

**NUCLEAR REGULATORY COMMISSION**

**ORIGINAL**

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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 WEDNESDAY

10 FEBRUARY 13, 2002

11 + + + + +

12 ROCKVILLE, MARYLAND

13 + + + + +

14 The Subcommittee met at the Nuclear Regulatory  
15 Commission, Two White Flint North, T2B3, 11565  
16 Rockville Pike, at 8:3 a.m., Graham B. Wallis,  
17 Chairman, presiding.

18 COMMITTEE MEMBERS:

19 GRAHAM B. WALLIS, Chairman

20 THOMAS S. KRESS, Member

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     ALSO PRESENT:

5     PAUL DAIBER

6     RICK LANE

7     MILTON HUFF

8     RICH SWANSON

9     DENNIS BOYD

10    MEHRAN GOLBABAI

11    ROGER WILSON

12    DOYLE ADAMS

13    DALE JAMES

14    DAN SPOND

15    KARL HASLINGER

16    JAMIE GOBELL

17    JOE CLEARY

18    DAN FOUTS

19    TAD MARSH

20    CHU LIANG

21    TOM ALEXION

22    DAVE CULLISON

23    RICH O'DELL

24    KAMAL MANOLY

25    BARRY ELLIOT

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1        ALSO PRESENT: (CONT.)  
2        MICHELLE HART  
3        MARK CARUSSO  
4        DANNY HARRISON  
5        MARK RUBIN  
6        STU RICHARDS  
7        KEN KARWOSKY  
8        TONY ATTARD  
9        FRANK ASTELUWICZ  
10       SHI LANG WU  
11       CHRIS BARCHEVSKY  
12       ALAN HIZER  
13       JOE WILLIAMS  
14       DALE SPENCER  
15       BOB KERESTES  
16       JERRY BLANTNER  
17       HAROLD CROCKET  
18       SAM RANGANATH  
19       KEITH MOSER  
20       FRAN BOLGER  
21       KENT SCOTT  
22       TIM BYAM  
23       JASON POST  
24       ERIC SCHWEITZER  
25       DAN PAPPONE

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I-N-D-E-X

Opening Remarks, G. Wallis, Chairman . . . . . 6

Arkansas Nuclear One, Unit 2 Power Uprate

Entergy Presentation

    Introduction, Rick Lane . . . . . 8

    Plant Changes to Accomodate Power Uprate

        Milton Huff . . . . . 19

        Bryan Daiber . . . . . 36

    Compliance with Regulatory Requirements

        Doyle Adams . . . . . 60

    Review Issues

        Rich Swanson . . . . . 94

        Dale James . . . . . 98

        Jamie GoBell . . . . . 116

    ECCS Analyses

        Bryan Daiber . . . . . 122

    PRA Analyses . . . . . 156

    Concluding Remarks, Rick Lane . . . . . 182

NRR Presentation

    Introduction, T. Alexion . . . . . 189

    Reactor Systems, C-Y. Liang . . . . . 194

    Plant Systems, D. Cullison . . . . . 210

    Mech. & Civil Engineering, K. Manoly . . . 230

    Materials & Chemical Engineering,

    B. Elliot . . . . . 239

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25

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NRR Presentation (cont.)

Resolution of Open Issues, M. Hart . . . 257

PRA Analyses, D. Harrison . . . . . 267

Concluding Remarks, T. Alexion . . . . . 276

Clinton Power Station, Unit 1 Extended Power Uprate

AmerGen Presentations

Introduction, Joe Williams . . . . . 288

Plant Changes, Dale Spencer . . . . . 289

Technical Subjects, Bob Keresetes . . . . . 300

Core and Fuel, Fran Bolger . . . . . 321

**Thermal-Hydraulic Stability**

**CLOSED SESSION . . . . . 327**

Core Flow, Kent Scott . . . . . 367

Concluding Remarks . . . . . 369

Adjourn . . . . . 375

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

(8:33 a.m.)

CHAIRMAN WALLIS: The meeting will now come to order. This is a meeting of the ACRS Combined Subcommittee on Thermal Hydraulic Phenomena and Future Plant Designs. I'm Graham Wallis, the Chairman of the Subcommittee on Thermal Hydraulic Phenomena, and Tom Kress the Chairman of the Future Plant Design Subcommittee will chair the meeting session beginning at 1:00 on February 14, 2002.

Other ACRS members in attendance are Dana Powers, Bill Shack and Jack Sieber. The ACRS consultant in attendance is Virgil Shrock. The combined subcommittee will first begin review of the license amendment requests of Entergy Operations, Incorporated for a core power uprate fo the Arkansas Nuclear One, Unit 2 Plant, and secondly we will begin review of the license amendment request of the Amer-Gen Energy Company for a core power uprate for the Clinton Nuclear Power Plant, Unit 1. And thirdly, we will continue review of the Phase 2 pre-application review of the Westinghouse Electric Company's AP1000 plant design.

The subcommittees will gather information, analyze relevant issues and facts and formulate

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1 proposed positions and actions as appropriate for the  
2 liberation by the full committee. Mr. Paul Boehnert  
3 is the cognizant ACRS staff engineer for this meeting.

4 The rules for participation in today's  
5 meeting have been announced as part of the notice of  
6 this meeting, previously published in the Federal  
7 Register on January 29, 2002. Portions of the meeting  
8 may be closed to the public, as necessary, to discuss  
9 information considered proprietary to General Electric  
10 Nuclear Energy and the Westinghouse Electric Company.

11 A transcript of this meeting is being kept  
12 and the open portions of this transcript will be made  
13 available as stated in the Federal Register notice.  
14 It is requested the speakers first identify themselves  
15 and speak with specific clarity and volume so that  
16 they can be readily heard. We have received no  
17 written comments, nor request for time to make oral  
18 statements from members of the public.

19 Now this should be a very interesting  
20 three days. We have two different power uprates for  
21 different kinds of reactors, and then we have a review  
22 of the AP1000, which some might claim is in some way  
23 resembling a 70 percent uprate from the AP600. So we  
24 have three different power uprates to discuss, and it  
25 should be a very interesting time.

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1 I'd like to begin this meeting, and I call  
2 upon Rick Lane?

3 MR. LANE: Yes.

4 CHAIRMAN WALLIS: Of Entergy Operations to  
5 begin.

6 MR. LANE: Good morning. My name is Rick  
7 Lane. I'm the Director of Engineering Projects for  
8 Entergy, and we appreciate the opportunity today to  
9 come and visit with you about our plant power uprate  
10 of Arkansas Nuclear One, Unit 2.

11 First of all, I'd like to introduce our  
12 presenters. First we have Milton Huff. Milt  
13 recognize yourself. He's with our designers group.  
14 Brian Daiber, safety and analysis, Rich Swanson, with  
15 operations, Dale James over here with the engineering  
16 programs components, and Jamie GoBell, design  
17 engineering also. We also have, as noted here, some  
18 other support staff with us today from Entergy and  
19 with Westinghouse.

20 Next, I'd like to talk about our primary  
21 goals in performing this uprate, and first and  
22 foremost was safety. We wanted to make sure we safely  
23 uprate the unit, doing the appropriate analysis, and  
24 modifying the plant as required to achieve the 7.5  
25 percent uprate. We want to make sure we maintain

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1 adequate operating and design margins as we did that.  
2 We want to use accepted and proven methodologies to  
3 achieve that.

4 And also, one other strategy we have, a  
5 major goal was to have one cycle of operation on any  
6 major modifications that were going to be necessary to  
7 accommodate this, and we'll talk about that further.  
8 We've already made some substantial modifications in  
9 our previous outages to accommodate this and to allow  
10 us to build with an uprate at the higher percentage.

11 As far as the project team, our Entergy  
12 staff really was the AE on this effort. We performed  
13 the necessary system evaluations and modifications to  
14 accommodate the uprate. We did utilize some  
15 contractor staff to augment our people, but we were  
16 always in the lead and had the oversight of that  
17 activity as the AE for the effort.

18 In addition to that, we had Westinghouse  
19 involved with us, formerly Combustion Engineering, who  
20 was the original SSS vendor for the ANO Unit 2 to  
21 perform the associated SSS related analysis for our  
22 safe analysis, structure analysis and so forth, to  
23 support us in this effort. And, as indicated here,  
24 it's a very substantial effort, a lot of man hours  
25 over a few years here have been spent in planning and

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1 to help us to be ready to execute this effort.

2 From the overview spent at standpoint  
3 again, as I mentioned earlier, it's a 7.5 percent  
4 uprate. We have also, and as is true in our 14  
5 outages mentioned here, have made some substantial  
6 changes, one of those of which was replacing the steam  
7 generators, and that was key in our overall effort as  
8 far as determining what kind of a size power uprate.  
9 We factored that into the design and the  
10 implementation of that replacement effort that was  
11 achieved at the last refueling outage for ANO Unit 2.

12 We also, as part of that, re-rated the  
13 containment for higher design pressure, and we'll talk  
14 more about that today as far as exactly what was  
15 involved there and what pressures and so forth we  
16 uprated to. And in the overall implementation  
17 schudule -

18 CHAIRMAN WALLIS: Excuse me.

19 MR. LANE: I'm sorry.

20 CHAIRMAN WALLIS: When you replaced the  
21 steam generators, you still have the same amount of  
22 surface, or did you change?

23 MR. LANE: No.

24 CHAIRMAN WALLIS: You changed the surface?

25 MR. LANE: We changed the surface area and

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1 we'll talk -

2 CHAIRMAN WALLIS: Are you close to the  
3 maximum surface you can get in there now?

4 MR. LANE: That was one of the limitations.  
5 We'll talk about that. We have increased the diameter  
6 of the generator, increased the surface area, and  
7 we'll talk more about that. So we pretty well maxed  
8 out as far as what we felt we could reasonable  
9 accommodate for the configuration within the  
10 containment building.

11 And again, our overall implementation  
12 schedule is for our 2R15 outage which is coming up  
13 this spring, is to come up out of that outage and go  
14 through a rigorous test effort and go into an uprating  
15 condition. That's our current schedule.

16 As far as the reactor design rating, the  
17 original core design rating is 2815 Mwt. The Post  
18 2R15 uprate again is 7.5 percent is at 3026. This is  
19 our first request for a design re-rate for this unit.

20 MEMBER POWERS: Does that imply that we can  
21 expect more requests in the future?

22 MR. LANE: One of the things that we have  
23 not, that we are going to be looking at is Appendix K  
24 type of uprate potentially to take advantage of the  
25 margins there and we will look at that and post the

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1 rerate here to see if the appropriate margins that are  
2 there possibly for an Appendix K uprate.

3 MEMBER POWERS: Are you speaking of an  
4 instrumentation?

5 MR. LANE: Instrumentation. As far as  
6 uncertainty, the two percent -

7 MEMBER POWERS: Relatively.

8 MR. LANE: We're talking about maybe a  
9 percent and a half, something like that would be a  
10 potential uprate that might, we might look at that.

11 MEMBER POWERS: You are not discussing  
12 going to a more realistic analysis for Appendix K  
13 then?

14 MR. LANE: No. We're talking about just  
15 taking the instrument of uncertainty that's available  
16 there is all we'd be talking about.

17 Next slide please. Our submittal that we  
18 provided here we feel was in accordance with the  
19 guidelines out there available, the Westinghouse WCAP  
20 topical, the guidance in the GE topical, also the SECY  
21 document 97-042, and also we utilized the Farley  
22 uprate submittal, as again guidance for us to make  
23 sure we were being consistent with what the  
24 expectations were, as far as our submittal.

25 CHAIRMAN WALLIS: That Westinghouse topical

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1 is quite old, isn't it?

2 MR. DAIBER: 1983.

3 MR. LANE: Yes, 1983. We tried to use the  
4 companion data out there to help us make sure we were  
5 providing the required information to address the  
6 appropriate requirements.

7 MEMBER POWERS: I guess I'm a little  
8 perplexed on how a Westinghouse topical is helpful for  
9 a combustion engineering plant.

10 MR. LANE: One aspect of that is to  
11 recognize that Westinghouse was the provider of the  
12 replacement steam generators, and that was part of our  
13 effort. But as far as the topical applicability -

14 MR. BOYD: This is Dennis Boyd. I work in  
15 the licensing department. Back when we were  
16 formulating our plans for uprating in power, we tried  
17 to find, assimilate all the guidance that was out  
18 there, in order to make sure we got the right kind of  
19 information to the staff for review.

