggested that we allow lots of time to talk about the decision as distinct from the details of the phenomenology, which are described in the reports that we gave here.

Our recommendation is that to cope with station blackout events, we should pursue further regulatory action for the ice condensers and the Mark IIIs. In the current process, if we concluded that there was no further action that was needed, we would write a letter to the EDO and close out the Generic Issue. If we conclude that further action should be taken, at that point NRR would undertake their work, us having completed our technical work.

Further regulatory action might take the form of rulemaking, plant-specific backfit. It could take many forms. We, RES, would not prescribe the form of that action to NRR.

But in talking, we believe that any action would be more of a performance-based and it would not be very prescriptive in terms of the details of the hardware.

MEMBER LEITCH: So what kind of success would you assume this back-up power supply would have?

MR. ROSENTHAL: Well, we were thinking that you could achieve .95, .98 success. So that earlier, maybe a couple of months ago, we were worried about what the reliability was. It really is irrelevant if it is 1 or .98 or .95 when I am sitting here saying I don't know if random ignition is .15 or .97 and that in my own mind that those are both equally likely and plausible numbers. So that the uncertainty in my mind is tied up in your understanding of the Level 2 containment phenomenology.

MEMBER LEITCH: But this back-up supply would not be --

MR. ROSENTHAL: One train, non-safety grade.

MEMBER LEITCH: Yes, non-safety, no prescribed surveillance test.

MR. ROSENTHAL: You would have to do some sort of surveillance and testing, and whatnot, to be determined, to know that it is there and hasn't been lost over the years.

MEMBER LEITCH: Right, right.

MR. ROSENTHAL: But it would be surveillance and testing consistent with what we have said to the industry about SAMDA.

MEMBER LEITCH: About what?

MEMBER ROSEN: Severe accident mitigation.

MR. ROSENTHAL: Severe accident mitigation.

MEMBER LEITCH: Okay, yes, right.

MR. ROSENTHAL: I mean, it would be in that world. In fact, you don't want another dual-valve diesel. You want something small and diverse and different because you got in trouble in common cores.

VICE-CHAIRMAN BONACA: The question I had was now the seals have been improved, as you mentioned --

MR. ROSENTHAL: Right.

VICE-CHAIRMAN BONACA: I am trying to understand the combination of the improvement in seals at a time we spoke about here of how soon do you have to hook up. Do they contribute, the two things together, to the 96 percent success that you are mentioning there?

MR. ROSENTHAL: The hardware guys said that they can go out and buy commercial grade, high-quality commercial grade, not safety grade, and achieve reliabilities of, let's say, .98. In discussion we realized that it doesn't matter if it is .98, .99, .95 compared to what is driving the decisions.

VICE-CHAIRMAN BONACA: I understand.

MR. ROSENTHAL: I have this slide and I have another one for ice condensers. I am going to rock back and forth, and this is the end of the presentation.

The hashed values -- maybe we should have used color -- the hashed values are cases where we think that the benefit exceeds the cost. Where the cost is two, three, four hundred thousand dollars, if

I go out to the 95th percentile because I'm risk-averse, I can make an argument to do it. Dr. Kress said that maybe you should look at the 5 percent. I will tell you, there was some discussion of taking the 5 -- before we saw you, of not even showing the 5 percent because it confused the situation and, as regulators, we should be risk-averse and think on the 95 percent.

Dr. Kress at the Subcommittee meeting pointed out that, wait a minute, this is an enhancement. As an enhancement, maybe you want to err the other way.

I personally think that you want to worry more about the 95th. Let me point out that I think that the mean in the 95th are likely closer. So it is not a bad basis for the decision.

This is internal events. You should get some additional credit for external events.

MEMBER WALLIS: Did you face the 1.174 issue that Dr. Kress raised, that given that you had put it in at Duke, then they could apply to have it taken out using 1.174 because there's no probabilities involved? They would use a mean. They wouldn't use some extreme value.

MR. ROSENTHAL: We don't think 1.174 is

the realm of backfit. Alan Rubin, Alan is a colleague --

MR. RUBIN: Alan Rubin, a member of the PRA Branch of Research.

As a result of the Subcommittee meeting, and even before that, we looked at what the requirements are of the backfit regulation. In order to have a backfit in the 50.109, it says you need to demonstrate substantial improvement and safety and then consider cost/benefits to see that the benefits are consistent with what the estimated costs are.

If you make that determination and require backfit, then that would preclude somebody coming back and saying in the Reg. Guide 1.174's space that you would be permitted to take out this modification that the agency said was required to put in, to be a benefit that the agency considered to be substantial.

So there is that check-and-balance issue. You don't go in this bureaucratic circle of requiring something be put in and then permitting it to be taken out because it was a marginal increase in risk.

MEMBER KRESS: You know, that is sort of regulatory stuff. My point was that, if you take the mean numbers for CDF -- well, for LERF anyway -- for the Catawba plant as the bottom line with these improvements, take the mean LERF that it has now, and you look at the delta LERF, assuming this device is already in there, and you look at the LERF that results from having the device, and then you take it out and look at the delta LERF you get due to taking it out, and then you look on the 1.174 guidelines, you would conclude that they could take this thing out on a risk-informed basis.

Now all this regulatory controls and stuff doesn't matter to me because there is no reason somebody can't come back later with the 1.174 and say, "We want to take this out. We don't need it, and we can justify it on the basis of 1.174." The regulatory space ought to allow them to do that.

If they could take it out, it is kind of crazy to make them put it in the first place. That was my point.

MR. RUBIN: Well, I certainly agree with that. If they could take it out, it would be not prudent to require them to put it in.

MEMBER KRESS: I didn't actually run the numbers. I just looked at them in my mind and then did them.

MR. ROSENTHAL: I think you're right. The difference in your mind between the 150 and 540 has got to be in your understanding that the 150 is based on 5 percent iodine released in the environment, that the 540 is based on 29 percent release to iodine.

MEMBER WALLIS: But, Jack, why do you start with that? Because I know that Duke is installing a flood wall. I know, then, that in a couple of years it is going to be 31, not 150.

MR. ROSENTHAL: It will be 31 or is the 31 really 110? I am not going to move the plant from one location to another. Is the 31 really 110 due to just your understanding of iodine, and is the 31 versus a number that is 300 or 500 tied up in your understanding of what is going on in terms of hydrogen phenomenology inside containment?

So it becomes a matter of how well do I think I know the containment phenomenology, how well do I think I know the source term. If you have cost/benefit ratios that are less than .1 or greater than 10, it is easy. Unfortunately, we are stuck with values that are -- well, the 31 is an order of magnitude lower, right? But as soon as they start asking other questions, I end up 100 and 300; we're in a judgment area.

We would like your advice. As I say, one of the issues that is driving it is, can you do preventive fixes, which we say are preferred, and drive down the frequency? Do you have to have a balance in mitigation, and what is that balance? Is defense-in-depth having multiple diesels and procedures and things like that or does defense-in-depth say that you need some sort of diversity called the containment? I think that those are the issues now that really are driving the decision process.

We can go back -- I personally think we have done enough number crunching over 20 years, that it is time to make a decision.

MEMBER ROSEN: Well, I agree with that 100 percent.

MEMBER LEITCH: Jack, shortly after our last Subcommittee meeting, we had an opportunity to tour an ice condenser plant. We went into the simulator. I asked the guys how they would go about, in a station blackout situation, how they would go about powering up these igniters.

They had some interesting rabbits that they could pull out of the hat. I mean, even after you've lost all site power and the safety grade diesels, they had other sources of power that they could --

MR. ROSENTHAL: Sure.

MEMBER LEITCH: I am just wondering, if we looked at these plants -- and there are not 100 of them, fortunately; there's nine units or so -- if it is not amenable to a plant-by-plant solution; some of these plants may have station blackout diesels that could be somehow utilized.

MR. ROSENTHAL: Yes.

MEMBER LEITCH: In other words, I guess what I am saying is, isn't this amenable to a solution that says: Think about this, guys, and see if you can't figure out some way or some emergency procedure to power up these things?

MR. ROSENTHAL: Yes, right. Absolutely, and maybe when I was saying that we would have finished our technical analysis, and it would now go to NRR; NRR could choose plant-specific or generic backfit. From discussion with my colleagues in NRR, I know that we would try to come out with some sort of performance-based criteria rather than saying: Go add another active power source.

I would imagine the plants could then -- as you said, what are all the alternate rabbits that would fulfill the performance-based criteria? So there is still room, yes.

MEMBER LEITCH: Okay.

MR. ROSENTHAL: Based on just a cost -- here are the Mark III numbers. Just because of our understanding of pool scrubbing, pool bypass, the wetwell versus drywell failure, et cetera, the fact that they have hit this, it is even harder to make a cost/benefit argument.

MEMBER ROSEN: But don't go away from that slide for a minute. You've got a couple of values shaded down in the lower righthand corner.

MR. ROSENTHAL: Yes, sir.

MEMBER ROSEN: That is really the basis for your including these plants in your recommendation?

MR. ROSENTHAL: That's part of my basis.

MEMBER KRESS: You might give that little speech that you gave that I liked.

MR. ROSENTHAL: Yes, sir, okay. So now, in fact, can I have the two back-up slides of the Mark III and the ice condenser?

Let's say that you strip away your knowledge of what you think you know about containment phenomenology, that it is just uncertain. Then you say that you have weaker containments, metal containments, atmospheric design pressure.

Here's an ice condenser, right. Let's

take and morph the ice condenser into a Mark III. They are both steel-lined. They both have about the same design pressure. They both have about the same free volume.

In one case I have a circle of ice, not a circle, a ring or annulus of ice surrounding it. In the other case I've got an annulus of water surrounding it. So you say, if I really don't understand the phenomenology, these aren't that different. They are small and they are weak containments; that station blackout is very important to total core damage frequency, and that you shouldn't be in a situation where you on some plants, like Grand Gulf, in NUREG-1150, that was 95 percent of the core damage frequency, was station blackout, that you shouldn't be right in there with a weak containment that you think is going to fail, relying solely on a low probability of occurrence.

So that is an extremist -- that is a perception where you have to strip yourself of what you think you know about the phenomenology. So that is a weak containment.

Yes, sir?

MR. NOTAFRANCESCO: Just one other point along those lines. I am Allen Notafrancesco.

BWRs have a lot more zirconium, about four times the inventory of hydrogen, which weighs into this.

MR. ROSENTHAL: So I was doing a "Fiddler on the Roof" type of exercise, where I said, hey, follow the backfit process, which would say put more weight on the means than on the uncertainties. It tells you to pay attention to the uncertainties, but it doesn't tell you what to do other than pay attention.

On the other hand, I say, wait a minute, these are weak containments with high containment conditional core damage frequencies. On one side, I say prevention is preferred to mitigation because it saves the plant. In fact, we have said that in regulatory space. On the other side --

MEMBER WALLIS: That doesn't exactly save the pond. You are going to fail the containment anyway. It is just a question of time. Isn't that true?

MR. ROSENTHAL: I'm sorry, if I put my eggs in prevention, I save the plant.

MEMBER WALLIS: Oh, I see. You mean don't let it happen at all?

MR. ROSENTHAL: Yes. Well, I reduce the

-- I don't change the station blackout -- I'm sorry, I don't change the offsite power frequency.

MEMBER WALLIS: Your igniters don't save the plant?

MR. ROSENTHAL: Correct.

MEMBER WALLIS: They just change the scenario?

MR. ROSENTHAL: Yes, sir.

MEMBER KRESS: But, Jack, it seems to me like this discussion you just had was basically the reason they passed the station blackout rule in the first place and came up with the fixes to the thing because of this. That is where you already have your defense-in-depth built in, I think. It is just because of the reason that you said, I think, mostly.

So we already have a station blackout rule that deals with this. Now we are talking about a different arena. That is a little bit of enhancement.

MR. ROSENTHAL: The goal of the station blackout rule was a core damage frequency of about 3 minus 5. Presumably, plants meet that or do better.

Is defense-in-depth in the mitigation or defense-in-depth in the multiple means of prevention? That is a decision process that we are going through right now.

MEMBER KRESS: Yes. Once again, we fall back on, just what is defense-in-depth and where do you put it, and how much is the right amount? It is always an issue we wrestle with. I am not sure we know yet the answers to that.

MEMBER WALLIS: I think we also have to ask about risk-informed regulation and what does this tell you. It tells you that you shouldn't impose small enhancements that don't really contribute to the risk status of the plant. Isn't that the interpretation that is usually given to it?

VICE-CHAIRMAN BONACA: Well, I think Reg. Guide 1.174, I mean, has also an integral decisionmaking process that has considerations --

MR. ROSENTHAL: Back when Sniezik and company were promulgating 50.109 with the backfit rule, there were two things, substantial improvements, and that it be cost/benefit --

MEMBER WALLIS: So where's the substantial --

MEMBER KRESS: The substantial improvement, though, was predicated on CDF. They didn't know about LERF then. So this is not a CDF issue, it seems to me. You really can't make a substantial improvement argument based on CDF here.

MR. ROSENTHAL: Right, but, clearly, they didn't want nickel-and-dime fixes. I mean, even if it was cheap, if it didn't change things, they didn't want to impose a lot of little things.

MEMBER KRESS: Yes, but I maintain that this substantial improvement guidelines, which has your CDF chart in it and decision boxes, should have had a LERF box, too, just like 1.174. Then if it had one that was appropriate and consistent with the safety of those, that you would have gone into it and probably come out with a decision that this was not a substantial improvement. Then you would have stopped right there. You would have missed that screening. You wouldn't have had to go to this cost/benefit.

I think that would have been the case. I am speculating because I don't know what the numbers actually turn out to be. We don't have such a box in the regulatory decision process. I say there ought to be a box like that.

MR. ROSENTHAL: We have not communicated -- we are agonizing over a decision, and I have yet to communicate that decision to either the EDO or NRR, and say I think the number crunching has stopped. So we look forward to your views, and we would like a letter.

MEMBER KRESS: Since you have asked for our views, particularly on how to go about making the decision and what we think, I am willing to throw the floor open to the Committee. I don't want to put anybody on the spot right now because we haven't discussed it and go around and say, "What's your view? What's your view?" But if anybody wants to volunteer a view at this point, before we have our own internal discussions, why, I would sure welcome that at this point.

MEMBER ROSEN: Yes, I have a view. I think, for one thing, and I have said it already, you have certainly done all the analysis a man could ever want.

MEMBER KRESS: Yes, that's clear. That's clear.

MEMBER ROSEN: We've got paralysis by analysis at this stage. So we want to get off the dime one way or the other.

MEMBER KRESS: With one exception to that. I would have thought they might have gone back to each of these licensees and said, "What's your current PRA tell you about your conditional CDF on station blackout and your conditional early containment failures?" I would have thought that would have been another input they might have looked for.

MEMBER ROSEN: The issue of prevention versus mitigation, if you have a small class of licensees who have this issue and you say, "Well, we will let you get away with prevention. You don't have to do this mitigation," but don't you have to have a regulatory process where they commit some sort of additional prevention feature that says, "Okay, I won't do the standby diesel, or whatever you have recommended here. I'm going to make some sort of change in my CDF, in my plant, hardware, procedures, or something, which will lower my CDF some more."?

But you have to have that in some sort of regulatory basis. So that gets complicated.

The third point: In this kind of thing, I think if the U.S. NRC staff and ACRS, and perhaps even Commissioners, are agonizing about whether to do something or not, that seems to me an immediate flag that says it's marginal; the decision is right on the cusp; we should always come down on doing it.

MEMBER KRESS: And I would have said, since it is an enhancement, you should come down on not doing it if it is marginal.

MEMBER ROSEN: I might have said that in a past life, but in this life I say, when it is not all that clear and there are good arguments on both sides, I would say you pass it on to NRR and say: Try to find a way, a reasonable accommodation, to get this additional feature in the plants that need it.

MEMBER KRESS: Does anybody else want to volunteer?

MEMBER WALLIS: Jack, in your recommendations you say you are not recommending back-up power for the return fans. If I understand the argument that you made the other day, it was primarily because of the deleterious effect that it would have on the melting of the ice. Is that correct? As I understand it, are you --

MR. ROSENTHAL: We made the observation that if you ran the fans, you melted the ice a little bit sooner, and that that was a downside. But if a licensee came in and said, "Hey, I intend to power the igniters and the fans because it gives me greater certainty that I know what's going on inside the containment," we would surely accept that. I haven't quantified the other.

The reason for not recommending the air return fans is that, based on what I now know in the year 2000 as distinct from prior analysis, when I used my MELCOR, when I consider the tests that were done at

-- there were tests done at a Nevada testsite. There was a Mark III test of flames over the pool. We have calculations of what the mass flow rates are with and without the fans going. We truly believe that you don't need the air return fans. So that would be the reason.

MEMBER WALLIS: But this is not a prescriptive recommendation?

MR. ROSENTHAL: No. As I say, in talking to my NRR colleagues, on the one hand, you had to come up with some sort of conceptual design that you can touch. You know, you had to go to a catalog and look up, what does it cost to get a diesel, a break, or so much cable, what is the cost of engineering, in order to come up with this idea of two, three, four hundred thousand dollars in cost.

Having done that, we would proceed forward in some sort of performance-based requirement rather than a prescriptive requirement. Then under that performance-based requirement -- maybe half this equipment already exists on the site. Maybe there's electric crossties. I think there are things that might well be there. You would still incur procedural costs. I mean nothing is free.

But, philosophically, if nothing else, we think that if you went forward, it would be on a performance-based rather than prescriptive, having convinced ourselves that, yes, there are reasonable things that you could do. So that is why I don't want to pay too much attention to the specifics of the cost.

Charlie, did you want to say something? I'm sorry, Charlie Ader is my Deputy Division Director.

MR. ADER: Jack, a couple of comments around the table I had heard, and I wanted to just kind of summarize where we are.

As Jack said at the beginning, this issue has been dealt with several times over the years. It was looked at in the CPI program. The decision at that time was we couldn't make a generic conclusion, so we put it into the IPE program because there is a lot of plant-specific attributes to a decisionmaking process here.

The licensees looked at it in IPE space. I think all concluded that it wasn't cost beneficial. One of the new pieces of information was the DCH study which showed a much higher likelihood of containment failure. There was more to that than just random ignition. They also looked at loads, load distribution, containment fragility distributions, where do the two cross, but a big assumption was random ignition. So that was a new piece of information.

In fairness, the memo we sent down with the package at this point in time has the research staff at the Division level recommending that we feel there is enough to go forward on the ice condensers with igniters. The memo actually said we were probably going to defer on the Mark IIIs.

There has been subsequent discussion since that memo came down and some of the issues Jack has raised about defense-in-depth, the weaker containment. It is being reconsidered with the opportunity to meet with the Committee. We want Dr. Kress to continue getting your all's views because we felt that was going to really help us inform that decision, whether we decide that we should make a recommendation across the board to NRR that they go further in powering igniters, we say just ice condensers and not Mark IIIs, but these other attributes we do really value the Committee's comments, thoughts.

There was some good discussion at the Subcommittee. There were some things to think about there. But that is kind of where we are as of today.

MEMBER KRESS: Well, I would offer one comment, that notwithstanding whether you decide to do anything or nothing, if you decide something needs to be done, I would agree that you do it for both Mark IIIs and ice condensers.

MR. ROSENTHAL: I'm sorry?

MEMBER KRESS: If the decision is that you do something, my opinion is that you do it for both Mark IIIs and ice condensers, pretty much based on your off-the-cuff reasoning, without knowing the phenomenology.

I think if you require something of ice condensers, I think there's enough uncertainty in all this that you probably ought --

MR. ROSENTHAL: I'm arguing prudency, and at that point they don't look that different, but --

MEMBER KRESS: Yes, just based on that kind of reasoning, I would say go forward with both of them.

MR. ROSENTHAL: There is also the issue of different shape of different views on what I will call regulatory coherence. Containments for the same design pressure, both with some pressure suppression, et cetera, why require one for the other?

MEMBER KRESS: I think there is a lot to

be said about this comment that there is a lot more zirc in BWR Mark IIIs, too. So you still have more hydrogen to deal with.

MR. ADER: Jack, if I could, one other point: Ultimately, the staff of NRR or the agency will have to make the finding to backfit test. So we have to do the substantial increase --

MEMBER KRESS: This is just an input to the NRR people.

MR. ADER: -- and the cost/beneficial part of it. So that is going to weigh in the decisionmaking process.

VICE-CHAIRMAN BONACA: I think, to think like Steve, I feel there is uncertainty enough that, if there was a flexible recommendation that says, as a minimum you must obtain, there are some means of powering, and Mr. Leitch here pointed out to go into a site and find that they probably have already means of doing it. If there was that kind of flexibility, I would say that I would lean in the same direction that Mr. Rosen was pointing to.

But, again, it is a hard call just because, again --

MEMBER SHACK: I'll come back to I just don't see the substantial increase in safety. It seems to me the argument here is really whether you are willing to accept the benefits you get from the prevention part versus the mitigation part.

At this point I would accept the prevention. I prefer prevention. It is hard to see a substantial increase in safety when all you are really trying to do is to maintain your balance between mitigation and prevention. So I don't see that it passes the substantial increase in safety test.

MEMBER KRESS: I think that was my view also.

MEMBER SHACK: And the other one, I am willing to believe that, if it ever came to it and these guys really had to scramble, they would be scrambling whether you had a regulatory rule or not, to find an alternate power source. In that situation all bets are off and everybody is doing everything you can. Whether you have a regulation that says go look for every alternate power source I've got onsite or not, he's going to be looking for it.

MEMBER SIEBER: Well, you know, you can go along and look at the licensee's viewpoint, and he is probably sitting back and saying, "Why is somebody in Rockville trying to re-engineer my plant?" He is faced with a decision, for example, if it is a PWR, you know, I could spend a quarter of a million dollars putting in a diesel on a truck or in a sheet metal building or I can spend a quarter of a million dollars and fix my pump seals.

Which would you rather do? If you buy the diesel and have the event, you've got a messed-up containment. If you fix the pump seals, you've got three more hours until you mess up your containment.

If you take that to its extreme, every kind of mitigating or preventive measure you take lessens the importance of containment, and you could get to the point where you ask yourself the question: Why do I have a containment at all because it is not doing anything for me? Then you leave the engineering realm and get into the political realm.

But going back to what Bill said, you have to ask yourself the question, what is driving you to make any change at all? Are the plants unsafe? If they are unsafe, then that should drive you.

But it seems to me, seeing the effort of these plants, it is pretty good. So what's the forcing function here?

So that would be sort of my viewpoint on that. When you think through all the branches, you end up at a bunch of different extremes, which upsets the balance between preventing initiating events, mitigation, prevention of the actual scenario versus defense-in-depth.

It is almost like the difference between being a Republican and a Democrat: What's your philosophy? Where do you want to put all your eggs?

MEMBER KRESS: Well, it has been a good discussion so far.

MEMBER POWERS: Dr. Kress, I assume that at your Subcommittee you explored the adequacy of MELCOR for doing these kinds of calculations?

MEMBER KRESS: We talked about the business of a lump parameter model to deal with hydrogen distributions and recognized that there was some difficulties with that, but we thought it was relatively good for the source of hydrogen. When they did the modeling of containment, they didn't put any artificial nodes in. Each node was a compartment with boundaries and walls. Of course, you have the well-mixed assumption in each one of those.

But we thought this was a pretty good scoping type of analysis that would be -- we recognized that it wouldn't give you something that a good CFD might do, but we talked about it and we didn't come to any conclusion, except that we thought that the conclusions that you would get, you didn't have conditions that would be conducive to transition to detonation or deflagration. We thought that was robust enough because they had also gone back and looked at other reviews of this issue, and they had experts looking at these things and trying to make a judgment.

Basically, the question is: Are you going to have detonation or are you going to have some sort of a control burn? We thought, in general, I think the Subcommittee thought that was a robust enough look that you could make that conclusion.

MEMBER POWERS: The challenge you have in looking at these things is, especially in the ice bed, if you get a concentration front that gets into the detonatable regime, you can never detect it in a lump node code unless you very finely nodalize --

MEMBER KRESS: Well, actually, the lump node code did show that in the ice condenser compartment itself conditions were high enough to be detonable. I mean, that was one of the outcomes of the calculation.

MEMBER WALLIS: It also varied the nodes, I understand, in the ice chest, the sensitivity studies to the nodalization in the ice chest.

MEMBER KRESS: But they thought that the primary mode would be it would ignite at the exit of the ice condenser compartment and there would be a downward propagation of the burn, and that the conditions weren't right for a transition to a detonation. That was based on expert opinion. You know, there's no way MELCOR can tell you that.

MEMBER POWERS: That's a remarkable conclusion, considering the amount of structure that you're passing through.

MR. NOTAFRANCESCO: The expert opinion back in the early eighties was that the high probability that diffusion flame at the top of the ice chest would be highly likely. So it is a combination of that is the dominant mode, and we did look at, let's say, the fundamentals of DDT and some of the criteria and the lambda or the cell size, and in a cold environment you would need a wide channel and things quite open in the ice chest. There is no confinement. There is a lot of lateral potential flow.

But based on overall judgment and the overall evidence of expert judgment, experiments, and calculations, it didn't seem to be a likely event to have a DDT in an ice chest.

MEMBER KRESS: I'm not sure whether that is relevant to the question of having back-up power to igniters. You have that question whether you have that or not.

Anyway, I think we are out of time. Thank you. We will let you know what we think later on when we hash it out. You know, we are likely to have knock-down, drag-out differences, too.

VICE-CHAIRMAN BONACA: Okay, so with that, do you have any other questions?

(No response.)

Okay, let's take the break for 15 minutes. We will resume the meeting at 10:25.

(Whereupon, the foregoing matter went off the record at 10:14 a.m. and went back on the record at 10:30 a.m.)

VICE-CHAIRMAN BONACA: Okay, let's resume the meeting.

The next item on the agenda is the early site permit process. We do have a presentation from the staff, and also NEI has prepared some slides. Dr. Kress, we've got you.

MEMBER KRESS: Yes, it is me again.

This is, I think, an initial jump in the

ACRS emphasis right now because there are three organizations that are looking for early site permits already. You might ask, what is our interest in that? Well, ACRS has traditionally for a long time been interested in siting issues, in siting questions.

Not only that, but I think siting is an important part of the equation of safety. Part 52.23, which is the certification, part of the certification rule, actually requires that the Commission refer a copy of any application to the ACRS, who must then report on those portions of the application which concern safety. So we are going to be in the loop.

It is time we got started because the applications are coming in, and we need to understand what the standards for siting and how they are going to go about dealing with early site permitting.

So, with that, I will turn the floor over to Jim Lyons to see if he has any introduction.

MR. LYONS: Thank you, Tom. This is Jim Lyons. I am the Director of the New Reactor Licensing Project Office.

I talked to most of you yesterday when I put up our schedule. We will talk a little bit about schedule here, too. I know that there were some questions that you all were looking forward to asking.

We have two presenters today: Ronaldo Jenkins and Michael Scott. Ronaldo is our program lead for the early site permits. He is also one of the project managers for the early site permits sites that are coming up, which are Clinton, Grand Gulf, and North Anna. Ronaldo is the Grand Gulf project manager for the early site permit. Mike Scott has been working with us to help us develop a review standard for the early site permit.

So, with that, let me turn it over to Ronaldo and let him go through and give you an overview what the early site permit is all about.

MR. JENKINS: Good morning. My name is Ronaldo Jenkins. I work in the New Reactor Licensing Project Office of NRR.

Just to outline our purpose here, we would like to summarize the early site permit process and some of the recent developments that have occurred, as a background for this discussion.

I would like to also talk about the review standard, which parallels the expanded power uprate review standard process. We would also like to talk about the various developments in terms of how we developed this document.

The next slide will just be a timeline.

I will talk about the background on the process, and my colleague, Mike Scott, will talk about the review standard itself. At the end we will entertain questions.

The early site permit by itself really does not have that much meaning. It is part of an overall scope under Part 52. As this slide depicts, the big picture is that you have the early site permit along with the standard design certification that would be referenced in the combined license, and there would be a review process separate from the early site permit and the standard design certification, along with a hearing.

An applicant could go directly to the COL stage, providing the same information that is contained within the early site permit and the standard design certification. Following that, the staff would implement verification of ITAAC, the Inspections, Tests, Analysis, and Acceptance Criteria, just prior to reactor operation.

The next slide basically -- yes?

MEMBER LEITCH: The three site permits under consideration now are at existing sites? They are operating reactors?

MR. JENKINS: That's correct.

MEMBER LEITCH: Is the process different if it were to be at a new site?

MR. JENKINS: The process would not be different. However, there are considerations that have to be taken into consideration, given the fact that you have an existing site there. Radiological consequences would have to be looked at. So you are essentially permitting another reactor to be built on that existing site.

MEMBER LEITCH: It is difficult for me to understand. When you have a site where the reactors are already operating and you have an early site permit application with no specificity as to reactor type or number of reactors, or anything else, what are you really approving in the early site permit? I don't really understand the essence of what the approval really is here.

MR. JENKINS: Well, the next slide talks about why an applicant would want in an ESP. That is, the Part 50 process, essentially, you had a construction permit and you had an operating license. The early site permit allows you to disposition siting issues prior to actually starting construction for that new plant, so that you can resolve those issues associated with a new plant without necessarily expending any resources involved with the construction.

MEMBER LEITCH: When you don't know what kind of reactor you are going to build, you don't know how many you are going to build, it seems to me that it is very vague, but I will listen. Go ahead with your presentation, and I will defer my questions.

MR. JENKINS: All right.

MEMBER KRESS: Suppose somebody came in and said, "I am going to build a 3,000-megawatt electrical plant there." Would that have been allowed? Is that something that the early site permitting would have excluded?

MR. JENKINS: Well, the main focus of the early site permit is to look to see whether or not the new facility will meet Part 100.

MEMBER KRESS: I see. Part 100 is the issue?

MR. JENKINS: Yes, and so that leads us to facility basically --

MEMBER KRESS: So the major criteria for this is Part 100?

MR. JENKINS: Yes. There are other parts of it. As we go through the presentation, we will talk about that, but there are basically three major parts, one having to do with emergency preparedness; the other one, environmental review to satisfy NEPA requirements, and the last one is the site safety review, which involves both a seismic and non-seismic review criteria that is found in Part 100. There is also a piece of it that was moved from Part 100 that is now in 50.34(a)(1).

