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Future Plant Designs: Subcommittee Meeting  
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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 (ACRS)

6 COMBINED THERMAL-HYDRAULIC PHENOMENA/

7 FUTURE PLANT DESIGN: SUBCOMMITTEE MEETING

8 + + + + +

9 ROCKVILLE, MARYLAND

10 + + + + +

11 THURSDAY,

12 FEBRUARY 14, 2002

13 + + + + +

14 The Subcommittee met at the Nuclear  
15 Regulatory Commission, Two White Flint North, T2B3,  
16 11545 Rockville Pike, Rockville, at 8:30 a.m., Graham  
17 B. Wallis, Chairman, presiding.

18 COMMITTEE MEMBERS PRESENT:

19 GRAHAM B. WALLIS, Co-Chairman

20 THOMAS S. KRESS, Co-Chairman

21 DANA A. POWERS, Member

22 VIRGIL SCHROCK, Consultant

23 WILLIAM J. SHACK, Member

24 JOHN D. SIEBER, Member

25

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1        STAFF PRESENT:

2                PAUL A. BOEHNERT

3                MAGGALEAN W. WESTON

4                MEDHAT EL-ZEFTAWY

5        ALSO PRESENT:

6                JOE WILLIAMS

7                DALE SPENCER

8                BOB KERESTES

9                HAROLD CROCKET

10                FRAN BOLGER

11                TIM BYAM

12                LARRY WESTBROOK

13                JASON POST

14                KENT SCOTT

15                ISRAEL NIR

16                BILL BURCHILL

17                KEITH JURY

18                TAD MARSH

19                JON HOPKINS

20                GEORGE THOMAS

21                TONY ULSYS

22                RICHARD LOBEL

23                DAN PAPPONE

24                ED THROM

25                ZEENA ABDULLAHI

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1     ALSO PRESENT (Continued):

2             JARED WERMIEL

3             MOHAMMAD SCHUABI

4             DAVID SHUM

5             ANDRZEJ DROZD

6             JIM LYON

7             LARRY BURKHART

8             JERRY WILSON

9             GOUTAM BAGCHI

10            DAVID TERAO

11            RICHARD ORE

12            MIKE CORLETTI

13            STEVE BAJOREK

14            MARINO DI MARZO

15            WILLIAM BROWN

16            KATSU OHKAWA

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

(8:33 a.m.)

CO-CHAIRMAN WALLIS: The meeting will please come to order.

This is the second day of the meeting of the ACRS combined Subcommittee on Thermal-Hydraulic Phenomena and Future Plant Designs.

We will continue to hear from the AmerGen Company about the application for extended power to operate at the Clinton Power Station, Unit 1. And then we'll take a break at about ten o'clock, and then we'll hear from staff.

MR. BYAM: Good morning. I'm Tim Byam with AmerGen, and we're prepared at this point to answer the one question we took away with us yesterday.

I'd like to turn it over to Joe Williams.

MR. WILLIAMS: Thank you.

Joe Williams, Exelon Nuclear.

Yesterday during the flow accelerated corrosion presentation we stated that the highest wear rate location predicted for the power upright flow accelerated corrosion calculations was 70 mLs per year versus a 38 mLs per year predicted for pre-EPU conditions.

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1           The question was asked what the actual  
2 measured wear rate has been at that location. Bob  
3 Kerestes of AmerGen will provide a response.

4           MR. KERESTES: Good morning. My name is  
5 Bob Kerestes, and we did some checking and the actual  
6 wear rate is 20 mLs per year. We have looked at this  
7 area three times in the past. So we have a good  
8 baseline from which to start.

9           MEMBER POWERS: Does that imply that the  
10 post EPU corrosion rate will be 52 mLs per year?

11          MR. KERESTES: I don't think you can  
12 necessarily say that it's going to, you know, double  
13 or be uniform, and that's why we have an  
14 erosion/corrosion, flow accelerator corrosion program  
15 that we look at, and we will continue to monitor this  
16 area.

17          MEMBER POWERS: Could it be 88 mLs per  
18 year?

19          MR. KERESTES: Again, you know, we will  
20 continue to monitor this and look at it, and it's  
21 going to change, and we need to look at it closely.

22          MR. WILLIAMS: We believe the calculation,  
23 the prediction is conservative. We can provide  
24 additional information from our flow accelerator  
25 corrosion specialist.

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1 MEMBER POWERS: Well, I mean, it looks  
2 like it's 100 percent at certain -- when the air range  
3 is equal to the major value.

4 MR. WILLIAMS: Harold?

5 MR. CROCKET: Harold Crocket.

6 In addition to what Bob just said, we do  
7 have inspections ongoing. This particular line has  
8 replacements scheduled for refueling outage ten, which  
9 will be two cycles from now. So we do have scheduled  
10 replacements, and as he stated, it is in our program,  
11 as are the other lines in the steam cycle.

12 MEMBER SHACK: What kind of a line is it?

13 MR. CROCKET: It's scavaging steam goes  
14 from the moisture separator reheater to the heaters.

15 CO-CHAIRMAN WALLIS: It's just pure steam  
16 going through there?

17 MR. CROCKET: The quality of the steam is  
18 a mix. I don't remember the exact numbers.

19 CO-CHAIRMAN WALLIS: So they are all  
20 droplets in there. So this is probably why the wear  
21 is so high.

22 MR. CROCKET: Yes, sir. And these lines  
23 throughout the industry are noted for being fairly  
24 high wear.

25 MR. BOEHNERT: You're indicating that I

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1 guess eventually these lines are going to be -- all of  
2 them are going to be changed out

3 MR. CROCKET: Normally we would upgrade  
4 this type of line to a chromolly or stainless, usually  
5 chromolly. But we don't automatically upgrade unless  
6 we see a significant amount of wear either in a sister  
7 train or that type of thing. Normally we would  
8 inspect first.

9 MR. BOEHNERT: Sure.

10 CO-CHAIRMAN WALLIS: Anymore questions  
11 about this issue?

12 MEMBER POWERS: Well, I guess the next  
13 question, I mean, what you're concerned about is some  
14 sort of a surrey event where we get surprised and  
15 suddenly we fry workers and things like that. With  
16 this kind of uncertainty in the calculation, of  
17 course, the next thing you ask is: are there areas  
18 where CHECKWORKS predicts there's no problem and, in  
19 fact, there is a problem?

20 CO-CHAIRMAN WALLIS: Well, is CHECKWORKS  
21 always conservative?

22 MEMBER POWERS: Yeah, I mean, that's what  
23 you're asking.

24 CO-CHAIRMAN WALLIS: What kind of  
25 uncertainty are we talking about?

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1 MR. CROCKET: CHECKWORKS, part of the  
2 planned operation of the code is that you do  
3 ultrasonic inspections to refine the analysis, and you  
4 input your actual measured wear from your UT exams  
5 back into the program, and it has what's called a line  
6 correction factor that refines those predicted wear  
7 rates.

8 So, yes, they acknowledge that the code is  
9 just a tool.

10 MEMBER POWERS: Well, I mean, the  
11 challenge you face is that where you do those UT  
12 inspections is where the code tells you you ought to  
13 do the UT inspections; is that correct?

14 MR. CROCKET: The code is one tool that we  
15 use. The industry interaction has been really  
16 excellent in the realm of fact, and EPRI sponsors  
17 meetings twice a year. We talk about where everybody  
18 is working and what's the right solution, either  
19 material upgrade or changes to the piping system  
20 itself, if you need a larger diameter line to cut back  
21 the velocity or whatever, whatever is appropriate for  
22 the specific location.

23 CO-CHAIRMAN WALLIS: With this particular  
24 line now, you've changed the steam conditions. You've  
25 got more pressure drop from the boiler to the turbine,

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1 a different kind of wetness, different pots in the  
2 cycle. It might well be the steam scavaging line  
3 would see significant change in dryness fraction. So  
4 it's not clear that it's all that predictable what's  
5 going to happen.

6 MR. BOEHNERT: Dana, I don't --

7 CO-CHAIRMAN WALLIS: Is that a true  
8 statement I've made or do you take issue with that?

9 MR. WILLIAMS: We believe it is  
10 predictable by the CHECKWORKS methodology, correct?

11 MR. CROCKET: The code has largely proven  
12 very reliable, and there have been few occasions that  
13 they have upgraded the analysis, but they always are  
14 looking at refinements and periodically have new  
15 releases of the code to acknowledge certain things  
16 either in chemistry or different -- where the industry  
17 is learning about.

18 MEMBER POWERS: CHECKWORKS seems to get  
19 used broadly within the United States. I notice the  
20 Taiwanese developing alternatives to CHECKWORKS. Has  
21 anybody looked at those to see if they're more useful,  
22 less useful?

23 MR. CROCKET: There is one site in the  
24 domestic utilities that does not use CHECKWORKS, and  
25 that site uses three analysis. So it's proven very

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1 reliable, and there are other foreign utilities that  
2 also use CHECKWORKS, and we have not seen a reason to  
3 switch over from an industry perspective.

4 CO-CHAIRMAN WALLIS: Does CHECKWORKS put  
5 in something about the flow regime when you have  
6 droplets in the steam?

7 MR. CROCKET: It recognizes steam quality.

8 CO-CHAIRMAN WALLIS: It does? It has some  
9 way of handling that?

10 MR. CROCKET: Yes, sir.

11 MEMBER SIEBER: That's provided you know  
12 what it is.

13 CO-CHAIRMAN WALLIS: Mostly you know where  
14 the drops are. When you have a bend --

15 MEMBER SIEBER: That's right.

16 CO-CHAIRMAN WALLIS: -- you get subterfuge  
17 and they come off --

18 MEMBER SIEBER: Yeah, it heats up the end  
19 of the bend.

20 MR. BOEHNERT: Several years ago, well, I  
21 guess it was four or five years ago, Fort Calhoun blew  
22 out a pipe, and they were using CHECKWORKS. In fact,  
23 we had Mr. Checks in here to talk about it.

24 MEMBER SIEBER: Yes, yes.

25 MR. BOEHNERT: And his allegation was or

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1 he said if you use the code properly, it works right.  
2 And as I recall, Fort Calhoun, I don't believe they  
3 were using the code, what they should have done  
4 because they went back and looked at the code again,  
5 and the code, indeed, predicted that area that blew  
6 out was a problem, and they had missed it the way they  
7 were applying the code.

8 So the code has been shown to be quite  
9 reliable when it's properly used.

10 MEMBER SIEBER: Yeah, there's another way  
11 that you can get into trouble, which is usually you  
12 don't analyze the whole plant. You, you know, start  
13 with the very large pipes and go down to some level.  
14 Unfortunately, erosion/corrosion will eat away any  
15 pipe, and a lot of the smaller lines are just as  
16 susceptible as the large ones, which leads to the  
17 question of how far down in pipe size do you go to do  
18 analysis for Clinton.

19 MR. CROCKET: We do all susceptible piping  
20 that's in our program, and if the information is not  
21 there for the analysis, we do inspections that are  
22 commensurate with that.

23 But there is no size restriction that we  
24 don't go beyond. We have one inch, two inch, socket  
25 weld fittings that we do exams on and replacements,

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1 and it's all in the program if it's in the steam  
2 cycle.

3 MEMBER SIEBER: Okay. Thank you.

4 CO-CHAIRMAN WALLIS: Are we finished with  
5 this issue now?

6 Return to the original plan?

7 MR. WILLIAMS: Yes, sir, and thank you,  
8 Dr. Wallis.

9 I would like to introduce Larry Westbrook.

10 MR. WESTBROOK: Good morning. My name is  
11 Larry Westbrook of AmerGen. I am the Clinton Power  
12 Station senior reactor operator, leading the EPU power  
13 ascension testing team.

14 I will be discussing large transient  
15 testing.

16 First, allow me to provide some background  
17 related to large transient testing. ELTR1 specifies  
18 that large transient tests be performed. One  
19 specified test is closure of all main steam isolation  
20 valves at 110 percent of original licensed thermal  
21 power.

22 The second specified test is a generator  
23 load rejection at 115 percent original licensed  
24 thermal power. AmerGen has taken exception to these  
25 tests as an unnecessary challenge to the plant.

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1           General Electric has concluded that large  
2 transient tests are no longer necessary when reactor  
3 steam dome pressure is unchanged. Supporting this  
4 conclusion are the following.

5           Clinton Power Station reactor steam dome  
6 pressure remains the same following power up-rate.  
7 Large transient tests will provide no significant ne  
8 information, and existing modeling code adequately  
9 predicts plant response.

10           Next, I would like to present AmerGen's  
11 methodology for exempting large transient testing.  
12 First, we have reviewed industry power up-rate  
13 experience and determined that similar plants have  
14 demonstrated acceptable performance following large  
15 transients. kKl performed planned transient testing  
16 at up-rated conditions with acceptable results.

17           Also, an unplanned generator load  
18 rejection at Hatch at up-rated power levels showed  
19 that the plant responded as expected.

20           Second, performance of plant structures,  
21 systems and components, at Clinton Power Station has  
22 been evaluated at EPU conditions and determined to be  
23 acceptable.

24           Also, surveillance testing will confirm  
25 that plant structures, systems, components maintain

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1 their required performance capability.

2 In conclusion, large transient testing  
3 will provide no new significant information. This is  
4 supported by the following.

5 Plant response to large transients at  
6 extended power up-rate conditions will not change  
7 significantly as demonstrated by acceptable transient  
8 modeling code results and operating experience at  
9 similar up-rated plants.

10 Based on evaluation and existing  
11 surveillance testing, Clinton Power Station structure,  
12 systems, and components will perform as designed.  
13 Therefore, large transient testing is not required at  
14 Clinton Power Station.

15 MEMBER POWERS: Can you show us an example  
16 of the plant response to transients before and after  
17 the upgrade?

18 MR. WILLIAMS: I think your question is  
19 getting at the details of the transient.

20 MEMBER POWERS: You can just point to it  
21 in the documentation if it's in there.

22 MR. WILLIAMS: I believe it is. G.

23 MR. WESTBROOK: Could you repeat the  
24 question, please?

25 MEMBER POWERS: A key element in this

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1 conclusion slide is the plant response to these  
2 transients as a result of EPU not changed  
3 significantly based on modeling, and I was just asking  
4 is there some demonstration of that equivalency of  
5 response.

6 CO-CHAIRMAN WALLIS: That's about the only  
7 conclusion that can be tested. Statements such as  
8 plant components will perform as designed is a  
9 statement of faith. What you really mean is that you  
10 think there's a high probability that they will  
11 perform as designed.

12 And the same thing about tests will not  
13 provide new significant information. You've got a  
14 couple of tests already. One more, that's not a very  
15 big base of tests. So, again, these are probablistic  
16 statements. You think it's not going to provide new  
17 information.

18 It will provide new information. You just  
19 don't think the information is going to be very  
20 useful.

21 MR. WESTBROOK: That's correct. I don't  
22 think that the information that would be provided will  
23 be significant or --

24 CO-CHAIRMAN WALLIS: But if it were to  
25 result in a failure or something, that would be

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1           extraordinarily useful information.

2                       MEMBER POWERS:   Without a doubt.

3                       CO-CHAIRMAN WALLIS:    So something is  
4           happening here about assessment of the likelihood that  
5           the plant will perform as designed.

6                       MR. WILLIAMS:   G.E.?

7                       MR. NIR:   Israel Nir, G.E.

8                       What I would like to add is that typically  
9           the actual events at the plant will turn out to be  
10          very benign, and we have discussed this with you in  
11          other occasions.  There are control systems in place  
12          and protection systems that actuate specifically to  
13          address this large transient, and the end result is  
14          that typically we see a very small increase in neutron  
15          flux, you know, a pretty minor change in peak  
16          pressure.

17                      And that has been demonstrated  
18          analytically, and that is what is expected from an  
19          actual event.

20                      Now, to actually test the type of things,  
21          I think, that you may have in mind, you really need to  
22          impose some restrictions or come up with a sequence  
23          that may represent some risk to the plant, and it is  
24          just not advisable, such as, for example, have the  
25          bypass, turbine bypass inactivated.

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1                   So this type of sequences will not occur  
2 during the actual plant events, and they will result  
3 in a very benign event.

4                   MEMBER SHACK: The prediction is made that  
5 you've done these calculations and comparisons for kkH  
6 and kkL. I mean, all you have to do is essentially  
7 show the comparison presumably.

8                   MR. NIR: Right, and we have -- in other  
9 occasions we have shown this Committee -- excuse me --  
10 last year we have shown you some comparisons for kkL.  
11 kkL happened to be a plant that has 100 percent bypass  
12 capability, and again, the comparisons are good, and  
13 they effects are very benign.

14                   MEMBER SCHROCK: I guess I continue to be  
15 puzzled by what prompted G.E. to require the testing  
16 in the ELTR originally. What has changed that changed  
17 the G.E. position?

18                   MR. NIR: I would say two elements. One,  
19 it was a new program. It was, you know, a major step  
20 forward. We had to consider the entire licensing  
21 process, and that at the time appeared to be the right  
22 thing to do.

23                   The other thing is that we included in the  
24 ALTR allowance for increasing dome pressure of up to  
25 75 psi. That is not the case here. There's no

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1 increase in pressure.

2 Based on our experience, and now that we  
3 have performed analysis for a large number of EPU's and  
4 actually implemented a few, our position is that if  
5 the dome pressure is not increasing, we don't see the  
6 value for these large transients. Our judgment is  
7 that, again, there is no significant information that  
8 can be extracted from them.

9 MEMBER POWERS: I guess I'm still  
10 struggling to understand the basis of the second point  
11 here. I mean, the statement is made that we've  
12 modeled before and after and it looks the same. Does  
13 it? I mean, can you show me that this is the case?

14 MR. NIR: Yeah. That's, again -- I  
15 believe that we already shared some of this information  
16 with the committee, but we can -- we can definitely  
17 review it with you and show you some comparisons.

18 CO-CHAIRMAN WALLIS: Can you find it this  
19 morning?

20 MR. NIR: This morning? Yes.

21 MR. POST: This is Jason Post.

22 For example, I have an ATWS comparison.  
23 It's not exactly what we're after, but I mean, I have  
24 that that we could show them if that's --

25 MEMBER POWERS: I mean, you looked at

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1 something in order to write the sentence down on the  
2 viewgraph. If that is an adequate demonstration of  
3 the truth of the second point, then let's see it.

4 MR. BOLGER: This Fran Bolger from G.E.

5 When we presented a few weeks ago, I  
6 presented for a AAOO licensing evaluation a low  
7 rejection type transient before and after EPU. Would  
8 you like to see that comparison?

9 MEMBER POWERS: Well, is it done for the  
10 Clinton plant?

11 MR. BOLGER: No, it's not.

12 MEMBER POWERS: Well, then it's not very  
13 useful, is it, to support this statement?

14 MR. BOLGER: The plants have shown a very  
15 small change of their flux response to a low rejection  
16 type event. All the plants that we've analyzed have  
17 shown a similar type, very small change.

18 Yesterday when we presented the results of  
19 the transient analysis, the decrease in the calculated  
20 operating limit was presented to you. If that were  
21 looked at in more detail, it would show that there's  
22 a reduction in the integral flux peak before and after  
23 power up-rate, and as was stated yesterday, that was  
24 primarily due to change in the fuel characteristic and  
25 not due to the power up-rate.

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1 CO-CHAIRMAN WALLIS: I think we have seen  
2 these figures before, but I'm trying to just get a  
3 picture in my mind. I think a blue and a red curve or  
4 something with these.

5 MEMBER POWERS: I simply don't recall any  
6 pictures for Clinton

7 CO-CHAIRMAN WALLIS: Oh, I don't know for  
8 Clinton.

9 MEMBER POWERS: Well, I mean, we're  
10 talking about Clinton here.

11 CO-CHAIRMAN WALLIS: He's saying Clinton  
12 is very close to the other plants.

13 MEMBER POWERS: I mean the other ones we  
14 were talking about, BWR-3, I think.

15 CO-CHAIRMAN WALLIS: That may well be  
16 true. That may well be true.

17 Perhaps you could dig something out to  
18 give us before the --

19 MEMBER POWERS: There must be something  
20 that existed in order to write the second bullet down.

21 CO-CHAIRMAN WALLIS: Yes, that's right.  
22 That's the only one which can really be tested by  
23 evidence, isn't it, without doing the test?

24 MR. WILLIAMS: Yes, we will.

25 CO-CHAIRMAN WALLIS: Okay. Thank you.

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1 MR. BOLGER: Let me clarify the request.  
2 Would you like to see the Leibestodt comparison?

3 CO-CHAIRMAN WALLIS: Like to see a Clinton  
4 comparison that supports conclusion two or something  
5 from a plant which you can show is very, very close to  
6 Clinton for some reason.

7 MEMBER POWERS: The technical basis by  
8 which conclusion number two was reached.

9 CO-CHAIRMAN WALLIS: And if you have a  
10 code prediction for the same event, that would also  
11 help to reinforce some of these statements. The  
12 existing modeling code adequately predicts plant  
13 response, but there you'd have to go to something like  
14 Leibestodt. We've seen that before.

15 MEMBER POWERS: That's the first question.

16 CO-CHAIRMAN WALLIS: But if you happen to  
17 have it, it might be useful to remind us of it.

18 With that request for information, are  
19 there any other points that the Subcommittee wants to  
20 raise?

21 (No response.)

22 CO-CHAIRMAN WALLIS: All right. So let's  
23 move on then. We'll return to this question later.

24 MEMBER POWERS: We might share with  
25 everyone that part of our challenge that we face here

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1 is that we have a member not present in the  
2 Subcommittee meeting that disagrees with this  
3 conclusion that transient testing is not correct, and  
4 we were unable to persuade him of the wisdom of not  
5 testing based on hand waving arguments.

6 So more hand waving arguments presumable  
7 are not going -- we're not going to wear him down.

8 CO-CHAIRMAN WALLIS: Maybe he'll persuade  
9 us this time.

10 MEMBER POWERS: And he might well persuade  
11 us this time.

12 CO-CHAIRMAN WALLIS: Okay.

13 MR. WESTBROOK: The next topic I would  
14 like to discuss is ATWS event response.

15 The Clinton Power Station extended power  
16 up rate ATWS event response operator actions are  
17 unchanged from pre-EPU conditions. For example,  
18 reactor power and flow response to reactor  
19 recirculation pump trip during an ATWS remains  
20 unchanged from pre-EPU conditions. This is a result  
21 of no change in the flow control line.

22 The symptomatic conditions for ATWS,  
23 greater than five percent APRM power following a scram  
24 initiation and shutdown criteria not met remain  
25 unchanged for EPU conditions.

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1           The mitigating operator actions remain  
2 unchanged for controlling reactor power, water level  
3 and pressure. These mitigating operator actions  
4 include standby liquid control initiation, lower  
5 reactor water level, and alternate control rod  
6 insertion.

7           CO-CHAIRMAN WALLIS: The first statement  
8 there, I'm trying to figure out what you're saying.  
9 The reactor power and flow is unchanged from what it  
10 was pre-EPU. Is that what that says? You have the  
11 same power before and after EPU?

12           MR. WESTBROOK: That's correct.

13           CO-CHAIRMAN WALLIS: That's a bit strange  
14 if you've got a power up rate.

15           MR. WESTBROOK: That is following the  
16 reactor reset. (phonetic) pump trip.

17           CO-CHAIRMAN WALLIS: Once you trip the  
18 pump, the reactor power becomes the same as it was  
19 pre-EPU?

20           MR. WESTBROOK: That's correct.

21           As a result of a plant specific analysis,  
22 the minimum allowable standby liquid control boron  
23 concentration was raised to insure that the rate of  
24 negative reactivity addition during an ATWS remains  
25 acceptable.

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1           The table compares analytical results for  
2 EPU ATWS versus original license thermal power ATWS  
3 and design limits. This shows the small changes in  
4 ATWS related peak parameters will occur due to EPU  
5 conditions, and that the peak parameters will remain  
6 within design limits.

7           The small magnitude of these parameter  
8 changes and the fact that they remain below limits  
9 supports the adequacy of existing operator actions to  
10 mitigate an EPU ATWS event.

11           MR. BOEHNERT: How much did you have to  
12 raise the concentration of boron?

13           MR. WESTBROOK: Actually we're not  
14 changing the concentration that we maintain, but we  
15 had a very low minimum level. It was 10.3 percent,  
16 and we essentially made the minimum allowable 10.8  
17 percent.

18           CO-CHAIRMAN WALLIS: Are these numbers  
19 dependent on proper operator actions?

20           MR. WESTBROOK: Yes.

21           CO-CHAIRMAN WALLIS: And they have less  
22 time with the power up rate than they had before?

23           MR. WESTBROOK: No, that's not correct.  
24 They have the same time.

25           CO-CHAIRMAN WALLIS: The same time?

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1 MR. WESTBROOK: That's correct.

2 CO-CHAIRMAN WALLIS: So the operator  
3 actions are all the same as before?

4 MR. WESTBROOK: That's correct.

5 CO-CHAIRMAN WALLIS: Do they have to take  
6 action to avoid an instability region or something  
7 like that?

8 MR. WESTBROOK: During an ATWS, they will  
9 always observe for instabilities and take the actions  
10 as directed by the EOPs.

11 CO-CHAIRMAN WALLIS: So they could get  
12 into an instability region during an ATWS event.

13 MR. WESTBROOK: That's correct. However,  
14 the EOPs are designed to compensate and to mitigate  
15 those oscillations.

16 In conclusion, Clinton Power Station has  
17 implemented an ATWS mitigation strategy consistent  
18 with the BWR owners group emergency procedure  
19 guidelines. Therefore, EOP operator actions remain  
20 unchanged for EPU conditions.

21 MEMBER SHACK: Now, is it my memory that's  
22 faulty that in the previous up rates we did see a  
23 change in the operator response time for the ATWS so  
24 that Clinton is different in that respect?

25 MR. SCOTT: This is Kent Scott from

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1 AmerGen, senior reactor operator.

2 I believe in the next presentation that  
3 Bill Burchill gives us on probablistic risk  
4 assessment, we'll see that the allowable times for  
5 operator actions are somewhat reduced, but also the  
6 key is that the magnitude of that reduction in time  
7 has no impact on the actions that we take.

8 So we're taking the same actions. We're  
9 doing them the same way, but as opposed to having 31  
10 minutes to automatically depressurize the unit, now  
11 we've got 28 minutes to do it. They're of a magnitude  
12 where it's easy to do those actions. We can get those  
13 done in that same period of time.

14 MEMBER SHACK: But when these calculations  
15 are done, they're done assuming the operator does  
16 something at a certain time, and that time is the same  
17 for before and after the EPU.

18 MR. POST: This is Jason Post of G.E.

19 That's correct. The example operator  
20 action time are injection of boron and initiating the  
21 RHR suppression pool cooling, and we use exactly the  
22 same operator response time in both cases.

23 MEMBER SHACK: What is that response time  
24 that was used in the calculation?

25 MR. POST: For RHR, I believe it's 11

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1 minutes after the beginning of the event, and for  
2 boron injection it's about two minutes after the  
3 beginning of the event, and we use the same in both  
4 pre-EPU and the EPU.