20 What we found was there wasn't a lot out  
21 there for PWRs, so we use this 1983 document, which  
22 like you say, it's a Westinghouse document, but it is  
23 for PWR. We also gathered as much as we could out of  
24 the GE topical, and then we looked at the 1997 SECY  
25 document and those three things, other than the

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1 uprates that were already out there, was all that we  
2 could put our hands on at the time.

3 MEMBER POWERS: So what you're going to  
4 tell me is that you're going to take this plant up to,  
5 what is it, 3065 Mwt, and there is absolutely no date,  
6 not one data point in the world on this type of plant  
7 operating at that level, right?

8 MR. BOYD: Bryan, do you want to.

9 MR. DAIBER: This is Bryan Daiber from  
10 Entergy. The ANO 2 plant is a CPC plant. It's a CE  
11 designed plant and it's similar, although a smaller  
12 version of the System 80 plants, the Songs (phonetic)  
13 Plant, the Waterford Plant, and the Paliverde Plants,  
14 all of which have higher rating than what we're  
15 planning to go to with the ANO 2 unit.

16 So there are comparable or similar CE  
17 designed plants out there already at higher power  
18 ratings and they are higher rated than where the ANO  
19 2 is going.

20 MEMBER POWERS: Your statement is similar  
21 to hear. It is a general one. I mean, it's not  
22 specific to the things that I would use, like  
23 Wendell's numbers and whatnot are exactly the same in  
24 the two.

25 MR. DAIBER: With respect to the rapid

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1 protection system design considerations, the fuel  
2 design considerations, the geometry, the layout,  
3 they're all CE designs using a comparable rapid  
4 protection system and design considerations.

5 CHAIRMAN WALLIS: Now you said this is all  
6 you could lay your hands on. You didn't get anything  
7 from the staff by way of guidance?

8 MR. BOYD: The staff requested that we use  
9 the Farley submittal.

10 CHAIRMAN WALLIS: That's for the use of the  
11 - because they don't have any review plan.

12 MR. BOYD: Not to my knowledge, no.

13 CHAIRMAN WALLIS: So they requested that  
14 you use Farley?

15 MR. BOYD: Yes, sir.

16 CHAIRMAN WALLIS: Okay.

17 MEMBER SIEBER: Farley was based on what we  
18 get.

19 MR. BOYD: That's correct.

20 MR. LANE: Okay. As a final point I'd like  
21 to make as far as we feel we have demonstrated  
22 compliance with the applicable regulations and safety  
23 limits. In doing the analysis for this effort, we  
24 looked at reactor operating conditions, accident  
25 conditions, transients, radiological consequences,

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1 probabilistic risk, and the programmatic evaluations.  
2 We'll talk more about that in the presentation today,  
3 to address that in more detail for you.

4 So that pretty much concluded my  
5 introduction, and what I'd like to do now, unless  
6 there's other questions, is to really turn it over to  
7 our next presenter.

8 MEMBER SCHROCK: I had -

9 MR. LANE: Yes, sir.

10 MEMBER SCHROCK: - a point that I'd like  
11 to raise and that is the kind of agreement that you  
12 had with the staff about proceeding as you have with  
13 substantial capital investment up front, to be  
14 followed by a review of the methodology to justify the  
15 uprate. It seems to me that that is an awkward  
16 position to be in, an awkward position on both sides.  
17 Was that discussed with the staff prior to installing  
18 these steam generators?

19 MR. LANE: The major capital investment,  
20 like the steam generators, were driven more from steam  
21 generator tube integrity and a new to do that  
22 particular change irrespective of whether we were  
23 going to uprate or not. It's just that when we did  
24 uprate, when we did replace the steam generators, we  
25 make sure we accommodate, as we have in other changes.

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1           MEMBER SCHROCK: In the documentation, you  
2 determined the level of 7.5 based on an economic  
3 consideration, that you would be able to recover the  
4 capital cost if you could get to 7.5, 6.5 was  
5 problematic. Did I have that right?

6           MR. LANE: The increase of 6.5 to 7.5 was  
7 when we really got into sizing the steam generators  
8 and looked at what was available as far as the -  
9 again, we talked about earlier about surface area and  
10 size and then we went from the 6.5 to the 7.5. But  
11 it's a combination on any of these uprates, a  
12 combination to look at the technical aspect and the  
13 economics aspect of what's the various pinch points  
14 and plateaus that make good sense as far as going to  
15 it.

16           MEMBER SCHROCK: Thank you.

17           CHAIRMAN WALLIS: Yes, sir. Aren't you  
18 going to introduce yourself?

19           MR. WILSON: Yes. I'm Roger Wilson. I'm  
20 with Entergy. We made some attempts to talk to the  
21 staff as early as possible about the potential for the  
22 uprate, but really we proceeded at risk with the  
23 increase in sizes. There was no dialog with the staff  
24 of agreeing that they would approve the 6.5 or 7.5  
25 uprate. We proceeded at risk. When we were changing

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1 the steam generator to put the surface area in there,  
2 which is about 24 percent more surface area in there,  
3 but we did that at risk.

4 MR. LANE: What I'd like to do now is turn  
5 it over to -

6 CHAIRMAN WALLIS: While we're on the  
7 overview.

8 MR. LANE: Yes, sir.

9 CHAIRMAN WALLIS: About what's changed, I  
10 noticed an increase in the containment building design  
11 pressure?

12 MR. LANE: Yes.

13 CHAIRMAN WALLIS: It's the same building  
14 though, isn't it?

15 MR. LANE: Yes, it was.

16 CHAIRMAN WALLIS: So what's happened?

17 MR. LANE: What we did, as far as, and  
18 Bryan will talk more about that, when we get into  
19 looking with the larger steam generator and then look  
20 at the boil down and so forth you get, we got an  
21 increase in building pressure, and so it's just a re-  
22 rate to the existing structure, and we went through  
23 the appropriate structural integrity testing and so  
24 forth to basically, you know, demonstrate that along  
25 with the analysis effort. And it's really about five

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1 pounds, from 54 to 59 pound increase that was involved  
2 as far as the re-rate of the existing structure.

3 CHAIRMAN WALLIS: So we'll hear about that  
4 later?

5 MR. LANE: You will hear about that later,  
6 yes, yes.

7 MEMBER POWERS: As we go through these  
8 presentations, will you be discussing how you know  
9 that you maintained adequate operating and design  
10 margins?

11 MR. LANE: Yes, we will.

12 MEMBER POWERS: I'd be intrigued to see  
13 this with the relative absence of guidance on how you  
14 know that they're adequate.

15 MR. LANE: Okay, we'll try to be sensitive  
16 to that and address those points as we get to those  
17 sections where we talk about the margins and so forth.  
18 The next topic on the agenda is talking about the  
19 plant changes to accommodate the power uprate, and I'm  
20 going to turn it over to Milton Huff to have that  
21 discussion with you.

22 MR. HUFF: My name is Milton Huff. I'm  
23 with Entergy. I was the engineering supervisor on the  
24 power uprate project. The power uprate project has  
25 been a plan in process for about the last six years or

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1 so. And before we even started this formal process,  
2 our site management, any modification coming into the  
3 site would have power uprate considerations.

4 All modification to accommodate the 7.5  
5 percent uprate condition, that was part of that  
6 strategy, modifications implement over the last four  
7 cycles. The point there I want to stress is that  
8 we've have opportunity to make the operations staff  
9 familiar with the large components that we have  
10 installed, evaluate the synergistic effects. So we've  
11 kind of with this planning effort and the way this  
12 project's been laid out has given us opportunity to  
13 feel comfortable with the changes in the power plant.

14 The majority of the major modifications  
15 are installed. Go to the next slide and we'll go  
16 through these. As Rick mentioned earlier, at the  
17 heart of this uprate is the steam generator  
18 replacement and that surface area increased from  
19 86,000 square feet to approximately 109 square feet.

20 The issue that drove us to the generators,  
21 as Rick mentioned, was the tube degradation and we  
22 took the opportunity to improve our power plant  
23 performance with these generators.

24 MEMBER SHACK: Now how did you get that  
25 increase in area. You changed the pitch of the tubes?

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1 MR. HUFF: The actual, yes the vessel size  
2 is approximately four inches bigger diameter. It's a  
3 smaller tube. It's Alloy 690. Dale James will go into  
4 tube integrity issues, but that's basically the -

5 MEMBER SHACK: There's a smaller tube?

6 MR. HUFF: Yes, smaller diameter.

7 MEMBER SCHROCK: What about the other plant  
8 components, such as heat exchangers and smaller pumps?

9 MR. HUFF: I've got these on these next  
10 slides.

11 MEMBER SCHROCK: Oh, okay.

12 CHAIRMAN WALLIS: What were your units?  
13 You said 109?

14 MR. HUFF: Yes, sir. The original was  
15 86,000 square feet. We went to approximately 109,000  
16 square feet.

17 CHAIRMAN WALLIS: I wasn't sure I heard the  
18 thousand. I was puzzled.

19 MEMBER SIEBER: Could you give us a little  
20 bit of an idea how the primary system DP across a  
21 steam generator changed in area?

22 MR. HUFF: I think Bryan -

23 MR. DAIBER: This is Bryan Daiber from  
24 Entergy again. From the pressure drop across the  
25 steam generators, we went with quite a few more tubes,

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1 and the smaller diameter. However, the tubes, the  
2 drawing process has improved so that the slickness,  
3 the roughness has gone down, and what we effectively  
4 designed for in the overall steam generator design  
5 through the tube sheet, was a comparable delta P as  
6 the original steam generators before 220.

7 MEMBER SIEBER: So RCS was the same as it  
8 used to be?

9 MR. DAIBER: We restored RCS flow back to  
10 essentially where it was, prior to a significant  
11 level. Yes.

12 MR. HUFF: These next two modifications,  
13 the condenser and the separator, even if we weren't  
14 doing uprate would have required replacement, because  
15 of the copper alloys present in the original  
16 component. The condenser, we uprated the size of it  
17 also to accommodate the higher steam flows, went with  
18 the Titanium because we are on the Arkansas River,  
19 which is border to brackish, so that was the reason  
20 for the Titanium tube support plate. Spacing is such  
21 that we won't get excessive vibrations, so we designed  
22 these new modular condensers for this uprate steam  
23 flow.

24 MR. SEIBER: So the spacing of the tube  
25 support plates is closer?

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1 MR. HUFF: Yes, that's correct.

2 MEMBER SIEBER: What is the distance from  
3 the tube sheet to the first support plate?

4 MR. HUFF: It's approximately two feet.  
5 Well, it's in the two feet range. It reduced about a  
6 third. I don't have the exact number, but we can get  
7 that.

8 MEMBER SIEBER: And you've operated with  
9 that condenser?

10 MR. HUFF: Yes, two cycles.

11 MEMBER SIEBER: Is its performance equal to  
12 the original? Can you maintain the same vacuum with  
13 the same cooling decline?

14 MR. HUFF: Yes, sir. Actually it's more  
15 efficient.

16 MEMBER SIEBER: More efficient.

17 MR. HUFF: More surface area, and obviously  
18 because of the change, we had copper nickel, there was  
19 an offset in surface area just to go to the same  
20 thermal performance, and then for the anticipated  
21 power uprate, we expanded that surface area even  
22 larger.

23 MEMBER SIEBER: How do you know that? I  
24 mean, it hasn't been operated at a higher level.

25 MR. HUFF: It's standard heat exchanger, we

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1 use the HEI standards in the sizing of that head  
2 exchanger.

3 MR. WILSON: This is Roger Wilson again  
4 from Entergy. The condenser, we went up about 13  
5 percent more in surface area, but with the slight  
6 decrease in conductivity through the Titanium tubes,  
7 effective surface area is around a 9 percent increase,  
8 adjusted for the Titanium tubes. We also put in an  
9 AmerTap system cleaning system, and during Cycle 14,  
10 when we were at degraded conditions, our secondary  
11 flow rates were up.

12 In order to correct for the lower steam  
13 pressures, we raised our flow rates. So our flow rates  
14 were up at Cycle 14, the last cycle at the steam  
15 generators, comparable to where we're going to be with  
16 power uprate. So we have operating experience with  
17 that, plus we made improvements on our condenser  
18 vacuum system, air removal system. So we've had very  
19 good experience with these new condensers.

20 MEMBER SIEBER: Generally when you go to  
21 Titanium tubes, one of the issues is tube vibration.  
22 I presume, have you measured that in any way, and did  
23 the decrease in spacing of the support plates correct  
24 it?