MEMBER LEITCH: I just don't see, without knowing the reactor type, how can you say anything about Part 100. I mean, obviously, we are not going to allow anything to be built there that doesn't meet Part 100, right?

MR. JENKINS: Right, and that is really the beginning criteria that you look at in terms of making a decision: Can the site accommodate another reactor or reactors at that facility?

The reactor type issue is something that the staff has looked at, and the industry has proposed an alternative approach plant parameter envelope to provide surrogate facility information. So that is where we are currently looking at in terms of an alternative approach.

But the review process, and maybe this will become clearer as we go along, the lower branch is the environmental review. That is comparable to what we do in license renewal. The upper branch is the site safety, and that would involve the Committee in the review of the safety evaluation report. That would include both the site safety and the emergency preparedness review effort.

This is basically a summary statement of the intent. Once again, the ESP is intended to provide Commission approval prior to, and separate from, a combined license or a construction permit.

Now into the contents that is what the applicant must submit; it should have a description, a safety assessment, including evaluation of the major structure, systems, and components of the facility that would imply a radiological consequence, both normal and accident conditions.

MEMBER KRESS: Doesn't that imply they need to have some sort of plant in mind, a type and a power?

MR. JENKINS: It would imply that there should be sufficient information so that the staff could make a determination regarding the acceptability of that. That is where we get into the bounding plant parameter concept.

MEMBER KRESS: That is where this NEI proposal --

MR. JENKINS: Yes, and they are going to talk about that later.

MEMBER KRESS: Okay.

MR. BELL: Excuse me. Dr. Kress, if I may, I am Russell Bell with NEI. After the NRC staff completes their presentation, I look forward to the opportunity to try to explain exactly how we are going to meet the challenge you both have pointed out, getting through this process in the absence --

MEMBER KRESS: That's what you guys are doing. Okay, that would be helpful.

MR. BELL: Thank you.

MR. JENKINS: So this is really to spell out what is in the regulations now, and industry is proposing an alternative method of meeting these requirements.

So the site characteristics must comply with Part 100.

The next couple of slides talk about "should." That is, the applicant should provide the following information, and that is where your question regarding reactor type comes in.

MEMBER KRESS: Is it really important that it is "should" instead of "shall"?

MR. JENKINS: Well, for the lawyers, it is very important.

(Laughter.)

For those of us who are engineers, if you look at the Part 100 criteria, it is relatively neutral in terms of reactor technology that you need, because your focus is on the site and what characteristics of the site that could impact the reactor operation.

So there you have a number of different types of parameters, type of cooling system, seismic, hazards, industrial and military and transportation facilities, in order to determine potential hazards, and also a feature population profile.

MEMBER KRESS: Is there any safety goal considerations in this process anywhere?

MR. JENKINS: What's that now?

MEMBER KRESS: Are there any safety goal considerations in this process?

MR. JENKINS: Not specifically, no.

MEMBER WALLIS: So this industrial, military, transportation facilities, that doesn't include something like a baseball stadium? That would include the population profile?

MR. JENKINS: That would be considered under the population profile. For example, Part 100 has a goal of not locating the facility near a high population --

MEMBER WALLIS: Even though they are very transient populations?

MR. JENKINS: Right. For example, at Zion station, where you would have the theme park right next door --

MEMBER WALLIS: Or, for example, Seabrook, near a beach?

MR. JENKINS: That's right.

MEMBER WALLIS: A transient population, yes. Okay.

MR. JENKINS: Right. The staff would have to make some kind of determination in situations like that.

As the next slide talks about, this is the environmental reporting requirements that have to be addressed, the main point being that at this point in the process the EIS does not have to assess the benefits, that is, the need for power, but it must consider alternatives, alternative sites.

The major features of the emergency plan are a complete emergency plan can be proposed by the applicant and --

MEMBER KRESS: Now my understanding was

that some of the applicants or some -- I don't know, maybe it is NEI -- would like not to have this feature of having to look at alternative sites, and they had reasons, justification for that?

MR. JENKINS: Well, currently, it is on our list of issues to be discussed.

MEMBER KRESS: It is an issue?

MR. JENKINS: We do not know exactly what their proposal is going to be, but we are scheduled at our next meeting in December to talk about alternative site under this provision.

MR. LYONS: Excuse me for a second. This is Jim Lyons again.

On the issue of alternate sites, NEI has proposed a petition to the rulemaking to remove the review of alternate sites. That petition is in the process of being forwarded up to the Commission with our recommendation.

MEMBER ROSEN: So the words, "obviously superior alternate" exist in the existing rule?

MR. LYONS: Yes.

MEMBER ROSEN: Okay.

MEMBER LEITCH: Does that mean alternate types of power generation or alternate sites for nuclear plants?

MR. JENKINS: I believe it's sites in terms of power plants.

MEMBER LEITCH: Any kind of a power plant?

MR. JENKINS: Right.

MEMBER LEITCH: In other words, we are going to build a 1,000 megawatts here; we could --

MR. JENKINS: Right

MEMBER LEITCH: -- evaluate doing it with nuclear? We have to evaluate building a 1,000 megawatts elsewhere with fossil or --

MR. JENKINS: Right.

VICE-CHAIRMAN BONACA: Once the ESP is granted, would the ESP contain conditions that authorize some of the issues described here, such as site density of population and other things?

MR. JENKINS: Well, there's language in the rule that basically states conditions and limitations as the Commission sets forth. We are in the process of developing the permit language itself, that is, what the form and content of that would be.

VICE-CHAIRMAN BONACA: For example, on the seismic issue, I mean, will it establish the requirements of the seismic criteria to be designed, too, given the characteristics of the site?

MR. JENKINS: Well, the site

characterization studies that would be done by the applicant would identify those sites and characteristics, and that would be part of the permit basis. So, in terms of specifying exactly what kinds of parameters, that would be part of the review.

VICE-CHAIRMAN BONACA: Okay.

MR. JENKINS: So the last bullet talks about, in the event that there are certain site preparation activities, roads, things like that that they would put in, there has to be a redress plan.

MEMBER KRESS: So that means if they decide not to go ahead, they --

MR. JENKINS: That's right.

MEMBER KRESS: -- have to go back and fix it?

MR. JENKINS: That's right. They have to return it.

On the alternate sites, because of the rulemaking, petition for rulemaking, we really have not been talking about that. As Jim mentioned, we do have that before the Commission now.

The next slide talks about, well, what has occurred recently. Staff has been notified that Exelon and Entergy plan to submit an ESP application in June 2003 for the Clinton and Grand Gulf sites, and

Dominion plans to submit an ESP application for the North Anna sites.

As we have talked about earlier, we have been engaged with NEI on the generic licensing issues. This leads into my colleague, Mike Scott's, talk on the review standard itself.

MR. SCOTT: Good morning. Can everybody hear me okay? Great.

As Ronaldo said, I am going to discuss with you the early site permit review standard that the staff is currently in the process of developing. The purpose of the review standard is to provide guidance to the staff on what to be evaluating when an ESP application comes in, and also to provide information to the stakeholders so that they know what the staff's expectations are before they submit an ESP application.

The basic premise that the staff has gone through in developing this document is to use existing guidance to the extent that that is feasible, to the extent that the guidance is available and still applies.

We have made an effort to have consistency between the review standard that is being developed for the early site permit and the review standard that is being developed concurrently for power uprate. They are, of course, different issues. Different considerations need to be taken. So there's only so far that that goes, but we have attempted, to the extent possible, to be consistent with theirs.

The document development approach that we have taken, the staff needs to develop guidance expeditiously. As Ronaldo has said, we are expecting three applications in the middle of next year. Therefore, we need to have the best document we can have out the door for those folks to look at and for the staff to have in reviewing the ESP applications.

So we have taken this as a matter of urgency to have an initial cut at this. We are presently finalizing a draft review standard. The plan is to submit that document for approval here by the staff and then to release it for interim use and public comment.

As noted here in the bullet, we recognize that there are open licensing issues regarding ESP, and you have heard some of them. We have discussed some of them here in the past few minutes. So there will, undoubtedly, be changes before the final document is issued next year.

As part of this process, we have sought

and received, we in the New Reactor Licensing Project Office have sought and received input from affected branches in NRR as well as from NSIR on the security issues. We have integrated those inputs and have developed the draft document that we are here today to talk to you about.

What we basically asked the staff to look at as part of the development process for the document for the review standard were the documents that you see in front of you on slide No. 11, primarily, NUREG-0800, the Standard Review Plan for Safety Evaluations for Nuclear Power Reactors, and NUREG-1555, which is the Environmental Standard Review Plan, basically a parallel document to the 0800 document but applicable to environmental reviews.

We also asked the staff to look at various other generic communications that have been issued over the years to determine whether they are applicable. You can see some examples of them in front of you here.

We looked at them from the standpoint of, are they already captured in the NUREG-0800 or 1555, the Standard Review Plans? If not, we need to add them to the list of guidance that the staff needs to consider when it performs its review.

We sought and received from the primary review branches positions on which documents are applicable.

We also requested the primary review branches for the different sections of NUREG-0800 and NUREG-1555 to accomplish two things: one, bring the text up-to-date, using a strikeout/redline approach, bring text up-to-date, and also indicate what text is applicable to the ESP itself. The objective here was to clearly show, for the staff's use and for the potential applicant's use, what applies and what does not apply at the time that the staff reviews an ESP.

As you may be aware, the 0800 document is intended to address all stages of licensing and, quite frankly, it was intended to address licensing in 1981. So we have a new rule and we have a new process, and we are just looking at a very small part of that process. So we are using this redline/strikeout method for the draft document, and I will discuss that a little further in a minute, to clearly show what applies and what doesn't apply.

Here's what we found, basically, as a result of the staff markups. You will probably not be surprised to know that most of the sections of 0800 needed some updating. So most of them have been provided to us in the form of redline/strikeout markups.

I'm sorry, I got ahead of myself here. Most applicable sections are in Chapter 2. That's the site characteristics sections. There are some additional sections that the staff has indicated are applicable to the review of the ESP review standard, and you see them here on slide 13, such as quality assurance; security, of course; site missiles, and some other sections.

The radiation protection has been identified as an applicable area if the new site is co-located with an existing reactor.

We have made the review standard in a manner that it is intended to apply to all ESP applications, whether the three that we are expecting next year, which happen to be co-located with an operating reactor or other applications that we might receive that might not be co-located. So this sort of section is an example of one that might or might not apply.

MEMBER ROSEN: The site workers you refer to they are construction workers for the new plant?

MR. SCOTT: That's correct, yes.

MEMBER WALLIS: Again, for the accident

analysis, you have to know quite a lot about what kind of a plant it is going to be.

MR. SCOTT: And that, as we discussed, is an issue that is currently under discussion between the staff and the stakeholders.

Site 14, as I indicated earlier, we have made markups on all of the NUREG-0800 sections. The Chapter 15 section that would be applicable in this case needs a substantial rewrite, and the staff will be planning to do that in the coming year.

We also found very little guidance in the NUREG-0800 document for security determination at the ESP stage. The rule requires that the site not be problematic for development of a security plan, and really the guidance that is there now does not reflect that. As you are also aware, security issues for nuclear power plants are in something of a state of change right now. So the staff is working on guidance to address that issue, which will be provided later.

MEMBER ROSEN: On your second bullet, the rewrite of Chapter 15 guidance --

MR. SCOTT: Yes?

MEMBER ROSEN: Since 1981, there's a new thing on the table also, which is risk analysis.

MR. SCOTT: Right.

MEMBER ROSEN: So is that going to be considered as part of the rewrite of this Chapter 15? Is this going to be a risk-informed process or is it intended to be a bounding process that says, it can't be any worse than this; therefore, the site is okay for an additional reactor or reactors?

MR. SCOTT: If I might ask Jay Lee, can you address that, Jay? This is Jay Lee with the NRC staff.

MR. LEE: My name is Jay Lee in NRR.

Currently, we are approaching the bounding process rather than risk approach, asking the applicant to provide bounding sequence of accidents, design basis accidents.

MEMBER KRESS: Suppose it turns out to be a gas-coolant, prismatic reactor? What would you envision to be this bounding-type sequence?

MR. LEE: Well, that we don't know yet. We are waiting and we are anticipating the applicants to provide that information complete with its associated source terms.

MEMBER KRESS: But they don't even have to tell you it is going to be a gas-cooled reactor?

MR. LEE: Pardon?

MEMBER KRESS: They don't even have to

tell you it is going to be a gas-cooled reactor?

MR. LEE: I think they will.

MEMBER KRESS: They will?

MR. LEE: They probably will specify a few types of reactor they are considering.

MEMBER KRESS: They might give you three or four options?

MR. LEE: Or five or six, yes.

MEMBER KRESS: And then of those options, they pick out some sort of a bounding type --

MR. LEE: Bounding accident sequences along with its complete source terms associated with it.

MR. SCOTT: And that issue, of course, falls under the same heading as what we were talking about a few minutes ago, about how much design information is needed and what type. That is still under active discussion between the staff and the potential applicants. I believe NEI is going to address how they would propose that that be addressed in their presentation.

MEMBER KRESS: Well, this bounding sequence, all it would be would be a source term to the environment? Is that what it means?

MR. LEE: Yes. We anticipate, we expect

source term to be associated with the sequence.

MEMBER KRESS: And then you would do that, use that source term like it is normally used in environmental assessment documents, the way they do -- is there where it would go? I mean, is that how you would use it?

MR. LEE: You mean the safety -- you mean the environmental side?

MEMBER KRESS: Yes, I am trying to figure out what you would do with this source term once you had it.

MR. LEE: Well, there will be two types of source term, I would think. First, only a safety consideration used from the design basis extent. The other one is for the environmental side.

MEMBER KRESS: The design basis, you know, is not a safety issue. It is just, can your plant keep you below 10 CFR 100?

MR. LEE: Right, right.

MEMBER KRESS: So there's no source terms associated with that because you have to know what the plant looks like and what the containment looks like, and then you have a source term in the containment. I don't know how you get any of that without a specification of what the reactor is.

But then there is the environmental assessment report, which uses source terms to make some sort of environmental assessment. They traditionally for lightwater reactors use some sort of a bounding source term, something like the 1465 source terms. I am trying to figure out what we are dealing with.

MR. JENKINS: Well, I think the major thrust here is that the ESP will allow the staff to, based on the information that we receive from the applicant, make a finding in regard to Part 100. Now if we do not have enough information to make that finding, then, of course, we couldn't make that.

MEMBER KRESS: It seems to me like the applicant would come in and say, "Well, we don't know what kind of a plant we are going to build here yet, and we are not sure what the power is, but we will guarantee you that we are going to meet the Part 100 limits."

MR. JENKINS: Right.

MEMBER KRESS: Now is that all they need to do, is tell you that?

MR. JENKINS: Well, they have to provide these plant parameter envelopes consistent with the review guidance that we are developing. In other words, the review standard --

MEMBER KRESS: Yes, I guess when we hear about the plant parameter envelopes --

MR. JENKINS: Right, when you hear that, then you can see how that fits in. But in the COL stage, the applicant would have to demonstrate that they, in fact, are meeting all of the parameters that they have specified in the ESP.

MEMBER KRESS: Yes. I can see that, yes.

MR. JENKINS: Okay. So the staff's task will be they evaluate, well, what is the impact of those parameters with respect to Part 100.

MEMBER ROSEN: Are we going to get a look at this review standard before it is cast in concrete?

MR. SCOTT: The answer is, yes, we are planning to ask the Committee to look at it next year, after the public comment period, on the draft version that we are developing.

MR. JENKINS: Which is consistent with the expanded power uprate new standard approach. In other words, we would get public comments back and then come to the Committee and seek your endorsement of the review standard prior to final publication.

MEMBER WALLIS: To get back to my colleague's question about risk, now, as far as I know, the design basis accidents don't contribute to risk. They are in a different world, and it is when you get beyond design basis you get risk?

MR. JENKINS: The structure of the ESP is not specific to a design. So the best that the staff would be dealing with would be a reactor type, a reactor technology. So a specific risk-based type of analysis such as the SAMAs, you know severe accident mitigation alternatives, would be based on the detailed design information, and that would be in the COL stage.

MEMBER WALLIS: That doesn't come until later? So there's no way you are taking risk into account in this early site program?

MR. JENKINS: I wouldn't say that at this point, but we are looking whether or not we can, in fact, take into consideration risk.

MEMBER WALLIS: See, I don't know about a plant which hasn't been designed and built yet --

MR. JENKINS: Right.

MEMBER WALLIS: -- and it is a new type, but it might well be that it would meet these bounding design basis accident criteria very nicely --

MR. JENKINS: Right.

MEMBER WALLIS: -- but it might still be

pretty risky on the risk basis.

MR. JENKINS: Well, once again, if the staff, the Commission accepts the design parameters as acceptable, and it is consistent with meeting the Part 100 requirements, then we would go forward and grant the ESP, with the proviso that these parameters, along with other information, other design information, would have to be acceptable in the COL stage.

So in the COL stage the ESP would be referenced, and that would allow the applicant not to deal with issues that have already been dispositioned in the ESP. So that is the main advantage for them, is that in terms of the environmental, emergency preparedness, and the site safety, the characterization of the site, that would be dispositioned. So the site-specific design issues would still be on the table and would be dealt with in the COL stage.

MEMBER WALLIS: So you are getting, in a sense, the easy issues out of the way?

MR. JENKINS: Well, I wouldn't necessarily say they are easy -- (laughter) -- but you are certainly allowing -- once again, the applicant has the opportunity to propose to disposition these issues, these siting issues, years ahead of any construction. Then once they select a design, then they would have to come back to the staff in the COL stage and go through the proceeding in terms of resolving site-specific design information. There may be some siting issues that are not dispositioned in the ESP that would have to be addressed in addition.

So the main message is that not all siting issues may be resolved in a particular ESP, but our expectation is that most of them would be.

MEMBER WALLIS: So if they wanted to build on an earthquake fault line, this would be caught where, at what point here?

MR. JENKINS: Well, it would be caught in the seismic evaluation, looking at exactly would this meet Part 100.

MEMBER WALLIS: Yes.

MR. SCOTT: The final bullet on page 14 is where we left off at. Staff determined that very few changes were needed to NUREG-1555, which is a much more recent document, 1999 versus 1981. That is the Environmental Standard Review Plan. It does contain references to the early site permit.

Slide 15 pretty much is just a summary of what the review standard consists of. There will be process guidance for the staff on its review. In a lot of cases that will be references to existing NRC staff guidance or requirements for reviewing these documents.

There is also a process flowchart for the staff's use on how the process goes. There will be two applicability tables, and I will show you on the next slide what I mean by that, one for the safety evaluation and one for the EIS.

There will be a boilerplate safety evaluation template for the staff's use. There will be standard language there that, to the extent it applies, can be directly put into the safety evaluation and then the additional language to be provided by the staff to address the specifics of the item under consideration.

Then there are the markups that I referred to and of which I will show you an example.

Slide No. 16 is an extract from the applicability tables. There is one of these for NUREG-0800, the Standard Review Plan, and another one for the Environmental Standard Review Plan. I have just pulled one page out of the one for the Standard Review Plan.

They are organized by branch for the convenience of the staff to identify which branch has responsibility, primary responsibility, for which sections. The areas of review are generally taken from NUREG-0800. We indicate who is going to do the primary and secondary staff evaluation, is there a markup attached, and, as I have indicated earlier, in most cases there will be markups attached to this review standard, at least a draft version, and the boilerplate safety evaluation section, which will coincide fairly closely with the NUREG-0800 and Reg. Guide 1.70 formats.

The next page is an extract from one of the markups. It is used to highlight and strike out, to show changes both to bring the document up-to-date for those areas that apply to the ESP and to delete, for the purposes of this review standard only, the text that does not apply.

What you see in front of you here is an example page of that and some language that we are considering, and this is still under discussion among the staff as to how we best deal with the very issue that you all have discussed and raised, which is: How do we talk about the design at this stage?

MEMBER ROSEN: Would you go back to 16 just for a quick minute?

MR. SCOTT: Sure.

MEMBER ROSEN: This boilerplate safety evaluation section, I know what you mean, but I am sure you are mindful of the Committee's concerns about the level of description in the safety evaluation reports for the license renewal and the go-rounds that we have had with the staff on that, bringing those safety evaluation reports to a level where the "why is the staff approving, agreeing to this particular feature," having that transparency in the safety evaluation report.

It is equally important, though even maybe more important here, that we have that sort of transparency. So I would commend to you the discussions of the Committee with the staff on license renewal as to the content of safety evaluations and the necessity for some degree of transparency, which is not the kind of thing you get from a word like "boilerplate."

MR. JENKINS: I think that, because ESP has such a long period between the time that it would be granted, 10 to 20 years, we agree that we definitely need to document what are the assumptions the staff is using and how we arrive at the decision.

MR. SCOTT: We have a couple of points to make there. One is that we have incorporated into this format the latest guidance that has been developed in the NRC regarding why are we doing this, what's the basis for it. I think that goes some way towards directing your concern.

In most cases, quite frankly, the boilerplate is a reference. It is not a lot of text in the technical -- there is almost no text in the technical evaluation sections. It just says you need to consult the Standard Review Plan for your guidance on how to develop this.

So we will definitely do what you are talking about here and take a look at that guidance. I think you will find we don't have a particularly prescriptive review standard.

MEMBER WALLIS: Are you putting conditions in this SER? I mean your decision is based on what you know about the site now?

MR. SCOTT: Right.

MEMBER WALLIS: But 10 years from now, there may be some major industrial facilities built in the vicinity, and so on.

MR. JENKINS: Well, the rule allows for considering new and significant information that the applicant would have to address in the COL stage. For example, the population doubles in that period of time. Obviously, there are going to be environmental impact considerations that would have to be revisited.

MR. SCOTT: Moving on to Slide 18, next steps for the review standard, as I mentioned to you earlier, that document is in staff concurrence. Our plan or objective is to issue it for interim use and public comment by the end of December of this year.

As we mentioned earlier, we would plan to provide the Committee the review standard for your review after we address the public comments that we will seek next year. And after receiving those comments from all sides, our goal is to issue the final review standard by the end of next year.

MR. JENKINS: The next steps basically involve, as far as the process is concerned, issuing the review standard so that we can inform all of the stakeholders regarding what the staff will be doing when we receive an application.

Currently, we have pre-application activities ongoing, a series of public meetings at each of the sites, site visits to observe the seismic investigation, efforts that the applicants are engaged in, and a QA review to look at their program for documenting the information that they are going to submit.

We are, as we said before, engaged with the NEI ESP Task Force on the plant parameter envelopes. There's a host of issues, but these three are the main ones that we are engaged with talking with them about: the seismic evaluation methodology. The industry has developed a pilot demonstration of their proposed approach for the staff to look at. We plan to complete internal preparations in order to enable our review when they are scheduled to come in.

DR. FORD: I have a question. In the researcher's infrastructure assessment for the advanced reactors, there is no mention at all made of early site permits. The presumption, therefore, is that new research is needed.

Yet, today we have heard various comments about what types of reactor will be put onto these new sites and we have been told that, yes, they could propose five or six different designs, and yet those designs have got very different source term characteristics, have got very different geometrical aspects in terms of blocks of water on top of the containment, et cetera, all of which must impact some way on the safety of the public outside in terms of seismic response, et cetera.

On that basis, do you not think that there is some need for research as it pertains to the ESP process?

MR. JENKINS: Unless we identify a particular issue that requires the research -- remember that the site safety reviews, the staff has performed those kind of reviews in the past. The one that comes to mind is the Blue Hills site. This is NUREG-0131, in which the applicant asked for the staff to look at and disposition siting issues before the construction permit was finished, before initiating or completing the construction permit.

On their Appendix Q, which is the predecessor for the ESP process, the staff was able to look at that site and say, okay, does the site meet Part 100? The differences are that, of course, at the time we knew that there would be a lightwater reactor and, therefore, some of the questions that non-lightwater reactors would come up would not be an issue.

The one thing we are going to look at very closely is the design parameters that are going to be offered, the idea being that those design parameters, that we would be assessing the impacts from a safety and environmental impact. There is no guarantee that that particular set of design parameters will actually result in a reactor. That burden is on the applicant going forward in the COL stage to say, okay, I have the following set of parameters; staff has looked at those parameters, and we can meet those parameters in a given design going forward.

That is the position that the applicants have proposed to us, that they are going to take that burden to ensure that those design parameters will, in fact, result in a reactor. Our task is to look at not only the plant parameter envelope that they are proposing those parameters associated with that, but also the other application information that they would be providing.

The purpose of the review standard is to lay out: Here are the applicable sections in terms of the review guidance that's applicable to an ESP. So if there are any gaps that are missing, then we are going to have to address those gaps before we can make a finding.

MEMBER LEITCH: I guess I see a whole lot of value in this process as far as a new site is concerned, but I am still left with a very unclear picture of what we are actually approving at an existing site. It sounds like what we are saying is you can build any kind of reactor so long as, obviously, the design is certified, any number of them -- we are not specifying a number -- any power level we want so long as it meets Part 100.

MR. JENKINS: The other part that has to be --

MEMBER LEITCH: Can't we say that right now? I mean, what are we doing here? I don't understand what we are approving here.

VICE-CHAIRMAN BONACA: I think the NEI document they are looking at has a lot of information that relates to that. Does it? I think that would help because it could bring some description of --

MR. WILSON: This is Jerry Wilson with NRR. Let me try to answer that question.

What we are approving here is acceptability of siting a particular plant at a particular location. Just the fact that there is an existing operating plant doesn't necessarily mean that this other location that is nearby is acceptable. It may be that there is a groundwater problem or a soil problem or other sorts of things.

Also, you have to look at, in terms of power level, what your cooling capability is. So let's assume for a moment that that site you are talking about is on a lake. There is not an unlimited amount of power you could put and have cooled by that lake. So there's a lot of factors like that you have to consider in terms of the acceptability of adding on another unit or units.

So that is why the application needs to specify numbers, types, power levels, or, in the case of what you are going to hear later, some alternatives, so that there is sufficient information for the staff to evaluate the acceptability of that site for a future power plant.

MEMBER KRESS: Since some of the sites have already been approved for power plants, haven't those things already been addressed?

MR. WILSON: No. I mean, they were approved -- remember, in a construction permit you are looking at a specific design at that point in time. It wasn't for an unlimited number of power plants, but it was for the particular plants that they were applying for. Now the question is, can you build an additional plant or plants there, and what power level and what kinds of releases you are going to see from those plants.

MEMBER KRESS: Well, take, for example, the restrictions on site on population density and distance to a population center.

MR. WILSON: Yes, exclusion areas in low population zones, we are going to have to make those calculations now for this new location. That is why you are going to need your releases, both normal and accidental.

MEMBER KRESS: But I thought the siting rule just said put limits; there's a limit on the population density and how far away you can have a population center. There is no calculation of releases and that.

MR. WILSON: Well, you use releases to determine the low population zone because you have to calculate a dosage at the boundary.

MEMBER KRESS: Originally, we did.

MR. WILSON: Yes, but that was for that plant. Now we have a new application for a new plant at a new location that is nearby. So you have to do a new calculation. It is going to be a different exclusionary boundary, a slightly different low population zone.

MEMBER KRESS: And different limits on the population?

MR. WILSON: Could be. I mean, those earlier determinations were made 30-40 years ago.

MEMBER KRESS: That is why I was saying I haven't seen any of that in the slides we talked about yet though.

MR. WILSON: But it is in there.

MEMBER KRESS: It's in there?

MR. WILSON: Yes, we are going to have to do that.

MEMBER KRESS: Okay. I guess it is time for what, NEI?

MR. JENKINS: Yes, NEI is going to give a presentation.

MEMBER KRESS: Yes, I'm looking forward to it.

(Laughter.)

MR. BELL: Good morning. I've got something very important, the overheads.

MEMBER KRESS: Oh, yes, that would be important.

MR. BELL: They match the hard copies that, hopefully, you have in front of you.

Good morning. My name is Russell Bell. I'm from NEI.

On the ESP project, I am fortunate to have a very dedicated group of individuals on the Task Force. The core of the Task Force is the pilot applicants themselves. On my left is Joe Hegner from

Dominion. This is George Zinke from Entergy and Eddie Grant from Exelon. While I drew the short straw in terms of handling the presentation materials, they are here to answer the really tough questions and otherwise correct me as I go.

The staff did an excellent job of outlining the context of our Part 52 and some of the activities that are going on. That is going to save us some time, save the Committee some time.

I think we can get to some of the answers to your very valid and good questions. In fact, I can skip slide 3. You know very well about the parts of the Part 52 process. They got exactly right the plans and schedules of the three applicants in terms of what we expect to happen next year.

MEMBER RANSOM: Excuse me. Before you go on --

MR. BELL: Yes?

MEMBER RANSOM: -- what is meant by "first ever"?

MR. BELL: Certain parts of the Part 52 process have not been tried or tested yet. The only thing we have accomplished so far are three design certifications.

The early site permit portion of the

process is the one we are talking about today. It has never been --

MEMBER RANSOM: Okay. I just wanted to know whether it meant first time you were putting a nuclear power plant there or what.

MR. BELL: First early site permit.

As with the design certifications before and the COL to come, there's a number of common issues. Just before we get into the details of how we are approaching the early site permit, just a little bit on how we are organized.

Again, I mentioned we have an NEI Task Force. We've got a number of generic issues on a list that is also in your package.

The most efficient way for the industry and, frankly, for the staff to deal with these issues is to deal with them one time generically upfront, and NEI's provides the mechanism for doing that. Obviously, the benefits are avoiding duplication of efforts.

Since this hasn't been done before, there is an opportunity to standardize on how to do it from the start. So you will see three applications that look very much alike, of course with exceptions for site-specific information. Again, our goal is to resolve as many of these common issues early, as early as we can.

It is not unlike the process that has been successfully used in the license renewal context. I am not going to spend a lot of time, but there's a two-page chart that looks like this in your package, just to give you a sense for the number of so-called common or generic issues that we have identified and are working to.

We have highlighted in gray -- we certainly could have used a color -- but we have highlighted issues that are really more equal than others. We've got a higher priority on those, and you can see from the dates of meetings, and so forth, that discussions on those priority issues are well underway.

In several cases there's an "X" indicating that the issue has a resolution pending. That means we have had some discussions with the staff and we are ready to move to the next phase or the end-game phase on that issue, which is an exchange of letters between NEI and the NRC which would document resolution of that issue. That is the mechanism that we have set up with the NRC and, again, following the precedent used at license renewal.