5 CO-CHAIRMAN WALLIS: So you expect the  
6 action at 11 minutes, but the time available is 28 or  
7 31, whichever?

8 MR. POST: The time available in the PRA  
9 analysis --

10 CO-CHAIRMAN WALLIS: In order to success,  
11 to be on the right path of succeed.

12 MR. POST: Right.

13 CO-CHAIRMAN WALLIS: So if the operator  
14 waits for 35 minutes, then it might be off on some  
15 other path.

16 MR. WESTBROOK: Next I would like to  
17 introduce Mr. Bill Burchill, Exelon Nuclear.

18 CO-CHAIRMAN WALLIS: This is where we need  
19 our PRA expert, keeping a reserve.

20 MEMBER POWERS: We have on the committee  
21 the classic problem. We have not one PRA expert, but  
22 two or three, and as in all things of this nature,  
23 they simply disagree.

24 CO-CHAIRMAN WALLIS: Well, Bill is going  
25 to explain it so that even we can understand it.

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1 MR. BURCHILL: Thank you, Dr. Wallis.

2 Good morning. My name is Bill Burchill.  
3 I'm the Director of Risk Management for Exelon. Good  
4 morning, and happy Valentine's Day. I hope you've all  
5 bought your flowers. Your wives will be happy if  
6 you've done that. Just a little reminder.

7 I'm here to present the results of the  
8 evaluation of risk impact of the EPU on the Clinton  
9 Power Station. This, as you know, is not a risk  
10 informed submittal, but according to the ELTR-1, risk  
11 evaluation will be done, and as you may also know, an  
12 ELTR-2, a generic evaluation was performed.

13 That generic evaluation was for a smaller  
14 power up rate than is being proposed here for Clinton,  
15 and we have, therefore, done a plant specific  
16 evaluation.

17 The presentation that I'll go through this  
18 morning is very similar to one that we discussed a  
19 couple of months ago for Dresden and Quad Cities, but  
20 I'll point out that the Clinton Power Station  
21 experienced much less impact in the risk area than did  
22 Dresden and Quad. The numbers there were small  
23 numbers. Here are even smaller. So we'll discuss  
24 that.

25 The purpose of the evaluation is to use

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1 generally accepted risk metrics, core damage  
2 frequency, and large early release frequency to  
3 measure the risk impact of the changes being proposed  
4 for the plant.

5 We've done quantitative evaluations using  
6 the full power internal events, PRA model, and we've  
7 done quantitative evaluations of individual effects  
8 where we had other quantifying tools. Where we did  
9 not, we did qualitative evaluations, particularly in  
10 the area of external events and shutdown operation.

11 We've identified revisions to the PRA that  
12 would be made to represent the plant following the  
13 EPU. These revisions were represented in sensitivity  
14 studies. During our risk evaluation, they will be  
15 folded into the PRA at its next scheduled update.

16 The subjects that I'll cover are  
17 essentially the same as I discussed with you a few  
18 months ago, the quantitative, the qualitative, and  
19 then a summary of the risk impact.

20 The methods that we used were to identify  
21 the plant configuration changes due to the EPU. This  
22 involved examining all of the hardware changes,  
23 procedures changes, operating condition changes, and  
24 set point changes.

25 The principal change, of course, here is

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1 the power level. As a number of speakers before have  
2 noted, there is really very little change to this plan  
3 in terms of actual hardware and operation other than  
4 the power level. Most of those changes are out in the  
5 balance of plant or in the switchyard.

6 The primary components' pumping equipment  
7 and so forth that we have available for mitigating  
8 core damage essentially are remaining unchanged in the  
9 EPU state. So there's no change to RCH RHR high  
10 pressure core spray, low pressure core spray, ECCS.  
11 NPH limits remain the same, and the service water  
12 remains the same.

13 The only change that I'm actually aware of  
14 is that there is a change out of impellers in the  
15 TBBCW, but that has very little impact, and no impact  
16 at all on dependencies.

17 We used the most recently updated PRA  
18 model. As the staff noted in their SER, the Clinton  
19 PRA has had a lot of attention over the years since  
20 its initial development in the IPE days. They seem to  
21 update more frequently than most that I'm familiar  
22 with, and the most recent was in December of 2000.

23 I will point out that that update was  
24 motivated by the fact that we were about to submit a  
25 license amendment request to extend the emergency

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1 diesel generator allowed outage time, and that has, in  
2 fact, been approved by the staff.

3 When I first encountered this PRA, it was  
4 about the time that we merged our companies, and I  
5 wasn't particularly satisfied with what I found. So  
6 we made a number of improvements to that PRA in order  
7 to support that EDG AOT LAR.

8 CO-CHAIRMAN KRESS: Has your PRA been  
9 through the industry peer review?

10 MR. BURCHILL: Yes. In fact, the industry  
11 peer review was in August of 2000, and in fact, that  
12 was just before our merger. I had a member of my  
13 staff on that peer review team, and so that was my  
14 first real detailed look at the PRA.

15 And the peer review results were what  
16 really drove our changing the PRA in late 2000 in  
17 order to support that earlier LAR.

18 We've also examined all of the elements of  
19 the comments made by the peer review team, and we've  
20 tabulated those for staff review relative to the EPU.  
21 It turns out particularly with the changes that we  
22 made for the EDG AOT extension there were no remaining  
23 significant elements for this particular application.

24 As you know, in a PRA we use realistic  
25 models. We've talked just a moment ago about operator

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1 response times. I'll come back to that, but we use  
2 realistic limits on thermal hydraulics, and we credit  
3 all available systems, and likewise we compare to  
4 realistic success criteria and limits.

5 MEMBER POWERS: When you think in terms of  
6 realistic models, what do you do with the frequency of  
7 a pipe break brought on with flow assisted corrosion?

8 MR. BURCHILL: Well, the frequency of pipe  
9 breaks is represented by industry data of an empirical  
10 nature. We do not do explicit analytical modeling of  
11 fact in a predictive way. We look at industry  
12 experience in like situations, and then we use that in  
13 an actuarial fashion in order to predict those passive  
14 component failures.

15 MEMBER POWERS: I guess what I'm asking  
16 here is we're coming along. We're making a change to  
17 this plan. One of the pieces of information coming to  
18 us is that we have predictions that some piping  
19 systems are more susceptible to corrosion and a more  
20 rapid rate.

21 One would presume then that the  
22 probabilities that the pipe would rupture unexpectedly  
23 must go up. I can't imagine it doesn't.

24 MR. BURCHILL: Theoretically, yes.

25 MEMBER POWERS: I guess what I'm asking

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1 is: how is that piece of information reflected in the  
2 PRA analysis for the Clinton plant?

3 MR. BURCHILL: There is no change in those  
4 rupture frequencies within the PRA model to reflect  
5 what you're saying for two reasons.

6 On is that, again, the PRA model is  
7 looking at a time average, you know, annual average,  
8 and it's not a point prediction. So what we're  
9 looking at is what's the overall impact for the  
10 remaining operating life of the plant.

11 The second is that the FAC program, I  
12 think, as we've mentioned earlier, does monitor these  
13 pipes and well before they would be expected to  
14 rupture with any probability of significance they  
15 would be repaired or replaced.

16 So that's taken into account, you know,  
17 industry-wide in the database that we use for the  
18 actuarial data on pipe rupture frequency.

19 So the simple answer is there's no change  
20 made, but I think there's a good rationale for not  
21 making that change.

22 The other comment I'd make is the areas  
23 we're talking about, extraction, steam lines, and so  
24 forth, you know, really have very little impact.  
25 You're down the dependency chain in terms of systems

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1 that would respond to a potential core damage event.  
2 You're down the dependency chain about three levels.

3 So I don't think you' ever actually find  
4 a place to insert that information in the PRA.

5 MEMBER POWERS: I guess I will concede to  
6 you that I have a poor example here, but --

7 MR. BURCHILL: Well, we'll work with it.

8 MEMBER POWERS: -- I'm going to pursue  
9 that poor example because I don't believe your answer,  
10 and that is that if I have a line that is corroding  
11 more quickly, unless I have a monitoring program that  
12 is accelerated parallel to that more quickly eroding  
13 thing, even if I look at an annual average, I must  
14 have a higher rupture frequency with that loss.

15 MR. BURCHILL: At the instant you're  
16 talking about, yes, you would.

17 MEMBER POWERS: And your annual average,  
18 I must have a higher value.

19 MR. BURCHILL: We could debate that. I  
20 agree that it will be higher until that line is  
21 replaced. Once the line is replaced, the rupture  
22 frequency, I think you'll agree, goes significantly  
23 down.

24 MEMBER POWERS: If I replace the line in  
25 July, from January to December, that average I must

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1 have a high rupture frequency.

2 MR. BURCHILL: Well, it will certainly  
3 have a higher rupture frequency from January to July.  
4 From July to December if we've replaced it with pipe  
5 that's not susceptible, I would think the rupture  
6 frequency would go down.

7 So I don't know whether the net would be  
8 plus or minus.

9 MEMBER POWERS: Okay. Suppose I replace  
10 it in November?

11 MR. BURCHILL: I think we're in agreement.

12 MEMBER POWERS: There must be something in  
13 the PRA to reflect this additional information.  
14 You're telling me there's nothing. What I come down  
15 to is this. I mean, what I think I'm seeing in all of  
16 these PRA analyses is that we change nothing, and we  
17 find that the CDF doesn't change. This is not a  
18 remarkable finding to me.

19 MR. BURCHILL: Hopefully I'll persuade you  
20 otherwise through showing you the things that we  
21 actually did change.

22 I think the more substantive part of the  
23 answer is the question of what the impact would be of  
24 this line rupture in terms of actually interrupting  
25 any of our --

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1 MEMBER POWERS: I really am using NMA as  
2 an example. I'll agree we're working --

3 MR. BURCHILL: We're down here.

4 MEMBER POWERS: -- in subsidiary systems  
5 that actually I'm surprised your answer was we don't  
6 even model that at PRA, but I'm using it as an example  
7 because clearly other things. It must be that  
8 probably if you are rupturing, the core shroud must go  
9 higher. It must be higher.

10 Do you reflect that in the RPA? I think  
11 you don't.

12 MR. BURCHILL: Well, actually, as you're  
13 well aware, we've had a recent occasion to experience  
14 some jet pumping failures in another area, and we did,  
15 in fact, explicitly represent that in the PRA and do  
16 a fairly detailed analysis of its impact.

17 In this particular case, the impact could  
18 be put in the PRA. It's certainly true that we do not  
19 explicitly represent these lines. It would come in  
20 through the initiating event frequency, you know, on  
21 the secondary side, you know, loss of feedwater or  
22 something of that nature that would be created by a  
23 rupture of an extraction steam line.

24 MEMBER POWERS: Yes.

25 MR. BURCHILL: Shall I proceed, sir?

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1 CO-CHAIRMAN WALLIS: Please do.

2 MR. BURCHILL: We did compare the results  
3 of our analysis with the guidelines provided by  
4 RegGuide 1.174. As you know, this RegGuide is for  
5 permanent plant changes, for evaluating risk informed  
6 submittals, but it is a generally accepted guideline  
7 against which to benchmark results. So we did use  
8 that.

9 The next slide shows how we went about the  
10 review a little bit more detailed. We evaluated each  
11 of the individual PRA technical elements. These, of  
12 course, are the same elements that are evaluated by a  
13 PRA certification team.

14 We didn't find any change in the  
15 initiating event frequencies. There was nothing that  
16 was indicated in the power up rate because of the lack  
17 of major equipment changes that would create a change  
18 in initiative events, and likewise the same is true  
19 for the success criteria.

20 The main place where there were changes  
21 were in the operator response times, and I will show  
22 you the examples of the more significant impacts in  
23 that area, but, again, even these changes were small  
24 compared to the required coping time for the  
25 operators.

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1 MEMBER SHACK: Of course, a lot of those  
2 elements were where you've got your two grades in your  
3 PRA peer review.

4 MR. BURCHILL: Well, that's a good point,  
5 and I'm happy you could bring that observation up. I  
6 mentioned my pleasure with this PRA when I first  
7 encountered it.

8 The grades on this PRA were somewhat lower  
9 than the ones that I discussed with you before on the  
10 Dresden and Quad situations, but they were a mix of  
11 twos and threes, actually a slight majority of threes,  
12 and some of the areas that they pointed out that they  
13 were uncomfortable with were the ones that we attended  
14 to in late 2000 prior to making that EDG AOT  
15 submittal.

16 So I'm keenly aware of what you're talking  
17 about in that PRA. I don't think that those detract,  
18 and, again, we gave the staff a detailed tabulation on  
19 this, from this particular application, but, you know,  
20 I can go into whatever detail you like on that.

21 We also did quite a number of MAP runs to  
22 support this evaluation. The MAP code, as you know,  
23 is a best estimate code for severe accident, thermal  
24 hydraulics and, in fact, releases. The reason that we  
25 did that is that this is a fairly substantial change

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1 in the thermal power of the core, and therefore, the  
2 decay heat level is higher post trip and the heat up  
3 and the boil down rates are considerably higher.

4 So we did a number of MAP runs in order to  
5 support this evaluation.

6 CO-CHAIRMAN WALLIS: This is for the  
7 containment, the MAP runs?

8 MR. BURCHILL: They are -- the MAP goes  
9 from the core all the way out.

10 CO-CHAIRMAN WALLIS: It is in the core,  
11 too?

12 MR. BURCHILL: Yes.

13 The next slide shows the evaluation of  
14 effects in the operating conditions, and the following  
15 slide will talk about systems. I'll preface this by  
16 saying we found no new accident types in the  
17 evaluation. We didn't find any significant changes to  
18 accident scenarios, going back to the previous  
19 discussions on operator response. We found no new  
20 operator responses required, nor were the sequencing  
21 of operator responses changed.

22 The only thing we did find in that area  
23 was that there is a higher demand on the time of  
24 operator actions in certain situations.

25 We found no change in system dependencies.

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1 In other words, the front line systems are supported  
2 by the same support systems and essentially the plant  
3 is wired and hooked up the same way that it was  
4 before.

5 And the risk evaluation revealed no  
6 vulnerabilities produced by the EU.

7 The principal effect in the operating area  
8 is the increased heat loads, the reduced time to  
9 boiling in both the core and the suppression pool, and  
10 of course, at least theoretically reduce the time to  
11 core damage.

12 This produces a reduced time for equipment  
13 response and operator actions, and in each case where  
14 those operator actions were shortened and were felt to  
15 be of significance, we evaluated explicitly the  
16 analytical impact of that on the core damage  
17 frequency.

18 The Atlas does produce increased power  
19 levels and peak pressure. In this particular case, I  
20 think the committee asked me this question a few  
21 months ago on the other plants. ATWS only contributes  
22 about four percent of the total core damage on this  
23 plant. So it's a significantly smaller fraction than  
24 we talked about before, and therefore, changes in this  
25 area would likewise have a small impact.

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1           The biggest difference between this and a  
2 previous discussion is that although the feedwater  
3 flow is increased, there's no change in the normally  
4 operating number of feedwater pumps or condensate  
5 booster pumps. So we still have the same two turbine  
6 driven feedwater pumps and three condensate pumps and  
7 condensate booster pumps that are in the pre-EPU  
8 condition.

9           MEMBER POWERS:     And these pumps are  
10 working harder?

11          MR. BURCHILL:     These pumps are --  
12 certainly they're working harder because you've got  
13 more flow coming out of them, yeah.

14          MEMBER POWERS:     And so does their failure  
15 probability go up?

16          MR. BURCHILL:     The failure probability  
17 could go up, and the way we evaluated that, we did not  
18 do an explicit model of that, but we did a sensitivity  
19 study where we raised those failure probabilities by  
20 ten percent. Well, the initiating event frequencies  
21 associated with them.

22          MEMBER POWERS:     So now the flow in is up  
23 by 20 percent. So you increased the failure  
24 probability by ten percent.

25          MR. BURCHILL:     Of the initiating event,

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1 right.

2 MEMBER POWERS: Right, and what was the  
3 rationale there?

4 MR. BURCHILL: yeah, the rationale was we  
5 used -- actually I think we did this more analytically  
6 than is justified -- but we used a bathtub type curve  
7 for the burn-in, and I think we increased the failure  
8 rate in the first year by 50 percent, and then the  
9 second year, I think it was 25, and then we tailed it  
10 down. And then the average came out to be the ten  
11 percent, yeah.

12 CO-CHAIRMAN KRESS: In your MAP analysis,  
13 do fission products enter in it any way other than  
14 decay heat level?

15 MR. BURCHILL: There's a source term  
16 represented, correct.

17 CO-CHAIRMAN KRESS: To determine its  
18 effect on containment?

19 MR. BURCHILL: Right, and so that was  
20 scaled up, but it was a simple scaling.

21 CO-CHAIRMAN KRESS: So it was just by the  
22 power ratio?

23 MR. BURCHILL: Right, correct.

24 CO-CHAIRMAN KRESS: And that adds a heat  
25 load to the containment.

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1 MR. BURCHILL: Oh, absolutely.

2 CO-CHAIRMAN KRESS: And that's why.

3 MR. BURCHILL: Yeah, everything, you know,  
4 starting in the reactor assembly with the boil down  
5 rate of the coolant out to the wet well, out to the  
6 suppression pool, everything, you know, the boil down  
7 rates, you know, go down. The times set shortened.

8 CO-CHAIRMAN KRESS: What sort of fission  
9 product release model is in MAP? We've never reviewed  
10 that as a committee.

11 MR. BURCHILL: I'm not going to be able to  
12 answer that question. We can get back to you on that.  
13 I mean, I'm not a fission products person. So I don't  
14 know explicitly how to even answer what the model is.

15 The next slide addresses the question of  
16 system effects. As I mentioned, there were no changes  
17 in systemic PRA success criteria. Systemic criteria  
18 though is associated with the number of pumps, the  
19 number of buses, the number of instrument air systems,  
20 and so forth. All of those remain the same.

21 The one area that would be of interest  
22 here would be in the over pressure protection and the  
23 depressurization capability, but the number of safety  
24 valves and relief valves that were required in each of  
25 these cases, as has been previously discussed,

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1 remained unchanged in the EPU state. So that didn't  
2 change at all in the PRA model.

3 The changes that were made in the BOP and  
4 in the AC switchyard were not represented explicitly,  
5 but rather, again, were represented by sensitivity  
6 studies in which we raised the failure rates to  
7 represent a burn-in period of those new components.

8 The set point changes also produce a  
9 negligible impact, and we did evaluate those  
10 explicitly in the PRA model. Again, there were no  
11 changes to the equipment itself, but some changes to  
12 set points.

13 The next slide is really the heart of the  
14 changes that were made. There were 45 operator  
15 actions that were evaluated for impact. Twenty-eight  
16 of these were chosen because of their importance in  
17 the PRA, in other words, their importance with respect  
18 to contributing to core damage frequency, and 17 were  
19 chose because they were the operator actions that had  
20 to be taken in under a half an hour. So we judged  
21 those to be time critical and evaluated them  
22 explicitly.

23 The remaining operator actions that were  
24 not evaluated, if you sum up all of their  
25 contributions to core damage frequency, it was less

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1 than a half a percent. So we've captured 95 or 99.5  
2 percent of the operator actions that contribute to  
3 core damage.

4 The first one which has been discussed at  
5 every one of these EPU, you know, applications, of  
6 course, is the failure to initiate ADS. That normally  
7 comes up fairly high on the list, and it requires a  
8 shortening of time from about -- and, again, remember  
9 this is realistic analysis now with best estimate  
10 parameters -- a shortening of time from about 32  
11 minutes to 28 minutes.

12 So there is some change in the human error  
13 probability, and that does contribute to about a three  
14 percent increase in the core damage frequency, a  
15 fairly substantial increase in relative terms, but a  
16 very small increase, of course, in terms of the  
17 overall PRA result.

18 The next one is an interesting one. This  
19 is the failure to restart a feedwater pump following  
20 a failure to initially depressurize the reactor  
21 pressure vessel. This is what's called a dependent  
22 failure.

23 In the reference case in the submittal, we  
24 were assuming that the plant would implement an auto  
25 start on the motor driven auxiliary feed pump, and in

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1 fact, that meant that this situation, this contributor  
2 got better. So that the risk actually went down by  
3 about one and a half percent.

4 We did do a sensitivity study, however, in  
5 the submittal that showed what would be the effect if  
6 we did not implement the auto restart feature, and  
7 that gave the result that you see on the slide, which  
8 is a plus, about one and a half percent.

9 And it turns out that at this time, that  
10 auto restart feature is not being implemented at least  
11 initially. So the result that you'll be seeing here  
12 will look like a slightly different figure than you've  
13 read several times in the staff SER, and the reason is  
14 the swing in this contribution from this particular  
15 human error probability.

16 The next two have to do with the slick  
17 operation by the operator, injecting boron post ATWS.  
18 As you know, there's an early and late period for  
19 that. The early period in this plant's case is  
20 measured by the necessity to inject boron to avoid hot  
21 well depletion, hot well inventory depletion in the  
22 late period. If you miss that one, you're next trying  
23 to save the suppression pool, and so you want to  
24 inject in time to avoid loss of unacceptable  
25 inventory from the suppression pool.

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1                   In the analyses we do, we do a set of MAP  
2 runs, and we do these parametrically so we can see what  
3 the impact is of various operator action times. This  
4 early time, which these next two actions deal with,  
5 decreased from in the case of a two pump injection,  
6 from 12 to nine minutes. In the case of one pump  
7 injection, the second one of these pair on the slide  
8 decreased from nine to six minutes.

9                   So, again, we modeled the effective --

10                   CO-CHAIRMAN WALLIS:       Well, that's  
11 different from the 31 minutes we were told earlier.

12                   MR. BURCHILL:   Well, we're talking early  
13 injection here.

14                   CO-CHAIRMAN WALLIS:       That was for  
15 something else.

16                   MR. BURCHILL:   That's right, and this is  
17 just for early injection. The reason I bring this one  
18 up in detail is this is comparable to the two minutes  
19 you discussed earlier. Two minutes is a licensing  
20 number, but if you look realistically at what time is  
21 actually available to the operator, in the worst of  
22 cases only one pump operation, there's at least six  
23 minute available.

24                   And depending upon, you know, the exact  
25 sequence of the event, it could be as much as nine

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1 minutes, and I'll let the operators speak to this  
2 question with respect to their response time if you  
3 wish, but clearly, you know, these are response times  
4 that are well reasonable.

5 MEMBER POWERS: I mean, what's intriguing  
6 to me in this area is you calculate some probability  
7 that the operator will do things in six minutes or  
8 nine minutes, depending on what he has, and those  
9 numbers, I hesitate to guess off the top of my head,  
10 but I suspect you calculate like ten to the minus  
11 third or something like that.

12 MR. BURCHILL: On that order.

13 MEMBER POWERS: And things like that.

14 And then we speak to the operators, and we  
15 haven't on this particular incident, but I'm just  
16 guessing that if I asked them, "How long does it take  
17 you to do this?" he says, "Well, about 30 seconds."

18 "What's the probability that you'll fail  
19 to do this?"

20 And he says, "Not a snowball's chance in  
21 hell that I'll forget to do this."

22 MR. BURCHILL: That would be pretty close.

23 MEMBER POWERS: "And I'm tested on this  
24 every two weeks, and it's beaten into my head. I  
25 dream about it at night and things like that. So

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1 there's just no chance."

2 And I come back and see, you know, you  
3 have this discrepancy, and we talk about realistic  
4 models in PRA, and how do we factor -- how would one  
5 go about trying to factor in what we learn from the  
6 operator testing and whatnot and what we calculate  
7 when we go through Swain or something like that?

8 MR. BURCHILL: Well, yeah. I'm not sure  
9 I understand the discrepancy you're describing because  
10 what the operator will tell you is that he's tested on  
11 this frequently in the simulator, and that he does it  
12 really fast.

13 And actually, these are sometimes measured  
14 time-wise, but the really important thing is that  
15 they're responding to symptoms, and the timing isn't  
16 really the deal. It's whether or not they respond to  
17 the symptoms adequately.

18 Now, the way that the PRA models is this  
19 is using human error probability models, that a big  
20 EPRI program you may recall about ten years ago or 15  
21 did a lot of measurements in simulators and  
22 determined, you know, what was the error rate that was  
23 occurring with various types of actions, either  
24 cognitive or skill based, you know, type of actions.

25 And so the numbers I'm talking about are

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1 based on that, and I don't think there's a real big  
2 discrepancy. If I say that the error rate is on the  
3 order of ten to the minus three, I think that  
4 correlates pretty closely with the operator saying,  
5 you know, "No way will I miss this, you know."  
6 Because at some point he might miss it, and that's  
7 what that ten to the minus three number is meant to  
8 represent.

9 But I think that you --

10 MEMBER POWERS: I think what you're saying  
11 is that, in fact, everyone is pretty bad at guessing  
12 what a ten to the minus third probability is.

13 MR. BURCHILL: Oh, absolutely, absolutely.

14 MEMBER POWERS: One chance in 1,000 is  
15 just zero to most of us.

16 MR. BURCHILL: Guessing it, guessing it,  
17 right.

18 MEMBER POWERS: To most of us it's zero.  
19 I mean, there's just no chance this will ever happen.

20 MR. BURCHILL: I will say, I mean, and  
21 there are certainly practitioners in my peer group  
22 that would say this is all voodoo anyway, but the fact  
23 is that it's come a long way since Swain wrote his  
24 handbook, and there are some very sophisticated models  
25 today. I won't try to defend the absolute numbers,

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1 but I think the relative numbers, and the  
2 understanding of the cause and effect relationship  
3 between various performance shaping factors and their  
4 impact on the actual probabilities is pretty good. I  
5 mean, I think we have a reasonable handle on that.

6 MEMBER POWERS: Yeah. I mean, I think I  
7 agree with that. I also have to inject that I applaud  
8 your use of sensitivity analyses on those things where  
9 it's difficult to find data. We talked about that  
10 earlier yesterday.

11 MR. BURCHILL: Well, I wouldn't be able to  
12 defend it with you if I did, you know.

13 MEMBER POWERS: Well, but I mean, that's  
14 the appropriate thing to do. You've got to go find  
15 out is there an effect because all you're trying to do  
16 is see if there's a magnifier.

17 MR. BURCHILL: Right.

18 MEMBER POWERS: I mean if I change things  
19 by ten percent and the core damage frequency goes up  
20 by 85 percent, I get nervous about that.

21 MR. BURCHILL: Right, right.

22 MEMBER POWERS: And if it goes up by six  
23 percent, then I'm not so nervous about my number.

24 MR. BURCHILL: Right.

25 MEMBER POWERS: That's all.

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1 CO-CHAIRMAN WALLIS: Okay. Should we  
2 leave this slide now?

3 MR. BURCHILL: We can leave this slide.  
4 Let's leave this slide.

5 MEMBER POWERS: Is it grating on your  
6 nerves?

7 CO-CHAIRMAN WALLIS: No, I think we've  
8 covered the important items on it.

9 MR. BURCHILL: Yes. The full power  
10 internal events model in this particular case does  
11 include explicit representation of internal flooding  
12 in both the base case and, as you would expect, in the  
13 EPU case. This is a very small contribution, on the  
14 order of five percent to the total core damage  
15 frequency.