25 MR. HUFF: Well, the tube support spacing,

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1 there are several things we did to it to address that.  
2 The steam lanes where we had the highest, you know the  
3 introduction into the bundle, we went with a higher  
4 gauge wall on top of the spacing, and there were also  
5 along the top, the top row is solid bar for  
6 impingement, because that was one of the big design  
7 concerns for Titanium was moisture impingement. So we  
8 put a lot of extra design features in there to protect  
9 those bundles.

10 MEMBER SIEBER: You didn't have to do  
11 anything like staking or?

12 MR. HUFF: No, that's correct. Had we had  
13 a stainless condenser, we would have had - if you  
14 can't change your support plate spacing, then you have  
15 to put the stakes in or something like that to stiffen  
16 it.

17 MEMBER SIEBER: That's sort of the fallback  
18 position if you start to get tube leaks caused by  
19 sweating.

20 MR. BOEHNERT: Closer to the mike, Jack.  
21 She's having trouble hearing.

22 MEMBER SIEBER: Okay, so that's the  
23 fallback position that you would have to take.

24 MR. HUFF: Right.

25 MEMBER SIEBER: Should you begin to get

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1 leaks.

2 MR. HUFF: That's the big advantage I guess  
3 we have over this period of time and the age of the  
4 plant and the opportunity to design these components  
5 to accommodate these increased mass flow conditions.  
6 The condenser is designed for the higher flow rates.  
7 I think we have ample design features in there to  
8 protect that and give us satisfactory performance.

9 The moisture separator reheaters fit in on  
10 the side are also. Primarily what drove it for the  
11 protection of the generators, was to remove the  
12 copper. We took the opportunity, we've improved the  
13 moisture separators in 2R12, and then changed the  
14 bundles out to 439 stainless, increased the surface  
15 area of this heat exchanger by approximately 50  
16 percent.

17 MEMBER SIEBER: What about copper and  
18 feedwater heaters and steam condenser ejectors and  
19 things like that. Is all the copper gone there?

20 MR. HUFF: All the copper is gone. The  
21 high pressure turbine, the first three stages with  
22 uprated condition represented a choke flow, so we were  
23 having to go into our HP turbine. So we took the  
24 opportunity, again, to pick the GE advanced design to  
25 get additional efficiency megawatts out of that

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1 modification. The low pressure turbines, we changed  
2 those out, put high efficiency turbine blading in, and  
3 just from the efficiency gain for these two  
4 modifications, separate from uprate, we're gaining  
5 about 42 megawatts for those two.

6 Other major modifications, we rewound the  
7 generator this past cycle, past outage. That took it  
8 was 1046 Mega Bars to 1133. That would be the rating  
9 after we've put the auxiliary components in here to  
10 support that re-rating. Hydrogen coolers, analysis  
11 showed we needed to replace those to support the  
12 uprate generator.

13 Standard piping, we made a configuration  
14 change. The Stator cooler and series with the main  
15 cooler, so it picked up, that flow path picked up heat  
16 so we separated them and put them in parallel paths to  
17 insure a cooler source of water for the Stator  
18 coolers.

19 I think Bryan will discuss this when he  
20 gets into the containment analysis. One thing we had  
21 to do, because the containment analysis results in a  
22 higher peak pressure, it has more load on the  
23 containment building fans and motors. To accommodate  
24 that requirement in increased load, we changed the  
25 pitch approximately three degrees, retarded the air

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1 flow to accommodate the change in pressure.

2 To counter that, from a standpoint of  
3 normal cooling, the containment chill water coils are  
4 the normal coolers. We increased the surface area  
5 there, and the result of this mod, we've already seen  
6 a 10 degree drop in normal containment building  
7 temperature. So we took the opportunity to improve,  
8 accommodate those conditions in what we currently  
9 have.

10 CHAIRMAN WALLIS: How cool is the chilled  
11 water?

12 MR. HUFF: Chilled water coming in,  
13 approximately 45 degrees, is that correct?

14 MEMBER SIEBER: Another question on the  
15 change to the turbine. Is the exit moisture content  
16 higher or lower or about the same as it was before?

17 MR. HUFF: Bryan, do you have the heat  
18 balance?

19 MR. DAIBER: Yes, it's higher. It's more  
20 efficient, so on the high pressure turbines, of  
21 course, it increased our loads on our heater drain  
22 pumps. It's a more efficient turbine.

23 MEMBER SIEBER: So you would expect more  
24 blade erosion because of that?

25 MR. DAIBER: I'm not the expert on that.

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1 I'm sorry. I believe it's been designed for that. I  
2 know we were able to increase the number of years  
3 between inspections, so I believe there's some  
4 advanced features in that too.

5 MR. HUFF: Well that design, that blading,  
6 GE provided the heat balance, and designed the blading  
7 off that.

8 MR. WILSON: Again, this is Roger Wilson.  
9 We replaced the whole high pressure steam path. It's  
10 not just three stages, but it's a whole new high-  
11 pressure turbine stators and rotors. The only thing  
12 that remains is the casing.

13 MEMBER SIEBER: Ok, thank you.

14 MEMBER SCHROCK: You mentioned GE in this  
15 regard.

16 MR. HUFF: Yes, sir.

17 MEMBER SCHROCK: Stepping back a moment, I  
18 was a little puzzled as I read the documentation to  
19 find that your basis in part if GE proprietary  
20 documentation for uprates. I'm unclear as to what the  
21 GE involvement is in this particular uprate. Can you  
22 give a very brief explanation of that?

23 MR. BOYD: Let me take a shot.

24 MR. HUFF: Okay, this is Dennis Boyd again.

25 MR. BOYD: What I was trying to convey

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1 earlier was, we used the GE document just as a basis  
2 for knowing the types of information to include in a  
3 power uprate submittal on the PWR side. So we only  
4 used that, as I stated earlier, for lack of having a  
5 specific topical form like a CE PWR plan. So we just  
6 used it for content.

7 MEMBER SCHROCK: Well, my question pertains  
8 to the proprietary nature of the document that's cited  
9 in the references here. How do you have access to a  
10 proprietary GE document is really what puzzles me.

11 MR. WILSON: I don't think there was any.  
12 Again, correct me, Dennis - Roger Wilson. I think it  
13 was all just a CE. See I don't remember any GE  
14 proprietary, did we?

15 MEMBER SCHROCK: Well, the one that you  
16 reference is proprietary. It's in the title of the  
17 report.

18 MR. WILSON: Oh, I don't know how we got a  
19 hold of that.

20 MR. HUFF: I'd have to go back and pull the  
21 string on that.

22 MR. WILSON: Yes. I guess we got it from  
23 a brother plant that's GE PWR.

24 CHAIRMAN WALLIS: That's the first time  
25 I've heard brother plant. Sister, they're usually

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1 female.

2 MR. HUFF: This slide represents the major  
3 modifications, hardware modifications left to go at  
4 this point for the Cycle 16 upcoming spring outage.  
5 We plan to put in the Stator water heat exchangers,  
6 replace those. We're also upgrading the Isophase bus  
7 cooling fans. The coolers were replaced last cycle,  
8 last outage, and the fans and housings are being  
9 changed out to this outage to improve that capability.

10 Heater drain pumps, on the feedwater side,  
11 the heater drain pumps are really the only major  
12 component to be changed out there, and that's with the  
13 more efficient heat cycle that we had, as Roger  
14 explained. We're going to have more drain flow, so  
15 the capacity of these pumps had to be increased and we  
16 also improved and redesigned three stages of the pump,  
17 and larger motors and recirc lines. There will be a  
18 change there.

19 The rest of the feedwater heater system  
20 isn't far from the original design. Each loop  
21 approximately capable of 80 percent power operations.  
22 So this is the last of the components that we saw we  
23 needed to change, and with the uprate - a footnote  
24 here. With the uprate conditions, feedwater system  
25 grids will be capable of approximately 65 percent

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1 single loop operations.

2 CHAIRMAN WALLIS: The transformers are  
3 okay?

4 MR. HUFF: The transformers, yes they were  
5 okay. There was an increased load, but from a life  
6 cycle, the load on the transformer will increase where  
7 degradation or the life cycle will be shortened. But  
8 there's no need to replace those to support uprate at  
9 this point.

10 CHAIRMAN WALLIS: There was a remark that  
11 I didn't quite understand about the load on the  
12 transformers being highest in the winter, highest in  
13 the summer?

14 MR. WILSON: Yes. I don't remember that.  
15 This is Roger Wilson. I don't remember that. The  
16 highest loads are in the summer. Our peak loads are  
17 in the summer.

18 CHAIRMAN WALLIS: That's what it says in  
19 there.

20 MR. WILSON: Well, I think what it says is  
21 you could load it higher in the winter.

22 CHAIRMAN WALLIS: You could load it higher  
23 in the winter, but it's going to be stressed more in  
24 the summer.

25 MR. WILSON: It's stressed more in the

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1 summer. Our peak time is definitely in the summer in  
2 Arkansas.

3 CHAIRMAN WALLIS: I didn't understand why  
4 that was relevant to deciding things were okay.

5 MR. HUFF: Ambient obviously has a lot to  
6 do with transformer performance and cooling. But I  
7 think the point they were trying to make there, during  
8 the summer period because of the limitation on the  
9 cooling power, the climate affect on cooling tower  
10 performance, you will get some lower megawatt  
11 predictions, a droop there in summer operations.

12 CHAIRMAN WALLIS: So it says here that the  
13 proposed 105 to 109 percent loading, which will occur  
14 during only the wintertime is acceptable. So what's  
15 going to happen in the summer? Are you going to  
16 operate at a lower loading?

17 MEMBER SHACK: Right, 101 to 103 is what it  
18 says.

19 CHAIRMAN WALLIS: So you're going to be  
20 stuck with a lower loading in the summer.

21 MEMBER SHACK: Right.

22 MR. WILSON: This is Roger Wilson again.  
23 As Milton said, because of our back pressure on our  
24 condenser, we do have a sag off of approximately 12  
25 megawatts in summer because our back pressure in our

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1 condenser goes up as a result of those in the cooling  
2 tower. Those loads are taken off prior to the main  
3 transformer, so the load onto the transform is lower.

4 CHAIRMAN WALLIS: So the two things go  
5 together.

6 MR. WILSON: Yes.

7 CHAIRMAN WALLIS: You produce less power  
8 because of the efficiency of they cycle.

9 MR. WILSON: That's right.

10 CHAIRMAN WALLIS: And the transformers can  
11 handle so much anyway, so it all works out all right.

12 MR. WILSON: Yes.

13 CHAIRMAN WALLIS: So the uprate we're  
14 approving really is for the winter?

15 MR. WILSON: No, it's a year round  
16 operation. That's incorrect.

17 MR. HUFF: Setpoint changes, we've kind of  
18 got this broken up into two parts of our discussion.  
19 Bryan, the Director of Safety Systems will discuss  
20 those setpoints, the ones that in my area here that we  
21 modified on the secondary side, such things as  
22 feedwater water control setpoints, seamed up bypass  
23 control setpoints, NRS release valve setpoints, things  
24 of that nature were changed.

25 All these setpoint requirements and the

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1 modifications, this process we've gone through is a  
2 system-by-system evaluation. We have an engineering  
3 request that we put out on each system, and that's  
4 what drove the modifications, is what drove the  
5 setpoint changes.

6 MEMBER SCHROCK: Your feedwater heaters,  
7 you say they were so robust in the original design  
8 that you didn't need to make any changes there, but  
9 there must be some reduction in performance.

10 MR. HUFF: And I have two per training I'm  
11 having to re-rate, the 3s and 4s, simply on  
12 temperature, not pressure. We've had Yuber do a  
13 detailed evaluation from thermal performance, design  
14 from a tube vibration issue, so from the standpoint we  
15 had the OEM on the heat exchangers validate the  
16 performance of those feedwater heaters, and they would  
17 be on site, along with the code inspectors, to re-rate  
18 the 3s and 4s on both loops.

19 The equipment and structure re-rates, Rick  
20 touched on it earlier, the containment uprate in the  
21 feedwater heaters are the two things that are having  
22 to be re-rated, and the containment went from 54  
23 pounds to 59 pounds. Bryan will discuss in his  
24 presentation what drove that, and the details on that  
25 uprate.

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1 In conclusion, is the balance of plant  
2 structures. Systems and components are acceptable for  
3 power uprate by either modification or evaluation. At  
4 this point, the modification section I'll turn over to  
5 Bryan.

6 MR. DAIBER: Let's see if I can do this  
7 without knocking the mike off. I'm Bryan Daiber. I  
8 work for Entergy. I've been involved with the RSG and  
9 power uprate programs for the last five years or so,  
10 and I was the safety analysis lead for the power  
11 uprate project.