The very first exchange of letters has occurred. The NRC responded in a letter dated Tuesday, this past Tuesday, November 5th, to our letter regarding the very mechanism we want to use for tracking and documenting resolution of issues. So that should be the first of many such exchanges of letters in each of these areas that document the discussions and the solutions we have come up to.

The second-from-the-far-right column reflects that some issues might potentially require senior management attention. In fact, we discussed the so-called plant parameter envelope issue, the PPE issue, with the senior management on Tuesday. So that is the nature of the "X's" over there in that column, issues on which there are differing opinions or some challenges needed to be highlighted to senior management attention.

That is another mechanism we have going. We periodically meet, the industry senior managers and the NRC's, to assess the status and progress on the early site permit.

One of the things I want to get into is the plant parameter envelope approach. That is one of the more challenging issues. It came up a couple of times already this morning.

Before I do, it is worth just highlighting again I think something the staff mentioned, that the objectives of the early site permit are pre-approval of sites -- it is a separate matter from design -- and resolution of just as many issues as possible associated with site suitability at this ESP stage. That is both safety issues and the environmental.

What the slide shows is that these objectives for ESP really flow from overarching objectives that the NRC has had for some time, the notion to decouple siting issues from design. Of course, in Part 52 the mantra is "early resolution of issues" there, early resolution of design issues through design certification, early resolution of siting issues through ESP, and, frankly, resolution of just about every other issue before you turn to pour concrete and begin to build a plant.

So back on ESP, there are two scenarios. I guess there's a number of subscenarios. But generally an applicant could come in knowing what plant he wanted to build at that site. He might have a lot of the design information, the kind of information that the Committee was asking about earlier.

The scenario of each of the pilot ESP

applicants is not that scenario. The scenario we foresee for most ESP applications in the future is the one where an ESP applicant does not know what type of plant is to be built on that site.

ESPs have a duration of between 10 and 20 years. They are renewable. It is very difficult, perhaps imprudent even, to select, try to select a technology at the time of ESP.

Certainly in the case of these applicants the intent is to use this bounding or plant parameters envelope approach to allow for sort of flexibility later to select the best technology at the time. Fortunately, the intent and the letter of the regulations allow for this. I will get into a bit more how that --

MEMBER RANSOM: Excuse me. On No. 9, does the applicant have to control or own the site? I mean, is it possible to propose a site that is public land, for example?

MR. BELL: It is an issue we haven't turned to yet, but the applicants need to have control of the site.

MR. ZINKE: Yes, there has to be a level of control. Then even after the ESP is issued, if something happens on that land that basically changes the assumptions of the permit, then the Commission has to be notified and potentially --

MEMBER RANSOM: But, for example, does control mean a lease or own it?

MR. HEGNER: Both of those would be possible, yes.

MEMBER ROSEN: How about an option to buy? Would that be possible?

MR. ZINKE: I think there's a lot of options we haven't pursued, like the legal channels, what options we would necessarily propose.

VICE-CHAIRMAN BONACA: You cannot make it too hypothetical. I mean, you are asking the NRC to spend resources in reviewing and approval. There has to be some level of -- you can't just say, "We hope to or may be interested in buying some land somewhere." I don't think --

(Laughter.)

MR. ZINKE: I mean, yes, obviously, you have to have some control. The easiest, our first goal is to only use land that we already own and have total control over.

MR. BELL: Certainly control, but how that control is assured, there may be options for dealing with that. Certainly we are talking about existing nuclear plant sites now that are well under our control.

MEMBER RANSOM: It is like a private party can propose to put a ski area on national forest land and get permission to do that, and eventually does it, and has a period of time that they are assured they can operate that facility. I am just curious whether a nuclear power plant could be treated in the same way.

MR. BELL: Your reference to No. 9 threw me for a minute, but that is our issue No. 9 on our list. That is certainly one of the ones we don't expect to have a difficult time with, but something that clearly needs to be understood. As with any other issue, we will write that resolution down and it will be clear what the nature of control is.

MEMBER WALLIS: Presumably, you are approving the site, not the company. So that if Exelon gets approval for a site, that increases the value of the site. They could then sell it to somebody else?

MR. BELL: I think that's true. Certainly it is an asset.

When you first mentioned 9, I thought slide 9. I quickly put up slide 9, which is this one.

I mentioned the objectives of ESP. The objectives of the industry, and these applicants are certainly in line with that, pre-approval of sites, but in a way that maximizes the resolution of those issues associated with site suitability and preserves the essential flexibility for the selection of the best technology at a later time, when it is time to build a plant.

MEMBER KRESS: Suppose you have an approved early site permit, and you now come in and say, "I'm going to build a certified plant, an AP600. It's already certified on there." Then you can just go ahead and start building it? What do you have to do? What else do you have to do?

MR. HEGNER: The Part 52 process has three main elements. We just mentioned two of them. Part 52 has three major components, one of which is the early site permit, which basically is, I think of it as, zoning approval for the site.

The second part is design certification for an approved design, in your example, AP600. The regulation then says you then have to go forward and get a combined construction permit and operating license drawing in both the early site permit and the design certification.

MEMBER KRESS: But that just consists of sort of an ITAAC-type thing that shows the commitments made in the Part 52 certification are met. What's the COL?

MR. BELL: The COL would include a number of things. There's certainly some site-specific design information that needs to be brought forward at that time, ITAAC, that might be associated with that; complete emergency plans, if not satisfied earlier; operational programs, programs in terms of how you are going to operate radiation protection for security programs. A number of these are design-dependent and would be addressed at the COL stage.

MR. HEGNER: And you have to do a cross-reference in the sense that you have to demonstrate that your specific site or design falls within the limitations of your site.

MEMBER KRESS: Of your certification.

MR. HEGNER: You have to demonstrate that --

MEMBER KRESS: When we certify a plant, they generally have some site data and characteristics in there.

MR. HEGNER: They make some assumptions about the site in order to issue a certified design.

MEMBER KRESS: You have to verify that those are met.

MR. HEGNER: You have to verify that you are within those assumptions that supported the certified design. We see a corollary there in terms of proceeding with early site permit, that there are certain assumptions we have to make about design in order to support early site permitting.

MR. BELL: Which is the point of this slide, which I won't spend more time on. But if you have the image that we need to do for ESP what we had to, we had to assume some things for ESP, as we had to assume some things to complete design certification, you have the right image.

MEMBER WALLIS: Presumably, these aren't assumptions. These are based on knowledge.

MR. BELL: Certainly. Certainly.

Briefly, in fact, the NRC did an excellent job in terms of the contents and the parts of an ESP application. There is an emergency plan. There is an environmental report, and there is a site safety analysis.

I will move off this slide by saying we intend that the PPE approach address all aspects and be used to support all aspects of ESP application and

NRC review.

We have talked about what is a plant parameters envelope. We have a working definition, and it is here. It is a set of bounding, postulated design parameters that are expected to bound the characteristics of reactor or reactors that may be deployed at a site. So we have a working definition of this envelope.

Ronaldo has used the word that we have used, "surrogate information."

MEMBER KRESS: What is the set of parameters? Are you going to tell us what they are?

MR. BELL: I am going to tell you a little bit about that.

MEMBER KRESS: Okay.

MR. BELL: Of course, this PPE -- we call it "approach" -- is used under the scenario we are talking about, where applicants have not decided what it is that will be built at that site.

This picture kind of describes the entire process. The parameters envelope is surrogate information that the NRC needs to conduct their safety and environmental reviews. In fact, it is incumbent upon the applicants to provide a sufficient amount of this parametric or bounding design parameter information so that they can perform the reviews.

MEMBER KRESS: Tell us what that middle bullet is.

MR. BELL: The middle bullet is --

MEMBER KRESS: No, no, no. There.

MR. BELL: Release?

MEMBER KRESS: Yes.

MR. BELL: Yes. In this case, it is a subject we are continuing to work on -- it is a challenge -- to address certain parts of the requirements in a PPE approach.

The bottom line, as the NRC mentioned, is meeting Part 100. I might, for purposes of today, try to answer it this way: My understanding is that meeting Part 100 depends --

MEMBER KRESS: So you could take your site that you are looking at for a permit and back-calculate, given this site, the Part 100 releases that you said, and that is what would go in there?

MR. BELL: That's an option. What I was about to say, there is a chi-over-Q element of the parameter and of course the source term --

MEMBER KRESS: The population -- well, actually, it is the boundary that you calculate?

MR. BELL: Yes, yes. The chi over Q will

be a site characteristic that is firmly established as part of this early site permit, but we do not have the design. So we are looking at different options for demonstrating, in compliance with Part 100, to meet the requirements, in the absence of an actual design, that we can do that -- it was mentioned earlier -- a bounding source term, a sample calculation using one of the approved analyses from one of the design certifications.

MEMBER KRESS: Well, you could almost just put a chi over Q there, saying that it has to meet this chi over Q.

MR. BELL: As a practical matter, I am very seduced by that because that is the characteristic of the site, and this is an early site permit. It is not a design approval mechanism.

MEMBER KRESS: Yes, it is not in the design. It is a characteristic --

MR. BELL: There are some words in the rule that we must try to meet, and that is to describe how the facility meets the Part 100 requirements. So this is something we need to talk through with the staff.

MEMBER KRESS: Does that come in at the combined license phase? Would that be addressed at the COL?

MR. BELL: Exactly. We are considering options for doing that, but under any option we choose, at COL the applicant, of course, will be required to secure -- well, first of all, you will need approved accident analyses and an NRC-approved source term to go with the plant that he is planning to put there.

MEMBER WALLIS: Yes, how do they do that? Suppose I come in and say I want to build, I think I am going to build a pebble bed reactor on this pond, and I claim that my bounding source term is very small.

MR. BELL: Well, let's separate it for a minute. I am at COL now and I know what plant I want to build. It will either be a certified design, in which case these issues are resolved, or if it is a design like a PBMR or another custom plant, the applicant will need to go through the design review process and gain approval of the NRC in terms of, what are the accidents associated with that design and what is the source term? So that would occur at COL.

The second thing that would occur, if he wants to reference an early site permit, is a verification or a demonstration that that plant fits within the bounds established at ESP. That, under any option we propose, be it the chi over Q focus, that must occur at COL.

MEMBER KRESS: Let me ask you a question. Suppose I have a site with four units on it already, four 1,000-megawatt electric. Where is that entered into this process as a consideration or is it?

MR. BELL: And the proposal is to add five and six?

MEMBER KRESS: The proposal is to add some more, an unspecified number.

MR. BELL: There would need to be a determination that that site is capable of accommodating additional nuclear units.

MEMBER KRESS: In terms of size --

MR. BELL: Certainly.

MEMBER KRESS: -- footprint, in terms of its cooling water capacity --

MR. BELL: Certainly. Environmental.

MEMBER KRESS: -- and then its environmental impact?

MR. BELL: I think Jerry Wilson has mentioned some of the safety issues involved. But because your footprint is not exactly where the plants -- if they are over here, there may be different --

MEMBER KRESS: Yes, you have to physically locate it somewhere. Geological issues --

MR. BELL: Even though you have an existing site with units on it, we recognize that is a further review to be performed. It is not a simple matter. It is not a simple matter to just say, "Well, then I can put additional units here."

What I would add to that is to say that we would expect that perhaps a significant matter, the previous information used to characterize the site and approve it for those four units that are existing may continue to be valid and usable to demonstrate the acceptability of the addition. That is something the staff has acknowledged, that valid existing information can and should be brought forward into a new application.

MEMBER SIEBER: It seems to me there's a couple of things that I am confused about a little bit. It seems to me you actually have to know what the plant is in order to look at the distribution of radionuclides which you write down and place in ESP 6. That's the table, and there's corresponding additional tables that give you the profile of what the nuclides are under normal operation, which ones are considered rad waste, which ones are accident emissions.

If I were doing this, I would look at Part 100 and say, "I'm not going to try to describe what the plant will put out in various accident scenarios. I will find out how much room I have, and then when I describe later on at the COL stage the plant and what happens to it under accident conditions, I will see if I fit in there."

The problem is that is always a judgment call because there's various combinations of radionuclides. Depending on the plant type, how do you know what those ratios are and what the overall contribution is?

I don't know if my question is clear or not, but it seems to me that, once you give those ratios, you are basically committing yourself to a certain type of plant.

MR. BELL: Which would not meet the objective of the applicants. So the Committee has zeroed in on what we consider one of our more challenging examples of how to apply the approach. In fact, I wasn't prepared to get into that because we are continuing to select our best way through that wicket.

MEMBER SIEBER: Well, let me ask you, is my thought process as to how an applicant would do this correct? Is that the way you interpret these tables and how to fill them out and disclose what the bounding parameters for the ESP are?

MR. BELL: If you think in terms of a bounding approach, yes, we think that the bounding approach is the one we want to use to answer any of these questions, cooling water, effluents.

Now in the case of radiological accident releases, there are just a number of variables in there. What type of plant is it? What are the credible accident scenarios? What are the source terms and radionuclides and the various concentrations?

MEMBER SIEBER: That's right, source term is a key thing.

MR. BELL: So it becomes a multidimensional problem when you try to find a bounding number for each of those parameters. We are looking for other ways, other than that, to accomplish this objective and still meet the requirements of the rules.

MEMBER SIEBER: You haven't found or discussed or negotiated what those other ways are yet, right? Because I am curious as to what they would be.

MR. HEGNER: No, we are still trying to

work through it. One of the approaches we thought on early on was, well, let's identify all the isotopes, identify the maximum amount from each of the various technologies that we are considering, identify at what time they appear during an accident sequence, and we build that source term.

MEMBER SIEBER: That's what we did in the old days, right, Bill?

MR. HEGNER: That's a big source term.

MEMBER SIEBER: Yes.

MR. HEGNER: We said, well, okay, maybe we could come up with a technology that appears to be the bounding technology that probably has the greatest contribution, has the greatest likelihood of meeting as close as it can the Part 100 dose limits. Then perhaps if we can get that bounding technology acknowledged, that you could site that at the particular site. Well, then everything else, maybe if we chose another technology at COL, we could demonstrate that that other technology fit within the envelope. We are still playing with that a little bit.

But this is the single hardest challenge in front of us: How do we meet the current words in the regulation that say, "Demonstrate that you meet the dose consequence limits of Part 100." We're struggling.

MEMBER SIEBER: I can appreciate that.

MEMBER LEITCH: I have some similar questions, perhaps similar, about cooling water. I mean, what do you do there? Do you say, "We're going to reject so many million Btu's per hour to the river," and that's the bounding analysis?

But that presupposes the present river. I mean, perhaps as the design evolves, there could be impounding basins, dams, river diversion schemes, all sorts of things to modify that. That many Btu's per hour may not be acceptable with your present river.

MEMBER SIEBER: Yes, but that has happened in the past, and then you are back to the cooling tower or in certain times of the year you don't run at full capacity because of the discharge temperatures. You can deal with that.

MEMBER LEITCH: Yes, but in order to bracket that, you may have to -- I mean the site may be right now at the maximum capacity.

MR. HEGNER: Right. The site might be suitable for an additional 1,000 megawatts but it can't handle 2,000 megawatts. That is part of the siting management that we are going through.

MEMBER LEITCH: Or maybe there are some design things that could be done to make it suitable for 2,000 megawatts.

MR. HEGNER: And you might be able to mitigate some of that by cooling towers or other water sources. Yes, so you can look at that and see what is reasonable and economical.

MEMBER LEITCH: But those thoughts are not going to be in the early site permitting process, right?

MR. ZINKE: Some of that actually is in the early site permitting process.

MEMBER LEITCH: Oh, it is? Okay.

MR. ZINKE: Yes. And in the cooling water, it ends up not near so difficult to do all of those things as the source term problem. Source term is the real complex one.

MEMBER SIEBER: Well, you assume a certain thermal efficiency. You've either got it or you don't have it. So you size your pond or you look at the current river flows and maxs and mins. I don't see that as -- if you use a sea-grade engineer, he would come out with the right answer.

MEMBER ROSEN: Is the number of reactors specified or number of units as part of this process or is that left to a variable also?

MR. ZINKE: The number of reactors is variable, but it is bounded --

MEMBER SIEBER: By megawatts.

MR. ZINKE: -- by megawatts.

MEMBER SIEBER: Right.

MR. ZINKE: Right, and there are some other parameters that could bound it, yes.

MEMBER ROSEN: Those are the cooling water limitations?

MEMBER SIEBER: And effluents.

MEMBER ROSEN: So then if you could figure out, find a very efficient reactor, you could put more of them on the site?

MR. ZINKE: Yes. In our putting together the ESP example, we looked at our site may be able to hold two AP1000s but it could only hold one ABWR; it could handle four of some other kind.

MEMBER ROSEN: It could handle 10 PWRs?

MR. ZINKE: Right. So there is always a limit. So the number isn't the same, depending upon what technology you are using. But we look at each and then say, well, if I was building 10 of this, what are these parameters and what do I have to evaluate the site for, so I can bound as much as I could?

MEMBER KRESS: We are running short on time. Some of us have another meeting we have to go to. I wonder if you could go to the slides that give us the main message that you would like for us to go away with and maybe skip some of the ones that you feel like we might be able to read on our own.

MR. BELL: Certainly, you have some reading material there. The Committee was asking, what is the NRC going to be asked to approve or what is the NRC going to be asked to find? We expect that the NRC will find that the site has been properly characterized, that the site characteristics are accurate and complete.

In the case of the design parameters, if you flipped ahead, I think, to the next slide, you see this chart. This is just the first page of 20-30 pages of hundreds of design parameters.

The NRC will need to find that that set of information is sufficient to support the required reviews and support the third finding back on this slide. This is the bottom line: that this site is acceptable for construction and operation.

MEMBER SIEBER: So you would use this chart, the applicant would use that to fill out the tables? There are several tables in ESP 6. Okay?

MR. BELL: You would use this chart. This is what we call a worksheet.

MEMBER SIEBER: Right.

MR. BELL: It's got six technologies here. For the technologies a particular applicant is considering, he chooses the bounding parameter. That becomes, the term that was used earlier, the permit basis or the number that NRC would use in its review of the application. The million-gallons-of-water-per-day kind of thing, is that environmentally acceptable? So find acceptability of that bounding value.

It is both different but similar to, if it was an actual plant that had a million gallons, they would perform the same review and come to the same conclusion.

MEMBER ROSEN: Doesn't this sort of transfer the burden to the staff, the NRC staff, rather than the applicant, in the sense that, if there's no plant parameter for a given -- I mean in your 30 pages, which I haven't seen, but let's say there's some X over Y, or something else that is not listed here in the 30 pages. It can be anything?

In other words, if it is not on this list, the applicant can come in and propose a concept that has that parameter that is not on the list at any level? That, to me, is the opposite of the way licensing works.

MR. BELL: We think the burden is actually here to describe this, provide the complete set of design parameters, to choose parameters that will do what they want to do, and that is bound the technology to be chosen later.

If we do a poor job of that or if a design comes along where there is an important parameter that was not considered at ESP, that design would not fit within the envelope, and at COL you would have to address that issue, if it is tritium for a heavy water reactor, and that type of reactor wasn't considered or that parameter was not considered in the PPE.

MEMBER ROSEN: So this is viewed as permissive? If you get within these limits, these bounding values, it is okay? But if you don't have a bounding value for something, then all bets are off and it has to be --

MR. HEGNER: You deal with it at COL. If you don't have it or you are outside the bounding value, you have to deal with it at COL.

MR. BELL: This is something we intend to share with the NRC and, thus, the ACRS, the entire PPE worksheet. The objective there is to make sure the staff understands where these values are coming from, that they are based in reality, how the bounding values will be selected. We expect to do that by the end of the year.

In the interest of time, we have one more discussion planned with the NRC staff to cover remaining aspects of this issue; for instance, the one that we confessed that we are still working on, the meeting Part 100 and the dose consequences. That is in early December.

At some time, at the Committee's convenience, we would be happy to come back with or without the staff and would give you an update.

On the subject of the review standard which the staff talked about, I think in the interest of time I would just like to summarize our perspective on that. We think it is going to be very important to ensure smooth and efficient ESP reviews. We certainly support the use of existing guidance, where applicable.

But our review of both 0800 and the NUREG-1555 indicates there's just a significant amount of design-dependent information and reviews woven throughout there. So we are very interested to see how the staff will parse that. We got some insight this morning on that. We will be interested to see how they parse that for ESP purposes.

Of course, ESP does not involve approval of any design information. So we expect design-dependent reviews to be excised from the reviewer guidance for purposes of ESP.

The staff intends to publish that for, I think, trial use and comment, also perhaps by the end of the year. We will be very interested to comment on that.

There were some examples back here. I would just indicate that we think there is a mixed bag. Some of the guidance seems readily applicable because it is strictly site-related; other guidance, strictly design-related -- we don't see how that really applies -- and then a middle ground, where there is both a site component and a design component to the review.

In the interest of time, I might just stop there and thank the Committee for your time and your attention. Your questions were very good.

MEMBER KRESS: Well, thank you. We appreciate it.

I guess we will discuss among ourselves whether there is a need for a letter about any concerns. We could air those now. We have a little bit of time, if there are members who want to make any comments about this.

MEMBER POWERS: I guess I am a little perplexed about what you call the "source term problem." Staff would like you to show that you can satisfy the requirements of 10 CFR Part 100. Why don't they just say you will and whatever plant you put up there will?

MR. BELL: We shall.

MEMBER POWERS: Yes.

MR. BELL: Or at COL you won't get a license.

MEMBER POWERS: Yes. Why agonize over it? Just say you will.

MEMBER KRESS: Yes, what's wrong with that approach?

MR. BELL: My take is that there is an element here where the prescriptive -- where the language in the regulation as it exists talks about describing the SSCs that bear significantly on the ability of the facility to meet the Part 100 requirement. Those words are in there now.

Our sense is that, like any regulation, it is subject to some interpretation. We think there are ways to work within those words and that framework to meet the intent of the regulations, to meet the objectives of the ESP and the PPE approach. But that is certainly one reason we are struggling.

MEMBER POWERS: I think I would offer, then, an exposition on natural and engineered aerosol removal and say, "I'm going to meet Part 100 whenever the plant gets designed." I mean it doesn't strike me there is a huge problem here.

MEMBER KRESS: As a matter of fact, when we certify something like the AP600, any design, we actually certify it on the basis it meets the regulations, the design does.

MR. BELL: Right.

MEMBER KRESS: And that doesn't have much to do with site except chi over Q. If you say, "Well, this meets the chi over Q; we now need the certification about it," then you know it is going to be Part 100.

And if for some reason it doesn't, when they get to the COL step, you just are not allowed to build that plant. I don't quite understand what the issue is.

It looks to me like when you are looking at early site permitting, you are looking at mostly environmental issues. Is this site suitable for another plant, given its characteristics? The plant that you are going to put there has to meet regulations. So, therefore, safety is not a real issue because you already know it's got to meet the regulations or else you aren't going to be allowed to build it.

So it seems to me like the early site permitting part just deals with the environmental aspects of this siting, but I am not sure if that is the correct view or not.

MR. HEGNER: I would like to pursue Dr. Powers' approach and even expand it and send in a one-page application that says, "We'll meet all the NRC requirements. Give us the permit."

(Laughter.)

MEMBER KRESS: I think there are environmental issues.

MR. LYONS: Well, this is Jim Lyons again.

The staff still has to do a review of the information that is provided to us. One of the things that is part of this process, these design parameters, which probably if you look at slide 14 of their packages, I think there is a real good description of the difference between parameters and characteristics, where parameters are things that are assumed to be and characteristics are what actually are.

In the early site permit we are assuming a design where we know the actual characteristics of the site. So we need, obviously, to review those characteristics of the site. Then, for this assumed design, would it fit, would this site be acceptable?

In the design certification process we did the opposite. We assumed a site. Remember it covered 80 percent of the sites in the U.S. There was some assumption that it would be able to fit on most of the sites, but we knew the actual design. We knew the characteristics of the design.

So, as part of the COL, you marry those two. You make sure that the design parameters assumed in the early site permit are met by the characteristics of the design, and vice versa. I think that is a key point to remember of how these two fit together at the end.

The other thing is that, as Mr. Hegner was saying, if you just came in and said, "Well, we'll meet all your regulations," we would want to know how. So that is where you get into more discussions of how they are going to do that and how we can assure ourselves that it is reasonable that they will be able to meet the regulations, because we want this early site permit at the end, when it comes up at the combined license stage, if at all possible, not to have to reopen any of those issues, that they are going to fit within that bound. So that is why we are trying to keep it reasonable areas and not build the box so big that it gets unreasonable.

MEMBER SIEBER: Jim, I presume that one of the products of the early site permit was the Environmental Impact Statement. That is the reason why the detail, because NEPA requires a certain amount of detail to write that statement.

MR. LYONS: That's correct.

MEMBER SIEBER: And you need the statement before you start digging holes in the ground. You can't issue the COL until the EIS is approved.

MR. LYONS: Right, and an Environmental Impact Statement will be issued as part of the early site permit. Then it would be updated as needed as part of the combined license.

MEMBER SIEBER: If I look at these tables in here, they look like the kinds of things you find in an EIS. So I just presumed that's what they were going to do when you get them.

MR. LYONS: The other thing I would like

to make the point of is, at this point the staff is not asking for a letter from the Committee. Obviously, when we come back with our review guidance and we have a well-defined process, then we would be seeking a letter. But at this point we just wanted to come in and inform you of where we were, where we are headed on this, give you an idea of how the industry is moving forward.

A lot of this, similar to the certified designs, we will be working through these issues as we do our reviews, and the final product will be reflective of the lessons we have learned as we do those reviews, as any first-time process usually is.

MEMBER LEITCH: I have a question still back on the cooling water issue. Suppose the licensee comes in and says, "We want to reject this many million Btu's to the river." Say that is reflective of a 2,000-megawatt plant. You wouldn't say it is a 2,000-megawatt plant because, as I understand it, within this envelope you would say we want to reject this many Btu's to the river, and you look at that and that's ridiculous. There's not that much capacity in the river. You could maybe only handle a 300-megawatt heat rejection to that river.

MR. LYONS: And that is where we would not issue an early site permit.

MEMBER LEITCH: But now the licensee has in the back of his mind, "Well, we are going to make major changes here. We are going to install a dam, a river diversion scheme, cooling towers," all sorts of things like that that are going to make this acceptable. But their design hasn't progressed that far. So they are not prepared to show you a design of exactly what they are planning to do to make this 2,000-megawatt plant acceptable on that site.

So what do you do about that? You reject the whole early site permit or do you say --

MR. LYONS: Yes, yes.

MEMBER LEITCH: -- it's okay, but we're not approving this Btu consideration at the moment?

MR. LYONS: I think at that point -- because that's, obviously, one of the major considerations -- we wouldn't be able to find it acceptable. They would have to either present us plans of how they would be able to accommodate that type of heat rejection or we wouldn't be able to find that.

MEMBER LEITCH: So they have to come in, then, with at least a conceptual design of how to accommodate --

MR. LYONS: Yes.

MEMBER LEITCH: -- the Btu, in my example the heat rejection from the 2,000-megawatt plant?

MR. LYONS: Yes. I think from industry's standpoint, you would view that the same way, I assume?

MR. ZINKE: Yes, because whatever you would be proposing would also have some environmental effects.

MEMBER LEITCH: You mean the cooling tower itself?

MR. ZINKE: Yes. So you do have to get into some level of detail on those kinds of things.

MEMBER ROSEN: And, also, clearly, you wouldn't be proposing to build a power plant on a site that had limited cooling capacity unless you had some idea in mind of how you are going to handle the heat loads.

MR. ZINKE: That's correct.

MEMBER ROSEN: That's right.

MR. BELL: Of course, that's what an ESP effort is going to present, the applicant's evaluation of the suitability of the site and the ability to handle that much heat rejection. Then it is for the staff to approve or not that evaluation.

MEMBER LEITCH: So with this at least comes a conceptual design of how you might do that?

MR. ZINKE: Yes. I mean, like for ours specifically, we evaluate, do we think we could get water if we had pumps or if we had an intake structure, or are there several options? We evaluate those and present those options.

MEMBER LEITCH: Okay.

MEMBER KRESS: Mr. Chairman, we will have to close the meeting. I will turn it back to you now because several of us have another place to go. So thank you.

VICE-CHAIRMAN BONACA: We thank you very much. We appreciate the presentation.

We have one last item on the agenda we would like to hold before lunch. That is a brief report from the License Renewal Subcommittee Chairman on the Peach Bottom license renewal application. I think that it is going to be brief. Mr. Graham Leitch.

MEMBER KRESS: Would you please tell the committee why you are qualified --

MEMBER ROSEN: And speak with sufficient clarity and volume.

(Laughter.)

MEMBER LEITCH: All right. Well, let's see, PT, David, come up and sit.

We had a License Renewal Subcommittee meeting on October 30th, where we discussed the Peach Bottom license renewal application. This is for Peach Bottom II and III.

What we wanted to do today was give you just a quick synopsis of what transpired at that License Renewal Subcommittee meeting. Many of you were there, and we just want to quickly review it.

I passed out this paper which is just some of my remarks here, and I will go through this quickly. You can read it for yourself.

Peach Bottom is the second BWR to seek license renewal. Hatch was the first plant, and Hatch used the functional approach to license renewal. Peach Bottom used the system approach. So, in that sense, it was the first BWR using the system approach.

As is usually the case, they are seeking a license renewal for 20 years beyond the original operating dates, which are listed there. Those dates include construction period recapture.

Peach Bottom II and III is on the same site as Peach Bottom I, which is a high-temperature, gas-cooled reactor that has been decommissioned years ago and is in safe store. There are no common systems between units II and III and unit I. Unit I is entirely out of the picture now.

Peach Bottom sits on the Susquehanna River on a large pond created by the Conowingo Dam, which is also owned by Exelon. Peach Bottom relies on this dam for operation, that is, the cooling water, but does not depend on the dam for emergency service water. There are onsite ponds, pumps, and supplies that make that not dependent upon the dam.

It does, however, depend upon the dam for station blackout purposes. They do not have a station blackout diesel, but they do have a submergible electrical cable coming up from the dam. To that extent, the Conowingo Dam is a part of the aging management program for blackout consideration.

The license on the dam -- dams are licensed for 50 years. Conowingo was built in about 1926, or something like that, and its license has been renewed once. So it, presumably, will come up for renewal of that license before the period of extended operation. Exelon intends to apply for expansion of the license on the dam.