16 We didn't find any new initiating events  
17 or increases in initiating event frequencies, and so  
18 we found that there really is a negligible effect of  
19 internal flooding on core damage.

20 The Level II is the actual containment  
21 response and release evaluation, Large in this case or  
22 LERF is used as the measure of merit here, and large  
23 is defined as a greater than ten percent release of  
24 the cesium and iodine inventory in the core, and early  
25 is defined as releases in under six hours.

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1           The methodology used here was an explicit  
2 calculation as opposed to the simplified calculation  
3 I mentioned to you a couple of months ago. This has  
4 explicit PRA model with containment event trees.

5           We did do a binning of the end states for  
6 the core damage and then put those as the initiating  
7 event frequencies into the containment event trees to  
8 calculate the containment response.

9           There were very minor changes in the human  
10 error probabilities here, largely because we're  
11 talking very long times, you know, on the order of  
12 hours for response in this case, and these are mainly  
13 conditional probabilities for either repair or  
14 recovery, particularly for earlier actions that were  
15 not successful.

16           The next to the last bullet should say  
17 that the EPU has no impact on the containment event  
18 trees. I apologize. That was a carryover, the minor  
19 impact. There actually were no structural changes to  
20 the event trees here, and we found that the LERF is  
21 directly proportional, as you would expect, to the  
22 core damage frequency impact, which we'll show on the  
23 next slide.

24           This is a summary then of the numerical  
25 results from the full power internal events model

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1 evaluation. These are similar to results that have  
2 been reported in previous EPU risk studies. The pre-  
3 EPU PRA has about a 1.4 times ten to the minus five  
4 core damage frequency per year, and the LERF is about  
5 1.4 E to the minus seven, two orders of magnitude  
6 lower, and the reason for that, of course, is that  
7 we're not using a simplified model. We are using an  
8 explicit model of containment response.

9 The EPU has a very small impact on both,  
10 about six percent. Again, I'll remind you that in the  
11 SER if you've been reading that, it reports a  
12 reference case of about three percent. The difference  
13 here is the swing on that auto start and the motor  
14 driven feed pump.

15 The absolute numbers are that the core  
16 damage frequency changed by nine E minus seven per  
17 year, and this puts it below the RegGuide 1.174  
18 criterion of ten to the minus six for being classified  
19 as a very small risk impact.

20 Likewise the LERF was eight E minus nine  
21 per year, which is well below the RegGuide 1.174  
22 criteria of ten to the minus seventh, to be classified  
23 as a very small risk impact.

24 The other important thing is the  
25 composition of initiating events contributing to core

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1 damage did not change. We did answer an RAI from the  
2 staff that displayed the explicit spectrum of the core  
3 damage due to individual initiating events, and there  
4 was only very slight change, some up, some down. But  
5 essentially the pie chart looked identical.

6 CO-CHAIRMAN WALLIS: Could you explain,  
7 Bill, on this SER, there's something about sensitivity  
8 number four and talking there about 23 percent  
9 increase in base CBF.

10 MR. BURCHILL: Sensitivity number four was  
11 the combination of sensitivities one through three,  
12 where we increased those initiating event frequencies  
13 by 20 percent, and we increased the operator error  
14 rates by 20 percent, which was a very high increase,  
15 and to be frank with you, I can't remember what the  
16 third one was.

17 But we combined all of them. In all total  
18 they gave a 23 percent impact, which I think, you  
19 know, referring back to Dr. Powers' remark, if this  
20 had been an 85 or 90 percent impact, we would have  
21 probably paid very close attention. At 23, percent  
22 giving the bounding nature of that sensitivity, it was  
23 felt not to be significant.

24 We did look at uncertainties. This is the  
25 following slide. We examined this through the

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1 traditional use of risk importance measures. We did  
2 do explicit sensitivity studies, the ones I just  
3 mentioned, and we did compare this PRA's results to  
4 those reported in NUREG 1150.

5 We didn't find any sources of uncertainty  
6 beyond those already identified by NUREG 1150, and if  
7 you took the NUREG 1150 outer bound on uncertainty,  
8 which is on the order of a factor of five or six  
9 overall, the results here would still be in the small  
10 risk range in the RegGuide 1.174 risk MAP as compared  
11 to the very small risk.

12 CO-CHAIRMAN KRESS: Excuse me. How did  
13 you examine uncertainties used in risk importance  
14 measures again?

15 MR. BURCHILL: In risk importance  
16 measures, what you do is you look at the change from  
17 the pre-EPU state to the post EPU state and see  
18 what --

19 CO-CHAIRMAN KRESS: Change in what is  
20 important?

21 MR. BURCHILL: Yes, what is important,  
22 right. And then you can look at whether or not if you  
23 find an important piece of equipment. Is there  
24 anything that's changed about the dependency structure  
25 of supporting that piece of equipment?

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1                   Basically you're looking at whether or not  
2 there's anything about the PRA in going from the pre-  
3 EPU state to the post EPU state that would actually  
4 change the impact on that importance for those pieces  
5 of equipment.

6                   CO-CHAIRMAN KRESS: Yeah, I was having  
7 trouble relating that to uncertainty, but I can see  
8 it's a nice thing to have done.

9                   MR. BURCHILL: Okay. The next three areas  
10 are in the qualitative evaluation area. We started,  
11 of course, with the IPEEE. It concluded that none of  
12 the external events had risk significance.

13                   We explicitly evaluated the fire risk. We  
14 do have a fire PRA for this plant. It gives a base  
15 CDF for the plant of about 3.3 E minus six per year,  
16 which is about an order of magnitude lower than the  
17 internal events frequency.

18                   We looked at the dominant scenarios.  
19 These are primarily loss of inventory control or loss  
20 of decay heat removal, and we found no change in the  
21 risk profile produced by the EPU; a minor impact on  
22 decay heat removal scenarios because of the human  
23 error probabilities, but again, most of these are out  
24 late in time.

25                   We didn't find any new initiating events,

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1 nor any increases in fire ignition frequencies. So we  
2 judged that the EPU has a negligible impact.

3 In the seismic area, a point to make here  
4 is that the IPEEE is based on seismic margin analysis.  
5 That analysis did not reveal any outliers or  
6 vulnerabilities in this plant. We looked at the  
7 seismic margin report, found no reason to believe that  
8 the seismic qualifications of the SSCs would be  
9 changed, and as was previously discussed, there's  
10 really negligible impact to the increase in stored  
11 energy on blow-down loads so --

12 CO-CHAIRMAN WALLIS: Do you have an  
13 increase in power? We have presumably great  
14 occurrence in part of the electrical system. Is this,  
15 in fact, a fire initiation risk, circuit breakers and  
16 things?

17 MR. BURCHILL: The only place that I'm  
18 aware that that would be an issue, I think we're  
19 making changes to the equipment. These are mostly out  
20 in breakers in the switch yard, if I remember, and  
21 those were the ones that we covered with the  
22 sensitivity study.

23 Is that sufficient?

24 Okay. The EPU has the word "negligible"  
25 that's also appropriate here for the seismic risk. We

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1 could not find any impact here.

2 In the shutdown risk area, we do not have  
3 a shutdown PRA, but, again, we can evaluate what would  
4 be the impact by principally being guided by the  
5 operator actions required for the dominant sequences  
6 that contribute to risk in the shutdown states. The  
7 shorter times for boiling, the decrease in inventory,  
8 decrease in the inventory loss time does shorten the  
9 time for operator response, and it also, of course,  
10 delays the time when alternative decay heat removal  
11 systems, such as the spent fuel cooling system or the  
12 reactor water clean-up system could be used.

13 But the times that we're talking about are  
14 measured in hours or even days. So the impact here is  
15 essentially negligible, and is managed through the use  
16 of a configuration risk management program.

17 So, in summary, we did evaluate the impact  
18 using standard PRA methods, both quantitative and  
19 qualitative. The risk impact is a very small percent  
20 of the current plant risk, on the order of six  
21 percent.

22 That risk was compared for both CDF and  
23 LERF to the guidelines provided for a permanent plant  
24 change in RegGuide 1.174 and found to be in the very  
25 small risk region, and the risk impacts from external

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1 events and shutdown conditions were found through  
2 examination of the dominant sequences in judgment to  
3 be negligible.

4 Again, as I will say, as I said a couple  
5 of months ago, the staff review in this area was, in  
6 our opinion, quite thorough, especially that this is  
7 not a risk informed submittal. We had quite a lot of  
8 dialogue with the staff, although not quite as much as  
9 we did on the previous submittal, but they did ask, I  
10 think, quite relevant questions relative to our  
11 submittal.

12 So if there are no further questions, I  
13 will turn this back to Larry Westbrook, who will  
14 discuss the project implementation.

15 MR. WESTBROOK: Thank you, Bill.

16 Good morning, again. I am Larry Westbrook  
17 with AmerGen, and as Bill mentioned, I will be  
18 discussing the EPU project implementation regarding  
19 operator training and EPU testing.

20 EPU training consists of classroom  
21 presentations and simulator scenarios. Classroom  
22 material was presented in licensed operator  
23 requalification training covering the following  
24 topics:

25 Technical specifications and updated

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1 safety analysis report changes;

2 Plant limits and operating conditions  
3 changes, such as core thermal power and generator  
4 limits;

5 Design changes associated with EPU;

6 The extended power up rate power to flow  
7 MAP operating procedure revisions;

8 And Exelon and industry power up rate  
9 experience.

10 Simulator training is being provided to  
11 operating crews --

12 CO-CHAIRMAN WALLIS: Could I ask you here  
13 now? Classroom training is presumably a two-way  
14 thing. I mean, you tell them things and they ask  
15 questions.

16 MR. WESTBROOK: Yes.

17 CO-CHAIRMAN WALLIS: Were there any  
18 particular questions they raised that you remember?

19 MR. WESTBROOK: I'm trying to think of  
20 particular questions. The questions generally that  
21 were asked --

22 CO-CHAIRMAN WALLIS: Did they have any  
23 particular concerns?

24 MR. SCOTT: Larry, if I could help you out  
25 here, again, I'm Kent Scott from AmerGen, senior

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1 reactor operator.

2 One of the concerns that I heard with the  
3 guys in training is focused around how we're going to  
4 operate the generator now. You know, we're going to  
5 be limited by the secondary balance of plant side. So  
6 there was a lot of concerns with respect to, okay, how  
7 do the limits on our generator change, explaining the  
8 increase in hydrogen pressure from 60 to 75 pounds.  
9 I think that was the most focus that I had saw, and I  
10 think that was supported a lot by showing the  
11 operators in the simulator the difference in response.

12 Here's the plant at a higher feed flow.  
13 Here's the plant at a higher steam flow. Here's a  
14 transient. It looks the same.

15 And they kind of took that away and  
16 focused in on, okay, what's going to be different. So  
17 the balance of plant inside the generator was the  
18 thing that I saw most from them.

19 MR. WESTBROOK: Okay. Simulator training  
20 is being provided to the operating crews covering the  
21 following: EPU full power conditions, and as Kent  
22 stated, that involved the generator limits and the  
23 plant response.

24 Normal operations scenarios, such as  
25 raising reactor power along constant rod line and

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1 dynamic scenarios that were selected to highlight both  
2 similarities and differences in plant response at EPU  
3 versus current power levels; these scenarios included  
4 a feedwater pump trip, a reactor recirculation pump  
5 trip, and ATWS.

6 Operator requalification training is being  
7 covered in two cycles of classroom and simulator  
8 training. The first cycle of training has been  
9 completed, and the second cycle is currently in  
10 progress.

11 CO-CHAIRMAN WALLIS: I would guess that  
12 there's no real significant change, and the way that  
13 they diagnose events is very much the same as before.

14 MR. WESTBROOK: That's correct.

15 CO-CHAIRMAN WALLIS: In terms of the same  
16 -- it's just slight qualitative differences in the  
17 response.

18 MR. WESTBROOK: That is correct. A slight  
19 difference in response. The way we operate the plant  
20 is essentially the same. If they're -- the most  
21 significant difference, if you will, is that to  
22 maximize Clinton's output will be BOP limited. They  
23 will be looking at and maximizing the output by  
24 focusing on the generator limits, and we won't be as  
25 bounded by our license power level because we'll have

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1 a margin to the license power level. Of course, we  
2 won't be monitoring that.

3 CO-CHAIRMAN WALLIS: It's like driving an  
4 automobile with a slightly different gear box or  
5 something. I mean, it's not as if many things have  
6 changed. It's just you're going to have a slightly  
7 different response.

8 MR. WESTBROOK: That's correct.

9 Also, just in time, simulator training  
10 specific to EPU testing will be conducted prior to  
11 power ascension.

12 CO-CHAIRMAN WALLIS: Just in time. The  
13 day before?

14 MR. WESTBROOK: The day before, a couple  
15 of days before so that this training, as I stated, is  
16 specific to the power ascension. It may be specific  
17 to certain testing done during the power ascension,  
18 and it may be specific to the crew that will be  
19 performing the testing.

20 MR. SCOTT: And again, this is Kent Scott  
21 from AmerGen.

22 That's a typical process that we do prior  
23 to any start-up, is we have the crew that's going to  
24 start up the reactor take them over there the day  
25 before.

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1 MR. WESTBROOK: Next I would like to  
2 provide an overview of the start-up test program.

3 The start-up test program employs a  
4 careful and deliberate approach to upgrade power  
5 levels. The program has incorporated previous  
6 successful Exelon power up rate experience.

7 The La Salle EPU test director is the  
8 Clinton Power Station project manager. Also the  
9 Dresden Quad Cities test procedure developer is also  
10 developing the Clinton test procedure.

11 Beginning at 90 percent original licensed  
12 thermal power, steady state data collection and  
13 testing will be conducted. Once 100 percent original  
14 licensed thermal power is reached, reactor power will  
15 be raised in two percent increments along a constant  
16 rod line to maximum achievable power level.

17 Beginning at approximately 70 percent of  
18 original licensed thermal power dynamic testing will  
19 be conducted. These dynamic tests include pressure  
20 control system stability tests, feedwater level  
21 control system stability tests, and turbine valve  
22 surveillances.

23 This slide shows the testing to be  
24 performed at each power level.

25 In conclusion, the operator training to

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1 prepare for EPU is extensive and utilizes both --

2 CO-CHAIRMAN WALLIS: I don't understand  
3 what you mean by testing of core performance, let's  
4 say. Are you just recording how it's performing?  
5 You're not performing any sort of transient tests.

6 MR. WESTBROOK: That's correct. Core  
7 performance is no transience test. It's monitoring  
8 with our 3D Monocore system that all of our thermal  
9 limits and our inspect and that we are operating on  
10 the power --

11 CO-CHAIRMAN WALLIS: This isn't so much  
12 testing. It's just monitoring that things are  
13 behaving as expected.

14 MR. WESTBROOK: Part of the testing is  
15 data collection and analysis and a static, and then  
16 some of the tests, such as pressure control system  
17 stability, feedwater level control system stability,  
18 those are the dynamic tests.

19 CO-CHAIRMAN WALLIS: Now, presumably you  
20 have guidelines here. I mean, you've got something  
21 like piping vibration data. These folks are recording  
22 piping vibration data. There must be some procedures  
23 written down about what they do if the vibration steps  
24 out of line beyond some magnitude or something. All  
25 of these must be things to look for --

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1 MR. WESTBROOK: That's correct.

2 CO-CHAIRMAN WALLIS: -- or guidelines  
3 about what to do.

4 MR. WESTBROOK: The test procedures being  
5 developed by or from the General Electric task report  
6 which selected the tests that need to be performed --

7 CO-CHAIRMAN WALLIS: All of those checked  
8 things, you've got to check that the vibration has not  
9 increased beyond something.

10 MR. WESTBROOK: Right.

11 CO-CHAIRMAN WALLIS: And so on and so  
12 forth.

13 MR. WESTBROOK: This test has a Level 2  
14 and a Level 1 criteria. Certainly exceeding the Level  
15 2 criteria requires evaluation, and exceeding Level 1  
16 criteria would certainly be more extensive actions  
17 required. Those criteria are being built into the  
18 test procedure.

19 MEMBER SIEBER: You've run these tests  
20 before. So you have a database --

21 MR. WESTBROOK: Yes.

22 MEMBER SIEBER: -- of what the vibration  
23 levels are. So you're really looking for deviations  
24 from that as you go beyond the old 100 percent power  
25 level; is that correct?

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1 MR. WESTBROOK: These tests are similar to  
2 the original start-up tests.

3 MEMBER SIEBER: Right.

4 MR. WESTBROOK: As far as the criteria,  
5 we're taking what's established in the task report and  
6 insuring in the course that they are consistent with  
7 the original start-up test.

8 MEMBER SIEBER: Right.

9 MR. WESTBROOK: In conclusion, the  
10 operator training to prepare EPU is extensive and  
11 utilizes both classroom and simulator environments.  
12 The testing plan is incremental and comprehensive and  
13 is a careful and deliberate approach to up-rated power  
14 levels.

15 Therefore, project implementation will  
16 insure that EPU is implemented as designed and plant  
17 response is as expected.

18 CO-CHAIRMAN WALLIS: When you're doing  
19 this power uprating by two percent, do you have extra  
20 people in the control room?

21 MR. WESTBROOK: The actual people in the  
22 control room will be very minimal. Clinton Power  
23 Station's control room is physically very small. A  
24 lot of the data collection will be taken off the  
25 process computer and analyzed outside the control

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1 room.

2 CO-CHAIRMAN WALLIS: So there are other  
3 people who are engineers sitting somewhere else  
4 monitoring what's going on?

5 MR. WESTBROOK: That's correct.

6 MR. WILLIAMS: Are there any more  
7 questions for Larry?

8 (No response.)

9 MR. WILLIAMS: Thank you, Larry.

10 Prior to concluding, we are prepared to  
11 answer the follow-up questions on the large transient  
12 testing.

13 Tim.

14 MR. SPENCER: Good morning. Dale Spencer,  
15 Exelon Nuclear.

16 We would like to address the earlier  
17 question regarding analysis of the plant response to  
18 transience. We have provided the staff with the  
19 results of these analyses, but in response to today's  
20 question, we have a couple of things we pulled  
21 together.

22 A couple of points here. General Electric  
23 has asked that the session be closed. Again, this is  
24 some proprietary information.

25 The other thing, if you'd please excuse

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1 us, we pulled it together at the last minute. We have  
2 to change computers and get a couple of flemsies up  
3 there so that we have the right information, but  
4 pardon us for just a minute.

5 And we would ask the Chairman that we  
6 treat this as a closed session also.

7 CO-CHAIRMAN WALLIS: Okay.

8 (Whereupon, from 9:57 a.m. to 10:05 a.m.,  
9 the Subcommittee meeting was recessed for closed  
10 session.)

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1 MR. BOEHNERT: Okay. Let's go back to  
2 open session.

3 CO-CHAIRMAN WALLIS: We're ready to  
4 conclude.

5 MR. SPENCER: Yes, Dale Spencer, Exelon  
6 Nuclear.

7 At this time I believe the ACRS had one  
8 pending question for Bill Burchill, and he's prepared.

9 MR. BURCHILL: This is Bill Burchill,  
10 Exelon.

11 I wanted to answer Dr. Kress' question  
12 about the radiological release model which is in the  
13 MAP program. I knew it would have some catchy name,  
14 and I couldn't remember what it was, but it's based on  
15 IDCOR data. It was actually a model developed by  
16 EPRI. It's called the IDCOR EPRI steam oxidation  
17 model, and it does detail a phenominological  
18 evaluation of both the release and then the various  
19 partitioning mechanisms as you go out from the fuel  
20 through the coolant, through the steel boundaries of,  
21 you know, the reactor assembly, and on out through the  
22 containment.

23 So it is a detailed model for radiological  
24 release. Does that answer your question?

25 Right. It's the old Cubachasie (phonetic)

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1 model, right.

2 MR. BOEHNERT: Dale, what version of MAP  
3 are you using now?

4 MR. BOLGER: This was all done with MAP  
5 3B. We are now converting fleet-wide to MAP 4, which  
6 we'll have in place this year, but all of these  
7 results were on 3B, and in this area, there is some  
8 enhancements in MAP 4, but basically the fundamentals  
9 are the same.

10 MR. WILLIAMS: If there are no more  
11 questions, we would like to introduce Keith Jury to  
12 conclude.

13 MR. JURY: Thank you.

14 Good morning. My name is Keith Jury, and  
15 I'm the Director of Licensing for the Midwest Region.

16 We had to have one licensing guy to talk  
17 here. So I guess I'm the token.

18 Dr. Wallis and the other committee  
19 members, on behalf of Exelon and AmerGen, we'd like to  
20 thank you for the opportunity to come here and give  
21 this presentation. As always, we appreciate the  
22 insights that we get from you all individually and  
23 collectively.

24 It's clear at least to me that the team,  
25 including G.E. and Sargent Lundy have done a very

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1 thorough job on this project.

2 I would like to apologize for the fact that  
3 we weren't able to answer all of your questions  
4 immediately and had to huddle, but I think that given  
5 the fact that the team has taken not only the lessons  
6 learned from our fleet, but the industry as a whole  
7 and have incorporated into this project, that it  
8 speaks to the thoroughness of the effort.

9 I'd like to bring up the fact that, you  
10 know, I think as time has evolved here and as we've  
11 gone through these up rates, for this up rate, we use  
12 the most up to date and accepted analytical methods  
13 and believe that we've demonstrated that the up rate  
14 will have a minimal impact on the plant from not only  
15 the plant perspective, but the system integrity, and  
16 as Bill so eloquently pointed out, from a risk  
17 perspective as well.

18 As such, we've concluded that the up rate  
19 in the plant operation at the up rated conditions is  
20 acceptable and clearly safe at these conditions.

21 And with that, I'd like to thank you again  
22 for your time, and that completes our portion of the  
23 presentation.

24 Thank you.

25 CO-CHAIRMAN WALLIS: Well, thank you.

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1 I believe we're ready to have a break, and  
2 so we will break, and we will come back here at 20  
3 minutes past ten.

4 (Whereupon, the foregoing matter went off  
5 the record at 10:10 a.m. and went back on  
6 the record at 10:23 a.m.)

7 CO-CHAIRMAN WALLIS: We'll come back in  
8 session, and now we're going to hear from the NRC  
9 staff, and we're looking forward to that.

10 MR. MARSH: Yes, I have a few opening  
11 comments. Good morning, Mr. Chairman. This is Ted  
12 Marsh, and I'm still the Deputy Director of Licensing.

13 And in the interest --

14 MEMBER POWERS: We're working on that.

15 MR. MARSH: Yeah, I know you are. In what  
16 sense I don't know.

17 (Laughter.)

18 MEMBER POWERS: EDO, EDO.

19 MR. MARSH: EDO. Thank you, thank you.  
20 I appreciate that.

21 I did want to point out that the agenda  
22 has us talking a little bit this morning about our  
23 efforts to improve safety evaluation quality, and we  
24 did talk about that yesterday, and we also have the  
25 letter to you. So I'm not going to go through that

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1 anymore, unless you'd like.

2 Let me just begin by introducing Jon  
3 Hopkins, who is the project manager for Clinton, who  
4 will be going through the presentation format and  
5 introducing the speakers.

6 Jon.

7 MR. HOPKINS: Okay. Thank you.

8 As Ted said, I'm Jon Hopkins, NRC project  
9 manager for Clinton.

10 And next slide.

11 I'll start with an overview. Clinton's  
12 BWR-6 Mark 3, it's the first one to apply for extended  
13 power up rate. This will be a 20 percent power up  
14 rate. Even after the up rate, which will be to 3473  
15 megawatts thermal, Grand Gulf will have greater power  
16 level and Perry will be slightly greater power level.  
17 It's a constant reactor dome operating pressure, and  
18 to achieve the 20 percent up rate, there are many  
19 balance of plant modifications that need to be done,  
20 and in large part because of that, this has two-part  
21 implementation.

22 The refueling outage that begins is it  
23 scheduled to start the end of March, early April with  
24 start-up in May, and they expect to achieve roughly  
25 seven percent when they start up this time.

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1           They will also have roughly two-thirds  
2 G.E. 14 fuel when they start up this time, and then  
3 the next refueling outage is scheduled for early 2004,  
4 where they'll make the rest of the modifications and  
5 achieve the rest of the power.

6           This application mostly follows the  
7 licensing topical reports, the LTR-1 and 2. It was  
8 submitted in June of last year, and as I stated, the  
9 refueling outage starts the end of March, early April.  
10 So we'll be going to full committee in March, and we  
11 will be looking for a letter from the full committee.

12           There are some exceptions to ELTR-1, too.  
13 It states four of them. The first one is large  
14 transient testing. That exception is similar to  
15 Dresden and Quad Cities, and we found it acceptable  
16 for them not to do large transient testing.

17           The other three exceptions are in the  
18 reactor systems review area, and they'll be talked  
19 about by the next presenter.

20           Mainly I'll mention that the other three  
21 exceptions in the reactor system area dealing with  
22 stability, transience and ECCS performance. It's hard  
23 to discuss those without getting into proprietary  
24 information. Our presentation is, you know,  
25 scheduled for an open presentation and everything.

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1 Questions, we may have to go into closed session based  
2 on --

3 CO-CHAIRMAN WALLIS: I think if things  
4 become proprietary, what you should do is stall them,  
5 and then at the end of the session we'll have  
6 discussion of the proprietary items if we need them.

7 MR. HOPKINS: Yes.

8 CO-CHAIRMAN WALLIS: Will that be okay?

9 MR. HOPKINS: Yes, I'm fine with that. I  
10 just wanted to mention it.

11 This is a non-risk informed submittal, but  
12 as you just had the presentation, there were  
13 substantial risk evaluations performed. I won't  
14 mention anything more about that.

15 Experience. This plant is owned by  
16 AmerGen now, which is 50 percent Exelon, and so they  
17 have plant up rate experience specifically with the  
18 Dresden-Quad extended power up rate.

19 The staff, of course, has that experience  
20 plus Duane Arnold and Hatch and Monticello in boilers.

21 CO-CHAIRMAN WALLIS: Has Dresden and Quad  
22 Cities actually implemented an up rate?

23 MR. HOPKINS: I know -- I'm sorry --  
24 Dresden 2 has.

25 CO-CHAIRMAN WALLIS: Dresden 2 has

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1 influence at the up rate.

2 MR. HOPKINS: Yes. To continue from our  
3 review to finalize my review of the application, we  
4 have one license condition at this time. It deals  
5 with the feedwater nozzle. That, again was discussed  
6 by the licensee yesterday.

7 They are doing additional analyses of the  
8 cumulative usage factor in there, and they have to  
9 submit them to the staff. We feel that this is not a  
10 significant item, that we can make it a license  
11 condition and resolve the issue easily during the next  
12 fueling cycle. We don't anticipate that this should  
13 stop them from starting up.

14 Also, one other item. The staff is going  
15 to perform or, in fact, is performing confirmatory  
16 containment analyses. We just received data from  
17 General Electric to allow us to go do that. The  
18 confirmatory analysis is similar to that performed at  
19 Duane Arnold, and I expect we'll have that done fairly  
20 soon.