12 The first thing I'm going to go over is  
13 one other plant modification for consideration at ANO  
14 that we took into account for the uprate condition was  
15 related to the fuel design. For Cycle 16, which is  
16 our next cycle, the first uprated core design, we're  
17 still using the standard 16 x 16 fuel assemblies that  
18 we're currently using. We're still maintaining the  
19 same number of total assemblies of 177 in the core.  
20 We are adding 80 fresh assemblies to the core for the  
21 first cycle of operation.

22 We are changing burnable poisons, however.  
23 WE're going from Gadolinia to Erbia.

24 MEMBER POWERS: I guess I don't understand  
25 the significance of 80 fresh assemblies being added to

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1 the first cycle.

2 MR. DAIBER: My next slide will get into  
3 that a little bit more, if you can just wait.

4 MEMBER SIEBER: From Baddinia to?

5 MR. DAIBER: Erbia.

6 CHAIRMAN WALLIS: You mean you take out 80  
7 old and put in 80 new?

8 MR. DAIBER: That's correct.

9 CHAIRMAN WALLIS: So it's an exchange.

10 MEMBER SIEBER: Basically that's what's  
11 happening.

12 MR. DAIBER: Right, we're exchanging 80  
13 assemblies with 80 fresh assemblies.

14 MEMBER SIEBER: Are all 80 the same  
15 enrichment, and if so, what is it?

16 MR. DAIBER: There's a range of enrichments  
17 for the assemblies. It varies. It's around four and  
18 a half weight percent, plus or minus about a half  
19 percent, is that correct, Mehran, the enrichments for  
20 Cycle 16, four and a half plus or minus about a half  
21 percent.

22 MEMBER SIEBER: And per given assembly, is  
23 it zoned fuel or is it all the same enrichment in a  
24 single assembly?

25 MR. DAIBER: In a single assembly, I

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1 believe it varies slightly within assembly, is that  
2 correct? There may be one or two zones in an  
3 assembly.

4 MR. BOEHNERT: You need to get to a  
5 microphone. There's a microphone there.

6 MR. GOLBABAI: I'm Mehran Golbabai. I'm  
7 from Westinghouse. I believe most assemblies, the  
8 enrichment within the assemblies are the same.

9 MR. BOEHNERT: Thank you.

10 MR. DAIBER: We're also changing Tcold.  
11 We're increasing Tcold 2° from where we're at in Cycle  
12 15, from 529 to 551, and also to accommodate power  
13 uprate, we're reducing the radial peaking factor. In  
14 the next slide, I'll get to some of the numbers in the  
15 following slides.

16 From the change in burnable poisons, we're  
17 currently using Gaddolinia, and we're moving to Erbia.  
18 Now the reasons for that has to do with the poison  
19 itself. Erbia is a much more dilute poison. It  
20 allows us to have better power peaking control, better  
21 moderating temperature control. It gives us more  
22 smooth power considerations, and this transfers, not  
23 just only during normal operations but also during an  
24 anticipated transient, such as CA withdrawals, the  
25 peaking considerations are controlled better with

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1 Ernia burnable poisons.

2 MEMBER POWERS: How does the Erbia change  
3 the oxygen potential of the fuel relative to what  
4 Gadolinia does?

5 MR. DAIBER: The oxygen potential?

6 MEMBER POWERS: Right.

7 MR. DAIBER: I'm sorry. I don't know the  
8 answer to that. We'll have to get back to you on  
9 that.

10 MEMBER POWERS: If it makes it worse and  
11 you have a stronger clad interaction, then it's not  
12 good.

13 MR. DAIBER: Are you talking about the  
14 oxide thickness?

15 MEMBER POWERS: Inside attack on the clad.

16 MR. DAIBER: On the clad.

17 MEMBER POWERS: By the fuel. It may not be  
18 a less adverse response to transients.

19 MR. DAIBER: I don't know about the exact  
20 oxide thickness, relative to the other core designs.  
21 We did look at that from the overall magnitude or the  
22 result of the oxide thickness, and I believe 100  
23 microns is what we used as an acceptance criteria for  
24 that, under power grid conditions.

25 MEMBER POWERS: How much is the power plate

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1 dependent on the changes in the fuel?

2 MR. DAIBER: With respect to the change  
3 from Gadolinia to Erbia, we gained quite a bit of  
4 margin in the peaking considerations, and we gained  
5 about five, six percent operating margin with respect  
6 to that.

7 MEMBER POWERS: This is because of the way  
8 things develop over the cycle?

9 MR. DAIBER: With respect to the  
10 challenges, with regard to peak considerations during  
11 normal operation and also during transient conditions.

12 MEMBER POWERS: Are you going to change the  
13 fuel again for the next cycle?

14 MR. DAIBER: With respect to the burnable  
15 poison, no. The intent is not to do that.

16 MEMBER POWERS: You're going to keep  
17 reloading with Erbia?

18 MR. DAIBER: Yes.

19 MEMBER POWERS: So you're going to have all  
20 Erbia after a while?

21 MR. DAIBER: That's correct.

22 MEMBER POWERS: How about the 80 fresh  
23 assemblies?

24 MR. DAIBER: The 80 fresh assemblies are  
25 all Erbia assemblies.

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1 MEMBER POWERS: No, I mean you're starting  
2 the cycle with 80 fresh assemblies.

3 MR. DAIBER: That's correct.

4 MEMBER POWERS: Okay, now we're going to  
5 come to the next cycle. Are you going to put another  
6 80 in?

7 MR. DAIBER: That will vary depending upon  
8 cycle length and the energy requirements for each  
9 individual cycle.

10 MEMBER POWERS: I'm still trying to  
11 understand what the significance of putting 80 -

12 MR. DAIBER: Go to the next slide.

13 MEMBER POWERS: And then the next cycle,  
14 there's going to be some different number.

15 MR. DAIBER: Yes, it will. It varies from  
16 cycle to cycle. With respect to the number of  
17 amenities with Cycle 14. In Cycle 14, we added 80  
18 fresh assemblies. The current cycle we're in, we  
19 added only 68 assemblies. The next cycle we are  
20 looking at adding essentially 80 assemblies.

21 Now that value, that number of assemblies  
22 is dependent upon the energy content, and what this  
23 slide compares here or shows effectively is for Cycle  
24 16, the energy and content in Cycle 16 is actually  
25 less than the energy content required for Cycle 14,

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1 due to the decrease in cycle length, and secondly due  
2 to the decrease in cycle length, even though we are  
3 operating at 7.5 percent for Cycle 16.

4 MR SCHROCK: What has been the past  
5 practice on exchanging fuel? How many cycles will  
6 they bundle experience in the core?

7 MR. DAIBER: Usually up to three cycles.

8 MEMBER SCHROCK: Up to three, meaning that  
9 some fractions go up to three, but some only do two.

10 MR. DAIBER: That's correct.

11 MEMBER SCHROCK: So what is the ratio of  
12 those?

13 MR. DAIBER: From cycle to cycle?

14 MEMBER SCHROCK: Do most of them do three?  
15 Do a few do three?

16 MR. DAIBER: A very small fraction of them  
17 do three, 10, 20 percent would be in there for three.

18 CHAIRMAN WALLIS: So you have to  
19 continually check that the fuel is satisfying all the  
20 margin requirements and all those things?

21 MR. DAIBER: Yes. That's done on a cycle  
22 specific basis.

23 CHAIRMAN WALLIS: It is. Well, I guess the  
24 staff has to be satisfied that you are continually  
25 doing that. This is not going to limit the power that

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1 you can get out.

2 MR. DAIBER: That's correct. On a cycle  
3 specific basis, we continue to look at the core  
4 designs.

5 CHAIRMAN WALLIS: So is this a step forward  
6 that's made possible with new fuel, this upgrade of  
7 7.5 percent? If you didn't have Erbia, you wouldn't  
8 be able to do it?

9 MR. DAIBER: It would have been a lot more  
10 challenging with Gadolinia. There are several other  
11 modifications - not modifications per se, but changes  
12 in the fuel design that also have helped accommodate  
13 power uprate; in particular, the original core designs  
14 did not credit or did not use the integral burnable  
15 poisons, such as Gandolinia and Erbia. They used  
16 shims.

17 So we removed those shims over the past  
18 several cycles, and now effectively, there's usually  
19 maybe one of the few assemblies that may still have  
20 the shims in it. But for the most part, we removed  
21 all those. That alone has increased the fuel pin  
22 percent by about five percent alone there.

23 CHAIRMAN WALLIS: Is experience with Erbia  
24 poison fuel over three cycles in other plants?

25 MR. DAIBER: Yes. Most the Westinghouse CE

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1 Plants using the integral burnable poisons are using  
2 Erbia.

3 CHAIRMAN WALLIS: So there has been  
4 experience over the full life of the fuel?

5 MR. DAIBER: Yes.

6 MEMBER SIEBER: What is the assembly  
7 average discharge burn up poison burning fuel?

8 MR. DAIBER: I believe the number is around  
9 58,000 plus or minus about 500. That's the peak rods.  
10 You're talking about the average assembly?

11 MEMBER SIEBER: The average assembly, yes.

12 MR. DAIBER: Mehron, do you know the  
13 average assembly numbers?

14 MR. GOLBABAI: (Off mike.)

15 MEMBER SIEBER: And I presume the Thot is  
16 the same for every cycle and if so, what is it?

17 MR. DAIBER: For power uprated cycles, as  
18 I mentioned, we're increasing Tcold by 2° from 549 to  
19 551 and with the increase in power uprate, the Thot is  
20 expected to go to 609 for Thot.

21 MEMBER SIEBER: And that's right around the  
22 activation temperature for Alloy 600. What components  
23 in the plant, for example, control rod drive mechanism  
24 and so forth that are IC600.

25 MR. DAIBER: Dale James will be talking

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1 about that in a later presentation. So if we could  
2 defer that, I'd appreciate it.

3 MEMBER SIEBER: Thanks.

4 MR. DAIBER: So with respect to the fuel  
5 design, we're changing the burnable poison. Another  
6 key factor here is part of the Cycle 16 core designs  
7 are we are reducing the radio peaking factor  
8 considerations and that reduction in radial peaking  
9 factor relative to prior cycles, is greater than the  
10 7.5 percent uprate.

11 MEMBER SHACK: Is the core protection  
12 calculator qualified for these fuel change designs?

13 MR. DAIBER: Yes. Yes, it doesn't  
14 necessarily look at the fuel itself, obviously. It's  
15 looking at the thermal hydraulics into the assemblies.

16 MR. BOEHNERT: Well, has that changed? Do  
17 these new assemblies have any modifications relative  
18 to the thermal hydraulic parameters?

19 MR. DAIBER: The CPC is the only one  
20 monitoring the Coles, the plant monitoring systems.  
21 They look at the RCS inlet temperatures, the flows,  
22 the in-core considerations with regard to flux  
23 mapping, and all of that is effectively staying the  
24 same, even with the new fuel. It's not any real  
25 different within the current Gadolinia core design.

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1 MR. BOEHNERT: No, I'm asking if the  
2 assemblies themselves, have they been modified or  
3 never been changed at all?

4 MR. DAIBER: No, there are no physical  
5 modifications to the general geometry of the assembly  
6 and the pins and the grids.

7 MR. BOEHNERT: Compared to what you were  
8 using?

9 MR. DAIBER: Compared to what we're  
10 currently using, that's correct.

11 CHAIRMAN WALLIS: Are you going to reach  
12 the conclusion that everything's okay, and that means  
13 that you still got a margin to all the various limits  
14 classified for fuel.

15 MR. DAIBER: Yes.

16 CHAIRMAN WALLIS: You haven't shown us any  
17 of these margins, so we don't have any direct evidence  
18 that you are below the margins, or how far you are  
19 below the margins. Do you care to explain that?

20 MR. DAIBER: With respect to the core  
21 designs and the considerations, we've looked at all  
22 those, with respect to current core designs and  
23 previous core designs, and with these modifications  
24 that we're making here, the challenge with respect to  
25 fuel considerations are really bounded by what we've

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1 seen in the past for Cycle 14 type core design  
2 considerations.

3 Now there are a few areas where we did go  
4 beyond past core designs. MTC is one of those. We  
5 went with - these core designs do result in a slightly  
6 more decative modulary core coefficient, and all the  
7 safety analysis have been updated to accommodate that  
8 with adequate margin. Pin pressure have gone up  
9 slightly, as a result of the core designs. But again,  
10 to insure that the pin pressures stay within  
11 acceptance criteria, we have limited our linear heat  
12 rate considerations after about 200 EFDP, we insure  
13 that the linear heat rate is limited to insure that  
14 pin pressures aren't exceeded.