The SER with open items, which is what we reviewed, had at the time we reviewed it 15 open items and 18 confirmatory items. All but a few of these appeared to be at least informally resolved at the time of the Subcommittee meeting.

The final presentation to the full Committee will probably be in March. We have every expectation that the open items and confirmatory items will be resolved by that time.

The license will be issued with several license conditions. I am not sure of the exact number yet, probably someplace between one and three.

Peach Bottom references some BWRVIPs, 15 in number, and credits their compliance with those VIPs in their license renewal application. There are three that may be of interest; 78 and 86 have NRC approval for 40 years and not for the period of extended operation, but that extension, the approval for that extension period is presently being considered. That may or may not result in a license condition, dependent upon the status of that approval at the time the renewed license is issued.

There's also another one, BWR-76, which is pending, not yet approved. Approval is expected by December 31st, 2002. If that approval is granted, fine. If it is not granted, that will likely yield another license condition.

A couple of interesting things about the Peach Bottom application: Certain systems were not in scope, but have portions that satisfy the safety function. These portions were realigned to be considered as part of the scope of the safety system.

They talk about five cases. I think these can be best understood by referring to some of these viewgraphs. In the interest of time, there's basically five different configurations. These are basically systems that were not classified, or portions of systems that were not classified, as safety-related, but they went through this realignment process, primarily as a response to an RAI, and subsequently reclassified portions of these systems as in the scope of license renewal.

For example, this system here is illustrative of a system, say, for example, service water, which penetrates the containment. The service water has no safety-related function and was not originally within the scope of license renewal.

But, obviously, from a pressure-boundary function, a portion between those two valves is in the scope. When that situation was pointed out to Peach Bottom, they included the portion between the two valves and the scope. Even though service water per se is not safety-related or not within scope, the portion between those two valves was added to the scope.

There are several other examples of this. I don't need to go through them all, in the interest of time. But here is the same kind of a situation where there is a piping system that the whole system is not in scope, but the portion out to the first isolation valve is. If there are questions about that, we can discuss that more thoroughly. But, I mean, basically, that's what they did, was classify those pieces into the scope. That is a process that they called realignment.

There were other systems that were originally not in scope but, as a result of RAIs, they were added, primarily because a rupture of those systems could spray fluid onto a safety-related system.

An important example of that was service water, for example, which Peach Bottom has no safety-related function, but yet its rupture could spray water on systems which are important.

So, as a result of the RAI, they went back and classified certain portions of service water within the scope. Now they didn't necessarily classify the whole service water system as being within scope, but they took big chunks of it, like, for example, all the service water in the reactor building was classified as being in scope. They didn't discriminate between over in this corner the reactor building is not and over in this corner the reactor building is. They classified the whole service water system and the reactor building as being in scope.

MEMBER SIEBER: I've got the feeling that everything in the reactor building was in scope.

MEMBER LEITCH: Everything related to service water, Jack?

MEMBER SIEBER: No, everything.

VICE-CHAIRMAN BONACA: Yes, I had the same feeling, that --

MEMBER SIEBER: Everything. They just said, if it is in the reactor building, it is in scope.

VICE-CHAIRMAN BONACA: Yes.

MEMBER LEITCH: I didn't quite hear it as being that all-encompassing.

MEMBER ROSEN: That's not my impression.

MEMBER LEITCH: No, it's not my impression, either.

VICE-CHAIRMAN BONACA: I had the same impression, but it may be the communication on this issue, anyway, was --

MEMBER LEITCH: I don't know, David, do you have --

MR. SOLORIO: Hi. My name is Dave Solorio. I'm the Project Manager from the staff for the Peach Bottom SER.

Actually, I am not sure I remember that the way you did, Dr. Sieber, but in a conversation with the applicant just two days ago I had on another issue they actually said that to me, that essentially, because of this non-safety-related issue, essentially all the piping within the reactor building that was non-safety-related was within scope, because they didn't want to get into the situation that Dr. Leitch just described of trying to pick out corners that were and corners that weren't.

MEMBER ROSEN: All the piping in the service water system or all the piping?

MEMBER LEITCH: Yes, I know all the piping in the service water system is --

MR. SOLORIO: Well, they did say other non-safety-related systems like the service water system were within scope. But I will take it just a little bit farther and get back to Ramin if there is any change from what I said now.

MEMBER LEITCH: I wouldn't be surprised if there's some miscellaneous systems in the reactor building that we haven't thought about that aren't in scope, like auxiliary steam or --

MEMBER SIEBER: Like instrument air --

MEMBER ROSEN: Potable water.

MEMBER SIEBER: Instrument air, service air, those would be the ones that don't have fluids in them. On the other hand, it seems to me I remember them saying that.

MR. SOLORIO: The applicant wanted me to --

MEMBER LEITCH: Well, we will verify that.

MR. SOLORIO: The applicant wanted me to apologize; they couldn't be here. They are having an EP drill today.

MEMBER SIEBER: That's okay. Thanks.

MEMBER LEITCH: Because of the above two issues, that is, this realignment and the reclassification of some of these systems in scope, you can't really get the full picture of what is in and out of scope unless you read the license renewal application, the SER, the RAIs, and the response to the RAIs. So, I mean, there's no one document that gives you the total comprehensive picture of the situation. I don't know that that is necessarily Peach Bottom unique, but it is interesting.

VICE-CHAIRMAN BONACA: Well, actually, we have raised this issue with the staff, because that I think has been a recurring concern of, where do you have the documented scope? But that is an issue that I know the staff is exploring, is looking at.

MEMBER LEITCH: And we have an SRM to discuss improving this process mid-year. I think we are thinking about the May timeframe next year. This may be one of the issues that we may want to address in that particular letter, because I think this is just a generic complication.

MEMBER SIEBER: A missing element is always marked-up drawings. However, they aren't required to supply marked-up drawings as part of the application. That is why we never get them.

MEMBER LEITCH: Right.

MEMBER SIEBER: Okay, but they do submit them, and every plant has done that who has done a system review as opposed to a functional review. Once you have those, it makes it pretty easy.

MEMBER ROSEN: Actually, saying that we

never get them is a little too strong, I think, Jack. We have seen some of them.

MEMBER SIEBER: We've seen them, but they are not --

MEMBER ROSEN: When they give it to them on a CD-ROM, I have seen several applications that have had marked-up drawings on them.

MEMBER SIEBER: Yes, including Peach Bottom, but they aren't complete. They don't have all the drawings, and they aren't required to submit them as part of the application, which is what I said. Every plant has allowed the staff to look at them, but it is not on the docket.

MR. KUO: This is PT Kuo, the Program Director for License Renewal and Environmental Impact.

Dr. Sieber, you are correct, the applicants are not required to submit the drawings. However, for the efficiency of a review, they have all volunteered to submit the drawings.

MEMBER SIEBER: Right.

MEMBER LEITCH: A couple of specific issues here: The cables, Peach Bottom has had a history of cable failure from moisture, resulting in cable treeing. Many cables have been replaced with moisture-resistant cables over the past eight to ten years.

But, according to a recent NRC inspection that is one of the inspections associated with this program, there is still moisture, water in manholes, and things of that nature. So this is an open item, and the ACRS is interested in the resolution of this item.

Another item that came up was related to Hilti bolts, that is, whether the aging of concrete would result in the relaxation of -- Hilti bolts are just a tradename for concrete anchors, basically. It was agreed that this was not particularly a Peach Bottom issue, but really a current licensing issue. The staff agreed to look into this matter.

MR. KUO: And after the ACRS meeting last week I have talked to our technical staff, and sometime later we will get back to the Committee.

MEMBER LEITCH: Another issue was with respect to the standby gas treatment system ductwork. The Subcommittee questioned the fact that there was no aging management program for standby gas treatment system ductwork. The licensee said that the ductwork was either at high temperature or insulated and, therefore, no program was required.

That is an issue that we still want to

hear some more back about, because Peach Bottom has a considerable run of underground ductwork. The discharge for the standby gas treatment system runs underground on its way up to the off-gas stack.

The inspection of the RWST and CST, we talked about that quite a little bit. These tanks are similar in construction, but Peach Bottom proposes to look at the refueling water storage tank and credit that for looking at the condensate storage tank.

The issue there is that the condensate storage tank is difficult to get empty, and so we have to just look at the refueling water storage tank. We did discuss that quite a bit. The tanks are built on an engineered backfill. It is not just they scrape up the ground. I mean it was an engineering fill. The tanks are similar construction. The fluid is reactor grade water in both cases. So we kind of got ourselves convinced that was okay.

The licensee also responded at the meeting to our concern about corrosion in the diesel generator tank. They said the tank was inspected in 1995, and part of the tech. spec. requirements is that it be inspected every ten years thereafter, and we were satisfied with that.

There was a good discussion about the

condition of the torus. Peach Bottom is a Mark I containment with a torus. There were detailed questions about the torus inspection program, the material condition and coating of the torus, depth of pits, future inspection. These questions were answered to our satisfaction by the licensee.

There were 29 --

MEMBER POWERS: How about the bellows on the torus?

MEMBER LEITCH: The bellows, that was not specifically discussed, as I recall. Do you recall any discussion about bellows?

MR. SOLORIO: This is Dave Solorio.

I believe they are within the scope, but I am going to have to get back to you, Doctor, and look that up. Probably today I can get back to you, in just a few minutes.

MEMBER LEITCH: I'm pretty sure they are in scope, but I don't know that that was exactly Dana's question. I think your question related to the inspection of the bellows, was it?

MEMBER POWERS: The inspection on how they are corroding because they do corrode.

MEMBER LEITCH: Yes.

MEMBER ROSEN: I don't think we

specifically addressed that.

MEMBER LEITCH: I don't recall any discussion about that, but that is certainly a good question.

MR. KUO: You're correct, I don't recall, either, that we ever touched upon the issue.

MEMBER LEITCH: There were 29 existing programs or augmenting aging management programs and five new programs. Some of these programs depend upon future experience and NRC and industry positions in the future. As with all licensees, these future programs will require a significant NRC inspection activity at some future time.

We have been concerned in the last couple of discussions we have had regarding license renewal with this fairly major NRC inspection activity coming at us, not now but 15 years into the future maybe. So the staff is preparing a document, which is now in the draft form, to attempt to manage and track these commitments.

I think, again, this is not a Peach Bottom generic issue, but it is one of these things that we may want to consider putting in this May letter that we are going to write in response to the SRM.

The TLAAs were addressed. They are listed there. I don't think there was anything particularly unique about those TLAAs.

The ROP status, there was some interest expressed in what is the current ROP status of the plant. The staff agreed to provide this information. I think it has been handed out to you just a few minutes ago outlining the current ROP status, which in a word I think is all green. It is in the licensee response column, but there are some other details there that might be of interest to some.

MEMBER ROSEN: I think it is all green, as you suggest, but the Committee should note what the ROP status is as a routine matter, in my opinion. That seems to me something for the May letter as well.

There are two white findings, preliminary white findings, in the emergency preparedness cornerstones.

MEMBER LEITCH: Right, yes.

MEMBER ROSEN: You can factor that into your thinking on whether that is a license renewal issue.

MEMBER LEITCH: Yes, I think this is easy to do. There is some internal disagreement, I think, as far as whether it is relevant or not to 20 years down the road, but yet it is easy to do. My own feeling is that we would be remiss if we didn't at least spend two minutes saying what's the current status of things. It is easy to do. Why not do it?

MEMBER SIEBER: The other side of the argument is, if it isn't very good, what are you going to do?

MEMBER LEITCH: We are probably not going to do anything about it, Jack.

MEMBER SIEBER: Okay.

MEMBER LEITCH: But, I mean, I would think we would all be rather embarrassed if there were some red bullets there, and somebody whom we just approved license renewal, and somebody said, "Well, what about that issue?"

MEMBER SIEBER: Agreed. You can look at anything you want.

VICE-CHAIRMAN BONACA: The only question, what are you suggesting, that we put a note in every letter that we write for license renewal? No?

MEMBER LEITCH: No.

VICE-CHAIRMAN BONACA: This is good that we talk about it, absolutely. Just the question is, you know, should we document -- I don't think we should document anything about --

MEMBER ROSEN: I think if there are things in the letter, I mean in the ROP, that impact on license renewal, we have a chance to assess it.

I think the example here, given we have one in front of us, which is there are two preliminary white findings on emergency preparedness involving inadequate critique of an emergency preparedness exercise, I think they could probably remedy that problem through the license renewal term.

MEMBER LEITCH: Given 20 years, I think they will straighten that out.

(Laughter.)

MEMBER ROSEN: And a timely classification of an alert, of an actual event. I think these are problems that don't bear on license renewal.

MEMBER LEITCH: I agree, yes.

MEMBER ROSEN: So that's all a judgment. Now there could be almost anything written on this piece of paper, and that is why I think I, for one ACRS member, would like to know what the status of the current plant before I would agree to a letter that said grant their extension of the license. I think it is like putting blinders on not to look at it.

MEMBER LEITCH: Yes. I don't see any problem looking at it.

So we went around the room at the

Subcommittee meeting. I believe that no one felt that an interim letter was required at this time. The full Committee should hear a presentation at an appropriate time, which is now expected to be about March of 2003.

PT, David, any additional comments?

MR. KUO: No, I have no further comment. Just one thing, I just want to point out that the EP in general is not in the scope of license renewal. Dr. Rosen, you just mentioned that there are two white items on EP, but that is generally not in the scope of license renewal.

MEMBER ROSEN: Well, I think that is fair enough for the staff to say, but the ACRS has broader discretion.

VICE-CHAIRMAN BONACA: Yes, I was just questioning whether we should, in the letter that we write to the Commission recommending that the license will be granted, make a statement about the current status of --

MEMBER ROSEN: No, I don't think so.

VICE-CHAIRMAN BONACA: No? Okay. That was the whole issue.

MEMBER ROSEN: I think if a license renewal plant came in that had all red findings --

VICE-CHAIRMAN BONACA: Oh, of course.

MEMBER ROSEN: -- but we recommended its license be renewed, I might have additional comments.

VICE-CHAIRMAN BONACA: I don't think it would come to us. But, anyway, you're right.

MEMBER LEITCH: That's it.

(Whereupon, the foregoing matter went off the record for lunch at 12:38 p.m. and went back on the record at 1:39 p.m.)

VICE-CHAIRMAN BONACA: Okay. The meeting is back in session.

Now, we are going to review the AP1000 design certification review by Westinghouse, and Dr. Kress is the lead person on this.

MEMBER KRESS: Yes. Well, you know, this is just Westinghouse wants to be sure we don't forget about them, and we're back keeping up to date on this before, you know. So eventually it's going to come to us to write some sort of letter on. So this is more of less filling us in on what's gone on up to date and getting us up to speed.

MR. BURKHART: Yes. Good afternoon. I'm Larry Burkhart, NRR's project manager for the review of the AP1000 standard design.

And, yes, the purpose of this discussion is primarily to give Westinghouse the opportunity to present the AP1000 design to you. To start that off, I'm just going to spend about five to ten minutes going over what we've accomplished and what's happened sine we last talked to you in March.

The last time we talked to you in March, we gave you an assessment of our preapplication review, which was limited to assessing applicability of the AP600 test program and analysis codes to the AP1000; acceptability of using design acceptance criteria in several design areas. I'll get a little more into that in a minute, and the feasibility of requesting three exemptions.

Since we last talked to you, Westinghouse has submitted its design certification application for the AP1000, and that was in March of 2002. They provided supplemental information over the next couple of months.

We performed an acceptance review and accepted the application for docketing on June 25th, and in accordance with the schedule, which I'll show you in a second, we issued 700 RAIs on all of the information.

To put that in perspective, we issued over 7000 for the AP600, and these numbers are a little different than what you may have. I updated them as of today.

As of today Westinghouse has responded to approximately 439 of those RAIs, and we are evaluating those right now.

Jim Lyons mentioned the schedule yesterday. These dates should reflect that schedule with a few more details. Westinghouse has committed to respond to the RAIs in nine weeks or by December 2nd of this year, and based on that, our plan is to issue draft safety evaluation report with open items by June 16th, 2003.

And let me just back up a second. The RAIs did not include any concerning the security aspects of the design certification application because we are reviewing if we need any new requirements. So the security portion of this review is on a different schedule. We're still working out these issues. So we may see, we probably will see some RAIs on the security portion of the review at some time. Hopefully it will still meet the schedule, but we're still working on that.

So draft safety evaluation report in June of 2003. Westinghouse addresses any open items, again, in nine weeks or August of 2003. We would plan to meet with the ACRS full committee shortly after the draft safety evaluation report is issued in June. We'll have some subcommittee meetings before that, and again, we would meet with the ACRS shortly before we issue the final safety evaluation report, which is scheduled for issuance no later than September 2004.

And that would be followed quickly by the final design approval, and the rulemaking would be completed no later than December 2005, and all of these dates were documented in a letter to Westinghouse in July, and we did commit to looking at the schedule to see, to explore any opportunities to shorten the schedule, if appropriate, and that would be based on the significance of the open items, how far we are from resolving the security requirements.

So what we have committed to is to review the schedule at the DSER stage.

MEMBER KRESS: If you come up with some security requirements, what would you do about AP600, which we've already certified? Would they have to meet the same security requirement?

MR. BURKHART: There are some options. Jerry, do you want to talk to that?

MR. WILSON: Jerry Wilson, NRR.

All of the certified designs have specific change requirements associated with them, and so if there was a new regulation that the Commission decided it wanted to backfit on those previous design certifications, we'd have to demonstrate that the new requirements met the appropriate backfit standards.

MEMBER KRESS: So it would be like a backfit.

MR. WILSON: Yes. Practically speaking, we probably wouldn't deal with it unless somebody referenced the design.

MEMBER KRESS: A security backfit is almost a sure thing though, isn't it?

MR. WILSON: Well, I'll make a note that you said that.

(Laughter.)

MR. BURKHART: So just a quick review. ACRS involvement, we're required by regulation to get a report from the ACRS for the final design approval, and we do plan on having several issue specific subcommittee meetings and probably two full committee meetings at the draft safety evaluation stage and final safety evaluation report stage.

So moving on, just to recap what we accomplished in the pre-application review, and again, the three topics as I've discussed before, in general we found that the AP600 test program and analysis codes are applicable to the AP1000 design certification.

A possible exception we identified is the issue of liquid entrainment, which I know you heard about yesterday and you'll probably hear more about today, and we are exploring that issue by RAIs and responses, and we will evaluate that.

We found acceptable the use of the DAC approach, design and acceptance criteria approach, for instrumentation and controls, control room, and piping design areas. And we believe that if sufficient justification is given, the three proposed exemptions should be justifiable.

In this slide, basically what I want to say is that we're not starting from scratch on the AP1000 review. Since the AP1000 design is based closely on the AP600, which we certified a few years ago, you know, we're not starting from zero.

We've done a thorough review of the AP600. We have the final safety evaluation report and the rulemaking that was completed for the AP600, and we'll use that as we can.

If certain portions of that evaluation are applicable, we will use it for the AP1000. We're really focusing on the changes here.

MEMBER WALLIS: Does the fact that you've got 700 RAIs, does that mean that there are lots of these changes?

MR. BURKHART: I wouldn't say a lot of changes. I would again put it in perspective with how many RAIs we issued for the AP600.

MEMBER WALLIS: Yeah, but how did you get so many RAIs if these are very similar plants, designed on a similar basis, similar codes, similar database.

MR. BURKHART: Right. I mean, many things shook out because of the changes. As you can imagine, there are a lot of topics that were covered in the RAIs, and you know, concerning a larger containment, larger structures. The seismic analysis comes into play there.

So there are a lot of issues that just because of the larger plant bring some things into question, may not invalidate our evaluation, but we need to ask certain questions.

And as you can imagine, there were quite a few technical topics, and now the next slide may -- numbers don't say everything, but it tells you a little bit.

MS. GAMBERONI: Larry, if I could add,

this is Marsha Gamberoni of NRR also.

A few of the RAIs or really more than a few of the RAIs, too, were based on some of the issues that have occurred in the industry in the last three years that needed to be addressed. Davis-Besse steam generator issues, other technical issues that we have more information on and we want to know how they're addressing those issues.

MR. BURKHART: That's true.

Here's a breakdown. When we issued the RAIs, we tried to categorize them just for tracking purposes and grouping purposes, and you can see where you could argue some of our focus is: reactor systems, reliability and risk assessment.

But, again, the technical issues vary all over the place, and the purpose of this presentation really isn't to get into the technical part of this. We will be engaging you on issue specific items in the subcommittee meetings and in the full committee meetings, but this just gives you an idea of how the breakdown was.

VICE-CHAIRMAN BONACA: I see a lot of questions in the reactor systems, auxiliary systems. Is the plant significantly different as laid out and most of our systemics?

MR. BURKHART: Not significantly significant, but as an example, probably 20 of these questions deal with the liquid entrainment issue, again, various topics. I would not characterize it as significantly different, no.

But, again, the exchanges bring into question some of the evaluation we've done, and we need to do a thorough evaluation.

So let's move on. So my assessment of the most significant issues at this time, you've heard it again and again: the liquid entrainment issue, which we are going to resolve.

And I think the last bullet there is what we really need to answer. How well do we need to understand the phenomenon versus its safety significance, and we are in the process of evaluating that. We will discuss that with you at some subcommittee meetings and full committee meetings.

MEMBER WALLIS: I thought Westinghouse was actually going to make this issue go away by showing that it didn't really make much difference.

MR. BURKHART: Right. They say it's not safety significance, correct. We just need to evaluate that.

And I've mentioned this issue also,

determining what the new security requirements will be, if any. Once that's determined, completing the AP1000 review, and to get that, we're narrowing down the schedule on that and hopefully it will support our schedule.

And that is my presentation, and again, the purpose of this discussion was to give Westinghouse the opportunity to provide their discussion of the AP1000 design.

So at this time if there are no questions, I would like to turn it over to Mike Corletti of Westinghouse to discuss the AP1000 design.

MEMBER KRESS: Were any of your RAIs -- you asked about the containment cooling, external. Were any of the RAIs about the external cooling?

MR. BURKHART: Of the containment?

MEMBER KRESS: Yes.

MR. BURKHART: Yes, I believe so.

MEMBER WALLIS: How rapidly is Mike going to speak?

MR. CORLETTI: Pretty fast.

MEMBER WALLIS: You have a whole book of slides

MR. CORLETTI: Just for the introduction, we're here today. My name is Mike Corletti. I'm with the AP1000 project team. I can introduce some of the members of our team that are here today.

We have Ed Cummins, who is the Director of AP600 and AP1000 project.

We have Bill Brown, who's responsible for our testing and analysis area, who seems to have left the building.

(Laughter.)

MR. CORLETTI: Here he comes. Bill Brown, who is responsible for testing and analysis.

We have Terry Schulz, who is responsible for system design.

And we have Selim Sancaktar, who is responsible for the PRA.

Today one of the purposes is we would like to give you really an overview of our AP1000 design certification review plan, and so I'm going to spend about 25 minutes on that to let you know what we've accomplished, what we accomplished in the precertification review and what we're doing as far as design certification, and some of our expectations on goals and what we're trying to accomplish.

And then we are going to have a talk on an overview of the plant design by Terry Schultz for about 50 minutes, and by 3:30 I think we're done.

We'll have maybe a half hour from Selim Sancaktar and an overview of our PRA. I think that adds up to two hours. So I'm going to shave off a few minutes just to end at 3:30.

Really I'd like to have about 15 minutes at the end of the meeting to go over with you to talk about future interactions and what you see as necessary because we are headed for a draft safety evaluation report in June. One of the things Larry didn't say, but it's our objective to have no open items for the draft safety evaluation report.

We are trying to be very responsive in our RAIs to have a target to close the issues by the draft safety evaluation report. That's our goal. I think that right now, I think NRC wrote us a letter back, which is right on the mark that said it was to early at this point in time to change the schedule, but let's stick to the next objective of that, which is right now December 2nd, answering all of the RAIs, and that's where we are.

So I think at the end of this meeting we're not looking for a letter from ACRS. We're looking for maybe some interactions on some future interactions that you would like.

As a way of just -- I know some of you are new to this committee since we received AP600 design certification. So I'd just like to start with the AP600 background just to give you some background.

AP600 is a standard plant which we received design certification in 1999. The technical review lasted from 1992 to about 1998, September of 1998, when we received our final design approval.

AP600, Terry is going to talk about the design features, but it was a 600 megawatt plant with passive safety features. It is the entire plant. It was not an NSSS, but it was an entire plant design, included the nuclear island and the turbine island.

With design certification, you heard a lot this morning about the early site permits. We have sit interfaces that are identified in our design certification that we use as our assumptions, and I think you hear about how those fit into the COL process.

We have quite a significant design effort with standardization. It requires a lot more of the engineering to be completed up front. For AP600, about 60 to 70 percent of the design was completed at the time of design certification. That was funded by both Westinghouse, U.S. utilities, Department of Energy, EPRI.

The total investment in AP600 by the industry is roughly $400 million, roughly $200 in first of a kind engineering and roughly $200 million in design and design certification of the licensing.

As I said, we had quite a significant review by the NRC and the ACRS, and quite a lot of years. A significant amount of testing. You know, we talked a lot yesterday about research and testing. The testing that we did in AP600 included separate effects tests, integral system performance tests, containment tests, component tests, quite a significant investment. Roughly a $40 million test program to support AP600.

And here are some of the gory details in regards to RAIs and meetings and ACRS meetings and what have you. The last bullet, AP600 was designed as a utility requirements document, and that served as a bid spec. as they talked as far as the new plants and for advanced plants.

High level key differences going from AP600 to AP1000, it's exactly the same, except for it's an 80 percent upgrade. So obviously it's not exactly the same, but we have increased the core length in a number of assemblies. Terry is going to talk to you about this in more detail.

But a key, I guess, to remember and I think you'll see it in Terry's presentation, our NSSS components are -- a big emphasis of the URD was proving this NSSS components, and you'll see we tried to stay within that provenness concept for AP1000.

Things like the reactor vessels in operation today; the core, the fuel is in operation today. The steam generators are very close to units that are built and operating today.

Canned motor pumps, we'll talk about that. That is a larger canned motor pump than we had for AP600.

MEMBER KRESS: Have you built and tested those?

MR. CORLETTI: No, we have not. We haven't built and tested pumps of that size.

MEMBER KRESS: But you will?

MR. CORLETTI: Our plan for COL would be to do a prototype. So the first plant deployment, we would build a prototype pump.

MEMBER KRESS: Well, canned motor pumps work pretty well.

MR. CORLETTI: Yeah.

MEMBER KRESS: A lot of people have used them. They've been around.

MR. CORLETTI: When we talked to our designers at the Electromechanical Division, yes. When we started with AP600, we had the largest one that they had built.

They have since been making bigger and bigger pumps, not quite this size, but larger pumps, and they are very, very good, reliable pumps.

Increased containment height. Increase the capacity of safety systems. Terry showed you a little bit of some of the safety analysis results, but really I think we're not going to get into too much of the details. I think we'll probably leave most of the details of that to a future subcommittee.

But we did increase the capacity of the safety systems to accommodate the safety margins.

MEMBER KRESS: They made some changes to the core, too?

MR. CORLETTI: To the core?

MEMBER KRESS: Yes.

MR. CORLETTI: Yes.

MEMBER KRESS: They made longer and longer fuel --

MR. CORLETTI: Yeah, we went with 14 foot fuel assemblies, which South Texas type fuel. It's also Doel and Tihange, two of our plants in Belgium that use this.

MEMBER KRESS: Had already used that.

MR. CORLETTI: Yes. And because AP600 was already a 1,000 megawatt reactor vessel, it was able to accommodate the additional fuel assemblies.

MEMBER KRESS: Did you have to up the enrichment any?

MR. CORLETTI: The enrichment is -- the power density, the kilowatts per foot is increased.

MEMBER KRESS: Increased?

MR. CORLETTI: Yes.

MEMBER ROSEN: Are you talking about 18 month cycles?

MR. CORLETTI: Our base is 18 month refueling cycle. You can go longer. The economics does not necessarily favor going to 24 months. When we did our economic evaluation to 18 months was optimum as far as fuel costs.

The key bullet there at the bottom is retained AP600 nuclear island footprint. The key to us, the reason was we had a significant investment in the nuclear island design. As I said, 200 million in first of a kind engineering was one of the drivers that we believed we could bring AP1000 to be ready sooner and really use the basis of the AP600 was keeping the nuclear island footprint the same.

And there you see with the exception of the steam generators being a little bit larger from this view, you can see that it --

MEMBER WALLIS: The only thing that I can see different is the size of the steam generator.

MR. CORLETTI: That's right.

MEMBER WALLIS: The only thing I can see different. Is that right?

MR. CORLETTI: From this view, I think that's right.

VICE-CHAIRMAN BONACA: It's a taller vessel.

MR. CORLETTI: The vessel is the same diameter, but it is longer. So you don't see it in this view.

MEMBER KRESS: What does the blue signify? Is that water?

MR. CORLETTI: No, it was just what the CAD system printed it out.

MEMBER LEITCH: Grading.

MR. CORLETTI: Yes. That's what that's showing, is the grading.

MEMBER KRESS: The grading.

MR. CORLETTI: Just the difference here.

You can see it a little more pronounced here between the AP600 and the AP1000. The containment is taller. No, we're not eliminating the containment despite the risk informed approach we heard about yesterday.

I wouldn't mind reducing the design pressure, but for another day, I think.

MEMBER ROSEN: What makes the containment taller?

MR. CORLETTI: We did tend to size it for the larger massed energy releases associated with a steam line break and --

MEMBER ROSEN: So that free volume concern.

MR. CORLETTI: Right. And in accordance with the URD, we have to design for steam generator replacement in a single component. So that helps make that a lot easier.

We didn't try to show that we could do it with the shorter containment, but that is another driver in the height of the containment.

MEMBER ROSEN: Does the equipment hatch allow for removal directly without --

MR. CORLETTI: Not on AP1000. AP600 we did, but AP1000, with this steam generator so large, we could not do that with the equipment. So we would have to make a cut in the containment.

Our studies that we've performed would show that you would take it up through the roof.

MEMBER KRESS: Is that shell around it removable?

MR. CORLETTI: I'm sorry?

MEMBER KRESS: Because of the concrete, the natural cooling shell.

MR. CORLETTI: This is open here. So it would allow for the removal of the steam generators.

MEMBER KRESS: Oh, that's open?

MR. CORLETTI: Yes.

MEMBER KRESS: You come right up through there.

MR. CORLETTI: Right.