21 MR. BOEHNERT: Who is doing that analysis,  
22 Jon.

23 MR. HOPKINS: Well, our plant systems  
24 branch.

25 MR. BOEHNERT: Oh, it's in house?

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1 MR. HOPKINS: Yes.

2 MR. BOEHNERT: Okay.

3 MR. HOPKINS: We have no other items other  
4 than those two I mentioned, the license condition and  
5 the confirmatory analysis.

6 With that I'd like to introduce our first  
7 presenter, who is George Thomas, and he will discuss  
8 reactor systems review.

9 MR. THOMAS: Yeah, my name is George  
10 Thomas. I'm from the Reactor Systems Branch.

11 Our review scope, mostly in the standard  
12 review plan, Chapter 4, 5, 6. There is a small  
13 portion of nine, and most of 15. And our review is  
14 mostly about the fuel and the reactor systems, and we  
15 review high pressure core spray, low pressure core  
16 spray, RCA system, CID system, and the standby control  
17 system.

18 Also we review reactor ore pressure,  
19 transients, LOCA, dose, and stability. So this is our  
20 scope.

21 As Jon told, you know, basically for all  
22 the ELTR 492, for most of the EPU evaluation, but the  
23 tech. deviations under -- they're in the areas of  
24 transient analysis, LOCA analysis, and the stability  
25 analysis.

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1                   Typically they sum it (phonetic) during  
2 the obligation, equilibrium, quote, analysis for the  
3 transients and the LOCA, but this obligation, they  
4 already are very limited analysis for the transients,  
5 LOCA.

6                   MR. NIR: This is G.E.? I think you're  
7 getting into proprietary information which has to do  
8 with scope, and I would like to strike this from the  
9 record if possible.

10                  And, again, we can get into this  
11 discussion in the closed session if necessary.

12                  MR. BOEHNERT: I know no way to strike the  
13 record.

14                  CO-CHAIRMAN WALLIS: I don't understand  
15 what. He hasn't said anything yet which is  
16 proprietary, has he?

17                  MR. NIR: It's G.E.'s position that he's  
18 discussing now some proprietary information, the basis  
19 for the analysis and the scope, which we consider  
20 proprietary.

21                  MR. BOEHNERT: I'm sorry.

22                  CO-CHAIRMAN WALLIS: Well, he hasn't  
23 really discussed anything yet, has he?

24                  MR. BOEHNERT: Yeah, that's --

25                  CO-CHAIRMAN WALLIS: Can we move on? Are

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1 you clear on what he's objecting to?

2 MR. THOMAS: I'm not going into details.  
3 I'm only just telling, you know, they did only a very  
4 limited analysis. It was not done typically like  
5 before. That's all I'm telling, you know. I'm not  
6 telling the details now.

7 MR. BOEHNERT: Let me make a comment here  
8 for the record.

9 There's been some controversy over the  
10 scope of what is G.E. holding proprietary here, and we  
11 need to get this straightened out between the staff  
12 and ourselves because this is becoming a problem.

13 I don't want to say any more right now,  
14 but I think this has to be straightened out because it  
15 seems that it's become quite broad, and it's impacting  
16 how we're doing business here.

17 CO-CHAIRMAN WALLIS: The fact that there  
18 are exceptions for transient analysis, LOCA analysis,  
19 and stability analysis is actually in the SER, isn't  
20 it?

21 MR. THOMAS: Right, right.

22 CO-CHAIRMAN WALLIS: Which is a public  
23 document.

24 MR. THOMAS: IT is in the SER.

25 MR. HOPKINS: Excuse me. The SER is the

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1 draft safety evaluation, which we have sent to the  
2 licensee for their comments on proprietary aspects.  
3 So, in fact, it is not a public document yet.

4 Now, I will state that this slide was  
5 developed, and we feel this slide is entirely  
6 nonproprietary.

7 MR. NIR: We agree.

8 MR. HOPKINS: So we feel that you can say  
9 that those exceptions -- that that's public.

10 MR. NIR: We agree.

11 CO-CHAIRMAN WALLIS: Okay.

12 MR. BOEHNERT: They agree. Okay. Then we  
13 don't have a problem.

14 MR. HOPKINS: So far, right.

15 CO-CHAIRMAN WALLIS: Well, you're going to  
16 be watched like a hawk by G.E. now. So --

17 (Laughter.)

18 MR. THOMAS: Okay. As part of our review,  
19 we went to D obviously some time in September of last  
20 year, and four of us went there for a week, and we  
21 reviewed their design record files and the past report  
22 and all of the recommendation.

23 The focus of our audit was all these  
24 deviations. So most of the time we sent there was on  
25 all these three deviations. So the first was about

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1 the transient analysis. With the summit (phonetic) of  
2 the EPU obligation, they only analyze only two  
3 transients. So when the (unintelligible) was done  
4 with the equilibrium core.

5 So all other transients will be analyzed  
6 as part of the reload analysis, and then --

7 MR. NIR: This is Israel Nir, G.E.

8 This is proprietary information.

9 CO-CHAIRMAN WALLIS: It sounds rather  
10 extraordinary that it's proprietary.

11 MR. NIR: Well, it is proprietary just to  
12 -- this has commercial implication just General  
13 Electric. The fact that we do or do not do certain  
14 analysis is based on significant experience, power  
15 operator experience, and this is information that is  
16 commercially sensitive, and we would like not to share  
17 it publicly, and we would like --

18 CO-CHAIRMAN WALLIS: How much of your  
19 presentation is going to run into this problem? Maybe  
20 we should just close the meeting and get on with it.

21 MR. NIR: We have no proprietary issues  
22 with the slides as they presented. We -- the words  
23 that are written here are not proprietary. We have an  
24 issue with some of the verbal information.

25 CO-CHAIRMAN WALLIS: So he has said

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1 something which is slightly different from the slide,  
2 which is a problem?

3 MR. BOEHNERT: Jon, do you want to  
4 comment?

5 MR. HOPKINS: It might be easier if we  
6 close this session.

7 MR. BOEHNERT: Okay. That's fine. We can  
8 close the session. We'll close the session. We'll do  
9 that, but I want to put on the record that we're going  
10 to have to decide, you know, where to draw the line  
11 here because you guys in the end make the decision on  
12 what is proprietary. We just go along with it  
13 basically, but I can close the session on the proviso  
14 that if you later decide this is not proprietary,  
15 we'll release the information.

16 CO-CHAIRMAN WALLIS: Well, let's close the  
17 session and see if anybody leaves.

18 (Laughter.)

19 MR. BOEHNERT: So again, anyone who should  
20 not be here to hear G.E. proprietary information,  
21 please leave the room. We're going to close the  
22 session and go into closed session.

23 (Whereupon, from 10:37 a.m. until \*\*, the  
24 Subcommittee meeting was recessed for  
25 closed session.)

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1 MR. BOEHNERT: And if they jump up again,  
2 I guess we'll see what happens.

3 CO-CHAIRMAN WALLIS: Yes, if you jump up  
4 again, you'll have to have good reason to do so.

5 Please go ahead.

6 MR. LOBEL: Good morning. My name is  
7 Richard Lobel. I'm with the Plant Systems Branch in  
8 the NRR, and I'd like to talk about the balance of  
9 plant review that we did in containment.

10 This review of plant systems covers a  
11 broad area. The standard review plan, there are some  
12 sections in Chapter 3 that we look at having to do  
13 with high and medium energy line breaks. We look at  
14 Section 6.2 on containment and 6.5 on combustible  
15 gases, and a large part of the SRP Chapter 9 that  
16 deals with heating and ventilation systems, the spent  
17 fuel pool and other miscellaneous topics.

18 The next two slides are just some examples  
19 of some of the topics that a balance of plant reviewer  
20 would look at, or reviewers, and that were looked at  
21 for the Clinton power up rate. I won't go through  
22 reading them all.

23 The containment systems review followed  
24 the power up rate topical report. I listed the codes  
25 that were used by G.E. in the calculations for the

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1 containment, and they're standard G.E. codes that have  
2 been used on other containment calculations that are  
3 used frequently. M3CPT and Super Hex are used pretty  
4 much on every containment, G.E. containment  
5 calculation, and LAMB code was used for this review.  
6 It was also used for the Dresden-Quad Cities power up  
7 rate. The LAMB code provides the mass and energy into  
8 the containment. M3CPT is for the short-term  
9 response, and Super Hex calculates the long-term  
10 pressure and temperature in the containment.

11 CO-CHAIRMAN WALLIS: This is a more  
12 realistic flow-down compared with one which was less  
13 realistic?

14 MR. LOBEL: It's conservative. The  
15 calculations are conservative.

16 CO-CHAIRMAN WALLIS: Which ones, the ones  
17 which are less realistic? I'm not quite sure what you  
18 mean by a more realistic flow-down.

19 MR. LOBEL: Oh, more realistic.

20 CO-CHAIRMAN WALLIS: More realistic than  
21 what?

22 MR. LOBEL: Oh, oh, I'm sorry. LAMB is  
23 less conservative, more realistic than M3CPT.

24 MR. PAPPONE: This is Dan Pappone of  
25 General Electric.

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1           The M3CPT break flow model that we're  
2           using is a simple hand calculation with critical flux,  
3           and then the LAMB code is actually a reactor model.  
4           So that's where we're getting more realistic break  
5           flow rates.

6           CO-CHAIRMAN WALLIS:       It's a hand  
7           calculation because you're using somebody's simple  
8           method?

9           MR. PAPPONE: That's right. We're looking  
10          at pressure and enthalpy for the up stream source for  
11          the break, the break area and critical flow look up in  
12          a table.

13          CO-CHAIRMAN WALLIS: Whose model are you  
14          using?

15          MR. PAPPONE:       That's in the M3CPT  
16          approach.

17          CO-CHAIRMAN WALLIS: Whose model is it?

18          MR. PAPPONE: It's G.E.'s. Oh, both of  
19          them were actually using the Moody-Slip.

20          CO-CHAIRMAN WALLIS: Using Moody.

21          MR. PAPPONE: Right.

22          CO-CHAIRMAN WALLIS: Which may give you a  
23          reasonable answer, but it's not realistic.

24          MR. PAPPONE:       Right. It's on the  
25          conservative side and over predicts the break flow.

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1 MR. LOBEL: I think the more realistic  
2 refers to the LAMB model.

3 MR. PAPPONE: That's right.

4 MR. LOBEL: Correct me if I'm wrong. Is  
5 a more detailed model of the vessel and the core.

6 MR. PAPPONE: That's right.

7 MR. LOBEL: Go on?

8 CO-CHAIRMAN WALLIS: Well, they're all  
9 approved codes. So --

10 MR. LOBEL: Well, they're approved up to  
11 a point that they're used all the time. We haven't  
12 written an SER on the LAMB code for containment use.  
13 It is an Appendix K code and has been approved by the  
14 staff for local calculations.

15 Super Hex hasn't been approved. There was  
16 a 1993 letter to G.E. that talks about the staff's  
17 intention with Super Hex, and what it says is that we  
18 don't intend to do a detailed review of Super Hex  
19 because it has the capability to vary the input, and  
20 we didn't see the worth of a detailed review of the  
21 code.

22 So what we ask is that a licensee that  
23 uses Super Hex compare a Super Hex calculation with an  
24 existing FSAR calculation just to verify that it can  
25 reproduce containment response that it's been

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1 previously approved.

2 And it also brings in the next bullet of  
3 the confirmatory analysis. One of the reasons for  
4 doing the confirmatory analysis is that these codes,  
5 in general, haven't been approved by the staff, and so  
6 that gives us -- that provides an impetus to us try to  
7 do an independent calculation with a staff code that  
8 we understand and compare it

9 CO-CHAIRMAN WALLIS: It says "is  
10 performed."

11 MR. LOBEL: Pardon?

12 CO-CHAIRMAN WALLIS: It says "is  
13 performed," and that means right now they're doing  
14 this?

15 MR. LOBEL: It's underway, yeah. We've  
16 just received, I understand, the last of the G.E.  
17 data. The calculation is being done in our branch,  
18 not by a contractor this time, and some preliminary  
19 work has already been done in setting up the model.

20 CO-CHAIRMAN WALLIS: hat happens when you  
21 get the results? Is that after you've issued the SER?

22 MR. LOBEL: It may be because we're  
23 looking at this as a confirmatory calculation.

24 CO-CHAIRMAN WALLIS: That's strange.

25 MR. LOBEL: Well --

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1 CO-CHAIRMAN WALLIS: It's a kind of "new  
2 speak." I know. I understand, but it's very strange  
3 that you do the test.

4 What are you going to learn from it if  
5 you've already given out the SER?

6 MR. LOBEL: If we find a significant  
7 problem, we can always deal with that problem.

8 CO-CHAIRMAN WALLIS: It would be very good  
9 if you could do these things in a slightly more  
10 anticipatory mode.

11 MR. LOBEL: I agree.

12 CO-CHAIRMAN WALLIS: So that the results  
13 were available before you wrote an SER.

14 MR. BOEHNERT: So this is not an open  
15 issue, Rich?

16 MR. LOBEL: No, it's not considered an  
17 open issue.

18 MR. MARSH: Mr. Chairman, let me clarify.  
19 Rich, maybe you could help.

20 Do we anticipate having the results by the  
21 full committee meeting?

22 MR. LOBEL: We're going to try very hard  
23 to have the results by the full committee meeting, but  
24 since it's a calculation and we may need to go back to  
25 General Electric or the licensee for some more

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1 information, and we're not sure how it's going to turn  
2 out, I'd rather not make that promise, but --

3 CO-CHAIRMAN WALLIS: And also if you rush  
4 it --

5 MR. LOBEL: -- it should be done by then.

6 CO-CHAIRMAN WALLIS: -- the chance of  
7 making some error is increased.

8 MR. LOBEL: Right.

9 CO-CHAIRMAN WALLIS: Are you using your  
10 own codes or are you using the G.E. codes?

11 MR. LOBEL: We're using Contain 2R code.

12 CO-CHAIRMAN WALLIS: You're using a  
13 different code altogether.

14 MR. LOBEL: Yeah. We're using Contain 2,  
15 which is the latest version of the NRC code, and we're  
16 trying to follow the guidance that we've received from  
17 research from a previous user need.

18 We made a request to research to give us  
19 guidance on how to use the contain code, which is  
20 essentially trying to reproduce the physics that  
21 really occur, how to use that in a design basis  
22 analysis, and they've prepared reports for us for the  
23 different types of containments, and this is going to  
24 be the first time we've tried to use the Mark III  
25 guidance that they've given us.

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1 We did follow the guidance we got from  
2 research for the Duane Arnold calculation, and we  
3 compared very well with the G.E. results.

4 CO-CHAIRMAN WALLIS: So this has been done  
5 before. They've run Contain for Duane Arnold? I  
6 forget now what happened.

7 MR. LOBEL: We had very good agreement.  
8 We were within a degree and less than a psi, if I  
9 remember right, with Duane Arnold.

10 CO-CHAIRMAN WALLIS: It was a different  
11 shaped containment.

12 MR. LOBEL: Right, and that's why we're  
13 repeating the process.

14 CO-CHAIRMAN WALLIS: Okay.

15 MR. LOBEL: And another reason this isn't  
16 an open issue is because we've asked questions about  
17 the containment response and why the results that G.E.  
18 got or the licensee got are what they are, and we  
19 think we understand what's going on.

20 So we're doing the calculation as a  
21 confirmatory, not as an open item.

22 CO-CHAIRMAN WALLIS: It's not an open  
23 item.

24 MR. LOBEL: No.

25 CO-CHAIRMAN WALLIS: I thought you had

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1 said it was.

2 MR. MARSH: No, it's not.

3 MR. SCHUABI: Dr. Wallis, just to clarify,  
4 this is Mohammad Schuabi.

5 We have reviewed the licensee submittal in  
6 this area, and we find it acceptable. So we don't  
7 have a need for this confirmatory calculation, but we  
8 are doing it anyway. That's why it's being presented  
9 this way.

10 It's a little awkward. It's not the way  
11 we normally do --

12 CO-CHAIRMAN WALLIS: I would not encourage  
13 you to kill it just because you don't think you have  
14 a need. Please complete it.

15 MEMBER POWERS: When you do these  
16 calculations of the pressures and dry wells and wet  
17 wells and places like that, do you consider the dry  
18 well to wet well bypass?

19 MR. LOBEL: Ed, do you want to answer?

20 This is Ed Throm for the staff.

21 MR. THROM: My name is Ed Throm. I'm with  
22 the Plant Systems Branch. I'm kind of the resource  
23 that became available to Plant Systems to do this type  
24 of work. My background is more in the LOCA area, but  
25 I have experience running codes.

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1                   As Rich pointed out, we had researchers  
2 set up models for evaluating containment response, and  
3 we plan to use that. What we've basically done is  
4 looked at the Grand Gulf III model, and we are upgrade  
5 -- as a matter of fact, I've upgraded that model to  
6 Clinton, and at this point what I've done is  
7 benchmarked the current USAR calculation for the  
8 recirculation line break, and I missed it by a PSI and  
9 one degree.

10                   So we have --

11                   MEMBER POWERS: Boy, you must have been  
12 embarrassed, huh?

13                   MR. THROM: Absolutely.

14                   (Laughter.)

15                   MR. THROM: And I'm trying to figure out  
16 what the problem is. So it builds up the confidence  
17 in the fact that the analysis techniques are comparing  
18 well, and this is why I think it's really  
19 confirmatory.

20                   The other question, of course, is the  
21 long-term suppression pool, and that presents more of  
22 a challenge to do a calculation in a specific time  
23 frame. That's why we don't want to commit to having  
24 the complete set of confirmatory calculations done  
25 within a certain time frame.

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1           Anyone who runs these codes knows that you  
2 run into unanticipated numerical problems somewhere  
3 along the line. You've got to find the inertia factor  
4 or what's potentially leading to the problem and  
5 resolve it.

6           But the intent is basically to use the  
7 modeling criteria that research established and  
8 develop guidelines for doing design basis  
9 calculations, and to basically mimic or reproduce the  
10 efforts that we've done on Duane Arnold for Clinton  
11 just to make sure that we're not missing anything in  
12 the Mark III performance.

13           MEMBER POWERS: My recollection on the  
14 Grand Gulf model is a substantial bypass flow from the  
15 dry well into containment. It does not go through the  
16 wet well.

17           MR. THROM: That's right.

18           MEMBER POWERS: And you take that into  
19 account in the calculation, or do you shut that down?

20           MR. THROM: It's in the model as it is  
21 right now, as I understand it.

22           MEMBER POWERS: Could you remind me of the  
23 magnitude or do you remember?

24           MR. THROM: Do you mean area-wise?

25           MEMBER POWERS: Maybe area.

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1 MR. THROM: Well, I think the area is on  
2 the order of 40 -- in Clinton, I think it's about 42,  
3 43 square feet.

4 MEMBER POWERS: For the bypass --

5 MR. THROM: I guess I'm --

6 MEMBER POWERS: As I recall, it was like  
7 1,000 CFM bypass flow.

8 CO-CHAIRMAN WALLIS: Forty-two square  
9 feet.

10 MR. THROM: Well, I can't answer your  
11 question today. As I said, you know, we're using the  
12 models. I will look into that in terms of the way  
13 things are being considered, but as you pointed out,  
14 you know, as a resource, this work is just starting.

15 As I said, I've been able to benchmark  
16 against the USAR calculation for the recirc. line  
17 break. We did receive the hard part of the data from  
18 G.E. and the applicant on Monday, which is all of the  
19 mass and energies that are necessary to perform this  
20 calculation.

21 I think I have all the data I need, but  
22 there might be a couple of geometrical inputs, some  
23 flow areas that I might have to go back to the  
24 licensee to get. Sometimes what you think is in the  
25 USAR isn't quite there.

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1                   There's no challenging information that's  
2                   needed.

3                   MR. LOBEL:    The bypass flow area, the K  
4                   over squared A number that's in the tech. specs. is  
5                   determined from small break calculations and not the  
6                   large break because a smaller break turns out to be  
7                   limiting for that because you get flow for a longer  
8                   time.

9                   We can get back to you on the question.

10                  MEMBER POWERS:   Yeah, because the reason  
11                  I asked is because it's not clear what's conservative,  
12                  to include it or not include it.  I mean, if you were  
13                  interested in special temperature, then you want to  
14                  cut the bypass flow out.  If you're interested in  
15                  containment pressure, maybe you want to turn it on.  
16                  I don't know.

17                  MR. LOBEL:    Well, that's another reason  
18                  why we tried to do our own calculations, because we  
19                  can run sensitivities on things like that, and that  
20                  might be a good problem to run.

21                  We did that.    Yesterday I was talking  
22                  about Arkansas.  We did quite a bit of sensitivity  
23                  calculations    with    the    Arkansas,    independent  
24                  confirmatory calculations.

25                  CO-CHAIRMAN WALLIS:    As I remember the

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1 table we saw from yesterday, these criteria are met  
2 pretty well, except the dry well temperature briefly  
3 being above 330. Is that the one?

4 MR. THROM: Yeah, that's correct.

5 MR. LOBEL: And that was just for a short  
6 time so that it really --

7 CO-CHAIRMAN WALLIS: Most of the other  
8 criteria seemed to be met by reasonable margin. Is  
9 that true?

10 MR. LOBEL: Yeah, yeah, and the changes  
11 actually weren't that great. I have a slide that  
12 talks -- in fact, it's the next slide or the slide  
13 after -- talks about the actual numbers.

14 Yeah, that's true. Where are we? Well,  
15 I think we've talked about that.

16 The next slide says what you just said.

17 CO-CHAIRMAN WALLIS: And you're not  
18 concerned about this brief temperature exceeding  
19 criteria?

20 MR. LOBEL: The SER says that -- we've  
21 looked at that, and that it's brief enough so that the  
22 temperature of the containment structure won't be  
23 changed, won't exceed its limit even though the  
24 atmosphere is slightly above the design temperature.

25 MEMBER POWERS: Is the concern over the

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1 dry well temperature one of the structure or is it of  
2 the penetrations and the penetration seals?

3 MR. LOBEL: I believe the limit -- I don't  
4 know for sure. Maybe G.E. can answer that or  
5 licensee.

6 MR. PAPPONE: This is Dan Pappone with  
7 G.E.

8 The real concern is the equipment. If the  
9 dry well structure penetration seals, relief valves,  
10 solenoids, things like that, and what we get from the  
11 long-term containment analysis or short and long-term  
12 containment analysis is an EQ envelope, environmental  
13 qualification envelope that then is used for  
14 qualifying all of the equipment there.

15 And that's where we're looking at the  
16 short term of this excursion above the 330. It was  
17 only for half a second, I believe, and that's where  
18 making the judgment that the response time, you know,  
19 to actually heat up the components that we're  
20 concerned about is so short.

21 Remember they're starting out at, say, 150  
22 degree temperature, the initial dry well temperature.  
23 So there's a long time lag before they would reach  
24 that 330 degree temperature limit, and this is such a  
25 short pulse before we drop back down.

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1 CO-CHAIRMAN WALLIS: Okay.

2 MR. LOBEL: Okay. We also look at NPSH of  
3 the ECCS pumps and spray pumps, and there wasn't any  
4 change to the design temperature. Calculations were  
5 done at the design temperature so that the power up  
6 rate didn't affect those.

7 And Clinton does not take credit for over  
8 pressure. So that wasn't an issue.

9 Just briefly, some of the other  
10 significant systems that we looked at I'll mention.  
11 The ultimate heat sync was originally designed for two  
12 units, and so there's plenty of margin for --

13 CO-CHAIRMAN WALLIS: It was also built for  
14 two units, not just designed? It was actually built  
15 for two units?

16 MR. LOBEL: Built and hopefully designed  
17 and built.

18 MR. HOPKINS: Yes, the slide should say  
19 megawatt electric.

20 MR. LOBEL: Oh, yeah.

21 CO-CHAIRMAN WALLIS: Yes, it's a pretty  
22 small pump.

23 MR. LOBEL: Yeah, right. The component  
24 cooling water system is an important safety system.  
25 The only loads that increase with power is a small

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1 change to the reactor coolant pumps, and the spent  
2 fuel pool loads, and the temperature increase is  
3 small, I think, just a couple of degrees.

4 The spent fuel pool --

5 CO-CHAIRMAN WALLIS: This is sealed  
6 cooling or something?

7 MR. LOBEL: Yeah, for the reactor coolant  
8 pumps, recirculation pumps.

9 The spent fuel pool cooling, the peak  
10 temperature is less than 120 degrees with the ultimate  
11 heat sync at its tech. spec. number of 95 degrees, and  
12 one train of cooling. For a normal off load, which is  
13 a portion of the core for Clinton, the guidance is  
14 that the limit has to be met, assuming a single  
15 failure with one train, and the Clinton calculations  
16 show they do that.

17 An abnormal off load for Clinton would be  
18 a full core off load, and the peak temperature is less  
19 than 140 degrees, with the ultimate heat sync  
20 temperature at 95 degrees, and since it's an abnormal  
21 off load, they can take credit for both trains of  
22 cooling.

23 CO-CHAIRMAN WALLIS: This is an average  
24 temperature in the pool? This is one 40 degrees?

25 MR. LOBEL: Yes.

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1 CO-CHAIRMAN WALLIS: The pool mixes  
2 rapidly enough that you don't get concerned about  
3 variations around the pool?

4 MR. LOBEL: I don't think that's a  
5 problem. Is there somebody else that can answer?

6 I think that's been looked at and --

7 CO-CHAIRMAN WALLIS: I think it would have  
8 to be.

9 MR. LOBEL: -- the decision has been made  
10 that it's not an issue. I can't quite where, but I  
11 remember reading something at one time that that's  
12 been looked at.

13 MR. SHUM: David Shum from Plant Systems  
14 Branch.

15 Could you repeat that question, please?  
16 I couldn't hear.

17 CO-CHAIRMAN WALLIS: Well, we're talking  
18 here about an average pooled temperature. I'm just  
19 asking how much does the temperature vary from, say,  
20 the region of the fuel to the remote region of the  
21 pool.

22 MR. SHUM: Well, we didn't look at the  
23 temperature at the fuel. From the fuel pool cooling  
24 standpoint, we look at the average in the --

25 CO-CHAIRMAN WALLIS: Do you assume the

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1 average is good enough?

2 MR. SHUM: Un-huh, but from another plants  
3 we always look at it, and we have no problem before.

4 MR. LOBEL: My recollection is that that's  
5 been looked at, studied, and the mixing in the pool  
6 from natural circulation is enough that the  
7 temperature is uniform. But I'll take it as an issue  
8 if you'd like to try to find out where that's  
9 addressed.

10 CO-CHAIRMAN WALLIS: It would be nice if  
11 someone knew definitely. Yeah, maybe you could find  
12 out.

13 MR. SHUM: Yes, we will be able to find  
14 that out.

15 MR. LOBEL: Okay. In conclusion, the  
16 balance of plant containment systems for Clinton  
17 comply with NRC regulations and guidance at EPU  
18 conditions.