15 Other than that, for the most part, the  
16 parameters and other considerations with the core  
17 designs that we're seeing for this cycle and several  
18 other cycles, when we looked at this power uprate  
19 effort, we didn't just look at Cycle 16, we did  
20 various core designs beyond Cycle 16 and looked at the  
21 general range of parameters that we look at on the  
22 cycle specific basis, and all those core designs  
23 effectively fell in with the ranges that we had  
24 essentially used when we established the Gadolinia  
25 core designs back in Cycle 13.

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1           So a lot of the parameters and  
2 considerations that we are still using now in all  
3 their downstream analysis and considerations were  
4 established when we first went to integral burnable  
5 poisons.

6           CHAIRMAN WALLIS: And the staff has audited  
7 these methods that you're using.

8           MR. DAIBER: The methods that we use with  
9 respect to pin pressures, oxide buildup and those  
10 considerations, the fate methodology essentially, we  
11 use methodologies for considering fuel performance  
12 design considerations.

13           MEMBER POWERS: You tell us that all of  
14 them are the same, but I can think of at least one  
15 that surely must not be the same. I mean, if you were  
16 letting fuel up to 58,000 megawatts per ton, surely  
17 you can't have the fuel survive a rod ejection  
18 accident and put 240 calories per gram into it.

19           MR. DAIBER: I'm not thinking the high  
20 burn-up assemblies are typically limiting with respect  
21 to ejection analysis. Typically, it's the higher  
22 burn-up assemblies, correct me if I'm wrong, Mehran am  
23 I wrong, but typically the lower burn-up assemblies  
24 are more limiting with respect to route ejection and  
25 energy addition considerations.

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1 MR. GOLBABAI: The peak burn-up limit has  
2 not changed, so with respect to burn-up, even with  
3 operated power, the 60,000 megawatt per day per ton  
4 remains the same. So we did not extend that in  
5 response to your question.

6 MR. DAIBER: So in conclusion, we looked at  
7 the core design and we feel that the core design  
8 itself has met the design criteria and is acceptable  
9 for power uprated conditions.

10 The next area I'm going to go into will  
11 deal with the boric acid makeup tank volume and weight  
12 percent design criteria. The ANO operates with a high  
13 concentrated boric acid tank, the BAM tanks that we  
14 refer to, and the design of these tanks is essentially  
15 developed based on what we refer to as a cool down  
16 without let down situation. We go from Mode 1, which  
17 is power operations down to effectively Mode 4, and  
18 during this transient consideration, we looked at the  
19 cool down during that let down available.

20 We start the cool down at about 26 hours  
21 with essentially Xenon at its started 2K at that  
22 point. Similar offsite power, end of cycle conditions  
23 with respect to initial Boron concentration and MTC  
24 considerations, and during that cool down, we insure  
25 that the tank concentrations and inventory there are

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1 enough to insure that we have five percent shut down  
2 margin during that cool down.

3 In a similar fashion, we do a Mode 5 and  
4 6 cool down scenario, again making sure that the boric  
5 acid concentration and inventory is sufficient to cool  
6 the plant down and maintain a five percent shutdown  
7 margin in the tank.

8 As a result of the more negative MPCs that  
9 we are seeing, we did have to impose a slight increase  
10 in restrictions on the tank concentrations. The  
11 current tank concentrations can vary between 2.5  
12 weight percent and 3.5 weight percent. We've narrowed  
13 that band to the 3.0 to 3.5 weight percent, and  
14 inventory in the tank has increased slightly, also as  
15 a result of the demands.

16 But, all of these requirements with  
17 respect to the tank themselves, are within acceptable  
18 limits and design considerations for the tank and  
19 system.

20 CHAIRMAN WALLIS: Is somebody going to talk  
21 about mixing in the core. It seemed to be an issue in  
22 the SER.

23 MR. DAIBER: That's dealing with the long-  
24 term core, boric acid considerations on ECCS. So if  
25 we could wait until we get the ECCS analysis, we'll

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1 discuss that. So with respect to the BAM tank  
2 considerations, we reviewed design requirements on it  
3 and found it to be acceptable.

4 The next item I'd like to move on to would  
5 be the pressure temperature limits, the PT limits for  
6 active vessel limits of 4 ANL 2. The current PT  
7 limits were set in the tech spec to expire at 21 EFPY;  
8 however in response to generic letter 9201, the  
9 limiting material was changed and the effective EFPY  
10 was reduced to 17. Associated with that, more  
11 limiting material.

12 At the end of Cycle 14 operation, which  
13 was our last refueling outage, we had effectively  
14 reached about 15.5 EFPY. So to make sure we could meet  
15 the 17 EFPY considerations, we pulled a reactive  
16 vessel specimen at that point in time. We had that  
17 specimen analyzed and we have developed new PT curves  
18 as a result of that. The results have been submitted  
19 to the staff for review in October of last year.

20 In the development of that PT curves for  
21 that effort, we did account for the increased power  
22 uprated core designs in those PT calculations. The  
23 fluence to the specimen was based on the proved  
24 methodology, FTI's methodology BAW-2241P-A. We used  
25 that methodology to estimate the fluent and accounted

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1 for also the power uprate effects in the PT curves.  
2 Fluids outed 32 EFPY.

3 CHAIRMAN WALLIS: Is this something you  
4 submitted since the draft I see that we have?

5 MR. DAIBER: This was submitted to the  
6 staff in October.

7 CHAIRMAN WALLIS: I was puzzled by the SE  
8 we have because it talked about neutron fluence and  
9 everything seemed to be okay up to Cycle 16. I mean  
10 it's now or tomorrow.

11 MR. DAIBER: That's right.

12 CHAIRMAN WALLIS: I couldn't see why it was  
13 okay after that. You were going to submit something.

14 MR. DAIBER: Yes, and this is the submittal  
15 now.

16 CHAIRMAN WALLIS: Something which is since  
17 this document.

18 MR. DAIBER: That's correct.

19 CHAIRMAN WALLIS: Which I haven't picked up  
20 yet. I need to find it or read it or something, or  
21 the staff will explain it perhaps.

22 MR. DAIBER: Yes.

23 CHAIRMAN WALLIS: It's very puzzling that  
24 you were sort of okay until the next cycle. That's not  
25 a very comfortable feeling. You want to be okay for

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1 quite a few.

2 MR. DAIBER: That's right. The  
3 justification only went into about three weeks of  
4 Cycle 16, which is the uprated core design.

5 CHAIRMAN WALLIS: You uprate and then you  
6 shut down a few weeks later.

7 MR. DAIBER: Hopefully not. So we have  
8 submitted these new PT results, and the results of the  
9 PT limits actually have opened the operating space a  
10 little bit. And the reason for that is two reasons.  
11 One is the fluence that we've seen that the original  
12 PT curves were based on, were based on a specimen poll  
13 that occurred at 1.69 EFPY. Those early core designs  
14 which were effectively the first two core designs that  
15 that first specimen saw, were highly rich core  
16 designs.

17 In Cycle 6, we essentially started to go  
18 to low leakage core designs and we continued to  
19 implement core leakage designs even under the  
20 operating conditions. So the fluence values on your  
21 uprated conditions are essentially expected to be less  
22 than what the vessel was seeing in the first five  
23 cycles of operation.

24 And also, in the PT curve development  
25 itself, we referenced ASME coke case, N-641 in

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1 development of curves, which wasn't available when the  
2 original PT codes were developed.

3 So as a result of that, we've developed a  
4 new PT curves under power uprated conditions and the  
5 new PT curves have been determined to be acceptable  
6 under power uprated conditions.

7 MR. WILSON: This is Roger Wilson again.  
8 We made our original submittal back in December of  
9 2000, and we provided the additional information on  
10 the PT curves on July 24, 2001. I have a copy of the  
11 letter here.

12 MR. DAIBER: Yes, I believe the vessel  
13 specimen results, the PT codes were in October.

14 MR. WILSON: October, that's right.

15 MR. DAIBER: I'd like to move on to the  
16 third agenda item, compliance with regulatory  
17 requirements at this time.

18 CHAIRMAN WALLIS: We're just about on  
19 schedule. I'm making a rough calculation. It looked  
20 to me as if you were on schedule. Is that the way you  
21 feel?

22 MR. DAIBER: I think we are.

23 CHAIRMAN WALLIS: Because we've got other  
24 things going on later in the day. Is that about  
25 right?

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1 MR. DAIBER: It's about right. Compliance  
2 with regulatory requirements, from an analysis  
3 perspective, we started power uprate considerations  
4 back when we were doing the RSG design and  
5 implementation and all the analyses done at that time,  
6 in addition to the new analyses, specifically for  
7 power uprates, with respect to the containment  
8 analyses, the LOCA analysis, the 50-46 analysis, the  
9 non-LOCA transient analysis, all these events and  
10 considerations were performed with approved methods.

11 So all those analyses were performed with  
12 a few slight exceptions here, where we applied new  
13 applications of approved methods. In these cases, for  
14 large break LOCA and boric acid precipitation, we use  
15 approved methods, but this is the first time  
16 application for ANO 2 on these methods. And we'll get  
17 to both of those a little bit later on.

18 Also with respect to offsite releases and  
19 control room doses, again what we utilized here is we  
20 utilized methods consistent with what we had used in  
21 the RSG effort. The doses specific to power uprate  
22 were performed with the same methodology that we had  
23 used for RSG considerations, with respect to the  
24 control and dispersion factors in offsite releases.

25 MEMBER POWERS: When you calculated your

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1 control room doses, what leakage?

2 MR. DAIBER: When we did our original  
3 control and dose calculations, the limiting event is  
4 the MHA LOCA, and we did that with 10 CFM in leakage.  
5 And subsequent to that, we have done a test which has  
6 greater in leakage, and I'm going to go into that  
7 issue a little bit later on.

8 There was one area where we felt there was  
9 a new method that was applied and that was for feed  
10 level line break. Here the new method really deals  
11 with a credit for low level actuation in the affected  
12 generator. In prior analysis we had conservatively  
13 waited until low generator level occurred in the  
14 unaffected generator. With respect to the power  
15 uprate application, we've credited low level actuation  
16 in the affected generator for the first time.

17 Also when we performed the analysis, we  
18 looked at the acceptance criteria required for those  
19 particular evaluations and made sure that we met all  
20 the acceptance criteria and we also made sure that we  
21 applied all the appropriate regulatory guidance on  
22 those areas.

23 When we were using NRC approved methods,  
24 we also verified that all the limitations and  
25 constraints confined for those methodologies were

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1 appropriately accounted for in the application of  
2 those approved methods.

3 In conclusion, all the safety analysis  
4 that we performed for the RSG power uprate combined  
5 effort, we use verified, approved methods. We  
6 verified compliance with all the applicable regulatory  
7 guidance. We verified the acceptance criteria was  
8 met. We also verified that the limitations and  
9 constraints in the SERs were also met.

10 MEMBER POWERS: You're going to give us  
11 some more details later, are you?

12 MR. DAIBER: With respect to the LOCA  
13 analysis, we'll be going into more detail in that,  
14 LOCA containment analysis.

15 MEMBER POWERS: And the control room,  
16 you're going to go into more detail?

17 MR. DAIBER: That's right, yes. With  
18 respect to plant margins now, I'm going to kind of go  
19 over an overview in these areas. In the first part  
20 here, Milton Huff had presented mostly the balance of  
21 plant component considerations, and when we looked at  
22 the balance of plant design, we verified that those  
23 components would be able to operate within those  
24 design requirements for those systems.

25 For any of those components or systems

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1 that were not meeting the design requirements,  
2 appropriate modifications have been installed or will  
3 be installed to insure that we can meet those design  
4 requirements and margins.

5 MEMBER SIEBER: When you talk about the  
6 electric power portion of the plant, did you consider  
7 and have to make any changes to circuit breakers,  
8 since you're interrupting capability margin is  
9 probably reduced to some extent, current carrying  
10 capacity?

11 MR. WILSON: This is Roger Wilson. I don't  
12 remember any modifications to any of those, but all of  
13 those were reevaluated. We did detailed reevaluations  
14 in all of those areas. We have very detailed  
15 calculations on all that.