MEMBER KRESS: I see. You wouldn't have to take that --

MEMBER WALLIS: It's open in the middle.

MR. CORLETTI: Yeah. You would have to do a lot of --

MEMBER KRESS: Yeah, okay.

MEMBER SIEBER: Can you get a reactor vessel header or O ring through your equipment hatch?

MR. CORLETTI: I don't think so. I don't think the head. I don't think we could on AP600 either or could we have. I don't think so.

MEMBER ROSEN: Would you have to cut any concrete around the steam generators to get them out?

MR. CORLETTI: Not the steam generators. I don't -- Ed, do you want to?

MR. CUMMINS: No. This is Ed Cummins.

The steam generators are liftable by the polar crane with enhanced actual crane rig, and then you need a heavy lift crane to lift it from the crane rails up through the center of the existing opening. There's a concrete shield thing that you see on the bottom there, but that could be removable. It has no structural importance. It's only a radiation shield plate.

MEMBER ROSEN: Could you point that out, that feature?

MR. CORLETTI: I think he's talking -- right here, Ed?

MR. CUMMINS: Yes. This is a concrete shield plate.

MR. CORLETTI: Shield plate.

MR. CUMMINS: It also handles rain and other things. You have to cut the steel containment vessel here.

MEMBER WALLIS: If you touch the screen

with a marker which is open, it takes another month for certification.

(Laughter.)

MEMBER ROSEN: No, you actually have bought the screen if you --

(Laughter.)

MEMBER KRESS: I don't know of anybody who would do such a thing.

MEMBER ROSEN: The Kress memorial smudge has been repaired, and we don't want another one.

MR. CORLETTI: This slide here just really shows you this phased approach to licensing AP1000. I think you heard a little bit about this yesterday, too on these precertification, prelicensing reviews.

We started, I think, our first discussions with NRC April 2000, and so that was when we started discussions on the precertification review.

We finished that in March. I think we received a letter from the ACRS. We received a letter from the staff and also a SECY in regards to the DAC issue, and we are now in this Phase 3 here which we have called the design certification review, and I'll talk a little bit about the results of that precert., precertification review.

But just to give you -- I believe you have our entire application. I think we provided it to the ACRS in a CD version. Our application includes our design control document; the Tier I information, which is the inspections, tests, analysis, acceptance criteria.

The purpose of these is when you built the plant, these are the tests and evaluations, analysis that must be done to confirm that the plant that was built is the same as the plant that was certified.

MEMBER KRESS: Are those pretty much the same as the --

MR. CORLETTI: They are the same, except for the exception of the acceptance value.

MEMBER KRESS: Okay, yeah.

MR. CORLETTI: So we are following essentially the same path. I mean, there may be one or two modifications, but it took a lot of sweat between us and the staff and the industry to decide what were those things that we would -- what these were, and we'd rather not go there, to come up with a new list for this plant.

MEMBER KRESS: I understand, yes.

MR. CORLETTI: Also, we have essentially the contents of a standard safety analysis report similar to an FSAR. It includes the tech specs, and it includes a summary of the PRA, but the full PRA is provided with our application, and we've also submitted about 20 topical reports all told in various subjects dealing with entrainment or QA plan and the whole gamut that really fill out the rest of our application.

I think some of our strategy or the way we're approaching certification, we are really trying to follow the policy issues that were established in the AP600 review.

We also made this claim when we started, that 80 percent of the DCD is the same. I think Dana said, yeah, but the tough 20 percent is what's different, but it doesn't really matter if it's 80 percent, 75 percent. I think the message is that a large part of our application is really based on AP600, and I think to focus the differences or highlight the differences, we provided this red line strike-out version of our DCD that showed changed pages.

I'm sorry. It changes to AP600 in red and strike-outs so that the staff could focus where the differences were, and they found them all and asked us all the questions about what the differences were. But it was a way, I think, to maybe make the review more efficient, is to try to highlight those changes, too with that.

MEMBER WALLIS: That's a pretty big reactor, that AP10000 you've got there.

MR. CORLETTI: Did I get it wrong? No, no, no.

MEMBER WALLIS: In the blue.

MR. CORLETTI: Oh. Well, that's our next upgrading.

MEMBER KRESS: It's ten of them on the side.

MR. CORLETTI: I got it right three out of four times, Dr. Wallis.

And I think just the -- and I think maybe a note on these RAIs maybe now. I think you said why did we have 700. I think many of the RAIs are the same questions as we received on AP600, but perhaps how we -- you know, it wasn't apparent in our DCD or in our PRA -- why the answer was still the same, and I think there's a bit of some of the answers to questions are important, but don't work their way into the DCD, but are referenced in the FSER.

So in order for this -- I think the staff is looking at the FSER. What were the safety claims? What were the safety basis for AP600? And they're making sure that all of those are still the same.

I think a lot of the RAIs are in that category as well.

Just a slide on the results of the precertification review. We were looking at the application of DAC, the piping, seismic and structural areas. I think we agreed that we would use the DAC approach for piping. I believe the ACRS spoke --

MEMBER KRESS: Yes, we wrote a letter on that.

MR. CORLETTI: Wrote a letter on that.

In the area of structural design, we're not following the DAC approach, but we are performing the structural design of the nuclear island critical sections that were performed for AP600.

In addition, the important issue is the issue of the applicability of our tests and analysis codes that were approved for AP600. Were they applicable for AP1000?

I think the staff agreed that, yes, they were applicable. They have --

MEMBER KRESS: That was based on redoing the PIRT and showing --

MR. CORLETTI: Right. The PIRT and the scaling report.

MEMBER KRESS: And the scaling.

MR. CORLETTI: That's right.

MEMBER KRESS: Yeah. We looked at that also.

MR. CORLETTI: Yes, you did. You reviewed that as part of the precertification review, and I think your letter addressed that. I think essentially your letter endorsed probably the conclusion of our reports and the staff's findings.

MEMBER KRESS: Yeah, i think we did. I remember.

MR. CORLETTI: The one issue is on entrainment, the treatment of entrainment.

MEMBER KRESS: yes.

MR. CORLETTI: And that is an issue that I think we're still working on. I guess the --

MEMBER KRESS: Are you involved in the Oregon State test or is that strictly NRC's?

MR. CORLETTI: No, we are. There are two test programs out at Oregon State. There was the Apex facility, which was used for AP600, and we did our scaling studies during a precertification review that showed those tests were applicable.

But as a follow-on, Oregon State was successful in getting a NERI program through DOE to do

AP1000 tests.

MEMBER KRESS: Oh, yes.

MR. CORLETTI: So we've been cooperating with Dr. Reas in Oregon State on that, and in fact, we are I would say more than cooperating, but, yes, we are cooperating. We have provided then AP1000 design information. We're working on the scaling because it's an important set of tests.

Because the AP600 tests were scaled sufficiently to AP1000, we don't see the need to redo code validation based on those results, but we do believe that it will be useful for the staff as confirmatory analysis.

I know one of the elements of approval for AP600 was the confirmatory analysis that the staff did. I think this will provide the staff with the needed information.

MEMBER KRESS: What is the status of those tests? Will they be done in '03?

MR. CORLETTI: Well, in my understanding there's going to be a readiness review in December, and then following that they're ready to start testing shortly thereafter.

There is another facility that is the at last facility at OSU. It's sponsored by research.

Westinghouse has not been using that test facility as far as did not use it for AP600.

MEMBER KRESS: That was the one that was entrainment, wasn't it?

MR. CORLETTI: That's right. And I think we have some RAIs on that, and we owe some answers on that. I think that the issue of entrainment we should probably take up at a future subcommittee meeting.

MEMBER WALLIS: I think the key question with these OSU tests is not when they start, but when they're finished and when they're analyzed, and will they be analyzed in time to have any influence on the decisions made here.

MR. CORLETTI: As I said, because of the results of the precertification review, based on the scaling we did, we do not believe we need to rely on those for code validations.

MEMBER WALLIS: But they might have some surprises.

MR. CORLETTI: I think that will be the reason the staff will use as far as confirmatory.

MEMBER WALLIS: They will be done in time to have some influence?

MR. CUMMINS: This is Ed Cummins.

I think Westinghouse would say that we

already agreed that we didn't need test. "We" as the staff, the ACRS, the NRC and Westinghouse agreed we didn't have to do test in order to validate the codes for the AP1000.

We would claim we do not need those tests for our certification. I believe the tests, however, will be done before the certifications issue.

MR. CORLETTI: Yes.

MEMBER WALLIS: So we will be able to see the results of those tests before we're asked to make decisions on this today?

MR. CUMMINS: Well, we'd say you already agreed you didn't need the results of those tests.

MR. CORLETTI: Right.

MR. CUMMINS: I mean, you have to be careful --

MEMBER WALLIS: Well, it's not clear that every member of the committee had that point of view.

(Laughter.)

MR. CUMMINS: I think so, yes.

MR. BURKHART: This is Larry Burkhart.

I would say while the user need that we sent to Reactor Systems did not request testing to resolve the issue, however, I think -- and Steve Bajorek is the person to talk to the schedule -- I think if we have the information, we will look at it and incorporate it as we can.

Steve, do you have any more?

MEMBER WALLIS: It seems like a practical approach though. I mean if it's there, it should be used.

MR. BAJOREK: This is Steve Bajorek from Research.

We've been keeping a close eye on the facility modifications in the schedule at OSU. It looks as though they're going to be ready to start their hot testing in December and have the first sets of results early in 2003.

That's within I guess I would call the critical period where we're going to be answering the RAIs, trying to resolve some of the critical issues. So I think that the important part of the data is going to be there.

You know, I've encouraged Jose, the DVI line break should be one of the first ones done, and if that's in the schedule and moved up, I think we'll have it.

MR. CORLETTI: I think it is important to remember the results of the precertification review in regards to scaling. Now, how we've chosen to address it because we couldn't rely on the test really to make our application, and we've provided COBRA/TRAC, WCAP topical report where we do the detailed modeling of the area in question during entrainment, many sensitivity studies and noding studies, trying to see what the sensitivity, the plant performance is to this phenomenon.

And I think the staff has asked us RAIs on that topical, and we're providing the answers to those.

It is our position that we believe that the information -- that the studies that we've performed show the overall sensitivity to this is very small, and I think we need to resolve it.

We have a technical difference right now. It is an open item.

MEMBER WALLIS: Hot leg entrainment, I can sort of see why. Once the hot leg is dry, it doesn't matter, and you're not going to drop the level below that, but the entrainment from the core itself, if it's very easy to entrain liquid and sweep it away, I would think they would have to have an effect on the dryout, on the core.

MR. CORLETTI: It has an effect on the phenomena. It's a matter of does it -- there's variations in the magnitude of that. It makes a difference in your overall system performance.

MEMBER WALLIS: Well, clearly if it's big enough, it must.

MR. CORLETTI: I think the part of the equation that we tend to forget is the injection flow that's feeding this reactor vessel in this passive plant. If you look at it as a pot of water boiling, sure, entrainment is going to be large. If you remember that we have a 500,000 gallon tank of water feeding the nozzle, it's quite easy to see that variations will not make a big difference.

MEMBER WALLIS: So maybe you can make a bounding calculation which is convincing.

MR. CORLETTI: And we try to do that in our WCAP.

MR. BURKHART: Yes, and this is Larry Burkhart.

And I guess what we could say is we are looking at all information available, including Westinghouse's RAI responses and any available test information.

MR. CORLETTI: I think probably, unless you're disagreeing with it, I think this is probably the level of this meeting, but I do agree we need to probably get into some of the --

MEMBER KRESS: Yeah, these are some of the things we'll follow up on in additional meetings.

MR. CORLETTI: In regard to the safety analysis codes, also from the precertification review there were several I'd call them open items from the precert. review. I think the staff said, "We believe you need to show this to demonstrate issues with each of the codes."

We've provided those either in our analysis that we've presented in our DCD or in follow-up RAIs, the answers to our follow-up RAIs dealing with each of the codes that were reviewed as part of the precert. review.

Okay. I think this is an important scheduled. Well, not this one.

This is just a summary -- I'm sorry -- of the history. I think Larry covered it in regards to the numbers of RAIs. Seven hundred were received, and 440 is the number I have, not 439. So I'm not sure of that.

MR. BURKHART: I'll double check that.

MR. CORLETTI: We lost one.

(Laughter.)

MR. CORLETTI: We've also had design

information. We've provided the detailed design information, engineering drawings of our design for the staff. They're doing the confirmatory analysis.

We had two sessions, one with the full staff, with the reviewers reviewing the AP600 where we went over our full application, and one full day on the PRA.

I would encourage if you don't have those presentation packages that you get a copy of those. They're fairly comprehensive.

I'll work with Ed to make sure everyone has a copy of those presentation packages because I think in preparation for the subcommittee meetings, I think you'll find it useful to kind of highlight some of the differences also.

In addition, we have more information today that we can cover, but our plan is to let you take that back and review it so that when we come to the subcommittee meetings, we can get into the details where you'd like.

This next slide is a fairly important one. It's talking about scheduling, and as Larry said, we have an agreed upon schedule, June 16th actually, for the draft safety evaluation report. It is our goal; we're trying to do everything in our power to have no open items in that draft safety evaluation report, to provide sufficient information to the staff so that they can resolve any issues of safety that they need to.

I think as we see it, the most important thing is we have to provide our responses by December 2nd. There will be audits, I believe, the first quarter of 2003, but in addition, I think the staff has agreed that in February they would let us know what are potential open items.

And what this means is which of our RAIs perhaps did not sufficiently resolve any issues. So which of our RAIs remain open?

So we're hoping that if we can have an opportunity to have additional interactions, that potentially we could meet to improve our schedule.

This I'd say is our official schedule, and that's our target. I think our message is if we want to improve the schedule, if we don't have a target, we're not going to get there. But I think this committee needs to at least be prepared; we would like this committee to be prepared that in the July time frame, if we're able to resolve the issues, that we can also resolve any issues that you would have in that time frame.

But I think we need to think about; I'd like us to think about that as far as planning our subcommittee meetings over the next six, seven months.

That's all I have. I think I come back to this at the end. I think clearly, treatment of entrainment is an issue that we're going to just have to talk to you all about. I think the PRA is one that I know you've expressed interest in having subcommittee meetings, and perhaps I'd like to hear from you at the end of our presentation in regards to what other topics you might want to hear.

With that I'll turn it --

MEMBER WALLIS: Are we going to talk about the PRA today?

MR. CORLETTI: We have a summary discussion of the PRA, time remaining, of about 30 minutes. I'm not sure, maybe 20 minutes of the PRA, but it will be a summary of what we've presented.

MEMBER WALLIS: If there will be some mention of it, we can ask questions.

MR. CORLETTI: Yes.

MEMBER WALLIS: Okay.

MR. CORLETTI: Okay. With that, I'm going to turn it over to Terry.

MR. SCHULTZ: Okay. Good afternoon. I

will continue talking here, and I'm Terry Schultz, and I'm working the systems design area.

And we'll try to walk you through a quick overview of the AP1000 design. The list of key design features is exactly the same as it was for AP600.

Mike mentioned it's an overall plant design. Use of proven power producing components is a key objective for us and our utility partners. Simplified loops with can motor pumps, simplified passive safety systems with an objective to increase safety margins, for example, no pool uncover on small LOCAs, and to address up front design features to adjust severe accidents.

Going along with the simplification theme, to also work on the nonsafety systems; microprocessor based digital INC system; along with their compact control room; an integrated optimized plant arrangement, thinking about construction in terms of constructability, operation, maintenance, safety, cost. All is together.

And let's see. Extensive use of modularization of the plant. That was something that has been considered from the beginning of the design, in sizing and arranging components, as well as just thinking of how you put them in the plant.

The next overhead Mike has actually already shown you, and added the key differences. So I'm actually just going to pass by this. Mike has already talked about the increased size core. At this level of detail, and I'll be touching on each of these in some more detail as we proceed here.

Okay. Here now you can see a comparison of some key reactor parameters, comparing a Doel/Tihange, three plants. These are three loop Westinghouse plants that have essentially the same reactor vessel diameter and length, the same number of fuel assemblies as AP1000 has, the same fuel assembly type, the same fuel length, 14 feet.

You can see here the power density. AP1000 is higher than AP600, as well as Doel and Tihange. We have operating plants that are now in this power density range, and in the near future we expect plants to actually be going slightly above this.

We have increased the number of control rods, and we've maintained the use of gray rods. So for load follow we don't have to move boron around, just like AP600.

You could see here the total vessel flow has been substantially increased. Of course, this takes bigger reactor coolant pumps and all. I'll talk about those.

Here you see the total steam generator surface area. This is of all the generators in the plant. So we have substantially increased the heat transfer area. The pressurizer has also been upscaled.

MEMBER ROSEN: It's curious to me that you've used all Doel IV and Dihange as a comparison. Why wouldn't you use STP, South Texas?

MR. SCHULTZ: This uses the same fuel as South Texas. Okay?

MEMBER ROSEN: Yeah.

MR. SCHULTZ: It's closer in terms of the reactor vessel sizes, the same diameter. In fact, all three plants here have the same reactor vessel diameter. So it's closer in terms of total power output and reactor vessel diameter.

MEMBER ROSEN: To Doel and Tihange?

MR. SCHULTZ: Doel and Tihange, yes.

MEMBER ROSEN: South Texas is actually bigger.

MR. SCHULTZ: It's a four loop plant. It's basically --

MEMBER ROSEN: Twelve, fifty.

MR. SCHULTZ: -- the same rating per steam generator as Doel and Tihange, but it's got one more generator.

We have increased Tihange slightly from AP600, but it's still well below operating plants that we have out there.

Here you can see the basic loop arrangement, and it's exactly the same as AP600, two steam generators, four cold legs, four reactor coolant pump, can motor pumps. The loop arrangement is identical, the same size pipes, the same one weld per pipe or -- excuse me -- two welds per pipe, one in either end. So there's no welding of elbows to straight pieces and that kind of thing.

A large surge line. The surge line is actually the same diameter on both AP600 and AP1000. AP600 had a surge line that was basically dictated by the use of ADS valves on top of the pressurizer. We have not changed the size of those ADS valves on AP1000.

We've significantly increased the size of the fourth stage, which connect directly to the hot legs, but we haven't changed the size of the ADS-1, 2, and 3 on top of the pressurizer. I'll talk a little bit more about that when we talk about the passive systems.

But as a result, the surge line we've kept identical to AP600. I've already talked about the fuel internals reactor vessel, the use of same fuel as Duoel, Tihange, and South Texas. There is no bottom on instrumentation. This is the same AP600, AP1000 which is different than typical Westinghouse plant where you have fixed in core instrumentation that comes in through the top now. So our bottom is completely clean.

This simplifies plant arrangement, and facilitates the in vessel retention capabilities of the plant.

MEMBER ROSEN: How about refueling? Is there a rapid refuel package?

MR. SCHULTZ: Not like South Texas, no. No, South Texas has some very unique features in terms of being able to take the head off very quickly. We have done a lot of optimization of refueling outage planning with utilities, but we have not put in some of the very special features.

We have some enhanced shutdown purification capabilities relative to operating plants, and we have a relatively short, maybe 17 day fueling outage type plan.

South Texas originally was designed for even shorter than that.

Steam generators are larger. The same basic design features as AP 600 in terms of materials, tube support, all those features. The size is bounded by Westinghouse-Combustion Engineering steam generator sizes, and Westinghouse has actually built some ANO replacement generators which I'll show you later, that are almost the same size as what we're building here.

So even though these are bigger than a typical Westinghouse steam generator that we've used in the past, it's within our current experience base.

And motor pumps are a very important part of the plant design. They are larger than AP600. However, there is a large experience base with them. Mike talked a little bit about where we are relative to that experience base, and again, I'll talk a little bit more about that.

The loop arrangement is the same. We have significantly reduced the number of welds in the loop and supports. The pressurizer is also larger.

MEMBER WALLIS: Why is the pressurizer larger?

MR. SCHULTZ: We have taken as a design objective, first of all, not to require pressurizer power operated relief valves. So we want to be able to ride out anticipated transience without lifting the safety valves, which requires a certain size pressurizer. It also generally gives us a little more forgiving plant design in terms of upset transient type conditions without tripping your reactor and that kind of thing.

As I mentioned, the same 17 by 17 fuel. There are 12 more fuel assemblies in AP600, and they're basically put on the flats, three here or three here, and so on. And that's just like was done for the typical three loop Westinghouse plants.

The fuel is two feet longer, and that is identical to what we've done in Doel and Tihange and South Texas. I've talked about that.

One thing I haven't mentioned is the core is what we call a little boron core design. Basically at the beginning of life the boron concentration will be maybe 1000 ppm instead of 1200 or more.

This buys us a margin in performance capability improvement relative to ATWS and boron dilution.

MEMBER ROSEN: Do you have a positive moderator temperature coefficient of reactivity at any time during the cycle?

MR. SCHULTZ: No. No, we don't. It's always doing an equilibrium core cycle. It's always negative sufficiently to allow a ride-out of an ATWS transient even at the beginning of life.

The first core cycle was negative throughout the core cycle, but the very beginning of the first core cycle we can't really ride out an ATWS transient, but it's still negative.

MEMBER ROSEN: But your control rods --

MEMBER WALLIS: It's insufficient. You need some boron as well.

MR. CORLETTI: Well --

MEMBER WALLIS: To control reactivity?

MR. CORLETTI: We move boron around to handle burn-up. So at the beginning of life --

MEMBER WALLIS: You have to have some boron at the beginning of life.

MR. SCHULTZ: Yes. In the first core cycle, because of the nature of that, we have some more burnable poisons in there, and the moderator coefficient isn't as negative at the beginning of that cycle as it is in subsequent cycles.

So this is a safety improvement. It helps us also in the PRA when you look at the contribution of --

MEMBER ROSEN: What's the EUR requirement?

MR. SCHULTZ: European Utility Requirements. So the European utilities have put together requirements like the U.S. utilities, but they have their own spin on things, and one of them was to require a low boron core design. So we had some experience in working with them on a passive plant like AP600 in Europe, and we decided to adopt this core design for AP1000.

We've had some increased shutdown margins versus AP600. I've mentioned gray rods and 18 month cycle.

Again, the reactor vessel, the same diameter as AP600 and our typical three loop plants. The vessel is about 20 inches longer in length, not two foot longer in length. We saved a little bit of vessel length by shortening the gas point or the fuel assemblies.

Let me mention the radial reflector. The AP600 had in the core barrel region an almost solid stainless steel blocks with some cooling holes drilled through them that operates as a radial reflector that improved the fuel economy and also reduced effluence on the vessel.

When we put the extra 12 fuel assemblies into AP1000 in those flat areas, it really thinned out where the reflector was in those spots, and it raised doubts in our minds about the ability to have a reliable, robust reflector design.

So we ended up adopting a Westinghouse CE type shroud design, core shroud design. This is an all welded design that is used in the typical Combustion Engineering type plant.

So we have adopted that type of a baffle area design for AP1000.

MEMBER ROSEN: And that's different from AP600?

MR. SCHULTZ: Yeah. AP600 had a radial reflector which was a massive stainless steel blocks that made up that area. That was different than a typical westinghouse plant that had the barrel baffle formers with all of the bolts to hold it together.

And here you can see a picture of an actual core shroud design that was built for one of the Korean plants. This was actually very similar size in terms of diameter to the what we would use for AP1000, and here's pretty much the story that I just told you.

This will increase the fluence in the vessel somewhat, but with the modern material we have, there is no concern with being able to have a 60 year vessel life. So even though the fluence is somewhat higher for AP1000, we still comfortably can meet the 60 year life of the vessel.

MEMBER ROSEN: What do you say is the life of the steam generators?

MR. SCHULTZ: They are designed for the life of the plant. However, we also design so that we can replace them without -- you know, Ed Cummins was talking about how we can take them out as one piece through the containment.

Steam generator performance has dramatically improved over what we had in the past. So we're seeing a lot fewer tubes being plugged. So with the design features that we have now, the life of the steam generators are significantly increasing from what we've had in the past.

Whether we'll make 40 or 60 years we don't know.

MEMBER SHACK: Is the shroud a replaceable component?

MR. SCHULTZ: It's not welded in. It is welded together as one piece. Okay?

MR. CUMMINS: The internals in total are replaceable. The shroud is part of the internals.

MR. SCHULTZ: The shroud is part of the internals, and it can be replaced as a single piece. So it's welded together, but it can still be removed from the reactor vessel.

DR. FORD: With 316L presumably?

MEMBER WALLIS: Why does it look like that? Why isn't it just a continuous --

MR. SCHULTZ: I don't know what the material.

DR. FORD: Presumably.

MR. SCHULTZ: Yes.

MEMBER WALLIS: Why is it not a continuous cylinder? Why does it have this strange structure with --

MR. SCHULTZ: Well, it has to form the flats that the fuel assemblies stick up against. Okay? So it forms the region between where the fuel assemblies go. So what you're seeing on the outside there, these funny angle pieces are the outsides of the pieces where the fuel assemblies go.

This whole piece sits inside the core barrel. So that forms the nice, smooth, downcomer region.

MEMBER WALLIS: And then you have these sort of belts around it, which hold it together?

MR. SCHULTZ: That's part of the structural.

MEMBER WALLIS: Why don't you have them all the way around it? Why do you have spaces?

MR. SCHULTZ: In between here?

MEMBER WALLIS: Yes.

MR. SCHULTZ: It's not needed from a structural point of view.

MEMBER WALLIS: It would help your fluence presumably to have some more stuff there.

MR. SCHULTZ: It might. We actually thickened some of the steel up here for the IDR story, but I don't think we made this continuous.

DR. FORD: More welds. There are an awful lot of welds there.

MR. SCHULTZ: Yes.

MR. CUMMINS: This is Ed Cummins.

It's mostly one bent plate. They bend the plate in all those directions. It's one bent plate all the way around, and then they weld it once, and then they weld these reinforcement things. There are also some vertical reinforcement things.

DR. FORD: So it's not a welded --

MR. SCHULTZ: No, no. It's a vent plate.

DR. FORD: That's good news.

MEMBER WALLIS: There's something for cooling or something. There seemed to be some cooling passages or something in it.

MR. SCHULTZ: Well, certainly cooling water goes --

MEMBER WALLIS: Yes, if you look at it, there's some structure below those belts that looks like a coolant passage going underneath the belt there or something.

MR. SCHULTZ: Under here?

MEMBER WALLIS: No, no, go up there. No, go down about four -- there, those things, yes.

MR. SCHULTZ: Yes, that's total axial flow up in this region.

Okay. I mentioned the steam generators are larger, basically using AP600, delta 75 design features; also the experience that Westinghouse CEs had with larger steam generators.

Here you can see the two ANO steam generators at Westinghouse, Pittsburgh actually built for one of the Combustion Engineering plants.

We will, of course, have the reactor coolant pumps connected into the channel head, like AP600 was designed. You can see the pumps here from a bottom view.

The larger steam generator facilitates connecting those pumps. AP600 we actually had enlarged the channel head a bit so that we could get the pumps connected to it. With this bigger steam generator, they fit very easily.

MEMBER SHACK: So this is a quatrefoil rather than egg crate?

MR. SCHULTZ: Yes, yes. It's a quatrefoil Westinghouse tube support technology.

MEMBER WALLIS: Your feedwater ring has J tubes or something on it, does it?

MR. SCHULTZ: Yes. They don't show up in this.

MEMBER WALLIS: Well, they show up on one side, yeah.

MR. SCHULTZ: Yes, right, right, but this arrangement is a typical modern Westinghouse raised feedwater ring with J tube connections on top of it.

There is a separate lower power aux feedwater, start-up feedwater connection from the main feedwater.

MEMBER ROSEN: And these are like the South Texas replacement steam generators?

MR. SCHULTZ: Yes.

MEMBER ROSEN: Delta 75, that's the same?

MR. SCHULTZ: Yes. The technology in terms of the tube materials, tube support, channel head, the moisture separators are all the same technology. There are just more tubes here.

MEMBER SHACK: Are these 11/16 or some strange dimension?

MR. SCHULTZ: I believe so, yes.

PARTICIPANT: I think the area is.

MR. SCHULTZ: Yeah, you get lots of surface area.

Reactor coolant pumps, we've had to make some changes here. I'll touch on the next slide, the actual flow power requirement changes. This is basically going through some of the major advantages in terms of no shaft seals, therefore no seal failures; wire lubricated bearings, no oil. That's a fire hazard we've eliminated.

We have significantly increased the flywheel inertia relative to AP600. The loss of flow transient, we've picked up margin versus AP600, and I'll show you later on how much of that has happened.

One thing we did do is we added a frequency control for the reactor coolant pumps. This will only be used during shutdown cold type operation conditions because that is limiting in terms of the pump power. When you're pumping cold water, it's more dense. It takes more power to do that, and in a typical PWR, that controls how big the motor has to be in the pump.

So by slowing the motor down somewhat in cold conditions, we don't have to make the motor quite as big, and that was a benefit for the can motor pump design.

MEMBER ROSEN: How do you switch to normal frequency?

MR. SCHULTZ: Well, you have a frequency control that you bypass during power operation. So it cannot malfunction and somehow slow the pump down during a power operation.

MEMBER ROSEN: Now you're in refueling and operating at a lower speed, and you -- do you start the refueling operation? You're in low speed, but then at some point you're ready to go back into service.

So take me through the transition. What do you do, shut the pumps off and then turn them on at a higher speed?

MR. CUMMINS: This is Ed Cummins.

No. It's very similar to parallel link to electrical buses. The variable speed drive runs at 60 hertz, and you synchronize it with your normal 60 hertz, and you parallel and trip the variable speed drive.

So you do not turn the pump off in between.

MEMBER ROSEN: Did you analyze the accident of the device not getting it synchronized correctly? What happens there?

MR. CUMMINS: Well, that accident happens any time anybody parallel any bus, like when you test the diesels, for example.

MEMBER ROSEN: Yeah. What do you do there?

MR. CUMMINS: So when that happens, you have to replace the breakers because they all burn up or whatever. They're ruined. So the parallel linked breakers are breakers that you can buy and replace. This should not be a problem for power plant people.

MR. SCHULTZ: And it's only --

MR. CUMMINS: It'd done on every shutdown, let's say.

MR. SCHULTZ: But it's done after you've shut the reactor down or with the reactor shutdown. So it's not a nuclear accident type concern.

MR. CUMMINS: Yeah, the variable speed

drive is only used when the scram breakers are open.

MEMBER ROSEN: I'm just having you talk me through what happens, is you at some point during the start-up switch to normal 60 hertz.