19 CO-CHAIRMAN WALLIS: And this is the end?

20 MR. LOBEL: The end.

21 CO-CHAIRMAN WALLIS: Any closing  
22 statement?

23 MR. MARSH: I have a closing statement  
24 unless, Jon, do you have anything you want to conclude  
25 with up there? No?

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1 MR. HOPKINS: I just wanted to say this  
2 was the end of the staff presentation, and it would  
3 just be questions and if there are questions on other  
4 topics. This was the end of our presentation.

5 MR. MARSH: I've got some closing  
6 comments, Mr. Chairman, unless you'd like to.

7 Okay. Thank you.

8 I'd like to thank the committee for the  
9 time and the opportunity to present to you both  
10 Arkansas and Clinton's incentive power up rate. I  
11 want to emphasize again that the staff has undertaken  
12 extensive reviews of these applications, and all areas  
13 affected by the power up rates have been reviewed and  
14 evaluated.

15 The staff has critically examined  
16 methodologies and their application for these two  
17 cases. We've concluded that all of the analytical  
18 codes, methodologies used for licensing analyses are  
19 acceptable for these applications. The results of the  
20 deterministic analyses have demonstrated that the  
21 proposed increases in power for Arkansas and Clinton  
22 plants are acceptable and meet the regulatory  
23 requirements.

24 Now, this concludes the presentation.

25 Now, we, of course, would be glad to answer any

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1 questions, but I've got a couple other thoughts I'd  
2 like to leave with you.

3 Based --

4 CO-CHAIRMAN WALLIS: These are going to  
5 the full committee?

6 MR. MARSH: next month.

7 CO-CHAIRMAN WALLIS: Next month?

8 MR. MARSH: Right.

9 CO-CHAIRMAN WALLIS: Both of these?

10 MR. MARSH: Both of them, right. So  
11 any --

12 CO-CHAIRMAN WALLIS: And both the  
13 applicant and the staff will have considerably less  
14 time.

15 MR. MARSH: Yes, sir, right.

16 CO-CHAIRMAN WALLIS: And therefore, you  
17 have to bear that in mind regarding your presentation.

18 MR. MARSH: Yes, sir. Any guidance you'd  
19 like to give us in terms of what you'd like us to  
20 present would be great.

21 Let me add one more thing, if I can. Some  
22 of the issues that came out in yesterday's  
23 presentations we're going to respond to. There were  
24 some to do items and things. We'd like to respond in  
25 writing if you don't mind. We want to make sure that

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1 we answered those thoroughly and completely and  
2 formally. Okay?

3 So we're going to be getting the  
4 transcripts and making sure that we understand the  
5 questions and respond in the right manner.

6 And as you say, we don't have a lot of  
7 time for the full committee. So any -- we did talk  
8 yesterday about a potential approach for the full  
9 committee. What we talked about yesterday was, of  
10 course, we don't have the time to go through all of  
11 the issues, but you suggested picking a couple of key  
12 topics in each one of these areas and demonstrating to  
13 the full committee some depth of reviews and some  
14 issues that we went through.

15 So perhaps we'll identify if it's  
16 acceptable to you some key issues in each one of these  
17 plants' reviews, and we will go through with some  
18 detail to the full committee.

19 MEMBER POWERS: I think you need to be  
20 more cautious with your ANO than you do with the  
21 Clinton because this is effectively the third one.

22 MR. MARSH: Right.

23 MEMBER POWERS: One of these, I mean, it  
24 may be a BWR-6 and so it's somewhat different.

25 MR. MARSH: Right.

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1 MEMBER POWERS: My thought here would be  
2 saying that, look, this is yet another of the BWR up  
3 rates. They've done it a little differently than  
4 others. Here's the exceptions, and discuss the  
5 disposition of your exceptions.

6 I think you're going to have to discuss  
7 again the transient testing issue.

8 MR. MARSH: Okay.

9 MEMBER POWERS: I mean, I just think it's  
10 unavoidable simply because we had added comments to  
11 one of our letters, in which there's a dissent from  
12 the majority opinion discussion.

13 That's my personal thought on this  
14 subject. I don't think you need -- my point is I  
15 don't think you need to be as careful with this one as  
16 you do with the ANO just because it is a repetition.

17 And, by the way, I will thank you publicly  
18 for allowing your staff to meet with us this morning,  
19 and we could discuss BWR stability and the mathematics  
20 there and not bore everyone else to death.

21 MR. MARSH: Good.

22 MEMBER POWERS: It was a very productive  
23 meeting.

24 MR. MARSH: I'm glad it was helpful.

25 When you say "careful," are you suggesting

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1 that we spend more time discussing the Arkansas  
2 application?

3 MEMBER POWERS: Oh, I think you have to.

4 MR. MARSH: Okay.

5 MEMBER POWERS: Because it's new and it's

6 --

7 MR. MARSH: It's the first of this type.

8 MEMBER POWERS: The type, sure, and  
9 whatnot.

10 MR. MARSH: Okay. We'd be glad to do  
11 that.

12 MEMBER POWERS: I mean, I personally don't  
13 feel the need to be that cautious and careful with  
14 Clinton. It seems to me that the focus there is  
15 really on the exceptions issue because they're  
16 different, and among the exceptions, of course, is  
17 transient testing.

18 MR. MARSH: Right.

19 MEMBER POWERS: And I would try on the  
20 transient testing to really go through your logic very  
21 carefully just because we have a dissenting opinion.

22 MR. MARSH: We'd be glad to.

23 PARTICIPANT: We'll continue to.

24 MEMBER POWERS: Yeah, I mean, I don't know  
25 that you're going to persuade him.

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1 MR. MARSH: But we could at least say it  
2 to make sure that people understand our rationale for  
3 it.

4 MR. MARSH: Sure, sure.

5 MEMBER SIEBER: Well, you want it on the  
6 record also.

7 MR. MARSH: Yes.

8 MEMBER POWERS: And you want to give us  
9 ammunition to beat him.

10 MR. MARSH: No, we don't.

11 MEMBER POWERS: Yes, you do. Trust me.  
12 You do.

13 MR. MARSH: Whatever you say.

14 Well, Mr. Chairman, that concludes our  
15 presentation.

16 CO-CHAIRMAN WALLIS: Thank you.

17 MR. MARSH: And we thank you very much  
18 again.

19 CO-CHAIRMAN WALLIS: That's all right.  
20 Anything else that the members wish to say at this  
21 time?

22 (No response.)

23 CO-CHAIRMAN WALLIS: Well, thank you for  
24 helping us to finish early.

25 We will not reconvene until one o'clock,

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1 and then we'll take up a completely different topic.

2 Thank you all for your contributions to  
3 the meeting.

4 (Whereupon, at 11:38 a.m., the  
5 Subcommittee meeting was recessed for lunch, to  
6 reconvene at 1:00 p.m., the same day.)

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

(1:03 p.m.)

CO-CHAIRMAN KRESS: This meeting will now please come to order.

I think this is a new Subcommittee meeting from what we had this morning. This is combined Subcommittees on Thermal-Hydraulic Phenomena and Future Plant Designs.

I am Tom Kress, Chairman of the Future Plant Designs Subcommittee, and we have with us Graham Wallis, who is Chairman of the Thermal-Hydraulic Phenomena Subcommittee. We also have ACRS members Dana Powers and Bill Shack and Jack Sieber, and our ACRS consultant, Virgil Schrock.

The purpose of this meeting is to review the staff's review of Phase 2 of the pre-application review of Westinghouse AP 1000 plant design. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate for deliberation by the full committee.

Mr. Medhat El-Zeftawy is the cognizant ACRS staff engineer for this meeting.

The rules for participation in today's meeting have been announced as part of the notice of

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1 this meeting, previously published in the Federal  
2 Register on January 29th, 2002.

3 A transcript of this meeting is being held  
4 and will be made available as stated in the Federal  
5 Register notice. Therefore, it's requested that  
6 speakers first identify themselves, use the  
7 microphone, and speak with sufficient clarity and  
8 volume so that they can be readily heard and copied on  
9 the transcripts.

10 We have received no written comments or  
11 requests for time to make oral statements from members  
12 of the public.

13 I have no introductory comments. It's a  
14 self-introductory subject. Do any of the members wish  
15 to make anything before we start? Any comments?

16 MEMBER POWERS: This is really just a 67  
17 percent power up rate; is that --

18 CO-CHAIRMAN KRESS: That's basically what  
19 it is, yeah. It's another power up rate review that  
20 we're doing.

21 CO-CHAIRMAN WALLIS: It's for a  
22 nonexisting reactor. So it's not quite the same  
23 thing.

24 MEMBER POWERS: So it's in the imaginary  
25 space.

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1 CO-CHAIRMAN KRESS: Well, we will now  
2 proceed with the meeting, and I'll call upon Jim Lyon,  
3 our friend from the past, to open the meeting for us.

4 MR. LYON: Thank you, Dr. Kress  
5 I appreciate being here today.

6 MEMBER POWERS: Well, you didn't. You  
7 left us.

8 MR. LYON: Well, you know.

9 MEMBER POWERS: Short exposures are okay.

10 MR. LYON: Short exposures. A very  
11 helpful one and a very enlightening one.

12 As Dr. Kress alluded, we're going to talk  
13 about Phase 2 of the AP 1000 design certification  
14 review. This is the final portion of the pre-  
15 application review, and I think just to get us going  
16 I'd like to turn it over to the two project managers  
17 that are working on this at this time.

18 First, Andrzej Drozd, who is the acting  
19 project manager and has been helping us out since, I  
20 guess, about October time frame.

21 And Larry Burkhart, who will be the  
22 permanent project manager as Andrzej goes back to his  
23 old duties where he's going to help us a lot doing the  
24 review of this and other advanced reactors.

25 So with that I'll turn it over to Andrzej.

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1 MR. DROZD: Good afternoon. My name is  
2 Andrzej Drozd, and for the last four months I had the  
3 privilege to and pleasure to coordinate Phase 2 review  
4 of AP 600 pre-application review.

5 In today and tomorrow's presentation, I  
6 will give a quick background and the status of the  
7 project, and then we'll turn into a technical panel to  
8 discuss Phase 2 issues.

9 I will do the hopefully simple and  
10 straightforward regulatory exemptions issues, and then  
11 Jerry Wilson, Dave Terao and Goutam Bagchi will  
12 address design acceptance criteria.

13 After that, testing of AP 600 and its  
14 applicability to AP 1000 will be addressed by Steve  
15 Bajorek, and then Walt Jensen and Ed Throm will  
16 discuss with you and present to you the application of  
17 safety analysis codes.

18 Just to recall, some time in December  
19 1999, LC certified the AP 600 start-up plant design,  
20 and just about the same time Westinghouse in various  
21 forms expressed interest in doing power up rate, as  
22 Dr. Power says, that is, to apply for a certificate of  
23 a similar, if not identical, plan, but with the power  
24 of about 1,000 megawatts output.

25 Needless to say, there were a lot of

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1 introductory discussions followed by a meeting in  
2 April when staff and Westinghouse discussed what would  
3 be the best way to approach certification review of  
4 the new plant.

5           And the three-stage approach seems to be  
6 the most appropriate. The Phase 1 would be or was  
7 just identification of the issues to be reviewed in  
8 Phase 2, and Phase 2 would be review of those issues  
9 and potentially, depending on the results of Phase 2,  
10 the full design certification review as a Phase 3.

11           In May 2000, Westinghouse requested the  
12 NRC staff to proceed with Phase 1, and after several  
13 discussions and letters and meetings, NRC has provided  
14 six review issues and its estimated how much it would  
15 take to review it.

16           Based on that suggestion, in August 2000,  
17 Westinghouse asked NRC staff to proceed with Phase 2  
18 and focus only on four issues, that is, applicability  
19 of the test program, APC funded test program to the  
20 new design, as well as applicability of safety  
21 analysis code used for AP 600 to AP 1000.

22           They asked us to review proposed design  
23 acceptance criteria approach, as suggested by  
24 Westinghouse, and as well, applicability of certain  
25 regulatory exemptions for AP 1000.

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1                   As I understand it, by the end of August  
2 we made presentation to you for AP 1000. Therefore,  
3 I don't have any specific presentation on the design  
4 itself. However, I do have some back-up slides if  
5 needed.

6                   CO-CHAIRMAN KRESS: I think we're familiar  
7 enough with the design at this point.

8                   MR. DROZD: Thank you, Tom.

9                   Briefly, status of the review. Phase 1  
10 was complete in July 2000, and Phase 2 is being  
11 completed as we speak. Technical review was done just  
12 about a month ago, and as a result, we are writing two  
13 SECY papers.

14                   The Phase 2 issues were divided into two  
15 packages sort of. One package is a policy oriented,  
16 which is application of design acceptance criteria  
17 approach to design certification, and more technically  
18 oriented or utilization oriented testing of the codes.

19                   Both papers went through internal  
20 iteration, and final drafts are being reviewed and  
21 concurred. Some were in our administrative space.

22                   Today and tomorrow we'll present to you  
23 the results of our Phase 2 review, and eventually in  
24 about three weeks or in about a month, we'll make a  
25 presentation to the full ACRS Committee explaining

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1 what we did and asking for the approval or  
2 suggestions.

3 CO-CHAIRMAN KRESS: You'll want a letter  
4 in the March meeting.

5 MR. DROZD: Or asking for a letter of  
6 recommendations.

7 CO-CHAIRMAN KRESS: When do you go to the  
8 commissioners with this?

9 MR. DROZD: The week after. The paper is  
10 due to the Commission in March 28.

11 CO-CHAIRMAN KRESS: Okay.

12 MR. DROZD: And as we discussed with  
13 Westinghouse our findings, there is a good chance that  
14 Westinghouse will go ahead with full design  
15 certification application some time the end of March,  
16 beginning of April this year.

17 CO-CHAIRMAN KRESS: Does Westinghouse know  
18 what's in these draft documents?

19 MR. DROZD: Yes.

20 CO-CHAIRMAN KRESS: You've already been in  
21 discussion with them?

22 MR. DROZD: Not the letter of our  
23 findings, but major points were conveyed to  
24 Westinghouse, yes.

25 MR. BURKHART: We're still working out

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1 some of the what may be policy issues on design  
2 acceptance criteria. There's been some late  
3 developments.

4 In fact, we just received a letter today.

5 My name is Larry Burkhart. I'm the new  
6 and it is hoped the permanent project manager for this  
7 project.

8 So that aspect, the design acceptance  
9 criteria, is kind of in an evolutionary phase. We're  
10 towards the end of it where we still have a little bit  
11 of work to do.

12 MR. DROZD: Well, if there's no more  
13 questions regarding status of the project, let's turn  
14 to the issues, Phase 2 issues.

15 One, the first one that I'd like to  
16 address is regulatory exemptions. During AP 600  
17 certification review, Westinghouse asked for several  
18 regulatory exemptions, and three of them are being  
19 suggested to be granted also for AP 1000.

20 The three are the exemptions regarding the  
21 safety parameters display console, the auxiliary  
22 feedwater system, as well as off-site power sources.

23 The rationale for granting those  
24 exemptions for AP 600 are summarized right here for  
25 the display console. The reason that the exemptions

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1 for this specific console, this specific part of the  
2 design was that the safety parameter display console  
3 was integrated or is to be integrated with the control  
4 room design. Therefore, there was no need for a  
5 stand-alone requirements for safety parameter display.

6 CO-CHAIRMAN KRESS: Then the control room  
7 design is a COL item, put off until the COL or --

8 MR. DROZD: That is put up at the COL,  
9 yes.

10 MR. WILSON: Dr. Kress, this is Jerry  
11 Wilson.

12 We'll discuss that in the next  
13 presentation.

14 CO-CHAIRMAN KRESS: Oh, okay. This is  
15 just an overview of it, and you'll go into that a  
16 little more. Okay.

17 MR. DROZD: The two other technical areas  
18 that Westinghouse is seeking a regulatory exemptions  
19 are auxiliary feedwater system, as well as off-site  
20 power sources. Both of them are stemming from the  
21 passive nature of safety system and passive nature of  
22 safety injection systems.

23 CO-CHAIRMAN KRESS: These are general  
24 design criteria, these?

25 MR. DROZD: The off-site power deals with

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1 general design criteria, and aux. feedwater is -- I  
2 don't remember -- 50, 30 something. I'm sorry. I  
3 don't remember exactly which paragraph it is, but they  
4 were discussed during AP 600 certification review, and  
5 the issues are identical.

6 CO-CHAIRMAN KRESS: And the basis for  
7 granting approval of these exemptions is that you feel  
8 like the underlying purpose of the rule is met?

9 MR. DROZD: We feel that the new design  
10 has identical safety system function as AP 600, and at  
11 least the intention of the requirements are being met.  
12 Therefore, we don't see any reason why not to grant  
13 those exemptions.

14 CO-CHAIRMAN KRESS: It meets the intention  
15 of the rule.

16 MR. DROZD: The intentions are being met,  
17 yes.

18 CO-CHAIRMAN KRESS: Okay. We're going to  
19 get into a lot of detail on this testing and codes --

20 MR. DROZD: Oh, definitely.

21 CO-CHAIRMAN KRESS: -- and the DAC and so  
22 on. You're giving us the bottom line right now.

23 MR. DROZD: I'm giving a very high level  
24 summary of our positions and findings.

25 CO-CHAIRMAN KRESS: Good.

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1 MEMBER POWERS: This is a high level  
2 bottom line.

3 CO-CHAIRMAN KRESS: That's a little --

4 MEMBER POWERS: I will think about this.

5 (Laughter.)

6 MR. DROZD: Well, if there's no more  
7 questions on the exemptions, let me give you the high  
8 level bottom line position on the design acceptance  
9 criteria. The standardization review, review of  
10 standardized plans are laid out --

11 CO-CHAIRMAN KRESS: Somebody has fouled up  
12 on viewgraphs, and they didn't give us that one.

13 CO-CHAIRMAN WALLIS: I have it.

14 CO-CHAIRMAN KRESS: It's not in my  
15 package.

16 MEMBER SCHROCK: That's because you're  
17 Chairman.

18 CO-CHAIRMAN KRESS: Well, I guess so.

19 MEMBER POWERS: You are supposed to know  
20 all of this stuff.

21 CO-CHAIRMAN KRESS: I got two copies of  
22 your other slide though, the next one. So I guess  
23 that was -- okay.

24 MR. DROZD: It was a voluntary gift.

25 CO-CHAIRMAN KRESS: Okay. Now, you may

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1 proceed.

2 MR. DROZD: Thank you.

3 The ground rules for reviewing design  
4 certificate applicants are set out in Part 52, and the  
5 key words, the key approach in staff's view is the  
6 completeness of the design that's being submitted for  
7 review.

8 The design acceptance criteria approach  
9 were developed and applied during ABWR system 80 plus  
10 reviews, as well as AP 600.

11 CO-CHAIRMAN KRESS: Now, what exactly does  
12 5247(a)(2) say? Does it ask --

13 MR. DROZD: That will be covered with --

14 CO-CHAIRMAN KRESS: That will be covered  
15 later? Okay. We'll wait.

16 MR. DROZD: Just in a couple of minutes.

17 CO-CHAIRMAN KRESS: We'll wait a minute.

18 MR. DROZD: In a couple of minutes.

19 The bottom line position as of now, as of  
20 today is that based on the experience that we had with  
21 the previous design reviews, we don't see that  
22 approach as the preferred way of regulating, in  
23 general.

24 And we do agree that there are technical  
25 areas that are affected by rapidly evolving

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1 technologies, like instrumentation and control or  
2 human factors, control room design. Therefore, we do  
3 see good basis for granting design acceptance criteria  
4 approach, because of the nature of the evolving  
5 technologies.

6 Other areas are less obvious to staff,  
7 whether DEC should be applied or not. I'd like to  
8 make a note that the DEC approach granted or used for  
9 piping, for example, and radiation protection, that  
10 was used in ABWR System 80 Plus, we don't think it  
11 applies to the case of AP 1000, and the rationale for  
12 that would be presented in just a couple of minutes.

13 Also, we strongly believe that the level  
14 of design details submitted for AP 1000 certificate  
15 should be equivalent, if not the same, as the one that  
16 was submitted for AP 600.

17 And maybe before you ask anymore specific  
18 questions, I turn over the issue to technical panel,  
19 Jerry Wilson, Dave Terao, and Goutam Bagchi. They  
20 will address all there is to know about DAC approach.

21 Gentlemen.

22 CO-CHAIRMAN KRESS: I see they got  
23 together some of the people that reviewed AP 600 for  
24 this.

25 MR. WILSON: Yes, sir.

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1 MR. DROZD: Sixty-seven percent up rated.

2 (Laughter.)

3 CO-CHAIRMAN KRESS: One third.

4 MR. WILSON: Mr. Chairman, I'm Jerry  
5 Wilson with the new reactor licensing project office,  
6 and I'm joined by my colleagues from the Division of  
7 Engineering that will participate in this  
8 presentation.

9 Now, as Andrzej introduced, we're here to  
10 talk about the request from Westinghouse to use design  
11 acceptance criteria, and by way of background to  
12 understand our recommendation, I thought I'd give a  
13 little review of how we got to this point.

14 Now, the origin of this issue comes from  
15 when we were building plants, a lot of plants in the  
16 '70s and '80s, and electric companies got construction  
17 permits based on basically preliminary design  
18 information, and they completed their design while  
19 they were building the plant, which led to a lot of  
20 problems that we're all familiar with.

21 And so when the Commission set out to  
22 reform the licensing process and issue Part 52, a key  
23 aspect of that was to require design information be  
24 complete before construction was initiated.

25 So to resolve this problem, we have in

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1 Part 52 and also in the design certification process  
2 in Part 52, a requirement to provide complete and  
3 final design information.

4 And to get to your question you just  
5 asked, if you looked at page 3 of our handout, you'll  
6 see a summary of that requirement, and basically what  
7 we're looking for is final design information  
8 equivalent to what you would see in a final safety  
9 analysis report for an operating license application  
10 and for essentially complete design information.

11 CO-CHAIRMAN KRESS: Now, let me ask you  
12 this. What would be the practical implications if you  
13 granted this, the DAC on the piping, seismic loadings  
14 for the -- what would be the practical implications  
15 with respect to your completing your review and making  
16 a safety decision?

17 MR. WILSON: I'm going to get into this a  
18 little bit more, but to introduce the concept is that  
19 what's being used is design acceptance criteria in  
20 lieu of detailed design information, and so in those  
21 particular areas where it is used, the staff and the  
22 applicant agree on the approach to finalize the design  
23 at a later date.

24 And what we're looking at is the  
25 desirability to develop design acceptance criteria

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1 that would lead to an acceptable design when the  
2 applicant who references that certification actually  
3 completes it.

4 Now, picking up a legal aspect of this  
5 deck or a subset of ITAAC and the way ITAAC is set up  
6 in the regulations, an applicant is required to  
7 complete these design information until after they had  
8 gotten a combined license. So you could have a  
9 situation where we would get back to where we were in  
10 the past where an applicant was completing their  
11 design information while reviewing the plan.

12 CO-CHAIRMAN KRESS: You'd have to review  
13 it again then.

14 MR. WILSON: Yeah, we'd have to verify  
15 that they did implement the design acceptance criteria  
16 correctly and thereby coming out with an acceptable  
17 design.

18 CO-CHAIRMAN KRESS: Yeah, okay. I  
19 understand.

20 MR. WILSON: So when we issued Part 52, we  
21 were initiating reviews of design certification  
22 applications at that time, and the staff did a study  
23 of this issue of what's appropriate and necessary  
24 level of design information to support a design  
25 certification application and gave SECY papers to the

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1 Commission on that subject.

2 If you skip ahead and look at Slide 4,  
3 you'll see these papers listed here, but, in  
4 particular, SECY 90-241 and SECY 90-377.

5 The result of that led to a staff  
6 requirements memorandum that had a lot of important  
7 guidance to the staff on how to perform the design  
8 certification reviews, and in there the Commission  
9 said with regard to level of detail, "We meant what we  
10 said when we issued Part 52. Meet the requirement.  
11 Meet the 5247(a) (2) on level of detail."

12 Furthermore, the amount of information  
13 should be proportional to the safety significance of  
14 a particular system. So more significant safety  
15 systems you would expect to see, more design  
16 discussion.

17 And finally, they said, "Don't use ITAAC  
18 as a means of resolving this design information."

19 Now, after that --

20 MEMBER POWERS: I guess they made it  
21 pretty clear then, didn't they?

22 MR. WILSON: Yeah. At this point G.E. as  
23 the lead applicant came to the staff and expressed  
24 some concerns they had with actually completing their  
25 design, and they brought up two areas of concern.

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1           The first area of concern, as Andrzej  
2 introduced, was rapidly evolving technology. They  
3 were referring to the digital instrumentation and  
4 control systems and also the human factors design  
5 aspects of the control room.

6           And what they said is that these areas of  
7 technology are rapidly evolving or concerned if we  
8 completed that design at that point in time; that you  
9 would be locking up a design that if implemented later  
10 could be significantly out of date.

11           And the other area of concern that they  
12 raised is G.E. claimed that they couldn't complete the  
13 piping and radiation protection design information  
14 because they needed as building, as procured  
15 information to do that.

16           CO-CHAIRMAN KRESS: So in those two  
17 general areas of a possible DAC criteria, it seems to  
18 me like if you have those conditions, you disregard  
19 bullet three about being able to reach a final  
20 conclusion on any safety question?

21           MR. WILSON: Yes. What you'll see as I go  
22 through this history is we didn't fully implement the  
23 Commission's guidance in its SRM.

24           CO-CHAIRMAN KRESS: Right.

25           MR. WILSON: So because of that, we went

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1 back to the Commission with a new round of SECY  
2 papers, and once again, if you jump ahead to slide  
3 four, you'll see a number of SECYs issued in the '92  
4 time period where we explained these issues to the  
5 Commission and now we proposed to come up with design  
6 acceptance criteria in lieu of design information.

7 And the result of all of that effort was  
8 that the Commission allowed us to use design  
9 acceptance criteria in lieu of detailed design  
10 information in those first two applications in the  
11 areas of rapidly evolving technology and the as built,  
12 as procured area.

13 But they admonished us that use of DAC  
14 should be limited and if in the future that staff  
15 planned to use it anymore, we had to come back to the  
16 Commission.

17 CO-CHAIRMAN KRESS: They didn't prohibit  
18 it. They just said, "Be sure it's limited, and if  
19 you're going to do anymore DACs, come back to us with  
20 it first."

21 MR. WILSON: That's correct.

22 CO-CHAIRMAN KRESS: Okay.

23 MEMBER SIEBER: I presume they  
24 specifically approved the areas that you identified,  
25 right?

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1 MR. WILSON: Yes, and that's what I'm  
2 going to show on the table in the next slide.

3 So what you see is that for ABWR and for  
4 System 80 Plus, they used design acceptance criteria  
5 for instrumentation and control and human factors,  
6 radiation protection, and piping.

7 Now comes AP 600.

8 CO-CHAIRMAN KRESS: Now, he's a case where  
9 piping was included in a DAC.

10 MR. WILSON: That's correct.

11 Now comes AP 600, and in AP 600,  
12 Westinghouse continued to use the I and C and human  
13 factors DAC, once again applying the rapidly evolving  
14 technology criteria, but they did provide sufficient  
15 design information for radiation protection and  
16 piping.