16 MEMBER SIEBER: All right.

17 MR. DAIBER: In a similar fashion, we also  
18 looked at the NSSS, and the NSSS, which includes  
19 reactor coolant system, the volume control system, the  
20 safety injection systems, and your shutdown cooling  
21 systems. We looked at the design requirements for  
22 those systems and components, and made sure that we  
23 could maintain the same design requirements, which we  
24 were originally licensed to.

25 And after reviewing those systems and

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1 components, we were able to verify that no  
2 modifications were necessary to insure that the NSSS  
3 was able to meet its design requirements.

4 We also looked at the control systems.  
5 The control systems including the pressurizer pressure  
6 and level control systems, the feedwater control  
7 system, steam dump and bypass control systems. We  
8 also looked at the plant protection systems, and the  
9 plant monitoring systems to insure that the setpoints  
10 associated with those systems and those control  
11 systems also would operate and function properly under  
12 power operated conditions with the appropriate design  
13 margins.

14 In those situations where adjustments to  
15 setpoints were necessary, we've implemented and will  
16 be implementing as necessary, setpoint changes.

17 From the containment perspective, when we  
18 did the RSG analyses, we did indicate an increase in  
19 peak building pressure design requirements. So, we  
20 have, as part of the RSG effort, we underwent a re-  
21 rate of the containment design from 54 pounds to 59  
22 psig. During that effort, we looked at all the  
23 equipment inside containment and verified that the  
24 equipment inside containment could operate under the  
25 uprated pressure of 59 pounds.

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1 CHAIRMAN WALLIS: How does it explain  
2 what's going on here. You have the same building, and  
3 somebody naive would assume that it's designed for 54  
4 psig. That's what it's designed for. How do you  
5 manage to change its design pressure?

6 MR. ADAMS: My name is Doyle Adams with  
7 Entergy. I was working with the RSG when they did all  
8 that, and also was the RPE for the repairs,  
9 modifications to the containment, and also the testing  
10 as it came out of the outage 2R14.

11 To answer your question, we had some  
12 slides. Due to the modern ability of everything, we  
13 managed to lose those things. So I'll try to go  
14 through what I had prepared and then try to answer all  
15 your questions you have there.

16 What we have ANO is a Bechtel containment,  
17 designed in '68 to the early '70s when it was actually  
18 designed. It's a three butress plant. It's a sphere  
19 dome cylinder walls with a nine-foot thick concrete  
20 normally reinforced base mat. We have a quarter inch  
21 thick steel liner on the inside of it.

22 It was regularly designed for 54 psi at  
23 300 degrees Fahrenheit. We uprated the containment to  
24 59 psi and still used 300 degree Fahrenheit number for  
25 that. It was originally designed and still is to ACI

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1 318, '63 version of that code. And what we did, when  
2 we came out of the outage, we actually tested it  
3 again. I guess we're probably the only containment  
4 that's been uprated that way and actually did another  
5 structural integrity test on it.

6 And we came out using, read at 1.18 to do  
7 that test, with minor modifications to some changes in  
8 it that we dropped as far as amount of instrumentation  
9 we did and things like that, mainly due to the fact  
10 that we already had, the second time we had unit 1,  
11 which is basically the same plant, and Unit 2 we'd  
12 already done a SIT on it. So we knew how the building  
13 was reacting, and we wanted to confirm that as we went  
14 out.

15 We also subjected our containment to ILRT,  
16 which you would have to anyway. But to keep from  
17 recycling and more cycles on the containment, we  
18 actually performed the SIT and the ILRT at SIT  
19 pressures. So we did it - normally, you would have it  
20 in about three to four hours at SIT pressure. It's  
21 dated for 11 hours. We also had -

22 CHAIRMAN WALLIS: I'm sorry, what is SIT?

23 MR. ADAMS: It's structural integrity test.

24 CHAIRMAN WALLIS: Okay.

25 MR. ADAMS: As opposed to SIT tanks. But

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1 due to some construction issues, we also had two  
2 tenants that we want stressed up. We had one vertical  
3 and one horizontal.

4 CHAIRMAN WALLIS: What is the pressure of  
5 these tests?

6 MR. ADAMS: 68 PSI, 1.15.

7 CHAIRMAN WALLIS: Well, I don't know how  
8 long it's going to take, but is the basis for  
9 operating it that you did tests at higher pressures?  
10 You changed your basis of analysis?

11 MR. LANE: He's looking for the basis I  
12 think. You did a combination of analysis and tests,  
13 right?

14 MR. ADAMS: Oh, yes.

15 MR. LANE: Answer the question, you know,  
16 as far as the basis of how we re-rated the  
17 containment.

18 MR. ADAMS: The basis, okay. Well that was  
19 the next slide.

20 MR. LANE: How did you do this then?

21 MR. ADAMS: Okay. How we did this was we  
22 went through and we did all new analysis. We used  
23 Bechtel BCEP analysis, which is a fine idea on  
24 analysis developed and used for concrete containments.  
25 It was developed and is being used for, the San Onofre

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1 Plant used that particular code. It consists of a  
2 finite element, which gives you your moments and  
3 forces. Then it has a post operative system which you  
4 go through that compares it, does the load  
5 combinations and compares it to, in this particular  
6 program, actually compares ASME Section 3 Div 2, 75  
7 addition of code.

8 CHAIRMAN WALLIS: So you did a different  
9 analysis?

10 MR. ADAMS: Yes.

11 CHAIRMAN WALLIS: To get the power  
12 pressure.

13 MR. ADAMS: We did a complete reanalysis of  
14 the containment.

15 CHAIRMAN WALLIS: Using a different code?

16 MR. ADAMS: Yes.

17 CHAIRMAN WALLIS: Okay.

18 MR. ADAMS: Okay, as we went through, and  
19 I'm sure you're wondering where we got all the extra.  
20 When you design a plant you get to have the capability  
21 of adding in extra capacity as you go, and what they  
22 did originally, they had three additional tendons in  
23 there for surveillance, calling for surveillance for  
24 each grouping, both dome, vertical, and hook tendons.

25 They actually had a few more that were

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1 added in toward the last, probably for construction  
2 reasons. We lost some in Unit 1. We lost two hook  
3 tendons as we went through the construction issue. We  
4 used all tendons as we came through the re-analysis.  
5 All of them are credited in this particular analysis.

6 CHAIRMAN WALLIS: So there's something  
7 physically different. You're now using more tendons?

8 MR. ADAMS: No we did not change any  
9 tendons in there, but in the analysis, we used all the  
10 tendons.

11 CHAIRMAN WALLIS: In the analysis  
12 assumption, are you using more tendons than you used  
13 before?

14 MR. ADAMS: That's correct, sir.

15 CHAIRMAN WALLIS: So there is something  
16 different about the physical basis?

17 MR. ADAMS: There's nothing we did to  
18 modify the containment to get to where we were. The  
19 other thing that we had some additional capacity in  
20 was through the creep values. We used a very  
21 conservative creep value when they went through the  
22 first time around to do the analysis, and they used it  
23 because in Unit 1, they didn't allow time to go all  
24 the way through the creep testing.

25 So they went through part of it and they

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1 just used that value. We gathered data off of Unit 1,  
2 based on all of the tests that we did over the period  
3 of time that we had, because we had to do liftoffs and  
4 everything in Unit 1, where Unit 2 being a cinder type  
5 plant, we didn't have to do that over the years. But  
6 it's basically identical, the same concrete, basic  
7 mix, and tendons were the same, just a different  
8 number of them in Unit 2 based on the pressures that  
9 are there.

10 MEMBER SCHROCK: Your reference to creep is  
11 in the tendons?

12 MR. ADAMS: NO, this is creep in the  
13 concrete.

14 MEMBER SCHROCK: All right.

15 MR. ADAMS: But the rest of everything we  
16 used the same. We did not change the seismic values.  
17 In fact, we made real sure that we made sure that we  
18 did not do anything different in the seismic that  
19 would change how that actually got into the analysis.

20 MR. WILSON: Excuse me. This is Roger  
21 Wilson. One thing I don't think we have told him is  
22 that a Unit 1 design pressure is 59 pounds. So when  
23 he's comparing against Unit 1, he's comparing against  
24 a containment that is designed for 59 pounds. But the  
25 original analysis for Containment 1 was 59 pounds

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1       versus 54 pounds for Unit 2.

2                   CHAIRMAN WALLIS: These were essentially  
3 the came containment?

4                   MR. WILSON: They essentially are the same  
5 containment, very close.

6                   MR. ADAMS: Except for the fact that we  
7 have a different number of tendons in it.

8                   MR. WILSON: Right.

9                   MR. ADAMS: And they did reduce the tendons  
10 in some areas, based on how much pressure was actual  
11 design.

12                   MR. WILSON: But we had spare tendons.

13                   MR. ADAMS: We had additional spare tendons  
14 that were in there. That's where those numbers came  
15 from.

16                   CHAIRMAN WALLIS: The tendons are what  
17 holds the concrete together.

18                   MR. ADAMS: That's correct. Your design is  
19 such that you don't allow it to go into tension under  
20 certain conditions in your design basis.

21                   CHAIRMAN WALLIS: Are you pre-stressing?

22                   MR. ADAMS: We pre-stressed, yes.

23                   CHAIRMAN WALLIS: That's where the creep  
24 comes in then?

25                   MR. ADAMS: These are large tendons, and as

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1 I said three butress is what we have. They are  
2 basically tensioned up to about 1.4 million pounds.  
3 They're 186 wire tendons, massive things.

4 CHAIRMAN WALLIS: Yes, that's probably  
5 enough. Maybe we'll ask the staff to send questions.

6 MR. ADAMS: Is that enough?

7 MR. DAIBER: Thank you, Doyle.

8 MR. ADAMS: Okay.

9 MR. WALLACE: Thank you very much.

10 MR. DAIBER: Along with containment design,  
11 some of the things we did incorporate in the RSG  
12 program to try to minimize the impact of containment  
13 pressure challenges with the new steam generators, the  
14 new steam generators did incorporate an integral flow  
15 restrictive nozzle which was not available in the  
16 OSGs, the original steam generators.

17 Also we installed a containment spray  
18 actuation signal to isolate feedwater and steam.  
19 Prior to the steam generator replacement, isolation  
20 was only based on those steam generator level. We  
21 incorporated an additional isolation signal on high  
22 containment pressure of the main feed and main steam.  
23 Fuel design considerations. As I discussed before, we  
24 switched over to the Erbia burnable poisons to assure  
25 fuel design considerations.

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1           So in conclusion, with respect to plant  
2 margins, we removed the plant -

3           MEMBER SCHROCK: I'm still not completely  
4 clear on how you get to a change in the radial peaking  
5 by changing the burnable poison. You burn out more  
6 rapidly than you did with the Gadolinia, is that  
7 right? And so, you'd have more reactive old element  
8 in the periphery of the core?

9           MR. DAIBER: The peaking factors are  
10 actually more of a design other than in relation to  
11 the burnable poisons. The radial peaking factors I'm  
12 referring to here are designed into the actual  
13 assembly designs with respect to whether it's Erbia or  
14 Gadolinia. So, with Erbia core designs, there is the  
15 potential that future poisons -

16           MEMBER SCHROCK: Is there someplace in the  
17 documentation I haven't found that I could understand  
18 what this all means about the change in the radial  
19 peaking factor? What you do to come up with those  
20 numbers and why the physical changes in the fuel  
21 result in that change?

22           MR. DAIBER: With respect to the peaking  
23 factors, there's some information in the power uprate,  
24 though I don't think it's very extensive on that.  
25 Most of that work is done on the reloads.

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1                   MEMBER SCHROCK: See this is a problem I  
2 have. I mean we try to evaluate the technical details  
3 of what you're arguing. But it's difficult to do that  
4 when what you hear over and over again is that we've  
5 complied with all existing regulations. It doesn't  
6 tell us how you do the analysis in any technical  
7 sense. It tells us in a compliance sense that it's  
8 being done using methodologies that are approved, et  
9 cetera, et cetera. What I need is a little more  
10 technical explanation of how you come to a change in  
11 such numbers at the radial peaking.

12                   MR. DAIBER: The radial peaking factor, the  
13 decision on the lowering the radial peaking factor, is  
14 based on some recent data that's been gathered at  
15 Calvert Cliffs and Palo Verde Plants. There are  
16 concerns with the higher, more aggressive core designs  
17 resulting in actual offset anomalies, sub nuclear  
18 boiling considerations.

19                   Westinghouse has reviewed that data as a  
20 result of those other core design considerations, and  
21 they've developed a thermal hydraulics code. I forget  
22 the name of it, but they've developed a methodology to  
23 try to predict when that sub nuclear boiling would be  
24 onset and the conditions that would onset that. Then  
25 we went back and we looked at the Cycle 16 core

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1 designs.