MR. SCHULTZ: Yes.

MR. CUMMINS: When the reactor coolant temperature got 500 degrees or 450 degrees.

MR. SCHULTZ: Something relatively hot.

MEMBER RANSOM: What kind of bearings are used? Are these rolling contact bearings or are these sleeve?

MR. SCHULTZ: No. They're water lubricated bearings because the water in a can motor pump extends down into where the motor area is, and the bearings are a sleeve water film type bearing.

MEMBER RANSOM: Just a sleeve bearing the, huh?

MR. SCHULTZ: Yes.

MEMBER RANSOM: Is just the rotor canned or is the entire secondary fuel canned also?

MR. CUMMINS: This is Ed Cummins.

Both the starter and the rotor are canned,

MEMBER RANSOM: The what?

MR. CUMMINS: Both the starter and the

rotor are canned. Water runs in between the two.

MEMBER WALLIS: Do you have any idea if there's a mechanical efficiency of this pump?

MR. SCHULTZ: Of the motor?

MEMBER WALLIS: The pump, the hydraulic efficiency.

MR. SCHULTZ: The hydraulic efficiency of this pump, we actually changed the pump arrangements. It's an axial --

PARTICIPANT: Radial.

MR. SCHULTZ: Radial.

MEMBER WALLIS: There's not much of a diffuser on there, is there?

MR. SCHULTZ: This one is a littler more efficient than the AP600 was. We also don't have to have different rotations on the motors and pump. I don't know what the efficiency is. It's very high.

MR. CUMMINS: I think it's 85. It's quite good hydraulic efficiency, though the canned motors themselves are poor relative to other motors in efficiency. So they're also sort of in the 80s and they should be in the 90s for a normal motor.

MEMBER WALLIS: So it's important to cool them then, isn't it?

MR. CUMMINS: Well, it is important to

cool them. I think really this maybe is a tradeoff in the economics. The real issue is that power that you use to run your reactor coolant pump you can't sell and so -- but certainly the utilities, at the time of the utility requirements document, were weighing reliability over efficiency.

MR. SCHULTZ: And less maintenance. These pumps require very little maintenance.

Here you see a few more of the parameter.

MEMBER ROSEN: Well, you say very little maintenance. Do you say that the life of the motor is more than ten years?

MR. SCHULTZ: Oh, yes.

MR. CUMMINS: I think the issue is the inspection/maintenance time. I think that is 12 years between maintenance or inspection on the average, which is --

MEMBER ROSEN: A little bit longer.

MR. CUMMINS: Yes.

MEMBER ROSEN: Normal, ten.

MR. CUMMINS: Yeah.

MEMBER RANSOM: What are the minor connections on the motor up between the motor and the pump on the previous slide?

MR. SCHULTZ: There were cooling water

connections. There's two areas of cooling in the pump. One of them is in the -- to remove heat that's generated from the motor, and this is also a thermal barrier up here to keep the -- this is the flywheel area. So we have a thermal barrier. We have to keep heat from soaking down into the top part of the pump.

So these connections are for cooling water.

MEMBER RANSOM: And that has no connection to the primary water, I guess.

MR. SCHULTZ: That's right. That's right. So separate inside of like a tubing, heat exchanger kind of --

MEMBER ROSEN: That's component cooling water?

MR. SCHULTZ: Yes.

And here you see the major parameters in the pump, and we've increased the design flow, the design head, and most of that head is due to the longer fuel that we have to push the flow through, but we also did not increase the hot leg/cold leg pipe sizes.

The rotating inertia you can see here went up by more than a factor of three, and that was done intentional. It keeps the D&B correlation for this plant in the more traditional area where we have good data and have had very little uncertainty, whereas AP600, with the smaller inertia was dropping down to flow rates that were relatively low, and we had to use D&B correlations that had more uncertainty in them. So we've ended up with a benefit in AP1000 for loss of flow accidents.

It does take more power to run this pump.

MR. CORLETTI: Terry, I'm going to give you until five minutes after three.

MR. SCHULTZ: Okay.

MR. CORLETTI: Just to gauge your slides. Thanks.

MR. SCHULTZ: Okay.

MR. CORLETTI: Unless we can have more time, but I think we have more things to get to today.

MR. SCHULTZ: Let me basically skip this. This is pressurizer. We just increased the length to get more volume.

Height is relatively cheap in inside containment and had little impact on the design. This is a little system sketch of the reactor coolant system. It's identical to AP600 with a couple of minor pipe size changes through passive or HR, and the ADS Stage 4 gets bigger.

ADS Stages 1, 2 and 3, which are connected to the pressurizer, are exactly the same size as AP600. We've found from out testing and analysis that ADS Stage 1, 2, and 3 are not so important, especially when you want to get low pressure injection from IRWST and long term cooling from the containment. The Stage 4 is the dominant flow path. So we concentrated our efforts in design to make those bigger for AP1000. And I'll talk more about that.

Okay. I'd like to now move on to talk about passive systems. The design approach, safety approach is exactly the same as AP600. We're using passive systems as a, quote, unquote, where we have one time alignment of valves. No support system is required after the actuation, no AC power, cooling water, HVAC type systems required. They're greatly simplified in terms of what actions, activities are needed to keep the plant safe.

A greatly reduced dependency on operators.

MEMBER WALLIS: There's more dependency on predicting it right because your pumps aren't forcing the flow. It sort of happened by nature.

MR. SCHULTZ: Yes. Yes, that's -- once you do get that understanding though, you end up with a plant that has a lot less equipment to maintain, but you do have to be able to analyze properly how the systems do work, yes.

We still have active, non-safety related systems. Reactor make-up, start-up feedwater. We have two diesels in the plant. They're non-safety shutdown cooling systems just like AP600. They're not required to mitigate design basis accidents.

Passive safety features, these are treated with the full treatment in terms of design, QA, ASME codes, single failure for design basis accidents. We consider they are the primary defense in the PRA. So in some cases we have introduced diversity of valves, extra redundancy of valves to improve the PRA results.

Typically we have a very low dependency on operator actions. Once you turn these systems on, they can just keep running.

MEMBER WALLIS: But you don't put model uncertainty into your PRA?

MR. SCHULTZ: That's a different kind of a question Selim will actually --

MEMBER WALLIS: We heard yesterday that for passive plants it's more important.

MR. SCHULTZ: You're talking about thermal hydraulic uncertainty as opposed to equipment uncertainty.

MEMBER WALLIS: Yes.

MR. SCHULTZ: I would say equipment uncertainty --

MEMBER WALLIS: Not being quite sure what happens, yes.

MR. SCHULTZ: Yeah, we have much less uncertainty in equipment.

MEMBER WALLIS: Yes.

MR. SCHULTZ: We may have more uncertainty in thermal hydraulic predictions, and we have bounded that with thermal hydraulic analysis.

The general arrangement of the passive systems is identical between AP600 and AP1000. We have the same number of tags, basically the same number of valves. We, of course, did increase the capacity of the passive safety features. Core power went up about 76 percent, and here you can see some of the increases in capacity.

The passive OHR, which is very much related to your moving core power and transience was almost exactly, not quite, but almost exactly increased to match the power levels.

Core make-up takes were not increased as much. We learned from our testing and analysis that we had margin in the sizing of the core make-up tanks.

When we originally sized them, we didn't understand AP600 as well as we do now. So we were able to increase the core make-up tanks less than the core power increase and still maintain good safety margins.

Where we really concentrated our efforts are in the low pressure IRWST injection and containment recirc. Those are the areas where we're most sensitive to low DPs in operation of the plant. So we increase those capacities more than the power increase in order to provide some additional margin for AP1000.

And you can see especially in containment recirculation we've really gained something there.

MEMBER WALLIS: Now, your accumulators are the same.

MR. SCHULTZ: Accumulators are the same.

MEMBER WALLIS: They did not increase their size.

MR. SCHULTZ: That is true. They have the same injection flow rate capability and size.

MEMBER WALLIS: But compared with the volume of the core, they contribute less; the volume of the vessel, they would contribute less in the make --

MR. SCHULTZ: They get water to the core

at the same time. Okay? Because the downcomer lower plenum is exactly the same. It is a bit longer. It takes a little longer to fill --

MEMBER WALLIS: But the break flow rate is the same. So they're making it up at the same rate.

MR. SCHULTZ: Yes, and we do end up with higher peak clad temperatures. They're more like current operating plants than AP600 which had very, very low large break LOCA peak temperatures.

For small break LOCA, we've maintained the AP600 capabilities in terms of no core uncovery for accidents that are up to DBI line break, which is a challenging event because it breaks off half of our injection capability.

We've also maintained that no operator action is required for steam generators to rupture, which is a very unique, good capability for AP600 and AP1000.

MEMBER RANSOM: Early in the AP600 there was some concern about the PRHR heat transfer capability due to the fact that it's a natural circulation loop and two bundle. What was done to resolve that? And especially the code modeling, I guess, there was a lot of concerns about how to model the flow through that heat exchanger.

MR. SCHULTZ: I think the nature of the concern, as I understand it, was was our test data sufficient to justify the correlations we used in our computer codes. For AP600 we did some sensitivity studies where we reduced the amount of passive RHR capability arbitrarily.

We also did some predictions of what heat transfer you would get in ROSA, which Westinghouse-NRC testing in ROSA, and we were able to predict that testing very well.

So the combination of those things, in particular, the predicting of the ROSA testing convinced ourselves and the staff that our correlation for heat transfer of the passive RHR were good and accurate.

MEMBER RANSOM: What do you use for those accident analyses? Is that COBRA/TRAC that --

MR. SCHULTZ: No, it's LOFTRAN.

MEMBER RANSOM: LOFTRAN?

MR. SCHULTZ: LOFTRAN, our typical, the normal transient type.

MEMBER RANSOM: And there you have models for those heat exchangers?

MR. SCHULTZ: Yes, that were specifically programmed, coded to match the test data that we got on the passive RHR.

Let's see. We've got about five or six more minutes here.

PARTICIPANT: Seven.

MR. SCHULTZ: Seven? Thank you.

(Laughter.)

MR. SCHULTZ: In order to get the increased capacity of the passive RHR, what we did we used the same elevation. The heat exchanger is located in the refueling water storage tank, and we didn't move it. So we really had to keep the heat exchanger in the same place.

We did increase the size of the pipes to 14 inches, and that reduced the pressure drop through the heat exchanger. We added a few more tubes, and we increased the horizontal section length of the tube. So we got more surface area in the heat exchanger, and that's what we did to increase the capacity of the heat exchanger.

Let me skip the next slide. It basically just shows you where the heat exchanger goes inside containment, and this shows you a couple of the plots out of the Chapter 15 accident analysis. This is for loss of main feedwater accident, and the way we model this is reactor coolant pumps keep going, and you can see the small delta T and the temperatures, until the temperature gets down to a trip point for the reactor coolant pumps, which is an excessive cool down kind of safeguards.

And at that point in time, the reactor coolant pumps trip, and the passive RHR then transitions from a forced flow. As long as the reactor coolant pumps are running, the flow through the heat exchanger is forced by the pressure of the pumps. When the pumps stop, then the heat exchanger transitions to a natural circulation mode of operation. The delta Ts between hot leg and cold leg increase, but you can see the margin between the saturation temperature up here and the hot leg and cold leg temperatures is significant.

This is in the order of 140 degrees Fahrenheit. AP600 was a little bit more, maybe 170 degrees. Typical operating plants are a few degrees. So both AP600 and AP600 had substantially more margin in terms of subcooling than operating plants.

In this accident, the pressurizer approaches being full, but stays below filling. So you don't get over filling of the pressurizer.

Let me move on to LOCA protection. There was a slide on tube rupture which basically just showed you that we automatically terminate the tube rupture, and a key feature of that is the passive RHR heat exchanger. That can cool the primary site down to less than secondary site conditions.

Passive safety injection capabilities, again, same configuration, numbers of tanks, valves as AP600. We have changed some capacities of pipes and tanks that the cumulator didn't change. We didn't change it in terms of pipe sizes.

The core make-up tank, we increased the volume 25 percent. We got 25 percent more flow by increasing the orifice, opening the orifice up a bit. We didn't have to change the pipe size.

The IRWST injection lines went from six inches to eight inches, and so did the recir lines. They were six inches and now they're eight inches. So that increased our capabilities of injection.

ADS Stage 4 increased to 14 inches to give us substantially more fourth stage capability, which is a key to the low pressure injection.

I've already talked about the accumulator and how we didn't change that and we get higher peak clad temperatures, but they're similar to operating plant.

Core make-up tanks. Let's move on to

IRWST injection. Using the same boundary conditions in terms of water in the tank, which we did, by the way, increase slightly by reducing the uncertainty in measuring the water during normal operation.

We had about a foot error tolerance in there because we were using just wide range tank level monitoring. Now we added some small, and we were able to eliminate level errors, and we could raise the normal water level and IRWST some, and that gave us a little bit more head for initial injection.

That combined with the bigger pipes substantially increases injection capability.

MEMBER WALLIS: What's your worst pipe size break for PCT?

MR. SCHULTZ: Well, for large break LOCA, a double ended cold leg.

MEMBER WALLIS: Does that give you the highest PCT?L

MR. SCHULTZ: Yes.

MEMBER WALLIS: So the largest break is the worst.

MR. CORLETTI: Yes, the large break, large double ended cold leg break.

MR. SCHULTZ: Cold leg. Now, hot leg breaks are a less severe, of course, but the cold leg is the worst, yes.

ADS-1, 2 and 3, as I mentioned, was not changed. This helps us in the design point of view because the design of the valves and piping on top of the pressurizer was a very complicated, tricky design. Also, you don't have to change the sparger design, and the IRWST loads on the tank due to the initial opening of the ADS valves, and it also isn't really necessary for the safety of the plant.

MEMBER WALLIS: So that piping layout is Westinghouse specified. It's not something some architect engineer can change from plant to plant.

MR. SCHULTZ: That's right. As Mike mentioned, we have a total plant design; includes pipe routing. Something like that is very important.

MEMBER WALLIS: That's a real advantage.

MR. SCHULTZ: Yes, yes. It clearly reduces both yours and our work to make the plant safe and good.

Stage 4, we still use the squib valves to initiate the Stage 4. There's four of them, two on each hot leg. The pipe size of both the squib valves and the common pipe has been increased.

Critical flow area goes up about 76 percent, and the subcritical flow goes up about 93 percent.

MEMBER ROSEN: Is that something people have experience with, big valves like that, 14 inch valves, squib type?

MR. SCHULTZ: Squib valves are -- basically every one that you buy is custom designed. So it's not like you go to Edwards and you buy a motor operated gate valve, and they have a catalogue of standard valves.

They've built a valve this big, but not necessarily this high, pressure combination. They built a valve that's basically the same size as AP600 as a prototype; actually did it for General Electric in your SBWR design.

We're using the same design configuration, but it's being scaled up from the ten inch to the 14 inch. So this will be a new valve design, and it will be a little bit larger than what they built before.

MEMBER ROSEN: Clearly a lot of detailed testing to do yet on that valve off location?

MR. SCHULTZ: There is detailed design and testing will have to be done for the first plant. The valve is very simple. So it greatly reduces the amount of testing that needs to be done to verify that it works, but some testing will be needed, yes.

The next couple of slides show you some of the short term cooling -- oh, gee. Mike is going to cut me off here.

MR. CORLETTI: I would think, Terry, you'd want to get probably the one on containment and then show them your Slide 53 on safety margins.

MR. SCHULTZ: Okay.

MR. CORLETTI: It would be pretty important.

MEMBER WALLIS: I guess these wiggles we see here are evidence of the balance between gravity and other effects and some kind of a cyclic nature that has to be produced as well? The spikes, 150 seconds.

MR. SCHULTZ: Yes, this is a capability of where you get some injection. You get increased steaming. The pressure goes up. Injection slows down.

MEMBER WALLIS: That's the purpose of the critical thermal hydraulics person to say, "Did you get that right?"

MR. SCHULTZ: Yes. That's something you can --

MEMBER WALLIS: We can look at that later.

MR. SCHULTZ: Yes. Okay. Passive

containment cooling. Mike talked about the volume and design pressure was increased. Here you see main steam line break and a double ended loca result. The main steam line break has a higher peak pressure. We have big steam generators in here, and there's just two of them. So if you break the steam line, it's challenging.

However, the steam line break is not really sensitive to the passive containment cooling. Basically a volume and a little bit of passive heat sinks and that turns the accident around.

The LOCA is more limiting in terms of passive containment cooling operation, and generally the margins for AP1000 are a little bit bigger than they were for AP600 using the same analysis approach.

MR. CORLETTI: Terry, could you just show Slide 51 just to show them the system?

Sorry for jumping you on this. The one right before that.

MR. SCHULTZ: The cross-section that Mike showed of the containment has the water cooling tank. It's located -- supported by the shield building. We have now three different valves any one of which can initiate the drain-down. AP600 had two, had two air operated valves, which we still have.

We added a third valve here, which is a motor operative valve to get some diversity from a PRA point of view.

MEMBER WALLIS: You'd better show the water actually running down the containment. It seems to just go into a little trough.

MR. SCHULTZ: It goes into a bucket which provides some initial direction of the flow equally around the containment. So it spills over the side and enters from --

MEMBER WALLIS: If that bucket were tilted in a seismic event, it would only flow down one side?

MR. CORLETTI: I don't know how it could tilt. The whole plant would have to tilt, which I don't think is -- and still, the --

MEMBER WALLIS: Flow distribution is always a problem with these kinds of thing to make sure that it doesn't just go down one side.

MR. SCHULTZ: We have weirs to collect and redistribute the water around the containment in the upper regions here.

MEMBER POWERS: The Chairman of this subcommittee is an extremely suspicious person.

(Laughter.)

MEMBER POWERS: And he flat doesn't

believe all of these arrows and stuff like that, and he's asked me to look into this in great detail because he doesn't. He's very suspicious.

And I've been having a devil of a time finding your analysis of this flow. Can you help me find that?

MR. SCHULTZ: The analysis of the flow.

MEMBER POWERS: The air flow.

MR. SCHULTZ: There was testing done on AP600 on the flow distribution. We did a pie section, full size section of the containment up in Pittsburgh, Walt's Mill, where we simulated the plate maldistribution and stuff along the plates.

MEMBER POWERS: What the Chairman of this subcommittee is worried about is the air flow.

MR. SCHULTZ: The air flow. Okay. I thought you were talking about water flow.

MEMBER POWERS: No.

MR. SCHULTZ: Okay.

MEMBER KRESS: Well, the Chairman was worried about that, too.

MEMBER POWERS: But he kind of believes in gravity.

MEMBER WALLIS: Well, if the water is cold enough, the air might go the other way.

MR. SCHULTZ: I don't know how the air could go the other way. There is a baffle that goes down to basically where the heated part of the containment could be. So if the air heat in here, it seems like it's got to go up and then draw air in from the inlet area down here.

MEMBER POWERS: You surely have frictions and inlet coefficients and things like that --

MR. SCHULTZ: Yes.

MEMBER POWERS: -- some place.

MR. SCHULTZ: Yes.

MEMBER POWERS: Where is all of that stuff?

MR. SCHULTZ: It's in our calculation.

MEMBER POWERS: Where are you calculations?

MR. SCHULTZ: In Pittsburgh.

MR. CORLETTI: No, no, no. This is Mike Corletti.

Probably the best thing to look at from an AP1000 specific document would be our GOTHIC -- two volume GOTHIC WCAP, which ties together the testing that was done to our analysis code and goes into all of the gory details of that.

That's one of our topicals that we

submitted for AP1000, but backing that up is the slew of tests that we did for AP600, and we've really used the same methods and analysis that we did for 600.MR. SCHULTZ: One of those tests was the air flow test.

MR. CORLETTI: Yeah.

MR. SCHULTZ: To quantify the inlet, the turning losses. We actually have a device in here to try to minimize the losses down there which we designed and tested, supported the AP600.

MR. CORLETTI: Right. Dr. Powers, I'll get you or I'll work with the APR staff to make sure you have a copy of that, the AP1000 document.

MEMBER POWERS: I can't find anything.

MR. CORLETTI: On the AP1000 GOTHIC analysis?

MEMBER WALLIS: Did you do the air and the water together?

MR. CORLETTI: I'll get you all things containment, AP1000. I mean, we have a slew of reports.

MEMBER WALLIS: Together? Because water affects the air, doesn't it?

MR. SCHULTZ: We've done some separate tests.

MR. CORLETTI: Terry.

MEMBER KRESS: You know, you were asking what some of the additional interactions might be, and on my list is, one, to look at containment cooling and the calculations. So that may be a separate subcommittee.

MR. BROWN: Dr. Wallis, Bill Brown.

We have back in Westinghouse also at the Science Technology Center -- we did an eight scale test of both water with air with the baffle. That is, in fact, still physically up there if you ever want to look at it, sitting rusting in the back parking lot somewhere. It's still sitting back there, and it's actually plexiglass. You can look through it.

Anyway, we do have test reports on that that we could point you toward.

MEMBER WALLIS: It would be interesting to see that, yes. Please make a note of it.

MR. SCHULTZ: The final slide I guess I will show here is a summary of safety margins. I talked about DNB margin and how AP1000 has actually increased over AP600 mainly due to a larger flywheel in the reactor coolant pump feed line break, and transient subcooling margins are not quite as good as AP600, but substantially better than operating plants.

We talked about tube rupture and no

operator actions; small LOCA, basically the same as AP600 in terms of no core uncovery.

Large break LOCA we have increased into the realm of operating plants.

MEMBER RANSOM: How does this plant handle ATWS?

MR. SCHULTZ: Very well.

(Laughter.)

MR. SCHULTZ: I mentioned the low boron core.

MEMBER RANSOM: Pardon?

MR. SCHULTZ: I mentioned low boron core earlier in my discussion. What that means is that throughout an equilibrium core cycle, moderator temperature coefficient is low enough so that we can ride out an ATWS transience 100 percent of the time without exceeding the pressure limits in the reactor.

MEMBER RANSOM: So you don't vent the pressurizer?

MR. SCHULTZ: Oh, yes, yes. No, no, no, the emergency stress limit. So we go up to 3100 psi. Safety valves do open.

We also have a diverse trip of the rods, which we wouldn't -- I'm not even taking credit for in that transience. So if the rods go in, the safety valves won't open or they'll open briefly and reclose.

But even if the diverse rod trip doesn't work, then we can still write out the transient 100 percent of the time.

MEMBER RANSOM: Is that a feed and bleed type of operation, where you bleed the system and then feed more?

MR. SCHULTZ: Well, in the short term, passive OHR gets turned on by the diverse activation system. We trip the valves to the turbine. That maintains a heat sync as we transition from full power down to some low power.

We get a substantial heat up, swelling, and we do relieve some water and steam out of the safety valves, but then that stops. Core make-up tanks can come in and provide make-up without actuating ADS and borate the plant and eventually shut the reactor down.

MEMBER RANSOM: It's basically heating up the moderator that shuts it down.

MR. SCHULTZ: That's right. Typical BWR, Westinghouse BWR response.

MEMBER RANSOM: The question I had is: what have you done to eliminate the Davis-Besse type of problem with stress corrosion cracking, nozzle cracking, and corrosion in general?

MR. SCHULTZ: Basically not use Inconnel 600 there.

MEMBER SHACK: That's a good start.

MEMBER RANSOM: Are these more inspectable? You know, one of the problems with Davis-Besse is they didn't inspect what was going on on the upper head.

MR. SCHULTZ: Well, there's certainly some things that can be done from an operations point of view to minimize the chance of that reoccurring in any plant. I don't know that we're any more --

MR. CUMMINS: No, it's not any more inspectable.

MR. SCHULTZ: Yeah.

MR. CUMMINS: It might even be a little more difficult because you have the end course (phonetic) there, too, from the top.

MR. CORLETTI: I believe that was the subject of an RAI, too.

MEMBER SHACK: Is your insulation glued on then?

MR. SCHULTZ: No.

MR. CUMMINS: No. Ed Cummins.

We have an integrated head package. The

insulation is on the outside of a steel frame basically. So it's a more modern, like modern, South Texas sort of heads.

MEMBER SIEBER: The canned motor pump should help you detect leakage a little better.

MR. CORLETTI: The next presenter is Dr. Selim Sancaktar. He's going to talk about the PRA.

And I wanted maybe five minutes to wrap up at the end. How long can we give?

DR. SANCAKTAR: Yeah, how many minutes do I have?

MEMBER KRESS: Well, we have another item on the agenda, and it depends on how long those people are willing to stay and talk to us.

MR. CORLETTI: Yeah, I was asking for maybe 15 minutes for Selim. Is that okay?

MEMBER KRESS: That seems reasonable.

MR. CORLETTI: Okay. Thank you.

DR. SANCAKTAR: Okay. One of the interesting things that we had when the AP1000 PRA started was where do we start, you know. What's the initial conditions?

I mean, one can go to one extreme and say let's assume there was nothing before; I'm starting with a clean slate, and the other extreme is to rubber stamp the previous design, both of which would obviously not be suspect to one side or the other of the fence.

So we had to find a way to approach this, and I think we did a -- personally, I believe that we did a pretty decent job of it, and we tried to identify differences clearly not only in the design components. You know, it's not a surface thing, but also the implication on the success criteria, and some of the implications are actually reflected here.

There are very subtle things that kind of show themselves slowly as we looked into it. One that Terry mentioned was if you notice we had to add another valve, the PCS, passive containment cooling, because AP600 was pretty much sufficient with air cooling.

Now, it's not really enough. The air cooling alone, we don't really do it. We need the -- it would do it for a while, but not all the way through three days. So you need to increase the reliability of the PCS.

It turned out that although this is just a tank with two valves, it's sort of a complicated system. Common cause of the two AOVs to open was a major problem at least in a numerical sense, is a reliability problem.

So we have to introduce a third, very simple change, a third line with an MOV, which is different from AOV, and it was orders of magnitude. You know, it didn't give us like three orders of magnitude or anything like that, but gave us a little bit more so that we could use it.

So other examples of it varies here and there, and hopefully in the next presentation maybe I can show you a few more details that you may find interesting.

I'll try to find some interesting slides here for some conclusions because this is all basically stuff that can be read at your convenience.

Well, I would probably jump to -- let's see. I want to say one thing about large LOCA, then maybe show you some other core damage results.

Something interesting happened here. As Terry mentioned and you have observed, accumulator sizes did not go up in this plant for whatever reasons. Terry can go into it if you want to. So if you think of it from a PRA side, you know, suppose somebody comes to you as a designer and says, "Shall I or shall I not increase the accumulator size?" from a PRA point of view, from a risk point of view, what does that mean really?

In this --

MEMBER WALLIS: It's a good way for making a decision.

DR. SANCAKTAR: Yes. This is, I think, an excellent example. It also shows you -- you can look at it as a good example of PRA or a bad example of PRA, depending upon what your points of view, and I'll point out both of them because it's kind of obvious it's transparent. You'll catch onto it anyway in a matter of time.

(Laughter.)

DR. SANCAKTAR: If you look at AP600, the initiating event frequency was ten to the minus four. That was a WASH 1400 legacy kind of number, and then NRC itself has sponsored recently in 1999 time frame or so studies where we have five times ten to the minus six random failure of our really large pipe, and this kind of a number, five times ten to the minus six, was reported there.

So almost ten years after the AP600, initial AP600 analysis, we are nearing formation that says large LOCA is not -- this random break of pipes -- is not really such a big deal. So then what is the accumulator success criteria?

You can either keep it the same size; then you need both accumulators. You need two of two accumulators for success, whereas in AP600 one was enough. So either you retain the size, you take a penalty in --

MEMBER KRESS: Now, success in this --

DR. SANCAKTAR: -- in this sequence.

MEMBER KRESS: Success in this sense is defined as keeping the core covered? No?

MR. CORLETTI: No, it would be peak clad temperature less than 2200.

DR. SANCAKTAR: So either you can say, "Okay. I'll take a punishment here," which we did, which we couldn't if this was ten to the minus four, and we had a sensitivity analysis in the study that shows it. You know, this is open.

So or you can say, "Okay. I'm going to change the design slightly, make the accumulators larger, and this number will improve and become ten to the minus nine or whatever," you know, because it will be one out two accumulators.

So this is a deliberate decision on our part, and it's transparent, and it's part of the insights of the PRA and the interaction between PRA and the design.

MEMBER WALLIS: Well, maybe in a logical world the PRA should help drive the design.

MR. CORLETTI: Well, on AP600 we did seven PRAs where we used PRA as a design tool. The eighth PRA is on the AP1000. So it has been a natural use as a design tool for the entire project.

DR. SANCAKTAR: Here are some typical numbers for some missions of certain systems. I group them by decades so that you can see like 20 minus sixth and seventh level is here. So you can look here and say does this really make sense, you know.

Something up here should -- like we shouldn't say CCVS up here somewhere or we shouldn't have a passive system that is liable with these down here. That's so something is wrong. Either it's a mistake or it's a bad design.

So you can look at this as some way of trying to understand what did we really use, but when you look at a bird's eye view, does this make sense?

CHAIRMAN APOSTOLAKIS: Now, you know we're going to have a subcommittee meeting on the PRA.

DR. SANCAKTAR: Yes, a much longer meeting.

CHAIRMAN APOSTOLAKIS: A much longer.

MEMBER ROSEN: More than seven minutes.

(Laughter.)

CHAIRMAN APOSTOLAKIS: And you will give us, or maybe you have already given us, a document that explains how these numbers were derived.

DR. SANCAKTAR: Yes. These are like a fault tree. Basically these are fault tree results.

CHAIRMAN APOSTOLAKIS: Let me understand the PMS. What is PMS?

DR. SANCAKTAR: PMS is the plant protection system starting from --

CHAIRMAN APOSTOLAKIS: Plant protection system? Why is it MS?

MR. CORLETTI: Protection and safety monitoring system. In the AP1000 project, we have hundreds of systems with three lettered designators, and all of them end in S. so we're down to two letters. So we are challenged sometimes to come up acronyms.

CHAIRMAN APOSTOLAKIS: So this consists of what?

DR. SANCAKTAR: It starts from the sensors themselves, takes you to the processors, then to the safety systems they actuate, and it stops just before it gets to its safety system. So it includes the sensor, sensor, common cause, processors, cabinets, software failure, this and that.

MR. CORLETTI: It is all safety related INC. So our safety related INC system is the PMS. Our control system --

CHAIRMAN APOSTOLAKIS: And this is digital, right?

