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

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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.1

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.

MEMBER LEITCH: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.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: 497th Advisory Committee on Reactor Safeguards

Docket Number: N/A

Location: Rockville, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

/s/ Rebecca Davis

Rebecca Davis
Official Reporter
Neal R. Gross & Co., Inc.