2 MEMBER SCHROCK: See, this is precisely the  
3 point that I'm making. This is Thermal Hydraulics  
4 Phenomena Subcommittee. You're talking about now a  
5 thermal hydraulics consideration which somehow depends  
6 on a new analytical method developed in Westinghouse.  
7 I don't know what it is.

8 MR. DAIBER: That information has been  
9 provided to the staff in response to an RAI question  
10 in respect to the thermal hydraulics considerations  
11 there. There was an RAI on that. The staff had  
12 requested additional information with respect to how  
13 we were accommodating the data that was recently  
14 collected at Calvert Cliffs and provided some  
15 information in that area.

16 CHAIRMAN WALLIS: Maybe you can tell us  
17 where to find it.

18 MR. BOEHNERT: Can you reference that RAI,  
19 because we should have that?

20 MR. DAIBER: I was trying to find it.

21 MR. WILSON: October time frame, I think  
22 it's in the letters there.

23 CHAIRMAN WALLIS: Maybe at the break, you  
24 can call our consultant.

25 MR. BOEHNERT: Yes. We have these RAIs.

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1 MR. SHROCK: I've looked at a lot of RAIs  
2 and none of them have presented anything like the kind  
3 of explanation that I'm talking about. But what I  
4 find absent in all the discussions is any technical  
5 explanation of the phenomena that are involved here.  
6 But what we have instead is reference to a code we  
7 don't know, or may not know, something which meets the  
8 requirements in your view of the staff, and then we'll  
9 hear from the staff whether or not it has met these  
10 requirements.

11 But nowhere are we hearing a real  
12 technical explanation of how one gets a reduction in  
13 the radial peaking factor as a result of the  
14 modification in fuel.

15 CHAIRMAN WALLIS: Maybe we can take that on  
16 some sort of advisement.

17 MEMBER SCHROCK: I want to understand how  
18 and I want to understand how well you have the number  
19 that you're getting.

20 CHAIRMAN WALLIS: We're going to come back  
21 later in the day. Perhaps you folks can prepare a  
22 more detailed explanation for us.

23 MR. DAIBER: I think Mehron may be able to.  
24 You're referring to the actual fuel design and how we  
25 build in that radial peaking factor into the core

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1 design itself to lower it in the design itself, versus

2 -

3 CHAIRMAN WALLIS: Maybe you've got some  
4 other slides that show a sort of typical -

5 MEMBER SCHROCK: The power of the plant,  
6 and to increase the power to the plant, you have  
7 certain constraints, and some of those you may be able  
8 to negotiate more freedom on. Others you may not.  
9 But it becomes terribly unclear as to exactly how you  
10 achieve a comfortable increase in power by 7.5  
11 percent.

12 I don't know how I can say it more simply.  
13 The technical basis for it does not come through  
14 clearly, through all of these graphs and thick  
15 documentation of what has been done to achieve the  
16 change in the power, using all approved methodologies  
17 and all of that.

18 MR. GOLBABAI: May I?

19 MEMBER SCHROCK: Yes.

20 MR. GOLBABAI: My name is Mehron Golbabai.  
21 I am with Westinghouse. I'm not a core designer, so  
22 I'll try to make a brief explanation, and if that  
23 doesn't satisfy you, I'll get in touch with someone.  
24 Our understanding is there are three elements that are  
25 involved. One is originally these cores were

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1 designed, of course, with shims and now we have  
2 burnable absorbers. That gives about, let's say three  
3 percent more number of fuel rods that you already  
4 have, compared to when these cores originally were  
5 designed.

6 The second element of course is the number  
7 of batches. You put up a few more assemblies for  
8 every number of reloads and that reduces the general  
9 power that each assembly has to generate. And then  
10 the third element is the Erbia. That being a diluted  
11 poison, that allows the power within each assembly to  
12 be more uniform. Therefore, the peak in a given  
13 assembly is not high with respect to the rest of the  
14 rods in that assembly. So those three elements  
15 combined, but if you like to, I can get more of an  
16 explanation.

17 MEMBER SCHROCK: That's a local peaking  
18 consideration, not a core. That's not something you  
19 can explain here in five minutes. What I'm saying is,  
20 the documentation ought to provide enough technical  
21 detail about exchanges and, instead, the documentation  
22 is voluminous but doesn't convey an awful lot of  
23 technical information. That's basically the problem  
24 I have.

25 MEMBER SIEBER: It seems to me you

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1 ordinarily find the detailed explanation of the  
2 analysis as part of the safety evaluation for each  
3 core, which is usually prepared two or three months  
4 before the refueling occurs. And the way those are  
5 done is, at least in the old days, they would use some  
6 steady state core model, which was a diffusion code,  
7 describe the flux and the relationship between flux  
8 and power, both locally within an assembly, and across  
9 the core.

10 And then from that, they would use  
11 correlations of thermal hydraulic mixing correlations  
12 to determine what the rod temperature would be in each  
13 case and the numbers are the peak clad temperature of  
14 2200, which was the final acceptance criteria for ECCS  
15 plus DMBR and these are expressed in terms of peaking  
16 factors that you can measure by looking at things like  
17 axial offset and so forth.

18 I really didn't expect to see that detail  
19 in this application, but I know that before you can  
20 start up, you have to have an approved safety  
21 evaluation for the reload and modern RSEs don't have  
22 a lot of documentation either, because they rely on  
23 preapproved topicals that all the fuel vendors put in.  
24 So they just list all these and say, this is how the  
25 answer came out, and here are all your limits.

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1           It is, I agree with you, difficult to  
2 understand exactly what they're doing because they've  
3 been doing this for so many years over and over again,  
4 using basically the same methods that they sort of cut  
5 it short I think. Do you agree with that, sir?

6           MR. GOLBABAI: Yes, things that we are  
7 discussing here are well within the range of what  
8 we've been experiencing in all our plants, and the  
9 analyses are the same methodologies.

10          CHAIRMAN WALLIS: I think the problem is  
11 you have a big computational system for all kinds of  
12 computer calculations. When you look at the details  
13 as we did with some of the GE cores, we find that the  
14 sort of power distribution jumps all over the place,  
15 depending on how things are reloaded, which is a  
16 burner which is not running. And it's difficult for  
17 someone to get sort of the perspective with all those  
18 details there. How do you actually achieve this power  
19 distribution on the average? You're lost in the  
20 detail.

21          MEMBER SIEBER: When you do core design,  
22 you design for whatever works, as opposed to having a  
23 code system that will optimize fuel. Generally that  
24 comes from experience. There are insertable, burnable  
25 poisons. There are codings. There are integral

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1 burnable poisons like Gadolinia, plus you can zone the  
2 fuel, different enrichments within a rod or different  
3 rods within an assembly. And it's sort of a guessing  
4 game and you keep trying designs until you get one  
5 that works. And then once you get one that works,  
6 that's what you end up building.

7 MEMBER KRESS: Basically you have to have  
8 more neutrons, more power in the radial directions.

9 MEMBER SIEBER: That's correct.

10 MEMBER KRESS: And you do that by putting  
11 in more fuel and taking out some of the poisons.

12 MEMBER SIEBER: Right. Iron enrichment and  
13 then you'd have to shape that.

14 MEMBER KRESS: You have to shape it.

15 MEMBER SCHROCK: Well, when you put this  
16 together with the fact that an uprate of 7.5 percent  
17 is requested based on methodology that is archaic, it  
18 leaves a lot of unanswered questions. I mean there  
19 have been very, very developments in reactor  
20 neutronics analysis in the 19 years that this thing  
21 was put on the street, the Westinghouse plan for  
22 uprates 1983.

23 MEMBER SIEBER: Right.

24 MEMBER SCHROCK: And I'm confident that  
25 some of the basis justifying the request is embedded

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1 in new analytical methods that are available and that  
2 in some way are being used. But it is very unsettling  
3 to understand that the decision finally is going to be  
4 based upon thermal hydraulics analyses that are so  
5 archaic as to essentially reflect no improvement over  
6 those 19 years. It's not a satisfactory situation.  
7 That's my view.

8 MEMBER KRESS: How well do you know, after  
9 the fact, what your power distribution is?

10 MR. DAIBER: The cold system on my  
11 monitoring system does verify the core power  
12 distribution.

13 MEMBER KRESS: It verifies that you've got  
14 the power distribution you thought you had.

15 MEMBER SCHROCK: On an assembly basis.

16 MR. DAIBER: Yes, on an assembly.

17 MEMBER SCHROCK: Not on a rod basis.

18 MEMBER KRESS: But that's close enough to  
19 give you a pretty good average.

20 MR. DAIBER: I think so.

21 CHAIRMAN WALLIS: So you say even though  
22 it's not a method that's been checked against many of  
23 these real cores, it's really got a solid basis of  
24 empirical evidence behind it?

25 MR. DAIBER: Yes, and obviously we use

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1 Westinghouse for our core designs, and they've been  
2 designing the cores for comparable CE plants. They  
3 have a wealth of knowledge and experience based on  
4 their prior core designing considerations, and they  
5 use that when looking at our Cycle 16 specific core  
6 designs.

7 MR. KRERSS: And there are tech spec limits  
8 on these core power distributions that you can't  
9 exceed, or not?

10 MR. DAIBER: There are with respect to ASI  
11 indices. There are limits, and the verification,  
12 there's more of a tech spec with respect to verifying  
13 that the actual predicted and actuals are within  
14 compliance. The verification of the inquiries that  
15 they're measuring is verified I believe on a monthly  
16 basis. Is that correct? On a monthly basis to the  
17 predicted method, the predicted core powers.

18 MEMBER KRESS: Thank you.

19 CHAIRMAN WALLIS: Now you have another 10  
20 slides or so before the next speaker?

21 MR. DAIBER: Yes.

22 CHAIRMAN WALLIS: Can we get through this  
23 by about quarter past 10:00, we have a break then.  
24 That should decide how it's going for you. But I  
25 think it appropriate to have a break after you

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1 presentation, unless you get really stuck along the  
2 way.

3 MR. DAIBER: Like I was now? With that,  
4 I'm going to move on to the fourth agenda item, which  
5 are review issues. And within the review issues,  
6 we've kind of reordered some of the sub-bullets here.  
7 The first one we'll be going over is ATWS, and then  
8 containment, and then I'll turn it over. We'll go to  
9 break possibly at that point before we go to the  
10 operations.

11 MEMBER POWERS: Just glancing at your  
12 slides, when you introduce this discussion of ATWS by  
13 explaining an ATWS transient to the panel?

14 MR. DAIBER: With respect to the PWRs, the  
15 ATWS transients, we consider a lot of the same  
16 initiating events with respect to loss commensurate  
17 backings, loss of feedwater type events, in which the  
18 plant does not, would not have scram by the normal  
19 reactor protective system, and hence resulted in  
20 increased pressures and core powers due to loss of  
21 feed potentially too as a result of that.

22 When we analyzed - as far as the CE design  
23 considerations with respect to ATWS, we don't analyze  
24 those specific events. Based on compliance with 10  
25 CFR 5062, the CE design approach was, rather than to

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1 actually analyze those events where the scram and  
2 feedwater actuations may not have occurred, we have  
3 rather committed to and have already installed a  
4 diverse scram system, a diverse turbine trip system,  
5 and a diverse emergency feedwater actuation system.

6 So from our design consideration  
7 standpoints, we don't analyze a specific event. We  
8 insure that the probability of design is low enough  
9 and reasonable enough for us to consider. Again,  
10 that's achieved with the installation of the the DSS,  
11 DEFAS and DTT. Those systems that we've installed,  
12 we've verified those design criteria with respect to  
13 those redundant systems, to make sure that under  
14 operating conditions, that the design criteria were  
15 still met.

16 CHAIRMAN WALLIS: These design criteria,  
17 you have diverse systems so that it never really  
18 happens or the probability of it really happening is  
19 very low. Do you have numbers to put on those  
20 probabilities?

21 MR. DAIBER: I don't have numbers with me.

22 CHAIRMAN WALLIS: Is the decision made by  
23 the NRC based on some quantitative probalistic  
24 analysis or by some expert estimates or what? How do  
25 you decide it's good enough.

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1 MR. DAIBER: I believe that was decided  
2 with the NRC through the development of the rulemaking  
3 where there is acceptable criteria.

4 CHAIRMAN WALLIS: A long time ago. It  
5 probably says if you have enough diversity, it's okay.  
6 It probably doesn't stick numbers on it.