MR. CORLETTI: Yes, digital, and our control system is PLS, and our diverse actuation system is DAS. So those are the three major INC systems.

CHAIRMAN APOSTOLAKIS: Now, on Slide 78 --

DR. SANCAKTAR: Yes, it is a huge number.

CHAIRMAN APOSTOLAKIS: Yeah, I mean, I wonder -- this is raw, isn't it?

DR. SANCAKTAR: Yeah.

CHAIRMAN APOSTOLAKIS: This is the risk achievement worth.

DR. SANCAKTAR: Basically if you fail the --

CHAIRMAN APOSTOLAKIS: Sixty-five thousand eight hundred and seventy-eight, what does that tell us?

DR. SANCAKTAR: That tells us that if this system fails, you cannot deal with LOCAs and so on. You can only handle transience and other things by using non-safety systems, and that's all it says. You have very simplistic sense because we are taking --

CHAIRMAN APOSTOLAKIS: But you see --

DR. SANCAKTAR: -- codes for PSM, DAS and PLS.

CHAIRMAN APOSTOLAKIS: You still have a frequency of about one in 100 --

DR. SANCAKTAR: Yeah.

CHAIRMAN APOSTOLAKIS: -- that you may have core damage.

DR. SANCAKTAR: Yeah. So this is the sum of all LOCAs and stuff that has steam line breaks and so on that --

MEMBER ROSEN: So because of the importance of this system, you want to make sure it's highly reliable.

DR. SANCAKTAR: Yeah, and that's why we have DAS and also --

CHAIRMAN APOSTOLAKIS: But this does not include DAS.

DR. SANCAKTAR: No, it doesn't.

CHAIRMAN APOSTOLAKIS: No, it does not. Well, I guess the thought that came to my mind when I saw this number is that we keep saying in risk informed system we should maintain the defense in depth philosophy.

So I'm wondering now if I have a row of 65,000, am I maintaining the defense in depth philosophy?

DR. SANCAKTAR: There is still DAS in there.

CHAIRMAN APOSTOLAKIS: But DAS is something else.

DR. SANCAKTAR: DAS will allow you to manually actuate some of the selected set of safety systems.

CHAIRMAN APOSTOLAKIS: Well, I don't know. Is anybody else bothered by it, 66,000 raw?

MEMBER ROSEN: Well, if you look at the SSPS --

CHAIRMAN APOSTOLAKIS: Would it be a Risk 1 category?

MEMBER ROSEN: Oh, yes. Oh, yes, but it would be highly reliable, highly redundant, but if you assume these highly reliable, highly redundant systems fail, you're going to get risk achievement where it's likely.

MR. CORLETTI: There's no --

MEMBER SHACK: -- the vessel.

CHAIRMAN APOSTOLAKIS: No, the vessel is

out.

MR. CUMMINS: Yeah, this system is for four train, completely independent train, four divisions with four actuations just like you have in modern INC systems. So with most --

DR. SANCAKTAR: I know what's bothering you. Let me answer that, if you don't mind. I know what's bothering you. I understand that.

MEMBER ROSEN: You think you so.

DR. SANCAKTAR: The DAS -- no -- yes. Actually DAS -- I bet I do.

MEMBER ROSEN: Yeah, yeah.

DR. SANCAKTAR: I believe that this does not reflect DAS.

CHAIRMAN APOSTOLAKIS: No, it does not because --

DR. SANCAKTAR: I think these numbers should be better.

CHAIRMAN APOSTOLAKIS: -- PMS is different, right?

DR. SANCAKTAR: The reason why it doesn't is we also kill the sensors. See, sensors are in this same, and they feed different -- like they also feed DAS and other things. So this is actually killing not only the cabinets, but like it's not only taking out the brain of a person, but taking off his sensing devices and so on. So he --

CHAIRMAN APOSTOLAKIS: That would be terrible to do that to a guy and he doesn't have brains.

DR. SANCAKTAR: So actually if we just took out the electrical part, just the processing part, the sensors theoretically can process the DAS and --

CHAIRMAN APOSTOLAKIS: So when we have the subcommittee meeting maybe we can spend some time on this.

DR. SANCAKTAR: Yes.

CHAIRMAN APOSTOLAKIS: What is the philosophical indication of a raw of 66,000? It is something that I shouldn't even calculate because it reflects the failure of a highly redundant one out of four system?

MEMBER ROSEN: That's probably the answer with that.

MEMBER ROSEN: No, I think you should calculate everything. You shouldn't be afraid of a number, George.

(Laughter.)

CHAIRMAN APOSTOLAKIS: I don't know what

integrated decision making process has maintained defense in depth philosophy. As far as I'm concerned, I'm not maintaining it here.

DR. SANCAKTAR: But you are actually to some degree.

CHAIRMAN APOSTOLAKIS: Well, see, that's what I'm saying. Maybe it's a meaningless thing to calculate.

MEMBER KRESS: I think so.

MEMBER SHACK: We could raise the core damage frequency.

CHAIRMAN APOSTOLAKIS: But it will be smaller.

MEMBER ROSEN: I think it's the property of the way that raw is defined.

CHAIRMAN APOSTOLAKIS: Well, anyway, I intend to --

MEMBER KRESS: It's a subject worth thinking about.

CHAIRMAN APOSTOLAKIS: -- to understand it a little better.

MEMBER ROSEN: You guarantee the failure of a system that you have spent enormous amounts of time and money guaranteeing the success of, and then you calculate what its raw is. Well, obviously, if you were successful, making it highly reliable and highly redundant, it will come out 65,000 or more. That's a test of how good you were in designing this highly reliable, highly redundant --

CHAIRMAN APOSTOLAKIS: The system is digital.

MEMBER ROSEN: It better come out high like that.

CHAIRMAN APOSTOLAKIS: Yeah, we really don't have very good methods for assessing the reliability of digital systems.

MEMBER ROSEN: That's another subject.

CHAIRMAN APOSTOLAKIS: It's related.

DR. SANCAKTAR: If you do this to a current plant, I mean, if you find the equivalent of this in a current plant and take it out, you'll get 10,000 or whatever it is. It's ten to the minus five, for example, core damage. It's going to go to one basically because there is nothing left. I mean even aux feed won't work.

So what? I'm just telling you what it is basically.

CHAIRMAN APOSTOLAKIS: Well, the whole point of calculating these importance measures is to tell you what it is and maybe do something about it or think about it.

DR. SANCAKTAR: Yeah, but remember --

CHAIRMAN APOSTOLAKIS: I'm not prepared yet, but I'm just telling you that this is something that may --

MEMBER WALLIS: But, George, if you made it more reliable maybe this number would be even bigger.

PARTICIPANT: That's right.

(Laughter.)

MEMBER RANSOM: Well, it seems like what you really need to know is what is the probability that --

CHAIRMAN APOSTOLAKIS: No, there are two answers to this. First of all, do you believe that it's so reliable sine it's not a standard system that we have methods for, and second -- let's see. What on earth was the second one? Oh, the difference in depth again. Is it something that we take seriously or not?

Anyway, let --

DR. SANCAKTAR: But, again, let me emphasize one point, which I didn't decide before. This is not only the record part. This is also the sensors and everything.

CHAIRMAN APOSTOLAKIS: Yeah.

DR. SANCAKTAR: So it is inadvertently discrediting DAS, which shouldn't really because I cannot imagine a situation where all of the sensors and all of the electrical stuff and everything is suddenly gone. You can say, okay, all of the cabinets are gone, but software --

CHAIRMAN APOSTOLAKIS: But that's why I'm saying, Selim, that maybe it's a meaningless thing to calculate. So let's think about it.

DR. SANCAKTAR: That's possible.

CHAIRMAN APOSTOLAKIS: Because you can say arbitrarily what if I lose 80 percent of my systems. What is the role?

DR. SANCAKTAR: Also --

CHAIRMAN APOSTOLAKIS: Well, I don't want to report it then if it's meaningless.

DR. SANCAKTAR: It's the same number as or similar number as in AP600. I mean, it's not the first time you are seeing it.

CHAIRMAN APOSTOLAKIS: Yeah. Well, if you look at the conventional plants now, do you see numbers like this?

MR. SCHULTZ: Higher.

CHAIRMAN APOSTOLAKIS: Higher?

MEMBER SHACK: No, because the CDF isn't

as small.

CHAIRMAN APOSTOLAKIS: These are relative things.

DR. SANCAKTAR: If you have a plant times ten to the minus five in a conventional --

CHAIRMAN APOSTOLAKIS: I don't recall any role that was in the 60,000.

DR. SANCAKTAR: You're going to get what, 50,000 or whatever the number is

MEMBER ROSEN: Yeah, but no one system does that. The answer is to your question I've never seen a number that high, but I've seen multi-thousands.

VICE-CHAIRMAN BONACA: Yeah, and I haven't seen the RPS ranked either.

DR. SANCAKTAR: After a few thousand, but they're all the same.

CHAIRMAN APOSTOLAKIS: Anyway, you know, these are suggestions for discussions in general.

DR. SANCAKTAR: Okay. I guess I overran my time, but --

CHAIRMAN APOSTOLAKIS: Yes, you did.

DR. SANCAKTAR: -- here is --

CHAIRMAN APOSTOLAKIS: Oh, no, I'm sorry. I'm not chairing.

(Laughter.)

DR. SANCAKTAR: But here is the summary. We'll pick it up next time from where --

CHAIRMAN APOSTOLAKIS: The other thing though, again, two points for January.

DR. SANCAKTAR: Yes.

CHAIRMAN APOSTOLAKIS: Why are all of your numbers here point values?

DR. SANCAKTAR: Which ones?

CHAIRMAN APOSTOLAKIS: You know, you're saying that the CMT valve signal failure probability, 5.7, ten to the minus seven. With a number like that, it would be interesting to see what kind of uncertainty we have.

DR. SANCAKTAR: Okay. Let me make sure. Are you looking at page 73?

CHAIRMAN APOSTOLAKIS: Seventy-three, yes.

DR. SANCAKTAR: Okay. Would you say it one more time?

CHAIRMAN APOSTOLAKIS: The very first entry.

DR. SANCAKTAR: Yeah.

CHAIRMAN APOSTOLAKIS: CMT valve signal.

DR. SANCAKTAR: Five, point, seven minus --

CHAIRMAN APOSTOLAKIS: Yeah. I mean, how uncertain are you about it? This is a passive system, is it not? No.

DR. SANCAKTAR: It's not a system. It's just a valve signal.

CHAIRMAN APOSTOLAKIS: It's a valve.

DR. SANCAKTAR: The system itself is further down, core make-up tanks --

CHAIRMAN APOSTOLAKIS: Where is that? Core make-up tanks is ten to the minus four.

DR. SANCAKTAR: Yes, core make-up take system is 1.1 minus four.

CHAIRMAN APOSTOLAKIS: Yeah.

DR. SANCAKTAR: This is just a signal.

CHAIRMAN APOSTOLAKIS: Right.

DR. SANCAKTAR: One train, it's qualified.

CHAIRMAN APOSTOLAKIS: Ten to the minus four came from where?

DR. SANCAKTAR: From the whole system, multiple valves failing and this and that.

CHAIRMAN APOSTOLAKIS: Not physical failure of the tank.

DR. SANCAKTAR: Right, right. This first number you're seeing is one train. Just what's the probability of failing only one train.

MEMBER SIEBER: One device, you mean.

DR. SANCAKTAR: One device by auto and -- both auto and the manual fail. It's insignificantly small. However, the system failure which is further down is CMT, is like --

MEMBER SIEBER: Has a lot of other contributors.

DR. SANCAKTAR: Right. It's here.

CHAIRMAN APOSTOLAKIS: So what does it mean? Yeah, I know what it is.

DR. SANCAKTAR: Yeah. This number, if you remove the manual, drops to ten to the minus, say, five just for the sake of argument.

CHAIRMAN APOSTOLAKIS: Yes.

DR. SANCAKTAR: If you remove DAS, it will go down to ten to the minus four, and so on.

CHAIRMAN APOSTOLAKIS: Now, Selim, on page 80, you go to overkill, page 80, Slide 80. Show 80, 80, eight, zero.

DR. SANCAKTAR: Oh, eight, zero.

CHAIRMAN APOSTOLAKIS: You know what's coming.

(Laughter.)

CHAIRMAN APOSTOLAKIS: How did you use the cyrtosis in your design?

DR. SANCAKTAR: Just like everybody else.

CHAIRMAN APOSTOLAKIS: This is critical, 386?

DR. SANCAKTAR: We use it just like everybody else.

CHAIRMAN APOSTOLAKIS: Now, you will explain to us in January why you have that little bump there?

DR. SANCAKTAR: This bump?

CHAIRMAN APOSTOLAKIS: Yeah.

DR. SANCAKTAR: I'm sure we --

CHAIRMAN APOSTOLAKIS: No, no, the other one.

DR. SANCAKTAR: Oh, this?

CHAIRMAN APOSTOLAKIS: The second one.

DR. SANCAKTAR: This bump?

CHAIRMAN APOSTOLAKIS: Yes.

DR. SANCAKTAR: I'm sure we can.

CHAIRMAN APOSTOLAKIS: Okay.

DR. SANCAKTAR: If you really want to.

CHAIRMAN APOSTOLAKIS: All right. Skewness, 16. Wow.

DR. SANCAKTAR: But you should realize that this did almost nothing to anything. I mean --

CHAIRMAN APOSTOLAKIS: No, I want to

understand where it comes from.

DR. SANCAKTAR: Oh, that I can explain.

CHAIRMAN APOSTOLAKIS: Usually you see a uni-model distribution.

DR. SANCAKTAR: Well, what does it do to anything? I don't know. I don't know the criteria on use of uncertainty, other than gives you some whatever confidence you live with. Okay? Anything else?

CHAIRMAN APOSTOLAKIS: It's currently fun.

DR. SANCAKTAR: It's my intention, is to make it fun.

CHAIRMAN APOSTOLAKIS: Well, it's wonderful.

(Laughter.)

MEMBER ROSEN: No one would do this if it wasn't fun.

MR. CORLETTI: I think, George, just for your benefit, this is the schedule that we went over in my introduction to try to orient this committee to understand that perhaps in June, it's our goal in June that we have a DSER from staff that has zero open items, which means we've resolved everything, but in which case, if that is the case, we're going to be looking for ACRS to write a letter, if we can get to that point.

In any event, I think we all know we have to get engaged now, and I think we're talking about a PRA subcommittee in January, which sounds very good.

CHAIRMAN APOSTOLAKIS: Good.

MEMBER ROSEN: The staff gave you 7,000 questions you say?

MR. CORLETTI: Seven --

MEMBER ROSEN: The ACRS subcommittee would give you how many?

MR. CORLETTI: Seven hundred.

(Laughter.)

MR. CORLETTI: You don't get to write RAIs, do you?

MEMBER WALLIS: On Slide 80, it says number of errors, zero, but I think the scale is ten to the minus seven or something. It's not quite the same as minus six. It gives a different answer. It should be a minus ten to the minus seven scale, ten minus seven.

MR. CORLETTI: I think I would like to turn it over to you for discussion on some of the other -- I know we're going to have a subcommittee on thermal hydraulic issues. I think I heard containment. It sounds like we at least need part of a meeting to talk about containment for AP1000.

Do you all have other items?

MEMBER ROSEN: There is an ACRS PR operations subcommittee, and I don't know what they would all say, but as one member, I would be interested in hearing about refueling and the risk of refueling and how refueling is done.

Is it different than what we --

MR. CORLETTI: Well, I know we have actually planned a very detailed 17 day refueling outage plan that we did for AP600 that really applies to AP1000.

Ed, do you want to speak to --

MR. CUMMINS: No, I think his question is what is the refueling design, and the refueling design is the same as any PWR. We have manipulator cranes to take fuel elements out, put them in the carrier, carry them to the fuel building, turn them up, and put them in the fuel racks.

So the refueling design is essentially the same as any Westinghouse PWR.

MEMBER ROSEN: It's just not apparent to me from looking at these cartoons what the canal configurations are and the up-enders and all of that stuff.

MR. CORLETTI: Right.

MEMBER ROSEN: It's also not apparent to me whether you do -- you know, how you handle the top head with the upper head mounted instrumentation.

MR. CORLETTI: Okay. Yeah.

MEMBER ROSEN: You know, the other thing is when you get done teaching me how to do this in this AP1000, can you tell me something about the risk of shutdown?

MR. CORLETTI: Yes. As part of the PRA, we have done a shutdown PRA risk assessment. We will talk about that probably with the PRA or we can do it as part of Shutdown 2 in addition.

I don't know. Are you on the PRA subcommittee?

MEMBER ROSEN: Oh, yeah.

MR. CORLETTI: Okay. So I think that will be probably the best time for that.

MEMBER SIEBER: I think in the operations area another thing we might want to look at is the man-machine interface in the design of the control system, including the features, diversity, redundancy, separation.

I notice you have slides in here that describe that, but I think we should know more detail because I think it's an important facet.

CHAIRMAN APOSTOLAKIS: Which subcommittees besides the --

MEMBER KRESS: Well, we have an AP1000 subcommittee, and we will probably handle all of these others, and maybe we'll combine subcommittee meetings, but I have a list of things, too, that we'll want to review the Ohio State stuff, and I don't know if that's yours or the staff's. That may be just the staff. I don't know.

But we'll review that, and that will be a combined thermal hydraulics subcommittee, and we'll want to look, of course, very closely at your SER when it comes out, and that will be an extensive, couple of day review type subcommittee where we'll look at all of your calculations, using codes to meet the design basis accidents.

MR. CORLETTI: You'd like to do that as part of the review of the DSER?

MEMBER KRESS: I think so.

MR. CORLETTI: Okay.

MEMBER KRESS: It could be we might want to do that sooner. I would want to talk that over with the thermal hydraulics people because it's supposed to --

MR. CORLETTI: It's part of the thermal --

yeah, because our analysis is done. So we could present.

MEMBER KRESS: We may want to have a separate thermal hydraulics subcommittee just to look at that, and of course, we're going to review the PRA coming up pretty soon.

As I mentioned over there, I think somewhere maybe as part of the thermal hydraulics subcommittee we will look at the containment cooling aspects.

MR. CORLETTI: As part of the thermal hydraulics?

MEMBER KRESS: Yeah, somewhere as part of the thermal hydraulics. That's really what I have on my list right now. It includes the issue of entrainment in there somewhere.

DR. FORD: But you know, on the materials side, there's a whole slew of RAIs on material. From my personal viewpoint, I'd like to review with you what John said.

MR. CORLETTI: Is that --

DR. FORD: Six, ninety, why using 690. What's your --

MEMBER KRESS: I've been assuming we'll consider those RAIs as part of review of the SER.

MR. CORLETTI: Yes. I think what would be best is I'll be able in December 3rd to collect them all and put them on a disk. Then we'll have all of the questions and the answers, and we can make that available to the ACRS as well so that you can see it in one place.

And they're grouped by material. You know, they're grouped by subject, if you will.

MEMBER KRESS: You might want to know that we told the commissioners that our priority would be to accommodate the review of the AP1000. So we'll fit whatever reviews we think we need or the staff thinks we need or we think we need; we'll try to schedule them and get them in in this time frame you're talking about.

MR. SCHULTZ: Well, that's great. We appreciate that.

MEMBER LEITCH: I was not on the ACRS when the AP600 was reviewed, and I'd like to go deeper into systems. I don't know that we need everybody to do that, but I for one would like to. And I was wondering if you had any suggestions about what would be the best way to do that.

MEMBER KRESS: Yeah, I think when we do this thermal hydraulic subcommittee review of how the plant responds to the various design basis accidents, you get a lot of system information out of that and how the passive cooling systems work particularly, and so that's very useful, I think.

MEMBER LEITCH: But my point is a lot of what, you know -- like today, it seems to be based on, well, this is the delta between 600 and 1000, that's fine if you have a good, solid understanding of 600. I for one do not.

MR. CORLETTI: Well, one thought I had, would it be possible to have something in Pittsburgh for several of you, whoever would like to come, as far as a one-day --

MEMBER LEITCH: Tutorial?

MR. CORLETTI: -- tutorial?

MEMBER KRESS: That might be a good idea.

MEMBER LEITCH: I would be very interested in that.

MEMBER KRESS: Yeah, we'll let Bill Shack be the director of that meeting.

MEMBER SIEBER: Well, I can't go. It's too far for me.

(Laughter.)

MR. CORLETTI: Perhaps we take one day or two days, you know, whatever to accommodate, but something like that would give you a good background, for those that especially weren't in --

CHAIRMAN APOSTOLAKIS: Yeah, as part of the planning and procedures subcommittee discussions -- that's tomorrow -- we'll discuss the review of PRA. We can expand the discussion, talk about other reviews and perhaps the location of these reviews.

For example, Graham, you are down to review some of the systems in the PRAs. So that's part of your concern.

MEMBER LEITCH: Right.

CHAIRMAN APOSTOLAKIS: So I think this is an internal committee matter, but thank you for the invitation. That may be, in fact, something that we want to do.

MR. CORLETTI: Okay.

MEMBER KRESS: I think we're basically through, aren't we?

MR. CORLETTI: Yeah, I think so. Thank you.

MEMBER KRESS: Thank you very much. Good day.

MR. CORLETTI: Thank you.

CHAIRMAN APOSTOLAKIS: Thank you very much.

We'll be back at 4:05.

(Whereupon, the foregoing matter went off the record at 3:52 p.m. and went back on the record at 3:52 p.m.)

MR. CORLETTI: On December the 5th, Westinghouse will be making a demonstration to members of NRC, the Executive Committee, showing them our 3D virtual construction model.

MEMBER KRESS: Is that going to be here?

MR. CORLETTI: It's going to be here. I know you're in session. I think it's arranged at one o'clock. And maybe on lunch break you could come and you could see it. It's an interesting --

CHAIRMAN APOSTOLAKIS: How long is it?

MR. CORLETTI: We can tailor it. I'm not clear on that. I think it might be a one hour session or something like that, but --

CHAIRMAN APOSTOLAKIS: We can try to put it as part of our agenda.

MR. CORLETTI: And it will show you our 36 month construction schedule in 3D.

CHAIRMAN APOSTOLAKIS: Wonderful. I'd like to see that.

MR. CORLETTI: I think it would be interesting, and it's going to be here. So --

CHAIRMAN APOSTOLAKIS: Okay.

MR. CORLETTI: Okay.

CHAIRMAN APOSTOLAKIS: Four, ten.

(Whereupon, the foregoing matter went off the record at 3:53 p.m. and went back on the record at 4:13 p.m.)

CHAIRMAN APOSTOLAKIS: Okay. The next item is risk informed improvements to standard technical specification. Mr. Rosen is the cognizant member.

MEMBER ROSEN: Yes. I will introduce Bill Beckner, who is going to tell us about the staff's efforts to monitor and manage risk informed improvements to standard technical specifications.

DR. BECKNER: Okay. I'm going to give a very brief introduction from back here.

I'm Bill Beckner, Program Director of the Operating Reactor Improvements Program.

We last talked to the full committee back in July as part of the PRA implementation plan, and we got a lot of interest in the risk management tech specs and were successful in that area and were invited or we invited ourselves back to let you hear more.

Because of that, we talked to the

subcommittees last week. What our objection today is, I think, we're going to start out by trying to give you feedback on what we heard to make sure that we heard you right and no misunderstandings, and then, of course, we'll try to go through the presentation again to let those of you who were not present in the subcommittee enter into some discussions.

The only other thing I wanted to point out is that we only have really a staff presentation, but this has been an effort where we've worked very closely with industry and other stakeholders, and Biff Bradley is here from NEI, and he will be glad to answer any questions from an industry perspective.

So with that, let me just introduce a few people. My boss, Frank Gillespie, is here. He is just in from the field. That's why he's got a sweater on. He can tell you exactly how Ginna is implementing the maintenance rule.

CHAIRMAN APOSTOLAKIS: Now it's on the record.l

DR. BECKNER: And Chris Grimes is leading up our PRA coherence efforts, and he'll help. So these are the non-speakers, the people who are really going to do the work.

CHAIRMAN APOSTOLAKIS: PRA coherence

efforts?

DR. BECKNER: Yes.

CHAIRMAN APOSTOLAKIS: Very good.

MEMBER SIEBER: Long overdue.

CHAIRMAN APOSTOLAKIS: What is that?

MEMBER SIEBER: We're losing a battery.

DR. BECKNER: Okay. The real workers are at the table, and my section chief, Bob Dennig, Tech Spec Section, will give the presentation, and he'll introduce his capable assistants.

CHAIRMAN APOSTOLAKIS: And you will tell us who they are?

MR. DENNIG: I will do that, right.

I'm Bob Dennig, section chief in Tech Spec Section. I work for Dr. Beckner.

I've got Bob Tjader, a senior engineer in Tech Spec Section, and Nick Saltos is senior engineer in Risk and Reliability in NRR.

As Bill said, in order to frame today's discussion, and begging the indulgence of the folks who didn't sit through the whole presentation last week, just to give you some sense of what we thought we heard and have this in mind as we go through this, the three major points from my notes as I summarized them -- and, folks, please help out if there's some elucidation on this -- the first point was that we talked about a graded approach in this risk informing technical specifications as far as the use of reliance on PRA or the PRA capability.

And to give you a sense of what that means is on one end, in order to justify some of these changes that are risk informed, we rely on generic analysis performed by owners' groups. That generic analysis can be qualitative or quantitative.

On the other end, we are relying on licensee's capability, the degree to which they have implemented (a)(4) in the most sophisticated way, with a highly developed PRA, integrated that PRA into their operations, maintenance, and planning. That's on the other end of the spectrum.

And what we heard was there's concern about we get this right and that the capability that plants get in their technical specifications is commensurate, appropriately commensurate with the degree that we're relying on a generic analysis or their plant specific capability.

In the latter case, where we're actually turning over some decision making, live, real time decision making, to licensees that would normally occur in like a NOED process, so we heard that, and we think we're doing it appropriately. We certainly hope we're doing it appropriately, and you've reemphasized that point to us.

Now, that was a point that we heard the last time we briefed the subcommittees back April of 2000, this same point.

MEMBER ROSEN: Well, I wasn't on it in April of 2000, but I agree wholeheartedly in what they said in April of 2000. That was my exact complaint last week, was that there should be no free lunch, no free rides. If you want sophisticated, on line relief, you just don't do it with eight and a half by 11 inch piece of white paper or table.

MR. DENNIG: The second point was the concern about -- and it's a horse race -- but to guard against abuse, gaming of the system. How do we have some feedback about how people are behaving under changes through tech specs that are in some sense a revolutionary departure from past perspectives.

For example, a missed surveillance, that was a litmus test of your entire operational capability at one point, and now we say, well, if you miss the surveillance, we'll let you manage the risk.

How would we be aware of whether or not people were behaving the way we suppose they would when they're given that flexibility?

VICE-CHAIRMAN BONACA: Well, you know, just for clarification, the concern was now we use the corrective action program, and the reason, to plan to track this. Today if you miss a surveillance of the plant, that's a big thing and people take it very seriously. The question is: will they take it seriously when they just -- you know, if there is no oversight?

And the important thing is to make sure that they keep taking it seriously. So although they have relief from tech specs to go up to the next surveillance, still it's not going to happen with more and more frequency because it is becoming unimportant.

MR. DENNIG: Right, and the refinement of that that we heard was perhaps a sense that we had enough built in where we could pick this up at a specific plant, but the concern was, well, how would we integrate that across plants. How would we get a sense of whether or not in some overall sense there were more of these things happening?

And I think that's something that we have to think about. How are we going to do that?

MEMBER ROSEN: Yeah, we need some suggestions like maybe the resident inspectors in their reports could give you a summary of when they actually use those flexibilities.

MR. DENNIG: So that's some feedback and something we're going to have to go meditate on.

And then lastly, that we consider how these initiatives interact. The specific example, and again, I beg the indulgence of the folks that weren't here the last time, we have an initiative. The number is three, where you have mode flexibility to go up in mode with inoperable equipment as long as you're going to comply with the time limits in the mode you're going to for that inoperability.

We have another initiative, the most ambitious initiative that involves extending the time. So the question is, the obvious question is: well, can I go up in mode and extend the time?

And the answer is I think the industry envisions that they would have that flexibility. The final word on that is not here because we haven't done four yet. We have not done the one where you can using your capability make decisions about extending at completion time within the context of the plant configuration.

But, yes, that's a good point, and that is something that we have kept in mind, and you've reinforced to us. So we heard that.

Next slide, please.

We understand the necessity of staying in touch and proposing an opportune time to come back again and talk with you, and on first reflection, we feel that we've got some things that are supposed to happen here shortly that have been in process for some time, Initiative 4b, which I mentioned; flexible completion times, which is the one that has the most reliance on the licensee's capability.

We should be seeing some guidance that's been drafted by the industry, and also I believe we may get a proposal or a draft amendment, something that look like an amendment, but that's a pre-amendment proposal for a pilot for this initiative.

And I think it would be appropriate at that time, once we have that in hand, and we're looking at it to come back and share that with you and get your views and reflections and reactions to what's on the table for that. So that would be something for you to consider.

And next slide, please.

MEMBER LEITCH: Does that pilot just apply to Initiative 4b or might it include the whole range?

MR. DENNIG: We have asked. We have

suggested that if possible, we would have a pilot that would integrate all of the initiatives. We will attempt to do that. We would like to do that on an improved tech spec plant, an ITS plant, if possible.

That may not be the first pilot that we get. That's been our dialogue with the industry. That's been our suggestion and our desire.

The development slide just was meant to show that we've been at this for some time. This slide is important, I think, more for other folks than for you folks, and that the notion of risk informing tech specs goes way back. We can trace the development of some of these initiatives back into the early '80s.

And in a sense, what we're doing today is following through on some thoughts that were engendered back when the PRA capability was not as well developed as it is today, and we've just taken advantage of those developments as they've progressed.

The key point here is that we play off of 50.65(a)(4). That's a key development in this area, and in fact, its implementation came at a point after the risk management tech specs were first conceptualized, but it gives us the risk engine, if you will, the risk program at the site to use for configuration risk management purposes, to whatever degree, to look across equipments, to do that integrated look that tech specs don't do currently.

And so that's what we springboard off of. That thing is running in the background all the time. We take advantage of the fact that that exists, and that's kind of like an engine that makes this thing go.

Some high level principles. I've mentioned the second point, the graded approach to crediting PRA, and that's another way of saying that it's crediting the way they've implemented the 50.60(a)(4) program.