17 CO-CHAIRMAN KRESS: Now, why was it deemed  
18 that, for example, System 80 Plus couldn't provide  
19 sufficient design information for piping whereas AP  
20 600 could? What is different about the two?

21 MR. WILSON: Yeah, I'm going to ask you to  
22 hold that thought for a minute, and I turn it over to  
23 Mr. Terao and he's our piping expert and it would be  
24 better if he answers that.

25 MEMBER SIEBER: I have a question about

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1 radiation protection. To me you can split that into  
2 two broad areas. One is the physical features of the  
3 plant, like shielding and ingress and egress pathways,  
4 et cetera, and the other half of that or part of it is  
5 all of this instrumentation, area monitors and  
6 effluent monitors and things like that.

7 MR. WILSON: And what we're talking about  
8 here is the aspect of the barriers, the shielding and  
9 that sort of thing, protection, and really what  
10 sources are you going to get from various components  
11 and how that would affect the design aspects of the  
12 shielding.

13 MEMBER SIEBER: And I take it that all  
14 instruments fit into the instrument and control areas,  
15 which would be another DAC.

16 MR. WILSON: I believe so.

17 MEMBER SIEBER: Okay.

18 MR. WILSON: So on AP 600 they will  
19 provide that information. They didn't require design  
20 acceptance criteria. From the staff's perspective  
21 this was an improvement, and we came closer to meeting  
22 the Commission's goals, and our regulations for  
23 complete and final design information.

24 Now, we come to the pre-application review  
25 for AP 1000, and as you've heard from us previously,

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1 Westinghouse has asked four questions of the staff,  
2 and the one we're focusing on today is can you use  
3 design acceptance criteria on AP 1000 in three areas,  
4 piping structures and seismic analysis.

5 Well, when we went to look at this, we  
6 looked at it both from a technical perspective and  
7 from the policy perspective. First of all, the  
8 question is, well, is it technically feasible to  
9 develop design acceptance criteria when all three of  
10 these design areas are not complete?

11 And then the other part of it is where are  
12 we with regard to meeting the Commission's goals.

13 So what we concluded -- and I'm going to  
14 turn it over here to Mr. Terao to talk about our  
15 ability to develop, for example, a piping DAC when the  
16 structural design and seismic analysis hasn't been  
17 formed, hasn't been completed -- but let me back up  
18 for a minute and say, first of all, in the rapidly  
19 evolving technology, that decision was originally made  
20 in the '92 time period, and so I went back to our  
21 technical staff, and I said, well, a decade has gone  
22 by. Does the basis for allowing the use of design  
23 acceptance criteria for instrumentation and control  
24 and human factors still apply?

25 And my technical experts said, yes, it

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1 does in those areas. So if Westinghouse requests  
2 that, we are supporting the use of design acceptance  
3 criteria in those areas.

4 However, from the standpoint of piping  
5 structures and seismic, Westinghouse was able to  
6 complete that at AP 600, we believe, for the reasons  
7 that we started out down this path, that we should  
8 have complete design information in those areas, and  
9 so from a policy perspective, we would recommend that  
10 Westinghouse should provide that information also for  
11 AP 1000.

12 CO-CHAIRMAN KRESS: You don't happen to  
13 have an example of one of these DACs? For example,  
14 what do they look like? Are they just a set of  
15 criteria that have to be met in terms of general  
16 criteria?

17 MR. WILSON: Dr. Kress, I've met with you  
18 so many times that I anticipated this question.

19 (Laughter.)

20 MEMBER POWERS: You were predictable?

21 CO-CHAIRMAN KRESS: I hate to be so  
22 predictable.

23 MR. WILSON: Med, could you give me a hand  
24 here?

25 I don't have a lot of copies, but I have

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1 some for the reporter and perhaps for the Chairman and  
2 let Westinghouse have one.

3 What I've done is I've used human factors  
4 as an example probably because I understand it the  
5 least, but first of all, in order to understand how  
6 design acceptance criteria is different, what I've  
7 given you is a handout from some human factors  
8 criteria, and there's two parts of it. The part I'm  
9 going to really talk about is in Section 3.2 there.

10 First of all, let's talk about what a  
11 regular ITAAC looks like. An ITAAC is a verification  
12 process, and so if you went into the Tier 1  
13 documentation for AP 600, for example, you would see  
14 that ITAAC were organized by structures and systems.  
15 Most of them are systems based ITAAC. There will be  
16 a high level design description of the system, will  
17 pick out key elements of the system key design  
18 commitments. That will be in your left hand column,  
19 and will then specify whether that verification is  
20 going to take place by a test or analysis, physical  
21 inspection or combination thereof.

22 So you can see in the first example here,  
23 the design commitment has to do with the technical  
24 support center. We're going to verify it with a  
25 physical inspection, and we have our acceptance

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1 criteria.

2 This one is pretty straightforward. Most  
3 ITAAC aren't quite that straightforward, but it's good  
4 enough to give you the concept of what you would  
5 normally find for a regular ITAAC.

6 Now, when it comes to design acceptance  
7 criteria --

8 CO-CHAIRMAN KRESS: And ITAAC is for  
9 something that's already designed?

10 MR. WILSON: That's right. That was the  
11 idea.

12 CO-CHAIRMAN KRESS: And this is just a  
13 verification.

14 MR. WILSON: You finish the design, and  
15 then this ITAAC sets for the verification process  
16 we're going to use to verify that they built it the  
17 way they committed to do it.

18 CO-CHAIRMAN KRESS: Right.

19 MR. WILSON: Now, when it comes to a  
20 situation where the design isn't complete, we need an  
21 ITAAC that has a design process built into it, and  
22 this is just kind of a flow chart of what I'm going to  
23 go through, and I'm not going to show you all of it,  
24 but the idea being that we set up a group to do the  
25 human factors design. They do an analysis and design,

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1 and then they verify it at the end of the day.

2 And so if you looked at that ITAAC, you  
3 would see a discussion of the process used to do human  
4 factors design, and then we would get into the ITAAC  
5 or in this particular case, DAC, and you would see  
6 things like, okay, you have to perform a TAC analysis,  
7 and it talks about what should be done in that task  
8 analysis, and I'll skip ahead here, and you'll see  
9 that -- make sure that that's done correctly. I'm  
10 trying to find a good example here.

11 Once the design is complete, then they'll  
12 see some more traditional verifications in the main  
13 control room and key things you're looking for in  
14 there, and acceptance criteria for that.

15 CO-CHAIRMAN KRESS: And I presume  
16 something equivalent to this exists for piping DAC for  
17 System 80 Plus?

18 MR. WILSON: Yeah. Now, if you looked at  
19 the instrumentation and control DAC, you'd see it's  
20 very similar to what I've just shown you from human  
21 factors, and it even has a similar flow chart that I  
22 had up earlier, and which I can't put my finger --  
23 yeah, here we are.

24 So you'll see instrumentation and control  
25 looks very similar to this. So that gives you an idea

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1 that instead of a straight verification of a design  
2 that's completed, you first have to go through a  
3 process where we have criteria on completing the  
4 design, and then once it's complete, you would verify.

5 CO-CHAIRMAN KRESS: There was something  
6 thought about piping and structures and seismic that  
7 prevent you from developing such a DAC high tech?

8 MR. WILSON: Yes, and with that question,  
9 I'll turn it over to Mr. Terao.

10 MR. TERA0: I'm David Terao. I'm with the  
11 Mechanical and Civil Engineering Branch in NRR, and  
12 before I go into my presentation, just to answer your  
13 question, Dr. Kress about piping DAC, each of the DAC  
14 actually has slightly different format, and for  
15 piping, we did have ITAAC, but the DAC were actually  
16 the design and acceptance criteria that were spelled  
17 out in the FSAR by G.E. and System 80 plus, and they  
18 were in different parts of the FSAR.

19 Since the FSAR doesn't have a section  
20 called piping, they have a section called seismic and  
21 mechanical design and relief valve designs. So the  
22 DAC were just spread out in all different parts of the  
23 SSAR, the standardized safety analysis report.

24 What the staff then did was to be  
25 consistent in addressing DAC, we wrote in our safety

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1 evaluation for ABWR and System 80 Plus. We had a  
2 specific section, Chapter 3.12, which was devoted  
3 solely to piping and piping DAC and piping ITAAC.

4 And in those sections what we addressed  
5 were all of the different design and acceptance  
6 criteria that we reviewed and devaluated as part of  
7 our Part 52 reviews, and there are actually seven  
8 different areas that we looked at in piping design,  
9 and these are some of the areas.

10 They're broken into different sections.  
11 For example, we looked at the codes and standards. We  
12 looked at the analysis methods. We looked at the  
13 piping modeling techniques. We looked at the pipe  
14 stress analysis criteria. We looked at the pipe  
15 support design criteria. We looked at energy line  
16 break criteria, and we looked at leak before break  
17 criteria.

18 And each of those had many subissues that  
19 we addressed in our safety evaluation. So there are  
20 many issues that we had to review specifically for  
21 ABWR and System 80 Plus.

22 MR. WILSON: Now, those two slides aren't  
23 in your handout, but we'll provide you copies.

24 Do you want to go to this one next or the  
25 next one?

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1 MR. TERAQ: Yeah. Actually since we got  
2 diverted a little with this discussion of DAC, let me  
3 try to refocus where we are and try to put my  
4 presentation in perspective again.

5 Staff was requested to review the  
6 acceptability of the DAC approach for AP 1000 for  
7 seismic analysis, structural design, and piping  
8 design. And I stress that because, first of all, this  
9 is a pre-application review. This is Phase 2. So we  
10 aren't reviewing the actual DAC themselves, as I put  
11 up on my slide. We aren't at that level.

12 That would be done in Phase 3 when  
13 Westinghouse submits its application for design  
14 certification. So right now we're looking at the  
15 acceptability of the DAC approach.

16 And I guess the two big picture questions  
17 that we asked ourselves were, one, since seismic  
18 analysis and structural design DAC are new, they've  
19 never been used before; can we accept that approach?

20 And then the second question was on the  
21 piping DAC which had been used before on ABWR and  
22 System 80 Plus. We said, well, why wouldn't it be  
23 acceptable for AP 1000.

24 So those are the big picture questions.  
25 That's what I addressed today.

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1 CO-CHAIRMAN KRESS: Well, what I was  
2 fishing around for is is there something about piping  
3 structural and seismic that actually makes it  
4 extremely difficult for you to do a DAC or is it just  
5 a policy question.

6 MR. TERAQ: Those are the details I'm  
7 going to get into right now.

8 CO-CHAIRMAN KRESS: Okay.

9 MR. TERAQ: Yes, for each of the areas.  
10 So in answering the question of what is  
11 the acceptability of using the DAC approach, the first  
12 question that came in our mind is: well, what  
13 criteria do we use for establishing acceptability of  
14 DAC?

15 And this is why we went into a lot of  
16 detail about the policy issues, because we reviewed  
17 the DAC for three different areas:

18 One, does it meet established policy  
19 issues as described in the SECY paper?

20 Two, does it make technical sense? In  
21 other words, by that what I mean is when we look at  
22 the seismic design of a plant, we start with the  
23 ground motion, the earthquake ground motion  
24 accelerations. We look at those ground motion  
25 accelerations onto the building. We perform a

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1 building analysis. The building analysis generates  
2 the amplifications, the accelerations that are used  
3 for the piping analysis.

4 The piping analysis then is performed and  
5 the results are used to calculate break.

6 CO-CHAIRMAN KRESS: Which is something you  
7 can do if you have a site, and the site described.

8 MR. TERAQ: I'm sorry?

9 CO-CHAIRMAN KRESS: Well, you can do all  
10 of that if you have a site, and the site  
11 characteristics.

12 MR. TERAQ: yes.

13 CO-CHAIRMAN KRESS: But if you don't have  
14 a site, what then do you do? Use a bounding analysis  
15 for those things?

16 I mean, I can see how you can do all of  
17 that for a plant where you have a specified site.

18 MR. WILSON: The way we handle the site  
19 characteristics and design certification is the  
20 applicant specifies what we call site parameters, and  
21 then we review the design to the site parameters.

22 So, for example, the applicant may specify  
23 that he's designing the plant SSE of .3 G. He'll  
24 specify ground motion associated with that. He's  
25 specify flood levels and those sorts of things.

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1           So part of the definition of the design  
2 includes that site parameter.

3           CO-CHAIRMAN KRESS: Okay. So the design  
4 then would -- I mean, if someone built one of these  
5 things, it would be limited to the site, to at least  
6 fall within reference categories, and that would be an  
7 ITAAC? You would have to --

8           MR. WILSON: No, it's just part of the  
9 review at the combined license stage to verify that  
10 that particular applicant is referencing AP 600. We  
11 checked the site they planned to put it on and made  
12 sure that that site fits in with those parameters that  
13 Westinghouse specified when they did their design.

14           MR. BAGCHI: My name is Goutam Bagchi.

15           I just wanted to give a perspective as to  
16 what constraints we had. AP 600 design layout is the  
17 basis for AP 1000, the same footprint, the same  
18 structural element, except everything is higher. More  
19 mass, more of everything.

20           We know that while doing our AP 600  
21 reviews the site parameters were varied over a wide  
22 range, and certain sections became quite critical, and  
23 it is our concern trying to locate AP 1000 under all  
24 site conditions my not even be feasible. That was the  
25 concern.

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1                   So we could have perhaps in a theoretical  
2 sense used the structural design acceptance criteria  
3 had it not been constraining based on AP 600.

4                   MR. TERAQ: Okay. Coming back to my slide  
5 -- thank you, Goutam --

6                   MEMBER POWERS: Just to make sure you  
7 don't get through this slide --

8                   (Laughter.)

9                   MEMBER POWERS: You've discussed over and  
10 over again and the slide discusses, you know, what  
11 makes things acceptable, and I'm saying, gee, I wonder  
12 why you don't also look at what makes things  
13 unacceptable. That is, why don't you include going  
14 back to 52.47 and say why is it that the Commission  
15 would impose such a rule.

16                   And in the introduction, I thought a  
17 pretty good synopsis was given, that they put this  
18 rule in because when you didn't do this, you got a lot  
19 of on-the-fly design activities that resulted in just  
20 an enormous number of headaches.

21                   MR. TERAQ: That's a very good point, and  
22 we certainly did consider it. And that's the third  
23 point that I'm trying to make if I can get to it.

24                   (Laughter.)

25                   MEMBER POWERS: Oh, no. That's our job,

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1 to try to keep you --

2 MR. TERAQ: You saw that, didn't you?

3 MEMBER POWERS: -- to keep the flow of  
4 your presentation --

5 MR. TERAQ: So the three areas, the policy  
6 issues we looked at. We looked at technical issues,  
7 and we also looked at the safety issue on 5247, and I  
8 believe Dr. Kress asked what does 5247 actually say.

9 These are the relevant words: application  
10 must contain the level of design information  
11 sufficient to enable the Commission to reach a final  
12 conclusion on all safety questions associated with the  
13 design before the certification is granted.

14 CO-CHAIRMAN KRESS: There's that word  
15 "sufficient" in there.

16 MR. TERAQ: Sufficient.

17 CO-CHAIRMAN KRESS: That's a judgment  
18 call.

19 MR. TERAQ: That's a judgment call.  
20 That's correct. But the key words I'd like to focus  
21 on are before the certification is granted because  
22 there is certainly a timing issue involved here on  
23 when the staff can resolve any safety questions or  
24 potential safety questions.

25 And that's a crucial issue here because

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1 with the Westinghouse DAC approach, they propose in  
2 their topical report to provide certain information  
3 after design certification, and that leads me into my  
4 next slide.

5 CO-CHAIRMAN KRESS: But aren't the DACs --

6 MR. TERAQ: I'm sorry?

7 CO-CHAIRMAN KRESS: Are the DACs that have  
8 already been granted for the other types sort of a  
9 precedent for that?

10 MR. TERAQ: Well, yes. We did establish  
11 a precedent for I and C, human factors and piping, and  
12 RAD protection, but seismic and structural, we have  
13 not.

14 CO-CHAIRMAN KRESS: I know, but precedents  
15 are established by doing it.

16 MR. TERAQ: Yes. The precedents were set,  
17 and what I'm saying is that Westinghouse is not using  
18 the exact approach. They're proposing something  
19 different than the DAC approach that were used in  
20 these other plants.

21 CO-CHAIRMAN KRESS: Is there some reason  
22 why they have to be exactly like the others?

23 MR. TERAQ: Well, that's what I'm trying  
24 to point out. They may not be. It may be acceptable,  
25 but what I'm trying to point out here is where they

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1 deviate from the DAC approaches in the other plants,  
2 where do they not meet established policy issue ,  
3 technical issues or safety issues? That's what I'm  
4 trying to point out here.

5 CO-CHAIRMAN KRESS: Okay.

6 MR. TERA0: Okay? Thank you.

7 What this slide shows, what I'm trying to  
8 show in this slide is what design information will be  
9 provided and when, and for three different areas: for  
10 seismic analysis, for structural design, and for  
11 piping design.

12 And the second column shows the  
13 information that would be provided at the design  
14 certification stage, and the third column shows the  
15 information that would be provided at the combined  
16 operating license stage.

17 CO-CHAIRMAN KRESS: Now, this is  
18 Westinghouse's proposal.

19 MR. TERA0: Yes, yes. This is in their  
20 topical report.

21 CO-CHAIRMAN KRESS: Okay.

22 MR. TERA0: And so at the combined  
23 operating application stage, that's just prior to  
24 construction, and then the last column shows what  
25 information would be provided once the plant has been

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1 licensed and construction has started.

2 So for seismic analysis, Westinghouse is  
3 proposing to develop stick models for the AP 1000 at  
4 the design certification stage, and then perform a  
5 more finite element analysis for AP 1000 at the COL  
6 stage.

7 We didn't see any major problems with  
8 that. You go down to the next area, and what  
9 Westinghouse did here is they broke down their  
10 proposal between rock sites and other than rock sites,  
11 and for purpose of simplicity, we'll just call them  
12 soil sites. But soil sites means other than rock  
13 sites.

14 So for rock sites, the seismic analysis is  
15 actually rather simple because you don't get the soil-  
16 structure interaction, and so they can -- Westinghouse  
17 is proposing to perform a fixed base seismic analysis  
18 and generate the amplified response spectra for the  
19 piping design, and they would also perform the  
20 overturning and stability analysis for the plant. And  
21 we agree with that.

22 But when you get to the soil sites,  
23 Westinghouse proposed to not do the analysis, but  
24 rather, they proposed to develop the seismic analysis  
25 DAC, and that would tell you how to do the analysis,

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1 say, to generate the soil structure analysis, how to  
2 generate the amplified response spectra, and how to do  
3 the overturning of stability analysis.

4 And that analysis, we believed, is very  
5 complicated. There's a lot of uncertainties. The  
6 amplifications can be much larger, and in fact, let me  
7 from here jump to the next slide, and I'll come back  
8 to this slide.

9 For the seismic analysis, as we're just  
10 discussing, it is a first time DAC approach, and it's  
11 applicable to only non-hard rock sites, but you would  
12 see that the applicant would be required to complete  
13 most of the seismic analysis, including the soil  
14 structure interaction, the amplified response spectra,  
15 overturn the stability analysis.

16 And we found that this was inconsistent  
17 with the policy issue of level of detail that's in  
18 SECY 90-377. And specifically what it said in SECY  
19 90-377 is that the level of detail should be  
20 equivalent to or no less than an FSAR at the operating  
21 stage for a recently licensed plant.

22 So at that stage obviously the seismic  
23 analysis has been completed. So we identified this as  
24 a policy issue, but more than that, in the next  
25 bullet, we believe that there are some safety concerns

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1 or safety questions that will not be answered until  
2 after design certification, and as Goutam Bagchi has  
3 described briefly, the AP 1000 plant is taller and  
4 heavier than the AP 600 plant. So there is a question  
5 about the overturning stability and you would have  
6 higher seismic amplifications on soil sites.

7 CO-CHAIRMAN KRESS: But it's not a safety  
8 concern until the plant is built and turned on, is it?

9 MEMBER POWERS: Can't one say that just  
10 about anything in the design?

11 CO-CHAIRMAN KRESS: Well, my point is you  
12 have another chance to say no.

13 MR. TERAQ: Yeah, but, no, we don't.

14 MEMBER POWERS: Don't you do that on  
15 everything?

16 CO-CHAIRMAN KRESS: Can't you at the COL  
17 stage -- can't you say, "No, this has a safety  
18 problem. That's not sufficient"?

19 MR. WILSON: Let me get in here and  
20 amplify what Dave said, is what we're laying out are  
21 ITAAC, in this particular case certain types of ITAAC  
22 that's set forward process and acceptance criteria for  
23 doing the design and then verifying the design.

24 So if we wrote an ITAAC and they met the  
25 ITAAC, then we would have to find that acceptable, but

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1 if we didn't write one sufficiently robust that would  
2 lead to what we would normally refer to as an  
3 acceptable design, if we were reviewing the design at  
4 that stage, then, yeah, we would have a significant  
5 problem now.

6 Because in effect, the way the process is  
7 set up is if they met all of the ITAAC we're obligated  
8 to give them an operating license. And so the burden  
9 would be on us then to say --

10 CO-CHAIRMAN KRESS: Yeah, so what that  
11 means i you'd have a real burden trying to anticipate  
12 all of the things that might be safety related and  
13 being sure you have a DAC and ITAAC written in such a  
14 way that it covers those.

15 MR. TERAQ: That's exactly right. In  
16 fact, what I was going to say is that was the  
17 difficulty when we established the DAC, the piping DAC  
18 for ABWR. I was intimately involved with that. What  
19 we had to do is identify what type of issues,  
20 anticipate what type of issues can come up in piping  
21 and to assure that we have designed an acceptance  
22 criteria that will address how those issues are to be  
23 analyzed at the COL stage.

24 And it required us to go back and look at  
25 all the bulletins, generic letters. At the time there

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1 were issues with Comanche Peak on piping and pipe  
2 support designs. We did quite a -- and plus, the  
3 five Stone & Webster plants that were shut down.

4 So there were many issues that we tried to  
5 incorporate in addressing that.

6 CO-CHAIRMAN KRESS: Well, let me ask you  
7 another question about that. If you're doing the  
8 design certification at the design certification  
9 review stage, don't you have to do that anyway at that  
10 time?

11 MR. TERAQ: I'm sorry?

12 CO-CHAIRMAN KRESS: Don't you have to know  
13 what the issues of the safety problems with the  
14 seismic are and be able to review the SAR and looking  
15 for those issues and going back and checking all of  
16 the letters?

17 MR. BAGCHI: This is Goutam Bagchi again.

18 Dr. Kress, if we had the freedom to change  
19 the base size to anything the applicant wants, then we  
20 could do that. However, we are constrained by the  
21 size. We are constrained by the design. That is the  
22 certified design. The Commission has certified that  
23 design.

24 MR. WILSON: Also, Dr. Kress, in your  
25 question, you said at the design certification stage.

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1 So understand we don't have that design information at  
2 that stage.

3 CO-CHAIRMAN KRESS: If you had that  
4 information thought, you would have to do exactly what  
5 he said.

6 MR. WILSON: That's correct.

7 CO-CHAIRMAN KRESS: So it would seem to me  
8 like the question is do you do that now or do you do  
9 it later?

10 MR. WILSON: Yeah, but can you write the  
11 design acceptance criteria to appropriately pick up  
12 all of that information so that the output product is  
13 acceptable, and that's what he's talking about.

14 CO-CHAIRMAN KRESS: And I think that's a  
15 legitimate question there, is can you do an ITAAC or  
16 a DAC robust enough to cover everything at that time.

17 MR. TERAQ: So I guess the bottom line  
18 here is that we felt that there were too many  
19 uncertainties or unanswered questions that would  
20 remain at the design certification stage for us to say  
21 that this was a viable approach to use seismic  
22 analysis DAC.

23 Even though it's technically feasible, we  
24 may be able to come up -- and I say technically  
25 feasible with uncertainties here because this is a

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1 first time approach, and we don't know what we're  
2 going to encounter or whether we can anticipate all  
3 the type of problems for seismic analysis.

4 CO-CHAIRMAN KRESS: And all you're left  
5 with is you have to make a judgment, and it's a  
6 judgment call.

7 MR. TERAQ: That's right, and also  
8 remember that PAR 52 means design finality. So once  
9 the design is certified, this staff -- and this is to  
10 assure regulatory stability and predictability so that  
11 the staff cannot ask anymore questions on that part of  
12 design that's certified at the COL stage.

13 CO-CHAIRMAN KRESS: But I view DAC as an  
14 exception to that.

15 MR. TERAQ: No. Oh, no, as a matter of  
16 fact. It is not because once we approve the DAC, then  
17 the CO applicant only has to complete the piping  
18 design and verify it using ITAAC.

19 MEMBER SIEBER: And the only set of rules  
20 come from the DAC.

21 MR. TERAQ: That's correct. That's  
22 correct. The only set of rules come from the DAC.

23 MR. WILSON: Are you ready for the next  
24 slide?

25 MR. TERAQ: Let me go back to this one.

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1                   So we discussed seismic analysis. The  
2 second item here on structural design, what  
3 Westinghouse is proposing is to provide some  
4 preliminary assessment of the key structural elements  
5 for both soil and rock sites at the design  
6 certification stage, and then they would establish  
7 structural design DAC that would be used at the COL  
8 stage to complete the piping structural design.

9                   And then at the COL or after the plant  
10 started construction, then they would verify the as  
11 built structural design using ITAAC.

12                   MR. WILSON: Ready for the structural one?

13                   MR. TERAQ: So to address the structural  
14 DAAC, again, this is the first time DAC approach. So  
15 this is a new policy issue, and this is appropriate  
16 for the use of the structural DAC is to be applicable  
17 to all sites, hard rock and soil sites.

18                   The CO applicant would then complete the  
19 structural design. So a substantial amount of design  
20 would remain for the CO applicant to complete, and we  
21 found that the level of detail here again is  
22 inconsistent with the policy issues in SECY 90-377,  
23 where a complete design -- in other words, it's not  
24 consistent with the type of information that's in an  
25 FSAR at the operating license stage for a recently

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1 licensed plant.

2 And obviously we will lose benefits of  
3 standardization if we don't know what the final design  
4 of the buildings look like.

5 The approach is technically feasible  
6 though. We believe it can be done, especially for  
7 hard rock sites. For soil sites, we think it's  
8 technically feasible, but there are some uncertainties  
9 that we might anticipate. It gets a little bit more  
10 complicated when you have not completed the analysis  
11 up front.

12 So we anticipate that there could be some  
13 problems later on for other than hard rock sites.

14 And finally, for the piping DAC, the  
15 piping DAC is similar to ABWR and System 80 Plus  
16 approach. The only difference is that you can see in  
17 the third column there on the COL application what  
18 Westinghouse is proposing is that the analysis for  
19 leak before break qualified piping be provided after  
20 design certification, and this is different than what  
21 we accepted on System 80 Plus.