We are cognizant of the need to be coherent with other risk informed development. There is an initiative I'll talk about, Initiative 8, where we talk about risk significance of equipment, and we want that notion to align with how that's being determined in other places, such as in special treatment rulemaking.

We also want to have ourselves aligned in the area of PRA technical adequacy with whatever comes out of, for example, the draft reg guide on PRA technical adequacy that's now out for review and potential piloting.

We may pilot that along with our Initiative 4 pilot, and a point that we heard from the ACRS, again, the last time that we were here was the need to involve a broad range of people in this activity and keep them apprised of what we're doing.

In particular, I would point out that we are working with the Equipment and Human Performance Branch in the area of the maintenance rule, and through them, there have been briefings in the regions on the subject, such as Initiative 2, which has been approved and licensees are adopting, which is the missed surveillance provision, allowance.

They have included a discussion of how that is to be interpreted and what it means and what we're looking for in their discussions on 50.65(a)(4) when they've gone out to the regions.

Next slide, please.

I'll go through these fairly quickly. Initiative 1, in shorthand term, is end state, and the essence of it is that tech specs always were formulated to drive the cold shutdown, and that is not always the best thing to do. So this is a provision to stand hot shot down for the purposes of performing the repairs rather than to go cold.

And here's this rated approach thing. CE

Owners Group and BWR Owners Group's generic analysis underlies this initiative, and we've reviewed that particular. Dr. Saltos has been involved in that review.

At the present time we've done the safety evaluation, which is like step one of what happens to implement this. Step two means that the findings of the safety evaluation have to be translated into tech spec mark-ups to implement this thing in current tech spec structure, and that's where we are now, is either looking at that translation for the CE Owners Group or awaiting that translation for the BWR Owners Group.

CHAIRMAN APOSTOLAKIS: I understand we don't have the generic analysis that the owners groups.

MR. TJADER: No, you don't have the Initiative 1 generic analysis. I wasn't -- what was provided was Initiative 2 analysis and what was approved and Initiative 3, what is proposed and what was issued in the Federal Register notice.

MR. DENNIG: But we can if you wanted that; we could give you that.

CHAIRMAN APOSTOLAKIS: If you could send them to Ms. Weston.

MR. DENNIG: Okay. We will provide that

to yo.

CHAIRMAN APOSTOLAKIS: Sure. Thank you.

MR. DENNIG: Initiative 2, missed surveillance actions. Modification of SR 3.0.3. It used to say if you missed the surveillance, we'll give you 24 hours to make it up, and that was what 87-09 allowed.

And we've extended that to allow the licensee to manage the risk of when they make up that missed surveillance up to one surveillance interval, and I've kind of given the highlights of the risk management basis, the risk informed basis for granting that allowance.

One frequent use, the likelihood that th equipment is operable, that's what the history has shown, that you miss a surveillance. When you go do the surveillance, it generally works okay or the surveillance was performed incompletely, and when you complete the surveillance, it works out okay.

There's a commitment to enter missed surveillance and a corrective action program, and then one manages the risk of delaying the surveillance as an extension of your (a)(4) program.

And to date 47 plants have adopted that. We've granted amendments to 47 plants, and there are

21 in the pipeline.

Initiative 3, mode, flexibility. Again, this is an extension --

MEMBER LEITCH: Once again though with this issue, as with most of these, but I just want to make sure I have them straight, is that the risk analysis is not a blanket risk analysis that's done in advance, but at the time; is that correct?

In other words, when you miss this surveillance, then you take a look at what are the risk consequences of having missed that surveillance.

MR. DENNIG: Right.

MEMBER LEITCH: For that particular situation.

MR. DENNIG: Yes.

MEMBER LEITCH: So you may not always be allowed to go on more surveillance in the hole.

MR. DENNIG: That's correct.

M E M B E R L E I T C H : It could be that you conclude that --

MR. DENNIG: It's up to.

MEMBER LEITCH: Yeah, it's up to one surveillance.

MR. DENNIG: Yes, sir.

MEMBER LEITCH: You my conclude that,

well, this is a pretty high risk situation. If this piece of equipment is bad, we're going to have to do that surveillance now.

MR. DENNIG: Yes, sir.

MEMBER LEITCH: Okay.

MR. DENNIG: It's not an automatic.

MR. GILLESPIE: Well, Bob, isn't it graded when they put it in the (a)(4) program? Under (a)(4), there's four categories, if you would, of actions, and so it's not an on-off switch that you do the surveillance. It talks about operator cognizance going down to positive compensatory actions being allowed, which may not be doing the surveillance.

MEMBER LEITCH: Okay.

MR. GILLESPIE: So there's a span. It's kind of graded on what your grade comes out. So it's not an on-off switch. So there is a gradation actually built into the (a)(4) process.

MR. DENNIG: But you do have to do the surveillance at the first reasonable opportunity not to exceed the backstop is the one more interval. Now, depending on where the numbers come out, where the analysis comes out, you can do compensatory actions. You can manage the risk in the same way that you manage risk of doing maintenance in general under (a)(4) until such time as you make up that surveillance.

Initiative 3, mode flexibility. This is an extension of an allowance that was risk provided in generic Letter 87-09. What that generic letter allowed was for mode transition up in power in those situations where you could remain indefinitely in the higher mode. There was no time limit after you made that transition.

What we do is we allow the transition, relying on the compliance with tech spec actions and time limits in the higher mode. We have based this on a generic risk analysis that rules out some transitions as inappropriate across the board, and infrequent use. Plants generally store it up twice a year now that it would be transitioning through lower modes and coming up in power.

MEMBER ROSEN: This is another one of those that we haven't seen, this generic risk analysis

MR. DENNIG: You were provided, I think -- we did send this out.

MR. TJADER: We provided the safety evaluation, but we didn't provide the analysis from the industry. Well, no, the justification was provided with the proposed tech spec change.

MR. DENNIG: I thought we provided -- each owners group put together a generic analysis, and I thought that what we --

MEMBER ROSEN: We get a lot of paper, Bob. It's possible, but I don't remember.

MR. TJADER: Yes, you were provided each of the owners groups' analysis.

MR. DENNIG: You have their generic analysis somewhere and the safety evaluation that we had out for public comment. So if you don't have that, we'd be glad --

MR. TJADER: They do. They do.

MR. DENNIG: Okay, and we're in the midst of resolving public comments that we got when we published the SE in the Federal Register in August.

MEMBER LEITCH: Here, again, this is one of these that has the potential for abuse. The spirit of the law here is infrequent, an evolving situation. It's not to have an outage plan that says, "Well, we're going to get the" --

MR. DENNIG: Exactly.

MEMBER LEITCH: -- "the RHR pump back three days from now. So" --

MR. DENNIG: Exactly.

PARTICIPANT: "We'll start up without it."

MEMBER LEITCH: Right. So it's one that requires monitoring to be sure that we're not falling into a pattern of abuse.

MR. DENNIG: Right.

MEMBER ROSEN: Yeah. Now, you have monitoring, and let's assume you do. You put into place a good monitoring. So you are made aware of a pattern of abuse.

Do you have the regulatory tools to stop it?

MR. DENNIG: I think that factors through the oversight of the (a)(4) program in compliance with the intent of the bases that go with the spec.

MEMBER ROSEN: So you're saying that through (a)(4) --

DR. BECKNER: I think yes and no. There's a couple of things. First of all, if they were routinely going up and not getting stuff repaired with an AOT coming down, that would certainly look and adverse consequences on the performance indicators, and certainly it would impact their equipment availabilities and reliabilities. It would be out of service.

The no part is, yeah, they can still game the system. They can game existing tech specs. I talked about should they be scheduling this. I think not. I don't think there's anything to prevent it, just like there's nothing to prevent them from scheduling back-to-back AOTs. It's just something that right now that's one advantage of (a)(4), is that helps a little bit in that area, but the tech specs really never do a very good job of that. You can still game them.

MR. GILLESPIE: Bob, could you -- I think it might help because one of the comments here was start-up -- could you go through the mode changes that you feel would be allowed and the ones that wouldn't be allowed?

For example, going four to five.

DR. BECKNER: In other words, would you sum up with diesels out or not? That's for example.

MR. TJADER: Diesel generators are one of the higher risk systems, and, no, you wouldn't and you wouldn't -- there's generally three high risk systems in which mode transitions can occur if they're out, and that's diesel generators, RHR, and L, but before you do any transitions that are permitted, the risk assessment must be done prior to that for the current plant configuration.

MR. DENNIG: Those are the real low modes that Bob is talking about. There are -- and this is in the Federal Register notice and the safety evaluation also in the owners group submittals.

HPSI transition going from two to one, which is like going from start-up to power operation in a BWR, is ruled out. High pressure core spray, similarly. RCIC, similarly. Isolation condensers, similarly. Bob mentioned emergency shutdown AC power supplies. That's across the board.

MEMBER ROSEN: Aux feedwater?

MR. DENNIG: Let's see. Aux feedwater. No transitions in the mode 43201. L-top Bob mentioned and five of four. Emergency diesels, this is PWR 54321. That's all of them.

Pie head safety injection system, Westinghouse, no -- not permitted to enter Mode 4.

MR. GILLESPIE: Bob, you don't have to -- I just wanted to give people a sense that a lot of thought had gone into the boundary conditions. It's not quite as blanket as the viewgraph would kind of lead you to believe.

MR. DENNIG: Okay.

MEMBER LEITCH: So these things that you mentioned are prohibited across the board regardless of the risk implications.

MR. DENNIG: Yes. That's hard wired into the specification.

MEMBER LEITCH: So even a plant -- I'm familiar with a plant that has four diesels per unit.

MR. DENNIG: Yes.

MEMBER LEITCH: But still you need all four diesels regardless of the consequences.

MR. DENNIG: Yes. It was a generic analysis, and any licensee is permitted certainly to come in and add to their justification for this adoption and say, "Hey, we have this situation. We've analyzed this situation. We think we should have the flexibility to make a mode change under these circumstances," and then we'll look at that on a plant specific, case-by-case basis.

But the enveloping analysis ruled these things out, and by way of a tie-in into the issue of capability versus, you know, the plant's ability to demonstrate their risk analysis capability, originally the concept was that plants would be able to somehow, based on their own local analysis justify changes in mode for these higher risks, what we term higher risk transition systems.

And we were not comfortable at this point in time with the plant specific capabilities in general, and so we kind of took that off the table and said for now as far as the generic change is concerned, we're going to stick with what the generic analysis shows We're not going to rely on plant specific capability.

MR. TJADER: In issue four, the table listing those high risk systems are in the owners groups' analysis, which I've provided to you.

MR. DENNIG: And it's repeated in the Federal Register notice.

Okay. This is the initiative that I suggested earlier we come back and get you involved in at the front end. The concept basically is you're familiar with the way tech specs are structured. You generally have a fixed completion time for a given plant state, loss of capability, loss of a train, 72 hours or whatever.

This concept basically has that time and place. The plant keeps that as a planning time or time to complete the actions within, and then would have the flexibility based on a risk analysis, configuration risk management approach to go beyond that nominal time up to a fixed backstop time that is put in place as a under no circumstance, no matter what your risk analysis shows, you may not go beyond this time.

It's under development. We should be seeing the guidance document industry has been working on in December. It includes requirements for PRA technical adequacy, a real time quantitative capability, and we're asking that the configuration and cumulative risk metrics, the kinds of things that are included in (a)(4) guidance in terms of the immediate risk impact and some cumulative tracking of integrated risk impact, those also be included in -- be four feedback loop in this case for oversight of this kind of a process. So that would be part of it.

Five.

MEMBER LEITCH: You earlier referred to 4b. What would you define as (b)?

MR. DENNIG: This is 4b.

MEMBER LEITCH: This is 4b?

MR. DENNIG: Four (a) is the garden variety completion time extension that we've been doing for some time, and a lot of plants have -- I'm sorry.

You know you've been doing this too long when you say the number and that's all you need to know.

MEMBER ROSEN: It's like the old joke

about the old joke.

MR. DENNIG: Okay. Initiative five, relocation of surveillance test intervals. The concept here is that tech specs have surveillance tests; that the requirement to perform the test and the nature of the test, the extent as described in the tech specs remain, and the frequency, how often one does it, becomes a variable, if you will, that is determined by a licensee program where we have reviewed the methods for calculating those intervals, changing those intervals, and then that program is referenced in the appropriate section of the technical specifications to the level of detail that we feel necessary to pin down that program.

So, again, the frequency of performance surveillance interval, the tech specs would say in accordance with the licensee's program described in Section 5. There's a Section 5 program that spells out some of the details of what this program is, and then the licensee has a methodology that they can use to change those intervals.

This is in development, and this is behind four. This is not going to come -- I don't believe -- it's not going to come to a point where we might sit down with you and discuss this before four would, but this possibly would be another candidate for discussion once we've gotten the specific concept from the industry.

MEMBER LEITCH: There may be a sort of second order effect that we might have to consider here. I think there is a grace period in the frequency with which you do tech specs that's 25 percent of the --

MEMBER SIEBER: Specified interval.

MEMBER LEITCH: -- specified interval. Now, if we're changing specified interval, does that also go back and affect grace period?

MR. DENNIG: Sure. It's certainly something that needs to be considered, sure.

MEMBER LEITCH: Yeah. I mean, it's sort of a second order effect, but it's just maybe a source of some confusion.

MR. TJADER: The grade period may become irrelevant with the methodology.

MEMBER LEITCH: Exactly, yeah, yeah.

MR. DENNIG: Okay. Initiative six, this is to date an effort that's pretty much the CE Owners Group effort. It involves risk informing the standard shutdown track for loss of function within an LCO. A lot of times specs will direct you to go to LCO 3.0.3, and that has a within one hour commence an orderly shutdown; for PWR in seven hours be in Mode 3; and then 37 hours be in Mode 5.

The CE Owners Group has looked at their standard specifications and the functions covered in specific LCOs and made an argument using a quantitative bounding risk analysis that Nick is looking at currently to adjust those times based on the specific equipment that's inoperable and, again, looking at that equipment inoperability in the context of the rest of the configuration of the plant.

And I don't -- did we send that over?

MS. WESTON: Actually I only have the analysis for 356 and your Federal Register notice for 358. I'm sorry. Yeah, 358 and 359. That's all that I have.

MR. DENNIG: Okay. What I suggest that we do is as a follow-up we'll get with Ms. Weston, and we will provide whatever supporting material, you know, she deems that you folks all want to see at this point in time.

CHAIRMAN APOSTOLAKIS: That would be very useful to me.

MR. DENNIG: So, you know, we'd be glad to do that.

Initiative seven, this is an initiative called risk informing support equipment impact. What we mean specifically is support equipment or design features outside of technical specifications.

There is a consequence of tech spec structure through the operability definition wherein something that is impacted by doing maintenance, such as a barrier that is not covered in tech specs, leads you to declare something that's in tech specs inoperable, meaning that you have to enter the completion time for that supported piece of equipment.

Those completion times that are in specs are in there for everything that could possibly require that equipment to operate, and the times are in some cases shorter than what might be appropriate where one has just removed a barrier that protects against a flood.

Nonetheless, you immediately go into a 72 hour completion time. So the objective of this initiative is to find a way to risk inform, if you will, the treatment of features that are outside of specs and their impact on operability.

And this one is kind of quirky because it's tied into the way tech specs work and the logic of tech specs. It's of great industry to the industry because of trying to integrate this into overall risk management of maintenance.

Finally, initiative eight, risk informing the tech spec scope. This one has two parts, and I did write down both parts.

One thing that's under discussion is to allow relocation of LCOs not meeting any 50.36 criteria, including the criterion of risk significance. There is some argument that there are features that are in technical specifications that under the current regime, under the current criteria, which include design basis criteria, in addition to a risk criteria, that that could be taken out because they're not risk significant, whatever that may turn out to be.

The features that were retained in standard tech specs in the late '80s when we looked at applying LCO criteria were RCIC, an isolation condenser, residual heat removal, standby liquid control, recirc pump trip.

Also, there's remote shutdown instrumentation, is in some specs or is in specs based on risk.

Is there anything else? No.

So some of the interest groups want to

revisit whether these things are risk significant or not or could, be relocated from specifications.

The broader goal of initiative eight is in B, limit the scope of technical specifications to risk significant SSCs. That notion, that idea was brought up and discussed back when these LCO criteria were being generated. It was suggested that -- I'll read criterion four, which is the risk informed one.

Structure system or component which operating experience or probabilistic risk assessment is shown to be significant to public health and safety. That's number four in addition to three other ones that relate to detecting leaks, design features or process variables that are assumptions in a design basis analysis, and then equipment there, part of primary success path for mitigation.

There was a suggestion at the time that criterion four should be the only criterion. Why should we have anything in technical specifications that wasn't risk significant? And the Commission deemed at that time that that was a premature way to go, but we would continue to think about that.

So now we're being asked to think about that in ernest. That would require a rulemaking to establish that as the sole criterion. So that's down the road some ways.

But there is a nexus to current activity in things like 50.69. You know, how are we using PRA to be an equipment? What's risk significant equipment? You wouldn't want to have conflicts between the logic being used there about what was -- how things were being treated and what was significant from a risk standpoint and what we were saying needed to be included in technical specifications based on its risk significance, but again, that's somewhere down the line.

MEMBER ROSEN: Where does defense in depth and margin fit into that discussion?

MR. DENNIG: Where does defense in depth and margin fit into that discussion? It would have to be fit into that discussion somehow.

(Laughter.)

MR. DENNIG: I mean, we have to deal with what those concepts mean under this kind of a structure.

MEMBER ROSEN: I just -- yeah.

DR. BECKNER: I think that's probably the reason why the Commission left the first three criteria in, and that's still a question that we're struggling with in risk informing regulations, and I guess it's appropriate we continue to struggle with it.

And I see Mr. Coherence here wants to say something.

MR. GRIMES: My name is Chris Grimes.

As Bill has so aptly anointed me Director of Coherence, as part of developing a plan where we could bring the guidance for PRA quality and the guidance for categorization and the other aspects of risk informed initiatives and performance based regulatory improvements, we've talked about how we can fit into the margins management and the assessment of what features constitute defense in depth and have measures for those things.

And so I think as Bob pointed out, we're closer now than we were ten years ago when we talked about risk informing for tech specs, but I don't think that the categorization process in 50.69 is enough of a definition of limiting conditions for operation for licensing purposes.

And so we would have to explore that further in terms of how do we want to risk inform the definition of limiting conditions for operation in order to bring the categorization process, which is driven more by function than margins issues.

So I've just made a very short story long by trying to surround it.

CHAIRMAN APOSTOLAKIS: How do you define margin in this context?

MR. GRIMES: Well, the way that tech specs treats margins is that any uncertainty is guarded against. Limiting conditions for operation are defined conservatively to avoid eating into margins and to take prompt and --

CHAIRMAN APOSTOLAKIS: What is a margin? Because we saw two definitions in the context of the principal for developing performance based regulation.

MR. DENNIG: We noted that comment.

CHAIRMAN APOSTOLAKIS: I know people are using the word, but apparently there is not a unique definition.

MR. DENNIG: I could be wrong, but I think in the tech spec context the way things are set up now, we have the magic phrase of the margins as described in the bases is one of the phrases that occurs in this area, and generally in the bases what you talk about --

CHAIRMAN APOSTOLAKIS: You mean the licenses.

MR. DENNIG: -- are redundancies.

PARTICIPANT: No, no, bases to the tech specs.

MR. DENNIG: As described in the bases, capital B.

CHAIRMAN APOSTOLAKIS: Yeah, yeah.

MR. DENNIG: And generally what those discussions deal with are single failure defense. With one train you still have the capability, and so on and so forth. It's at that kind of a level.

MEMBER SIEBER: There are no that I can recall numerical margins, parameter margins.

MS. WESTON: You have a comment?

MR. BRADLEY: Can I make a comment?

MEMBER SIEBER: Yes, sir.

MR. BRADLEY: Biff Bradley, NEI.

Tech specs do define safety limits, and they also have limiting safety system settings that provide margins to those limits such that when you set the set points and the instruments, et cetera, in the tech specs, you do have margin to the safety limits.

And the work we have underway to risk inform and to change the scope of tech specs is not intended to change those. We're not looking to change the safety limits or reduce the margin between the LSSS and the safety limit as part of our work.

I do think that the scoping criteria of 5069, as you're aware from having reviewed that guidance, do to some degree address defense in depth. It is an area where we do have an explicit section of that guidance trying to -- you know, it's always a difficult concept.

But we do look at that, and I think within the constraints of what we're talking about here, which is really just looking at the scope of equipment within tech specs, that I believe the 50.69 guidance is applicable, and of course, we'll have to make that case, but I don't see that there's a major disconnect between the approach we're using in 50.69, including how we treat defense in depth, and you've got to bear in mind we're not changing the safety limits or the limiting safety systems.

MEMBER SIEBER: Let me clarify something on what you said. The difference between the set point and the safety limit is when you reach the set point you're in a transient, and that parameter continues to go, and at the set point trips a device or actuates something at that point in time; you won't get to the safety limit, and that's what that margin is for, is to accommodate the effect of the transient.

That is not calculational margin or margin that's added on because of uncertainty and interpreter test data like the final acceptance criteria, peak clad temperature or anything of that nature.

And so margin is used in many different senses, in many different places, and I think you have to be careful. You can't use margin from the standpoint that it's a single entity that applies to everything because it's used differently for different concepts.

CHAIRMAN APOSTOLAKIS: Here in general it means the interval between some limit and --

MEMBER SIEBER: Well, that's the way it's used when you look at the safety limits and the set points, but from the set points or the tech spec standpoint, the definition that it supposedly described in the bases is, to my knowledge or my memory, the ruling definition.

On the other hand, when you read the bases, there's not much in there about margin.

MR. DENNIG: In the instrumentation margin I think you're right.

DR. BECKNER: Yeah, but I think as Biff said, tech specs -- there's instrumentation margin, and the other thing is basically equipment, and the first three criteria deal with margin in the sense that they basically require equipment that was assumed in the design basis analyses.

And if you have that equipment available, then you, in theory, retain whatever margin happened to be in that design basis analyses, and that's how I think by relaxing the first three criteria you may be relaxing margin, but you don't know that for sure.

MEMBER SIEBER: Well, there is another way to look at it. There is a design basis analysis that gives you a number of figures of merit. Then there's a best estimate calculation that goes beyond that that gives you another bunch of different figures of merit.

Some people consider the difference between design basis and the best estimate as the margin that's available and the conservatism that's built into the design basis analysis.

And so all of this leads to tremendous confusion because there are different ways the term is used. And I think if you're going to try to exploit margin and understand it, we ought to really have a bunch of new definitions for what it is we're talking about.

MR. GRIMES: I agree. As a matter of fact, I think these are all very good points because that is the nature of the complexity of the problem for instrumentation margin has a specific definition and a practice, and the IEEE standards explain how that works, and the staff has dealt with that and the practice of enforcing limiting safety system settings.

But as you point out, there are also margins associated with capabilities, and, for example, in the leakage limits in the technical specifications, the limiting conditions for operation establish certain action points when leakages get to certain values because of margins associated with leak before break design capabilities, and that's a different kind of margin.

And then there's yet another margin that's associated with my favorite example of margin management confusion, and that is the operability of a battery system because in the tech specs, we try to treat it as a black and white condition, but in the practices that we try to refer to in the IEEE standards, batteries can be operable, but going down or they can be inoperable but on their way up, and where are you in your technical specifications?

You're playing in the margins, and so the time that it takes to fix things now becomes very difficult to articulate.

So I do think that one of the first steps that we've defined for coherence activities is that we need to set out a glossary of terms --

MEMBER SIEBER: Agreed.

MR. GRIMES: -- in order to be able to communicate what things we're trying to do, and I think margins and defense in depth requires some very careful language and very careful term definitions.

CHAIRMAN APOSTOLAKIS: But you can also have a definition of margins that include the defense in depth. For example, the core damage frequency is a measure of margin. Ten to the minus four, yeah, why not?

Reaching that state, the probability of going to that state, and I can call that margin. Before I get into trouble --

MEMBER WALLIS: I thought it was probability.

MEMBER SIEBER: But that adds an additional level of complexity to an already complex problem to me.

CHAIRMAN APOSTOLAKIS: Right, right. I know.

MEMBER SIEBER: I mean, it doesn't clarify anything. It just makes it worse.

CHAIRMAN APOSTOLAKIS: When people in

general, say, complain that risk informing the regulations erodes the margins, what do they mean? They don't mean the set point. They mean something bigger.

MEMBER SIEBER: Well, that's why it's such a good term to use because nobody knows what you're --

(Laughter.)

MEMBER ROSEN: I withdraw my earlier hasty comments about defense in depth.

CHAIRMAN APOSTOLAKIS: Since we have Mr. Bradley here, what is the motivation behind all of this? I mean, are these things that you want to change in a new sense or why is the industry bringing up these?

MR. BRADLEY: Well, since we're in the term of coherence here, we had -- 50.65(a)(4) was put into place in November of 2000, and so we now have essentially dual regulation for plant configuration control. We have the deterministic tech specs, and we have the risk informed 50.65(a)(4).

Now, oftentimes these can conflict, and so the plants are having to meet two regulations that can give you conflicting results, and we're trying to resolve those and come up with a single system of configuration management.

I don't think that the net result of this will be some, you know, draconian change in the way we do this. We're not going to see -- I mean, we've already even under the current system been able to get the plant availabilities pretty high, and I don't see that there's a tremendous amount more to be gained by this, but I'd say it's beyond a nuisance. I think we're really just trying to have a regulatory system that makes sense and that doesn't create a lot of day-to-day headaches trying to reconcile these two different insights that come out of these programs.

MEMBER LEITCH: There's also some big economic considerations, too. I mean, perhaps you're approaching an asymptote as far as the availability of the plant is concerned, but you know, if you're sitting, waiting to be able to start up the plant based on diesel that suddenly become unavailable or perhaps the diesel is not a good example, but one of these less risk significant systems, and you know, the part is on the airplane and it's coming in, but by the time you get the part and check it out and install it, you've wasted 24 hours and you're sitting there with the plant shut down while maybe you could be running.

MEMBER SIEBER: Well --

MEMBER LEITCH: That's an important

factor. The other thing is some of these surveillance tests, there haven't been many occasions, but there have been some occasions when, oops, a surveillance test was missed, and the only way to do this particular surveillance is with the plant off line. So you have to take the plant off line to do a surveillance test.

Now, that's a million dollars down the drain in one shot.

MEMBER SIEBER: Well, it's even worse than that. Three, oh, three says that if you end up in an LCO where you're not permitted to operate in a certain mode, you've got to shut down the plant, which adds a transient to the plant, and we counted all of those transients because once you cool down, you're changing all of the stresses in the reactor vessel by using bunches of chemicals, and you just aren't doing the plant any good at all.

And if it's not risk significant, why would you put the plant there?

On the other hand, the other side of it is that human beings are human beings, and occasionally they'll miss a surveillance or a technician will miss a step, and all of a sudden he gets into an, oh, heck, situation so to speak, and they would like to have a way out of that.

Now, whether they could go on, not catch a notice of violation or what have you and, you know, just keep sailing away, and there's two sides to that, but I worry most about having to shut down from a risk standpoint, unnecessarily hard on the plant.

MEMBER WALLIS: I think the clearest example is where the tech specs force you to do something which actually leads to more risk and integration.

MEMBER SIEBER: Well, it's allowing more risk, but it's --

MEMBER WALLIS: Well, it probably does lead to more integrated risk in some cases than following one of these initiatives.

MEMBER SIEBER: Sometimes going through the transience of shutting down and starting up involve more risk than just operating.

MEMBER ROSEN: Well, this is the one example of Gulf being forced to go to Mode 4, which takes out your auxiliary feedwater pump and now you don't have reactor steam pressure to provide feedwater.

In the case where you have problems with the feedwater system, that's not what you want to do.

You want to stay in Mode 3 so that you can provide both steam pressure to the auxiliary feedwater system.

So there's an example of what you just were talking about.

MR. DENNIG: Okay. That concludes our prepared or unprepared --

MEMBER SIEBER: I guess there's all of these reasons why this is bad news to provide the tech specs as the motivation for going to a risk informed tech spec system, but I think you have to do it carefully. I sort of conclude that what the staff is doing is pretty careful.

MEMBER ROSEN: Now, are we asked for a letter here? We're not asked for a letter.

CHAIRMAN APOSTOLAKIS: Yeah, what is the request?

MEMBER ROSEN: Yeah, we are asked for a letter, but we're not asked for a letter. The bottom line is there was a little bit of confusion there. You're not asked for a letter.

Do you want to talk to that?

CHAIRMAN APOSTOLAKIS: Are you asking for a letter?

MEMBER ROSEN: Bill Beckner.

DR. BECKNER: We're not asking for a

letter at this time. What we would propose, I think, Bob in his second slide, is when we have something concrete for us both to review our initiative 4, which is probably going to be maybe a submittal maybe towards the end of the year, and I'm not sure when the review would go.

But when we have something concrete, then I think it would be appropriate for a letter at that time. So right now no letter. Next meeting probably we would --

CHAIRMAN APOSTOLAKIS: You can send us all the supporting documents you can send us right now so we can start preparing ourselves for this happy occasion.

DR. BECKNER: Sure, yes.

CHAIRMAN APOSTOLAKIS: Okay.

MEMBER SIEBER: I guess it's worth stating though even though we don't right a letter that I think I personally think as one member that the staff is on the right track here.

CHAIRMAN APOSTOLAKIS: Mr. Chairman?

MEMBER ROSEN: Well, I turn it back to you.

CHAIRMAN APOSTOLAKIS: Thank you, gentlemen.

Nobody seems to be willing to move. You didn't expect me to thank you?

(Laughter.)

CHAIRMAN APOSTOLAKIS: You seem to be startled.

MR. DENNIG: It's like, well, you're going to give me a shot. "Well, Doctor, is it over?"

(Laughter.)

MR. DENNIG: Thank you.

CHAIRMAN APOSTOLAKIS: Okay. The next item is a report by Mr. Leitch --

MEMBER LEITCH: Yes, sir.

CHAIRMAN APOSTOLAKIS: -- on recent operating events, but we will not do this right away. In fact, well, we're only ten minutes behind schedule. That's wonderful. A report regarding recent operating events, and we'll do that in about 13 minutes.

And I don't think we need the transcription anymore.

(Whereupon, at 5:14 p.m., the meeting in the above-entitled matter was adjourned.)