22 For ABWR, obviously they didn't use the  
23 leak before break approach.

24 Let me address the piping DAC in two  
25 slides. One, we'll discuss the policy issues with

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1 piping DAC and the second slide will discuss the  
2 safety issues.

3 So the policy issues here, piping DAC was  
4 used in ABWR and System 80 Plus, and both of those are  
5 evolutionary plants. AP 600 completed its piping  
6 design, and obviously it's a passive plant.

7 So the question was: how was Westinghouse  
8 able to complete the piping design for AP 600 while  
9 G.E. and ABB Combustion Engineering were not able to?

10 And staff would note that in a passive  
11 plant, there are significantly fewer number of safety  
12 related piping subsystems that have to be modeled, and  
13 most of those, if not all, are inside the containment,  
14 and that the passive plant by nature does not have  
15 large motor operator valves with offset actuators.  
16 They don't have pumps, heat exchangers where the pipe  
17 nozzle is dependent on the vendor design.

18 So because of the simplicity of the  
19 design, I mean, you do have check valves, but check  
20 valves are relatively easy to make assumptions on its  
21 weight. It doesn't have offset center of gravities.  
22 So you can make reasonable assumptions to complete the  
23 piping design.

24 And that is exactly what Westinghouse did  
25 for AP 600, but not for AP 1000. The diameters have

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1 changed, and Westinghouse is proposing to use the DAC  
2 for the AP 1000 piping.

3 Now, the question came up and we've had --  
4 yes?

5 MEMBER SIEBER: In the AP 1000, the number  
6 of components and the type of components would be the  
7 same. It's just the size that's different. Is that  
8 true or not?

9 MR. TERAQ: That's correct. You may have  
10 a slightly larger check valve.

11 MEMBER SIEBER: That's right. Larger  
12 diameter piping, larger heat exchanger, larger pumps.

13 MR. TERAQ: But they wouldn't have pumps  
14 and heat exchangers in either passive plants.

15 MEMBER SIEBER: Right.

16 MR. TERAQ: Right. So the question is:  
17 why could we not let Westinghouse use DAC approach for  
18 AP 1000?

19 And, again, this is more of a policy issue  
20 because -- what I'm addressing now -- because we have  
21 to go back to the basis for using DAC in ABWR and  
22 System 80 Plus, and the basis for using the DAC or a  
23 rapidly evolving technology, which doesn't apply here,  
24 but the other basis was that as built and as procured  
25 information was insufficient to complete the design.

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1 So for evolutionary plants when you had the motor  
2 operator valves or heat exchangers or pumps and didn't  
3 know where the nozzles were going to be on these  
4 vendor specific equipment, it wasn't reasonable for us  
5 to have General Electric and Combustion Engineering  
6 route the piping when the piping routing can change  
7 significantly when they actually purchase the  
8 equipment.

9 So the bases was as built land as procured  
10 information is insufficient to complete the piping  
11 design, and that we felt did not apply here with the  
12 passive plant; that the information is sufficient to  
13 complete the design.

14 Now, can it be done? Yes, it can be done.  
15 We've proved that it can be done, but unless we raise  
16 to the Commission that there's a different basis here  
17 for approving the use of piping DAC for AP 1000, we  
18 felt that this is a policy issue that needs to be  
19 brought to the attention of the Commission.

20 CO-CHAIRMAN KRESS: Could be done, but it  
21 would have to be on a different basis, and then you've  
22 done it before.

23 MR. TERAQ: That's true, and we asked  
24 Westinghouse if they can provide us that type of  
25 basis, that rationale for using piping DAC since the

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1 basis of as procured information being insufficient  
2 does not seem to apply in their case.

3 A separate issue, but nonetheless just as  
4 important, is that the leak before break approach is  
5 inconsistent with SECY 93-087. On my previous slide,  
6 I showed that they would provide the leak before break  
7 analysis at the COL stage.

8 In SECY 93-087, it states that leak before  
9 break may be used by establishing bounding limits  
10 using preliminary analysis results during the design  
11 certification phase and verified by ITAAC at the COL  
12 phase.

13 So that's the one difference that we felt  
14 that for leak before break on AP 1000, that it was not  
15 consistent with the SECY 93-087 policy.

16 And there are some safety issues, as well,  
17 which I'll discuss in the next slide that's related to  
18 leak before break.

19 Piping safety issues. We found that  
20 there's actually three areas that we identify that's  
21 related to safety, that identify safety issues. Some  
22 of these we've discussed with Westinghouse, and  
23 actually some of these we have not because they  
24 actually came out as a result of our discussions on  
25 developing our internal position on these issues.

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1                   So I apologize to Westinghouse that they  
2                   may not have heard some of these issues, but the first  
3                   issue on leak before break, when we approve leak  
4                   before break, it is usually for an operating plant,  
5                   and for an operating plant, you know the seismic  
6                   stresses. You know the piping materials. So for a  
7                   standard plant, for a paper plant, the staff had to  
8                   address three critical areas to assure that leak  
9                   before break can be used.

10                   And those three areas were the margins on  
11                   load, the margins on flaw size, and the margins on  
12                   leakage rate. And what we approved for System 80 Plus  
13                   was System 80 Plus established bounding surveys for  
14                   those three areas of loads, flaw size, and leakage  
15                   cracks.

16                   And then what System 80 Plus did is they  
17                   used preliminary stress analysis at least for those  
18                   leak before break lines or the critical size leak  
19                   before break lines to verify that there was sufficient  
20                   margin available so that when the plant is finally  
21                   built and they get the final stress analyses and the  
22                   material properties, that we felt that there was  
23                   enough margin to not have any questions raised at that  
24                   time.

25                   But Westinghouse is proposing to do this

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1 analysis at the COL stage. So what we feel is that  
2 these margins will not be confirmed at the design  
3 certification stage. So we believe that that's one  
4 issue that does not meet 5247(a)(2).

5 Another issue, the second issue here  
6 emerges as a result of the leak before break  
7 uncertainty, and this is an issue on subcompartment  
8 pressurization and flooding because without knowing  
9 what is the minimum size line that we will approve for  
10 a leak before break, the question is: well, what is  
11 the pressurization one would use? What size pipe  
12 break would one use to establish your subcompartment  
13 pressurization for flooding effects?

14 And in fact, this was an issue that was  
15 raised by the ACRS back in June, in an ACRS letter  
16 dated June 16th, 1992. So we were well aware of ACRS'  
17 concerns at that time of compartment pressurization  
18 and flooding of DACs, that it be addressed as part of  
19 the DAC.

20 And Westinghouse has not addressed this  
21 issue. It's not say that it cannot be resolved, but  
22 at this time, we have not discussed with Westinghouse  
23 how thy plan to address those issues.

24 The third issue is a relatively new issue,  
25 and this deals with that the passive piping design

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1 needs to be finalized because the thermal hydraulic  
2 characteristics of the passive safety systems are very  
3 sensitive to the piping volume.

4 And so when they change their piping  
5 sizes, we need confirmation that those final piping  
6 sizes are going to be the final piping size, and they  
7 will meet the seismic stresses and thermal stresses  
8 and the routing.

9 So without that confirmation, it does  
10 interface with the thermal hydraulics area.

11 So in summary, just summarizing what I  
12 talked about, so the seismic analysis DAC, what we  
13 found was there were safety issues involved and policy  
14 issues involved, but technically it's a feasible  
15 approach with some uncertainty.

16 With a structural design DAC, it's mainly  
17 just policy issues, and we feel that it's technically  
18 feasible even though there are some uncertainties  
19 since this is the first time we're using this  
20 approach, and for the piping design, we find that  
21 there were policy issues, safety issues, but we  
22 believe it is technically feasible.

23 So that concludes my presentation.

24 MR. WILSON: So, Mr. Chairman, in summary  
25 then, similar to what Mr. Drozd pointed out, what the

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1 staff is recommending is that we not accept the use of  
2 additional design acceptance criteria on AP 1000.

3 And with that we'll turn it over to you.  
4 If you have anymore questions in this area before we  
5 turn the presentation back to Westinghouse.

6 CO-CHAIRMAN KRESS: Well, I think you've  
7 answered most of my questions. Do any of the other  
8 committee members?

9 MR. LYON: This is Jim Lyon from the  
10 staff, and before Westinghouse comes up or, you know,  
11 we're making this shift, we presented this information  
12 to Westinghouse a couple of weeks ago. We've been  
13 having some conversations with them, and one of the  
14 things that we had raised to them is that in the  
15 seismic area especially, seismic area, that doing a  
16 design acceptance criteria for the seismic area for  
17 the soil sites could be alleviated by limiting the  
18 plant to a hard rock site, providing us the type of  
19 information that they were going to provide us, you  
20 know, and then providing us the structural design on  
21 that.

22 Westinghouse has been talking to us, and  
23 they actually sent us a letter this morning that talks  
24 about, you know, one of their ways of maybe providing  
25 limiting AP 1000 to a hard rock site, then a plant

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1 that would be built at an other than hard rock site  
2 would then have to be reviewed at the COL stage for  
3 that other than hard rock site. It would become  
4 basically a site parameter. One of the site  
5 parameters would limit it to a hard rock site.

6 That's something that then could be  
7 reviewed at the combined license stage for an  
8 applicant that wants to reference the AP 1000, but put  
9 it at a site other than a hard rock site with all of  
10 the site parameters.

11 CO-CHAIRMAN KRESS: What that does for you  
12 other than having a DAC is it gives you a handle to  
13 say no?

14 MR. LYON: Right, and what it allows us to  
15 do is resolve all of the issues at the combined  
16 license stage prior to issuing --

17 CO-CHAIRMAN KRESS: You can make a safety  
18 review then.

19 MR. LYON: Right.

20 CO-CHAIRMAN KRESS: And see if it  
21 satisfies your criteria, and if it doesn't, you can  
22 say no.

23 MR. LYON: Right.

24 MR. WILSON: In that situation, similar to  
25 what you asked before, then they would -- we would

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1 have an opportunity to review the actual design before  
2 the granting of the combined license.

3 CO-CHAIRMAN KRESS: And that's what I was  
4 misinterpreting the DAC to allow you to do, but  
5 apparently it doesn't, but this process would allow it  
6 to --

7 MR. LYON: That's right, and so we're  
8 considering -- and I think in that scheme, then if you  
9 take the piping DAC by itself, we may be able to work  
10 with that, and that's something that we're kind of in  
11 discussions with Westinghouse on now to try and move  
12 forward.

13 So I think that's probably a good, you  
14 know, lead-in to segue.

15 CO-CHAIRMAN KRESS: A good segue into the  
16 Westinghouse.

17 MR. LYON: Into their discussion.

18 MEMBER SIEBER: I wonder about that a  
19 little bit though. If you limit this to just hard  
20 rock sites, I don't think there are that many hard  
21 rock sites around, are there?

22 If you look at river sites, you have to  
23 have cooling water somehow. If you look at river  
24 sites, every one of them is -- or not every one, but  
25 a log of them have flood plains there. So that's not

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1 hard rock. In fact, soils liquification is pretty  
2 high on those kinds of sites.

3 Building them on pilings is not good  
4 because that effectively just raises the height of the  
5 plant, which seismically makes it worse.

6 Lake and ocean front sites, those are  
7 pretty tough, too, and so it may solve the licensing  
8 problem and the technical problems that you have, but  
9 then you end up with a certified design that nobody  
10 wants to buy.

11 MR. WILSON: Well, what it would mean it  
12 would be more likely if the plant is by reference,  
13 that there would be additional design work that would  
14 have to be reviewed during the combined license review  
15 process.

16 MR. BAGCHI: As I recall though, Seabrook  
17 site is hard rock. Catawba is hard rock. There are  
18 hard rock sites.

19 MEMBER SIEBER: There are some sites, but  
20 most of them are not, it seems to me.

21 CO-CHAIRMAN KRESS: I presume Westinghouse  
22 is sufficiently sagacious to design their system to  
23 make use of the sites they want to make use of even  
24 though they may have not put an end to this SAR yet.  
25 They probably would design it to make use of the

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1 various sites.

2 MR. WILSON: Why don't we let Westinghouse  
3 answer that?

4 CO-CHAIRMAN KRESS: With that we'll turn  
5 it over to whoever is taking the floor for  
6 Westinghouse.

7 MR. ORE: Good afternoon. My name is  
8 Richard Ore. I'm with Westinghouse. I have  
9 responsibility for the seismic work, for the  
10 structures, for the piping.

11 I would like to start by thanking the  
12 staff for sort of an excellent summary. It allows me  
13 to jump through some of my presentation very quickly,  
14 but I would like to sort of make a few points from it.

15 Firstly, --

16 MR. CORLETTI: One second, Richard.

17 This is Mike Corletti.

18 His presentation starts on about page 15  
19 of the handout.

20 MR. ORE: And the first slide I'm going to  
21 use is number 11.

22 Firstly, to address the --

23 CO-CHAIRMAN WALLIS: What is this? Excuse  
24 me.

25 MR. ORE: We did indeed --

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1 CO-CHAIRMAN WALLIS: Excuse me.

2 CO-CHAIRMAN KRESS: We're still trying to  
3 find it.

4 CO-CHAIRMAN WALLIS: This thing leaps from  
5 slide five to slide 14.

6 MR. ORE: There should be a package that  
7 is entitled AP 1000, approach to design acceptance  
8 criteria.

9 MEMBER SIEBER: Yeah, that's slide 15.

10 MR. ORE: And that was slide 15, and in  
11 the handout package, four back, is one that is  
12 identified as slide 11.

13 CO-CHAIRMAN KRESS: N, that's not in ours.

14 MR. CORLETTI: Richard, you added that.  
15 I'm sorry. I didn't put that in there.

16 MR. ORE: My apologies. Would you arrange  
17 for a hard copy for them?

18 We had submitted a request in Phase 2 to  
19 review the approach of using design acceptance  
20 criteria on both structures and seismic analyses. We  
21 had one meeting with staff early last year, and we  
22 have had another meeting recently and additional phone  
23 calls and resulting from that we transmitted a letter  
24 yesterday that said that in design certification, in  
25 the design control document that we propose to submit

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1 at the end of March, we will request design  
2 certification including seismic analysis and  
3 structural design for a hard rock site.

4 Now, in response to the question earlier,  
5 on AP 600 we did a review of 22 existing nuclear power  
6 plant sites, and we found 50 percent of them --

7 MEMBER SIEBER: Are hard rock.

8 MR. ORE: -- the nuclear island is founded  
9 on rock, yes. Sometimes it's down at the -- our  
10 excavation depth is 40 feet. I think there were one  
11 or two cases where the rock was down 50 or 60 feet,  
12 where perhaps I've taken credit for a rock site  
13 because you would go down to it with your foundations.

14 MEMBER SIEBER: Yeah, i think I know where  
15 that one is.

16 MR. ORE: Fifty percent of the existing  
17 plants are on rock.

18 MEMBER SCHROCK: Is there any potential  
19 ambiguity about the definition of a hard rock site?

20 MR. ORE: I don't believe so. There is a  
21 site parameter that is established in the first  
22 section of the design control document. For AP 600,  
23 we requested and obtained certification for sites  
24 where the shear away velocity of the soil exceeded  
25 1,000 feet per second.

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1                   For AP 1000 we have changed that to a  
2 shear away velocity exceeding 3,500 feet per second.  
3 In the AP 600 we did a series of analysis. One of  
4 them was at 3500 feet per second. In order to  
5 demonstrate there that soil structure interaction  
6 effects were negligible.

7                   In fact, in one of the previous revisions  
8 of a standard review plan I believe that that cutoff  
9 of 3,500 feet was given then for whether you needed to  
10 look at soil structure in traction or not.

11                   CO-CHAIRMAN KRESS: So given that comment,  
12 basically what Jim Lyon suggested, it looks like it's  
13 going to come about.

14                   MR. ORE: Yes.

15                   CO-CHAIRMAN KRESS: And all we have to  
16 deal with then is the piping deck.

17                   MR. ORE: That's correct. So now I would  
18 like just to talk about the piping deck unless there's  
19 any questions related to the seismic analyses or  
20 construction design.

21                   CO-CHAIRMAN KRESS: No, I think we're h  
22 pretty good shape there. So we can go straight to  
23 the --

24                   (Laughter.)

25                   MR. ORE: Now I will continue on the

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1 piping, and this now starts at slide 22 of the handout  
2 package that I believe you have. And this will be  
3 fairly brief because it's been covered by the staff  
4 extensively.

5 The DAC and ITAAC approach was permitted,  
6 was used for ABWR and for System 80 Plus. The way  
7 it's done is in the design control document we agree  
8 on the design acceptance criteria and for the piping  
9 design criteria and the analytical methods and the  
10 acceptance criteria.

11 The implementation is verified in the  
12 ITAAC, and basically the verification is that there is  
13 a series of ASME design reports on every piping line,  
14 and that the scope of that is clearly defined in ASME.  
15 It includes any reconciliation of as built changes,  
16 and in addition, we have an evaluation against the  
17 acceptance criteria for leak before break to  
18 demonstrate that those lines that we intended to apply  
19 LVP to were qualified to the acceptance criteria.

20 CO-CHAIRMAN KRESS: What about this  
21 comment that small changes in the piping layout or  
22 sizes could have significant safety implications  
23 because you're highly driven by passive systems that  
24 rely on natural convection driving forces?

25 MR. ORE: We don't believe so. I've got

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1 some additional slides. The AP 1000 -- let me just --  
2 I think I prefer just to defer that if I could get to  
3 it, if I may.

4 MR. CORLETTI: Richard, this is Mike  
5 Corletti. If I could just speak to that a little bit.

6 In regards to changes in the pipe routing  
7 and how it could affect the passive system performance  
8 from a thermal hydraulic safety point of view, those  
9 characteristics are already captured in the ITAAC and  
10 are set in other portions of the ITAAC. So  
11 information that we had a range of piping resistance,  
12 L over D information, for the inlet and the outlet of,  
13 say, the core make-up tank lines.

14 The elevation of those core make-up tanks  
15 are also set. So from the things that would affect  
16 the safety analysis from like elevations and  
17 resistances, those are already covered in the ITAAC.

18 MR. ORE: As described by NRC, for AP 600  
19 we did extensive analyses of all safety related  
20 piping. I believe it was all piping larger than two  
21 inch in diameter. In doing those analyses, we made  
22 certain assumptions on vendor data, particularly  
23 things like valves, valve weight, valve operators.

24 These calculations were audited by NRC and  
25 found acceptable. The question we ask ourselves

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1       though is: what have we gained when we end up with a  
2       verification process, the ITAAC, that is virtually  
3       identical to the ITAAC required of the other vendors,  
4       of the other plants?

5                       This now goes to slide 25. What we gain  
6       from our AP 600 work, very definitely we gained  
7       confidence that all of the line routings work in the  
8       audit. So with NRC staff we got agreement on the  
9       methods and the implementation particularly of all of  
10      those methods.

11                      We believe on AP 1000 we gain significant  
12      benefit from what we did on AP 600. Our line routings  
13      are substantially the same obviously, with a slightly  
14      bigger diameter pipe, with some slight changes, but  
15      nothing significant.

16                      The analyses will use the same methods as  
17      AP 600, and the design specifications, transient  
18      conditions, the operating conditions are all  
19      substantially the same as AP 600.

20                      Now perhaps I can go back to the question  
21      of the LBB lines. Mike had addressed the response on  
22      thermal hydraulics may be different. Clearly with the  
23      larger diameter there's going to be slightly different  
24      stress conditions, but we do not believe that there  
25      will be significant changes required.

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1           On AP 600, in the ITAAC that we have on  
2 each system, we have a requirement that we meet all of  
3 the acceptance criteria, and in the extreme, if we had  
4 to reroute pipe, we would have to still meet all of  
5 the acceptance criteria, which includes subcompartment  
6 pressurization issues, flooding, all of the sort of  
7 pipe rupture hazard type issues if you have to reroute  
8 a line.

9           We recognize that there are some sort of  
10 issues related to subcompartment pressurization that  
11 we don't want to defer until after the plant is built.  
12 Therefore, we have included in the design control  
13 document and a preliminary mock-up of this was  
14 actually informally given to the staff month ago, and  
15 we specifically say combined licensed applicants  
16 referencing the AP 1000 certified design will complete  
17 the leak before break evaluation, and this is sort of  
18 at the time of the combined license application, and  
19 they will demonstrate that they meet bounding curves  
20 that are provided in the AP 1000 design control  
21 document.

22           An example of this, which will be in the  
23 submittal, it was in the preliminary one a month ago  
24 and will be in the one at the end of March. We define  
25 for the piping analyst when he is qualifying the

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1 system a bounding curve that shows if he's at an area  
2 below the curve, designated here as .1, and this is a  
3 relationship between the stresses under operating  
4 conditions to the stresses under the safe shutdown  
5 earthquake condition; if he's below that curve, he  
6 meets to leap before break acceptance criteria. If  
7 he's above it, he doesn't.

8 These bounding curves include all of the  
9 margins required by NRC. There are margins on load  
10 and margins on leak rate built into these curves. So  
11 if the combined license applicant can demonstrate that  
12 he meets these curves, then his piping layout  
13 satisfies the leak before break requirements.

14 MEMBER SCHROCK: Could you restate the  
15 meaning of those terms on the axes of that graph?

16 MR. ORE: Certainly. On the X axis the  
17 normal stress. This is the stress, the membrane  
18 stress in the pipe, membrane plus bending, and normal  
19 operating conditions.

20 CO-CHAIRMAN KRESS: The internal pressure?

21 MR. ORE: No, this is -- well it's  
22 internal pressure and it's dead weight. It's normal  
23 thermal, and under a given condition, he identifies  
24 what his stress in the pipe is, and he can then go up  
25 to the bounding curve and see this is the maximum

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1 stress then that I can accept when I combine it with  
2 the safe shutdown earthquake, the faulted conditions.

3 And if, indeed, he's above this curve, he  
4 does not meet the criteria for leap before break. If  
5 he's below this curve, then he does. And this is  
6 similar to the approach that was used on the CE  
7 plants.

8 CO-CHAIRMAN KRESS: The only difference  
9 between the two axes is the loadings you'd get from  
10 seismic?

11 MR. ORE: Pardon?

12 CO-CHAIRMAN KRESS: The only difference  
13 between these two axes is the loading you'd get from  
14 seismic?

15 MR. ORE: One of them is normal operating.  
16 The other is faulted. I think the primary difference  
17 is just seismic, yes.

18 MEMBER SHACK: To be certain, to make sure  
19 that you have enough stress to get a measurable leak  
20 compared to the size of stress it's going to take to  
21 actually fail the pipe.

22 MR. ORE: That's correct.

23 MEMBER SHACK: Which is sort of what  
24 you're comparing.

25 MR. ORE: And that's why actually if the

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1 operating stress is higher, you can go to a higher or  
2 safe shutdown.

3 MEMBER SHACK: It's better news, yeah.

4 MR. ORE: It doesn't sound right, but  
5 effectively you're stressing the pipe enough under  
6 normal operating conditions if there is a crack, it  
7 will be a visible leak.

8 CO-CHAIRMAN KRESS: And why do these  
9 things flatten off at the ends? Is that just a  
10 safety --

11 MR. ORE: What we do is we take sort of  
12 two points actually sort of as a lower extreme and an  
13 upper extreme based on sort of typical practice. I  
14 think the upper extreme is the sort of highest that  
15 you can go under ASME.

16 CO-CHAIRMAN KRESS: So you know you're not  
17 going to be --

18 MR. ORE: You're pretty much up to yield  
19 at that stage.

20 CO-CHAIRMAN KRESS: Okay. I understand.  
21 There's just not any significance to those lines  
22 really since you're not going to be in there.

23 MR. ORE: You will never be able to  
24 qualify a line outside these ranges.

25 So sort of in conclusion, we intend, we

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1 are proposing to follow a path that we believe is  
2 consistent with the approach used on ABWR and System  
3 80 Plus. I was very pleased to see the overhead from  
4 Dave Terao that said he believes that such an approach  
5 is technically feasible.

6 Yes, there may be some sort of discussion  
7 on it, but we believe the overall approach is  
8 appropriate.

9 CO-CHAIRMAN KRESS: How do you argue  
10 against or debate their point that passive systems,  
11 piping is not nearly as complex as, say, System 80  
12 Plus piping, and therefore, it shouldn't be that  
13 difficult for you to really lay out a similar thing to  
14 AP 600 that you did?

15 MR. ORE: We have effectively laid it out  
16 the same as AP 600. Now, systems are clearly simpler  
17 because of the passive systems. Unfortunately, we do  
18 still have certain sort of valves and things like  
19 that, and Part 52 specifically says you do not have to  
20 select vendors on things like that.

21 So you cannot do final analyses anyway,  
22 and the question really is: well, why do very  
23 elaborate initial analyses for review by NRC and then  
24 have to redo them at the as built stage?

25 CO-CHAIRMAN KRESS: So you think it might

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1 fit that second criteria there. You really can't do  
2 it until you get the as procured and as built?

3 MR. ORE: You are not going to be able to  
4 have final confirmation until you have done the as  
5 built.

6 MR. CORLETTI: As you all know -- this is  
7 Mike Corletti again -- as much as I'd like to agree  
8 that we only have check valves in our plant, we do  
9 have quite a bit of motor operator valves. All would  
10 have to be procured. All with end to end dimensions  
11 and centers of gravity.

12 So whereas on AP 600, we did do analysis  
13 making assumptions, we learned, I think, the hard way  
14 that we still had to come back to that at the end and  
15 redo it again with all of the final, as procured valve  
16 information.

17 CO-CHAIRMAN KRESS: If you were to build  
18 an AP 600, is there some chance that you'd find  
19 yourselves in a bind because you said one thing in  
20 your FSAR or your certification rule and you find out  
21 that when you get ready to build it that your  
22 assumptions were bad?

23 MR. CORLETTI: We certainly hope not, but  
24 again, our DAC approach and the fact that we've gone  
25 through that on AP 600 gives us significant confidence

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1 that even for AP 1000 we're not going to have to face  
2 that same problem.

3 MR. ORE: Okay. That concludes my  
4 presentation.

5 MR. BURKHART: Mr. Ore, this is Larry  
6 Burkhart, the project manager.

7 You say that it's similar. Can you  
8 quantify the differences between the approach compared  
9 to the System 80 Plus?

10 You're saying it's similar. Is it exactly  
11 the same? What are the differences?

12 MR. ORE: Our intent is that it be exactly  
13 the same, yes, that we would, indeed -- we have got  
14 all of the design criteria in the design control  
15 document. We will provide a similar reference in the  
16 CE approach in Chapter 1, I believe it is.

17 There's a reference to all of the  
18 subsections containing design criteria for piping. We  
19 would have a similar table and that all becomes Tier  
20 2 stuff.

21 MR. BURKHART: So it sounds like your  
22 approach is the same, not just similar. I just  
23 thought there --

24 MR. ORE: The intent is that it be the  
25 same.

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1 MR. BURKHART: Okay. I just wanted to  
2 know --

3 MR. ORE: Without going line by line, I  
4 did not want someone to pick me up and say, "Well,  
5 something is slightly different.

6 MR. BURKHART: I just wanted to know if  
7 there were any differences that you knew of.

8 MR. ORE: No, the intent is that it be the  
9 same.

10 MR. CORLETTI: And this is Mike Corletti.

11 It is certainly our intent to follow that  
12 precedent, and we'd be very interested to work with  
13 the staff in regards to places where we perhaps have  
14 deviated. We don't believe we have, but we certainly  
15 look forward to working with them to resolve that.

16 CO-CHAIRMAN KRESS: Any other questions on  
17 the DAC from the members?

18 (No response.)

19 CO-CHAIRMAN KRESS: At this point in time  
20 I propose we take a break. We were supposed to be  
21 scheduled for one at three, but we can start a little  
22 early, and I'd say be back from the break at three,  
23 and we'll start on the applicability of the scaling.

24 Is that all right with everyone?

25 Okay. Let's recess for a break.

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1 (Whereupon, the foregoing matter went off  
2 the record at 2:43 p.m. and went back on  
3 the record at 3:03 p.m.)

4 CO-CHAIRMAN KRESS: Let's reconvene.

5 Before I turn this over to you to continue  
6 with the tests and scaling, I think Mike Corletti  
7 wants to make a few words for Westinghouse, if you  
8 don't mine.

9 MR. CORLETTI: Yes. I just thought I'd  
10 just take two minutes to brief you on really where we  
11 think we are in the overall program for AP 1000.

12 As you know, we started the pre-  
13 certification review. Really it began last December.  
14 We've been answering the RAIs with the staff, the  
15 staff RAIs. We believe we're just about to the end of  
16 this phase.

17 As part of that, we've just recently  
18 submitted to the staff a red line and strikeout, what  
19 we call our highlight and strikeout version of our  
20 DCD, of the AP 600 DCD, that really illustrates the  
21 differences between AP 600 and AP 1000, and this is  
22 one of the books.

23 There's 20 volumes, and it's being  
24 provided to the staff now as they plan the design  
25 certification review, as they get their estimates to

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1 see what they think it will take to certify AP 1000.

2 CO-CHAIRMAN KRESS: That's that little  
3 line with the pointed end on it

4 MR. CORLETTI: Yes, here. We're right  
5 here in the number three, pre-certification review,  
6 and we are preparing and we are prepared to submit our  
7 application at the end of March. March 28th is our  
8 scheduled date when we will be submitting the complete  
9 design certification document and the PRA.

10 What we've submitted so far is everything  
11 except for Chapter 15 and except for the PRA.

12 So our plan is to submit March 28th. The  
13 other two lines you see there is our projections for  
14 where the rest of the marketplace is as far as  
15 utilities are now getting ready to submit early site  
16 permits, and hopefully a COL application, which we  
17 believe is a critical path item.

18 Our goal is to make AP 1000 design  
19 certification not to be critical path, so to be  
20 finished prior to the utilities having their early  
21 site permits and, therefore, AP 1000 would be a viable  
22 product for them.

23 CO-CHAIRMAN WALLIS: How many utilities  
24 are involved in this?

25 MR. CORLETTI: There are several that are

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1 considering early site permits at this time, at least  
2 two or three that we know of.

3 CO-CHAIRMAN WALLIS: Haven't made a  
4 downpayment or anything.

5 MR. CORLETTI: No, not to our knowledge.  
6 (Laughter.)

7 MR. CORLETTI: But we're working on it.  
8 So that's all. I can pass this around.  
9 We have this on a CD, which we could also make  
10 available to the ACRS. I can get you copies if that's  
11 appropriate.

12 Paul we could do that.

13 CO-CHAIRMAN KRESS: Well, I think we  
14 definitely want that.

15 MR. CORLETTI: Okay, great. And you can  
16 look for the complete edition coming March with.

17 CO-CHAIRMAN KRESS: Okay.

18 MR. CORLETTI: So thank you.

19 CO-CHAIRMAN KRESS: Thank you.

20 Okay. With that I'll turn it back to you,  
21 Andrzej.

22 MR. DROZD: The last two remaining groups  
23 of issues from Phase 2 review are testing or a more  
24 precise applicability of AP 600 testing to AP 1000,  
25 and the applicability of safety analysis codes that

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1 were used in AP 600's review into 1000.

2 Today, this afternoon Dr. Steve Bajorek  
3 and Dr. di Marzo will address testing and scaling  
4 issues that were analysis and applicability and its  
5 applicability to AP 1000 design. I just want to  
6 briefly summarize major points that staff will be  
7 including in a proposed SECY paper to Commission on  
8 safety and testing.

9 First of all, we will notice that there  
10 are no new phenomena identified from what we see.  
11 That is, what other questions and problems there were  
12 with the design during AP 600, the certificate review,  
13 we see the same issues being addressed or needed o be  
14 addressed during AP 1000.

15 Therefore, in general, in general, we do  
16 see that whatever was used to analyze and/or support  
17 codes during AP 600 certificate review is applicable  
18 to AP 1000 review.

19 That doesn't mean that we do not have  
20 certain concerns. First of all, we notice that some  
21 physical models that are the basis for various  
22 subroutines and various analysis used in analyzing  
23 safety behavior of the plant needs to be either  
24 modified or verified or both, and specifically liquid  
25 entrainment model is one of the outstanding issues

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1 that we think needs to be verified and/or modified  
2 because it's a basis for many other applications, for  
3 transient analysis or small break LOCAs.

4 CO-CHAIRMAN KRESS: It's the same  
5 entrainment model they had for AP 600?

6 MR. DROZD: That is the same issue.

7 CO-CHAIRMAN KRESS: And we found AP 600  
8 acceptable because of what?

9 MR. DROZD: Well, Dr. Bajorek will show  
10 and prove the application for this particular model  
11 may increase -- the application of this model to AP  
12 1000 increases certain uncertainty of behavior.  
13 Therefore, we need some improvements.

14 CO-CHAIRMAN WALLIS: There's one liquid  
15 entrainment model or it applies everywhere liquid is  
16 entrained?

17 MR. DROZD: Might as well jump in.

18 (Laughter.)

19 MR. BAJOREK: This is Steve Bajorek from  
20 Research.

21 There are two models that we're going to  
22 discuss. I believe that in NOTRUMP and in other codes  
23 that Westinghouse would use there are different models  
24 and correlations in that code which would try to model  
25 both of these processes.

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1                   MEMBER SCHROCK: Isn't the question where?  
2 I mean, there are different entrainment problems in  
3 the whole system. Which one was we talking about?

4                   CO-CHAIRMAN WALLIS: Yeah, there's  
5 entrainment from the core. Let's say there's gas  
6 coming out, vapor coming out the core. Does the  
7 entrain drop?

8                   Then there's the question of whether or  
9 not drops are entrained into the ADS-4 line. From a  
10 pipe there's maybe a completely different problem.

11                  MR. BAJOREK: There's two different  
12 processes. Let me start and get to it.

13                  CO-CHAIRMAN WALLIS: Did I force you to  
14 go? Did I drive our friend away?

15                  (Laughter.)

16                  CO-CHAIRMAN WALLIS: As soon as I  
17 mentioned simple hydraulics.

18                  MEMBER POWERS: The man has the good sense  
19 to evacuate the scene.

20                  (Laughter.)

21                  MR. BAJOREK: Okay. There are two  
22 packages coming around. The first one will say 81,000  
23 top down and bottom up scaling evaluation, and there's  
24 another one coming around that we'll get to in a  
25 moment.

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1                   We'll start on the top down/bottom up  
2 scaling, though I'm going to switch the first couple  
3 of overheads, and I want to explain exactly what the  
4 role of research was in the review.

5                   We were asked to participate by reviewing  
6 the PIRTs that Westinghouse had supplied, look at the  
7 test programs that they applied to the primary system,  
8 and determine to what extent Westinghouse's contention  
9 that all of the test programs that were submitted as  
10 part of the AP 600 still were valid and could be  
11 applied to the AP 1000 conditions.

12                   So we started off by taking a look at the  
13 PIRT. We basically agreed with what we saw there at  
14 Westinghouse. They increased the rankings of some  
15 processes; others stayed the same. By and large, we  
16 did not have any major objections there.

17                   We asked them to add condensation induced  
18 water hammer and deal with that, and that was pretty  
19 much what we ended our analysis of the PIRT.

20                   And then we looked at scaling for the  
21 primary system tests. We looked at AP 1000. We  
22 revisited AP 600 because we wanted to make sure that  
23 as we did the evaluation, we were consistent with the  
24 decisions, and we were seeing the same types of  
25 problems that we saw in the AP 600.

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1           We also took a look at SPES APEX and we  
2           threw ROSA into the mix as well. To make sure that I  
3           clarify what we looked at, we stuck primarily to the  
4           test data and the test programs. We did not get  
5           intimately involved in looking at the codes or the  
6           analysis as part of our review.

7           We did not look at the containment issues.  
8           These were things that NRR decided that they would  
9           prefer to handle themselves.

10           So I'm going to look primarily at the  
11           test, the range of conditions. Is that data  
12           applicable now so that you can take a NOTRUMP, a LOFT  
13           TRAY (phonetic), and a COBRA TRAC, whatever code they  
14           might apply, and use these experimental data for  
15           validating --

16           CO-CHAIRMAN KRESS:        You're looking  
17           strictly at the integral effects test and not any of  
18           the separate effects?

19           MR. BAJOREK: We looked at the separate  
20           effects test. I'm not going to talk about those today  
21           primarily because the separate effects tests were  
22           either unchanged relative to how they would be  
23           applied, meaning ADS-1, 2, or three was not changed in  
24           AP 1000. The conclusions from those tests still  
25           apply.

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1 Westinghouse did produce some scaling  
2 rationale and some arguments for the separate effects  
3 test. They showed that they were very close or within  
4 the range for AP 1000.

5 In some cases, for example, the PRHR, if  
6 you remember, that was a test, three vertical tubes  
7 and they developed a heat transfer correlation. To  
8 comment on those tests was a bit difficult for the AP  
9 1000 because approval really hinged on their ability  
10 to model the PRHR component in the ROSA facility.

11 So we're starting to get away from the  
12 applicability of the tests, even in AP 600. So the  
13 focus of our work was on the integral tests.

14 How we're going to structure our  
15 presentation this afternoon is along the lines of the  
16 three main elements that we perform for scaling. I'm  
17 going to talk initially about top-down scaling and how  
18 we evaluated ROSA, SPES, APEX and compared that to AP  
19 600 and AP 1000.

20 Dr. de Marzo is going to talk about some  
21 supplemental calculations that he performed to take a  
22 look at the transient process in going from ADS 1, 2,  
23 3 through the IRWST.

24 What I will be doing for the top-down  
25 scaling looks at many of these processes in their

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1 steady state performance mode. What Dr. di Marzo will  
2 take a look at is the transient effects in going  
3 through some of these important changes in the  
4 transient.

5           Once we get done with that, we're going to  
6 focus on some of the bottom-up scaling issues, and  
7 that's where we're going to spend more time talking  
8 about entrainment. So what I'd really like to do is  
9 to go through the top-down type of scaling in a  
10 relatively rapid fashion so that we can get to some of  
11 the things that I think are going to be more  
12 contentious.

13           I think on the first page, I just wanted  
14 to lay out a few of the things that as we go through  
15 the top-down scaling those parametric changes in the  
16 AP 1000 that tend to affect most of or many of the  
17 scaling parameters, certainly the power.

18           Other things that come into effect are the  
19 larger volumes in the AP 1000. The steam generator is  
20 larger. We've got larger CMTs, and a larger pressure  
21 rise.

22           So we have a larger primary system, larger  
23 pressurizer.

24           One of the things that was done to the AP  
25 1000 is a change to the resistance of several lives.

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1 In particular, the ADS-4 line resistance was reduced  
2 till it was only about 28 percent of what it had been  
3 in the AP 600.

4 That's good. The idea is to try to get  
5 the system to blow down faster.

6 They also made it easier to get water into  
7 the system by reducing the line resistance from the  
8 CMT through the DVI line. The thing I want --

9 CO-CHAIRMAN KRESS: Don't they do that by  
10 changing the diameter?

11 MR. BAJOREK: The diameter, and also there  
12 is an orifice change in the CMT itself to make it  
13 easier. The thing I want to note here as we start  
14 going to the top-down scaling, well, in the tests we  
15 had whatever the AP 600 was, or as close as they could  
16 get to it in the facility, but now we've made change  
17 to make it easier to get water out than it is to get  
18 water in, and that's going to cause a little bit of a  
19 problem in one part of the -- in one period of the  
20 transient.

21 Where are we going to lead with this? I  
22 think as Andrzej was starting to mention, by and large  
23 we're going to find that the tests that were run for  
24 AP 600, SPES, ROSA, and APEX largely have many of the  
25 characteristics that show that they are acceptable for

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1 use with the AP 1000. That's good. That covers much  
2 of the transient.

3           However, we find two major exceptions, and  
4 we feel that those are the things that we're going to  
5 have to deal with in a lot more detail in Phase 3 of  
6 the review, and those are the entrainment processes as  
7 they affect the flow quality leading to the ADS. A  
8 look of these separately in terms of entrainment that  
9 occurs in the hot leg, something that might be  
10 important for one or two inch breaks where we have  
11 levels up into the hot leg, and this is our primary  
12 mode of entrainment that carries liquid into the ADS-  
13 4.

14           For the DVI line break, which leads to the  
15 minimum vessel inventory and is the most severe  
16 accident for AP 1000, the process that we're going to  
17 be most concerned with is this upper plenum pool type  
18 entrainment where we have a two phase level above the  
19 core plate. Gas is bubbling through this liquid  
20 carrying droplets along the streamlines, again, out  
21 through the ADS-4.

22           As we go along, we're going to talk about  
23 these processes. What Marino is going to take a look  
24 at is what's the effect of this flow quality as it  
25 gets to the ADS, and how does that affect the

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1 transient nature of AP 1000?

2 Top-down scaling. There were several  
3 different methodologies --

4 MEMBER SCHROCK: I guess --

5 MR. BAJOREK: Sorry?

6 MEMBER SCHROCK: I wonder if this is the  
7 right time or maybe it shouldn't be left until later,  
8 but the modeling of this in APEX experimentally showed  
9 that you get a sloshing back and forth in this line.  
10 It doesn't look like the picture that you're showing  
11 here, but is something quite different from that.

12 MR. BAJOREK: We're getting ahead a little  
13 bit.

14 MEMBER SCHROCK: Well, okay. So you don't  
15 mean literally that what you're looking at is a steady  
16 flow that has this kind of configuration?

17 MR. BAJOREK: No, no. We'll have some  
18 water in the hot leg. It will have a different  
19 regime, and I'd like to talk about that when we get to  
20 it.

21 MEMBER SCHROCK: A pulsating discharge.

22 MR. BAJOREK: Yes.

23 MEMBER SCHROCK: Okay.

24 MR. BAJOREK: There were several  
25 methodologies that were proposed for doing top down

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1 scaling for the AP 600. Westinghouse proposed, too,  
2 that they used for the AP 600 one that I would prefer  
3 as a multi-loop top down scaling, another a single  
4 loop.

5 In the W cap that was submitted in support  
6 of AP 1000, they submitted another scaling methodology  
7 different from the first two. So I would characterize  
8 that as the third methodology.

9 INEL produced a scaling methodology for  
10 the NRC, and in addition, there was work done by  
11 Wolfgang Wolfe to come up with another scaling  
12 methodology. Each one has different ways of looking  
13 at the system. Each one has their good points and  
14 their bad points.

15 For doing an independent scaling analysis  
16 for this, we decided we wanted to stay independent.  
17 So we stayed away from the Westinghouse methodologies.  
18 We looked at INEL and the work that was done by  
19 Brookhaven and decided that it was clearer but faster  
20 to use the INEL scaling methodology and went down that  
21 path.

22 That methodology takes AP 600 or the AP  
23 1000 transient, divides it up into five major periods,  
24 eight subperiods. We divided the AP 1000 transient up  
25 in the same type of detail and looked at two different

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1 scenarios, double ended guillotine break of the DVI  
2 line and also the one inch break, and developed the  
3 scaling parameters for each one of those scenarios.

4 CO-CHAIRMAN KRESS: Now, with the top  
5 down, you mean you write the equations for energy  
6 conservation and momentum and continuity, and you non-  
7 dimensionalize those, and you end up with your pi  
8 parameters.

9 MR. BAJOREK: That's exactly it.

10 CO-CHAIRMAN KRESS: Based on reformulating  
11 for some figure of merit of interest, like pressure or  
12 level or something. That's what's meant by top down.

13 MR. BAJOREK: Yes. Yes, sir.

14 The INEL looks at primarily the energy  
15 equation and the mass conservation equation to develop  
16 a pressure rate of change in a tank level equation, as  
17 they call it, basically a mass balance in the vessel,  
18 which is one of the things I liked about that  
19 methodology, because it focuses on mass in the vessel  
20 through much of the transient.

21 CO-CHAIRMAN KRESS: I don't like reopening  
22 old sores and things, but I don't think I ever got a  
23 good response to my question for AP 600, and I'd like  
24 to raise it again.

25 Just why is it you feel that that ratio of

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1 pi groups at range .52 is an acceptable range? What  
2 is it about that range that tells you it's acceptable?  
3 Is that a judgment or do you have some technical basis  
4 that says that if your pi groups are in that range,  
5 you don't have significant distortion of the equation  
6 so that you're outside of some limits?

7 I don't think I've ever received a good  
8 response to that question yet.

9 MR. BAJOREK: In starting this, I looked  
10 for that answer in the previous documentation, and I  
11 was unable to find that. My use of it here is  
12 primarily historical.

13 CO-CHAIRMAN KRESS: Yeah, that's the way  
14 it was used before.

15 MR. BAJOREK: Now, what I've tried to do  
16 here is at least make it scrutable and say, well, this  
17 is the criteria that as I step through the scaling,  
18 I'm going to look for numbers to fall within this  
19 range, say that they're okay. I keep an eye on things  
20 being close.

21 CO-CHAIRMAN KRESS: You've got to have  
22 some criteria for these pi groups to say whether  
23 they're acceptable or not. You know, why not .5 to  
24 1.5 or .75?

25 You know, the question is why this choice.

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1 MR. BAJOREK: From the top down scaling I  
2 really don't have a good answer for that, although I  
3 want to add that when we start to look at the bottom-  
4 up scaling, my opinion is that this is insufficient.  
5 You need to not only look at this relative change in  
6 some number, but also if you're headed to some type of  
7 a cliff, if you're simply looking at a froude number,  
8 well, this will give you a nice, warm feel that it's  
9 in about the same type of area of a flow regime map,  
10 but doesn't tell you if you just inched over a  
11 boundary or not.

12 CO-CHAIRMAN KRESS: Right, right.

13 MR. BAJOREK: So in the bottom-up scaling,  
14 I try to scrutinize this a little bit more that --

15 CO-CHAIRMAN WALLIS: That's because of  
16 CCFL. I mean, if the criterion is one and you happen  
17 to be two, that makes a tremendous difference.

18 CO-CHAIRMAN KRESS: Yeah, yeah.

19 MR. BAJOREK: Right.

20 CO-CHAIRMAN KRESS: That leads me to my  
21 other question about this, and maybe you can file it  
22 away, Professor di Marzo, and that is the pi groups,  
23 in my mind, are kind of coefficients on partial  
24 derivatives of these overriding equations, and there's  
25 no reason in my mind that each partial derivative

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1 should have the same influence as the other partial  
2 derivatives.

3 So why should I have one range that I say  
4 is acceptable? It seems like that range ought to be  
5 specific depending on the pi group I have. And also  
6 carrying on there, it looks like one could make  
7 sensitivity studies with pi groups, and you know, if  
8 you had the right way to do it, and you could find  
9 out. You could actually pinpoint some range that  
10 would give you the same change, percentage change in  
11 the endpoint thing.

12 You know, I don't see any of that in this  
13 at all, and that's what's bothering me about it.

14 MR. BAJOREK: Okay.

15 MEMBER SCHROCK: I had one other comment.  
16 That is that I think the INEL and Brookhaven scaling  
17 began with the HEM equations.

18 MR. BAJOREK: They did, yes.

19 MEMBER SCHROCK: And this leaves open the  
20 question of the adequacy of scaling decisions where  
21 non-equilibrium effects are of significance. I never  
22 heard an answer during the AP 600 discussions that  
23 resolved that question, and I don't know if we're  
24 headed towards one now or not, but I guess I might  
25 keep asking it.

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1 MR. BAJOREK: Okay. I won't have an  
2 answer for that today.

3 MEMBER SCHROCK: Okay.

4 MR. BAJOREK: But just to point out how  
5 we've addressed top down scaling in this review, very  
6 similar to what we saw for the AP 600. We stayed  
7 towards this acceptance criteria between a .5 and a  
8 two.

9 When things fell out of that range, we  
10 asked ourselves is the distortion conservative or non-  
11 conservative. If it was a conservative distortion in  
12 the test that was deemed acceptable,, if it was a  
13 distortion in one of the parameters that on an order  
14 of magnitude basis was a no never mind quantity --

15 CO-CHAIRMAN KRESS: Okay. So you did take  
16 that into consideration in your judgment.

17 CO-CHAIRMAN WALLIS: Let's look at a  
18 specific phenomenon. The fangs in the CMT or the  
19 condensation sucked the water back into the CMT. This  
20 was later concluded not to apply to full scale plant  
21 because the hydrostatic heads were so much bigger than  
22 something.

23 Did that get revealed by these pi groups  
24 or by someone's wisdom from something else or what?  
25 I mean, shouldn't it have shown up in the pi group

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1 somehow or would it be a bottom-up scaling?

2 MR. BAJOREK: I think a bottom-up scaling  
3 is a place where that would have to be addressed. The  
4 top-down scaling tends to homogenize the entire system  
5 and wash out sharp discontinuities.

6 CO-CHAIRMAN WALLIS: Well, this was a  
7 balance between them, some parts were dropped due to  
8 condensation and some pressure difference due to  
9 hydrostatics. It's a balance between the things. You  
10 would think it would show up as a pi group.

11 MR. DI MARZO: This is Marino de Marzo.  
12 Specifically to that phenomena there, it  
13 wouldn't be captured in top down because you don't  
14 have the description to that detail of components  
15 level that would -- so you have a PBL line and a CMD.

16 CO-CHAIRMAN WALLIS: No, if you look to  
17 the equations, you find you have the hydrostatic term  
18 and the pressure term that you --

19 MR. DI MARZO: Not at this level of  
20 detail.

21 CO-CHAIRMAN WALLIS: Not at this level?  
22 Okay.

23 MR. DI MARZO: So it is left to be  
24 addressed at bottom up.

25 MR. BAJOREK: This example of the top-down

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1 scaling, I just want to show you the way that we  
2 arrived at some of our results. The example is what  
3 INEL referred to as the intermediate Sub-phase 3.  
4 That refers to this period. You don't have this  
5 figure in your package. I'm sorry.

6 This is when the ADS 1, 2, 3 system has  
7 been triggered. The water in the CMT is below 80  
8 percent. The CMT is injected for a period.  
9 Accumulators are starting to come on. The system is  
10 depressurizing. There's voids in the upper head,  
11 upper plenum, hot legs. As a result, the steam  
12 generators have become ineffective.

13 The PRHR is operable, but is under a  
14 degraded condition at this point. Lots of things  
15 going on during this period, which makes it  
16 interesting from a scaling point of view.

17 CO-CHAIRMAN KRESS: When you talk about  
18 pressure, pressure varies around the system. Is that  
19 pressure in the upper head or where is that pressure?

20 MR. BAJOREK: Generally --

21 CO-CHAIRMAN KRESS: Oh, it says upper head  
22 pressure at the top.

23 CO-CHAIRMAN WALLIS: Yeah, it does.

24 CO-CHAIRMAN KRESS: Okay, okay.

25 MR. BAJOREK: It was either that or --

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1 well, the pressurizer wouldn't be good for this.

2 CO-CHAIRMAN WALLIS: Well, until you get  
3 on later on, it doesn't matter too much. Five mega  
4 Pascals is quite a big pressure compared with the  
5 hydrostatic.

6 CO-CHAIRMAN KRESS: Yeah, did you consider  
7 pressure a very definitive figure of merit to worry  
8 about?

9 Rather than say water level in the core,  
10 of course, is very important. Pressure may be, but  
11 I'm not sure I can see it.

12 MR. BAJOREK: Well, it makes a difference.  
13 It's used very frequently in defining the reference  
14 conditions in each one of these subphases.

15 CO-CHAIRMAN KRESS: Okay.

16 MR. BAJOREK: Okay. For the intermediate  
17 subphase, INEL defined roughly a dozen dimensionless  
18 groups to characterize the depressurization flows into  
19 and out of the system.

20 To apply the methodology, we got geometric  
21 information for the AP 1000, as well as for the test  
22 facilities and for the AP 600. In this case, APEX  
23 doesn't get thrown into the mix because it wouldn't be  
24 applicable for early parts of this period.

25 It took into account the larger area side

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1 in the ADS system. It gives us a larger flow rate for  
2 the AP 1000, lower resistance in the CMT, which  
3 increases the CMT flow rate; larger volumes in the CMT  
4 and the primary system

5 Recalculated all of the various pi groups;  
6 looked at the ratios of those pi groups for AP 600 to  
7 the AP 1000, ROSA and SPES, comparing those  
8 dimensionless groups. In this case ROSA comes through  
9 clean.

10 CO-CHAIRMAN KRESS: If your criteria of .5  
11 to two --

12 MR. BAJOREK: Point, five to two. If you  
13 decrease that to about 1.5, it still wouldn't make it.  
14 So it --

15 CO-CHAIRMAN KRESS: Right. And the closer  
16 those are to one, the more you feel --

17 MR. BAJOREK: The closer they are to one  
18 they are the better. As they start to get to 1.99 or  
19 two or .5, it's at least an indication that it's  
20 starting to get out of that acceptance criteria that's  
21 been used before.

22 Now, in the case of SPES, there were two  
23 groups that did fall outside of that range for the AP  
24 1000.

25 CO-CHAIRMAN KRESS: So when you

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1 reformulate your equations, undimensionalized, and you  
2 get these pi groups from the top down, you need to  
3 focus on the dependent variable that you're going to  
4 come out with.

5 Now, these pi groups are for pressure?

6 MR. BAJOREK: These two are for pressure,  
7 those two that like I say I have indicated. The si  
8 are for pressure. The five or six down below are from  
9 the mass equation.

10 CO-CHAIRMAN KRESS: Okay. So you've got  
11 different ones in there.

12 MR. BAJOREK: Yes. They're both in there,  
13 but for SPES we find two that are potentially  
14 distorted. We looked at both of those. In both cases  
15 the distortion is a conservative one, meaning that  
16 performance in the plant should be better than what it  
17 was in the facility, and they're both in groups which  
18 are of relatively minor importance in the comparison  
19 of the pi groups that had the maximum, the largest  
20 values.

21 CO-CHAIRMAN KRESS: And how did you  
22 determine the importance? How did you determine the  
23 importance?

24 MR. BAJOREK: Oh, that's done by an order  
25 of magnitude.

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