7 MR. DAIBER: I don't know if there were  
8 actual numbers generated at the time.

9 MR. BOEHNERT: Yes, there were.

10 CHAIRMAN WALLIS: Okay, there were.

11 MR. BOEHNERT: I don't remember them but I  
12 know there was extensive work on probablistic  
13 valuations for the development of the rule.

14 CHAIRMAN WALLIS: From a mathematical  
15 basis. It's not just somebody's estimate?

16 MEMBER SCHROCK: From the standpoint of  
17 protection of capital investment, wouldn't it be  
18 prudent to know what an ATWS analysis results be?

19 MR. DAIBER: From the risk perception -

20 MEMBER SCHROCK: Ever been done on the  
21 plant?

22 MR. DAIBER: No. ANO 2 specific analyses  
23 were never looked at. Back during the development of  
24 the rulemaking considerations, there were some generic  
25 analyses performed in bounding nature for the CE class

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1 of plants, the 2800 megawatt thermal and then the  
2 4000, 3800 megawatt thermal plant range.

3 So there were some generic analyses done  
4 at that point in time, and the decision at that point  
5 was, rather than to pursue analytical methods to  
6 mitigate these, we actually installed additional  
7 hardware to insure that the increased pressures would  
8 not occur, rather than rely on operator action.

9 The hardware installed from the diverse  
10 scram system is a totally independent diverse and  
11 redundant system to the normal reactor protection  
12 system. In addition to the normal reactor protection  
13 system on high pressurized trip, the CPC plants also  
14 have a high range high pressure trip in the CPCs that  
15 also fits.

16 In order for an ANO 2 CPC type plant to  
17 get to this point, CPCs would have had to fail, the  
18 normal high pressurized trip system would have had to  
19 fail, plus the reverse redundant, the scram system  
20 that we've installed would have had to fail. So  
21 getting to that point is very, very low on the CPC  
22 type plants.

23 CHAIRMAN WALLIS: There's no operator  
24 intervention which would somehow short circuit all  
25 these systems?

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1 MR. DAIBER: No. No.

2 CHAIRMAN WALLIS: The sequence you  
3 described as being unlikely is independent of operator  
4 action?

5 MR. DAIBER: It's very quick. In the times  
6 we're talking, a very rapid trip response. Now the  
7 operators do have an additional DSS and DEFAS  
8 actuation should all of that still fail. They do have  
9 that luxury. But the timing of such shouldn't be  
10 necessary.

11 With respect to the DSS system, the way  
12 the system was installed, again it's a reverse  
13 redundant scram system, installed at ANO 2. The  
14 setpoint it was at on that is set such that it  
15 actuates after the normal reactor protective system  
16 setpoint would actuate, but prior to this primary  
17 safety valves lifting. And the timing on that trip  
18 and the setpoint itself are verified to make sure that  
19 it doesn't interfere with the normal reactor  
20 protective system trip on high pressure.

21 We reviewed those design criteria and  
22 insured that the current setpoint and settings and  
23 response times are acceptable under operating  
24 conditions.

25 MEMBER KRESS: Is this power uprate

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1 strictly for ANO 2?

2 MR. DAIBER: Yes.

3 MEMBER KRESS: And does ANO 1 claim to have  
4 one at some time or has it already had one?

5 MR. LANE: This is Rick Lane again. We're  
6 initiating some studies this year to look at that.  
7 We've done a previous study back in the mid-'90s and  
8 we're going back and re-reviewing that and seeing what  
9 the potential is for ANO 1. But at this point in  
10 time, it's strictly in the study phase.

11 MEMBER KRESS: And they're both on the same  
12 site?

13 MR. LANE: Same site. They're on the same  
14 site.

15 MEMBER KRESS: And that's the only two  
16 plants on that site?

17 MR. LANE: That's the only two plants on  
18 that site.

19 MR. ADAMS: They (off mike).

20 MR. LANE: Yes.

21 MR. DAIBER: With respect to the DEFAS in  
22 a similar fashion, we have installed the diverse  
23 emergency feedwater actuation system, and it also has  
24 a redundant or a low steam generator actuation on  
25 DEFAS. So the normal RPS system actuates EFW at about

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1 22.2 percent, and the diverse actuation occurs at  
2 about 16 percent. The setpoint is set lower, and  
3 response time is set such that won't interfere with  
4 the normal reactor protective system response  
5 considerations.

6 Those were reviewed with respect to power  
7 uprate considerations and verified still to be  
8 acceptable under power uprated conditions. So in  
9 conclusion, we reviewed the ATWS design requirements  
10 for ANO 2 and found those to be acceptable.

11 I'll move on to the containment  
12 considerations and real quickly, I'm just going to go  
13 over it from the analytical perspective now, what we  
14 saw during the RSG effort.

15 From an overview perspective, we've  
16 looked, when we did the RSG project, we made sure we  
17 accounted for power uprate in those analytical  
18 efforts. Analyses and the methods we used for  
19 determining peak containment pressure design were  
20 based on approved methodology. We used the  
21 Westinghouse former CE methods for determining  
22 mass/energy release for both the LOCA and main steam  
23 line break analyses.

24 We looked at a spectrum of break sizes,  
25 and we also looked at various power for the steam line

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1 break considerations. We also looked at various  
2 single considerations. The mass and energy released  
3 that's generated with the Westinghouse method is then  
4 put into the Bechtel COPATTA code for determining peak  
5 building pressure.

6 MEMBER SHACK: What's the limiting break  
7 here?

8 MR. DAIBER: The limiting break is just  
9 every so slightly a LOCA over a steam line break and  
10 it's a discharge pump break.

11 MEMBER SCHROCK: But the number of break  
12 sizes specifically shown in the documentation was  
13 three. It's difficult to make a case that you found  
14 the peak in the relationship that peaks within the  
15 range of those three data points by selecting the  
16 highest among them.

17 MR. DAIBER: You're referring to the LOCA  
18 consideration?

19 MEMBER SCHROCK: Right.

20 MR. DAIBER: Yes, from the LOCA  
21 consideration, the double-ended -

22 (Simultaneous voices.)

23 MR. DAIBER: Yes, I jumped to combusted  
24 steam line. The limiting is LOCA. And from the LOCA  
25 consideration, the double-ended slot area break, which

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1 is effectively the cross-section of the cold leg pipe  
2 put into a slot formation has historically been  
3 determined to be the peak break consideration for the  
4 last many years.

5 MEMBER SCHROCK: Let me rephrase the  
6 question, because I think you're not getting it. If  
7 one has to determine the maximum in a value from  
8 several determinations, it's not possible to find the  
9 maximum or to justify that it is the maximum by saying  
10 that the one in the middle is the highest and the two  
11 on the extremes are lower, and we take the one in the  
12 middle from a three point evaluation as being the max.

13 MR. WILSON: Bryan, what he's asking if I  
14 could help. That's what we presented just to show it  
15 was, that we had looked on both sides. But they  
16 looked at other sizes. The way we submitted it was to  
17 show a size on both sides of the one we picked as a  
18 peak one, but that's not all I believe we looked at.

19 MEMBER SCHROCK: Let me just say, the  
20 documentation does not show clearly that you in fact  
21 had found the maximum.

22 MR. WILSON: That's right, it didn't.

23 CHAIRMAN WALLIS: I take it the argument is  
24 that you have from past experience, from calculating  
25 many breaks on low power -

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1 MR. WILSON: Right.

2 CHAIRMAN WALLIS: - you have sort of the  
3 curve.

4 MR. WILSON: Right.

5 CHAIRMAN WALLIS: Now you've got a curve  
6 and you've got three points which have moved a little  
7 bit from that curve. So it's not perhaps unreasonable  
8 to draw in a curve like the old curve.

9 MR. WILSON: Right, and then we presented  
10 the maximum one and the one on either side of it.

11 CHAIRMAN WALLIS: You're saying you already  
12 have the curve.

13 MR. DAIBER: I think I may be confused  
14 here. When we do the 5046 compliance on peak  
15 temperature, we look at a spectrum of break sizes, and  
16 have looked on both sides. With respect to the peak  
17 building pressure, containment pressure analysis, the  
18 limiting break historically has been determined based  
19 on a four guillotine slot leg break orientation, and  
20 that's what we've looked at here when we did these  
21 analyses.

22 So based on historical perspective,  
23 effectively used the same methods that we used  
24 originally, and we zeroed in on those classic limiting  
25 break sizes, again using Westinghouse methodologies

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1 and Westinghouse experience on doing these for not  
2 just ANO 2, but other CE plants, some of which are a  
3 significantly larger power rating than us.

4 And based on that, we developed our peak  
5 limiting breaks, based on their knowledge of what is  
6 a limiting break, which is a double ended guillotine  
7 slot orientation for the cold leg, and we also looked  
8 at hot leg breaks. We looked at suction, discharge  
9 and hot loge considerations.

10 Again, all those configurations are based  
11 on the double and the guillotine configurations and  
12 size for determining peak building pressure.

13 CHAIRMAN WALLIS: Did you resolve the  
14 question of mixing in the containment which the NRC  
15 raised with you?

16 MR. DAIBER: Yes, with respect to the dose  
17 analysis considerations, we did resolve that.

18 CHAIRMAN WALLIS: That's only for dose  
19 analysis. You don't worry about that for calculating  
20 pressure?

21 MR. DAIBER: No. That issue that raised  
22 with -

23 CHAIRMAN WALLIS: Is this one node? How  
24 many nodes are there in the containment?

25 MR. DAIBER: Under the large break LOCA

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1 mass energy release considerations for peak pressure  
2 we model it as one node.

3 CHAIRMAN WALLIS: It's a well mixed  
4 containment?

5 MR. DAIBER: Yes, under those turbulent  
6 condition, it's a well mixed.

7 MR. WILSON: Excuse me. Bryan Wilson. Was  
8 there not a confirmatory analysis in one of those?

9 MR. DAIBER: Yes, that's correct from the  
10 peak building pressure standpoint, there was - the NRC  
11 did perform a confirmatory analysis on the peak  
12 building pressure analysis evaluation.

13 MR. WILSON: And found, I believe in their  
14 analysis they came up with lower numbers than we did.  
15 They found our analysis to be conservative.

16 CHAIRMAN WALLIS: Okay, so we can ask them  
17 about that then.

18 MR. WILSON: Yes.

19 CHAIRMAN WALLIS: Thank you.

20 MR. DAIBER: So we did perform these  
21 analyses using the methods, approved methodologies  
22 that we've used in the past. The results were bounded  
23 for power uprate, and again this was all done as part  
24 of the RSG effort and approved under the license  
25 amendment 225 already.

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1           The limiting consideration. Again, we  
2 looked at large break LOCA and steam line breaks. We  
3 did look at single considerations, limiting single  
4 fire for the LOCA was a loss of 80g. For a steam line  
5 break, the prior evaluations had indicated a 2770  
6 megawatt thermal power level that is limiting.

7           We went through a power level verification  
8 as part of the RSG effort, and determined that the  
9 zero power level indication or power was more limiting  
10 under power uprated conditions, and it's really more  
11 a matter of the new steam generator design, the  
12 integral flow restricting nozzle, and the CS AS  
13 actuation signal that we implemented, caused that  
14 change in power level for limiting steam line break.

15           The peak pressure is actually calculated  
16 with 57.6 per LOCA and 57.4 for the hot zero power  
17 steam line break. There's a typo on the slide there.  
18 So in conclusions, the peak pressures that we  
19 calculated there were within the new uprated design  
20 pressure of 59 pounds, and therefore found to be  
21 acceptable.

22           CHAIRMAN WALLIS: These peak pressure are  
23 calculated with conservative assumptions, so there's  
24 no need to discuss uncertainty and predictions.

25           MR. DAIBER: Through the whole process of

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1 developing containment analysis, the LOCA analyses,  
2 5046 analysis and non-LOCA analysis process, when we  
3 developed input considerations, we interfaced with the  
4 field vendor on those methodologies for the most part,  
5 and the methodologies there, or the inputs associated  
6 with that are documented in what we call the ground  
7 rules.

8 So, before we kicked off this effort to do  
9 both RSG and power uprate, we did a thorough review of  
10 those ground rules that we interfaced with and made  
11 sure that we accounted for current operating  
12 conditions and made sure that we accounted for any  
13 conservatisms, and values that we felt we may want to  
14 accommodate additional margins in.

15 CHAIRMAN WALLIS: That's what I'm asking  
16 about. You give us 57.6. That I think is calculated  
17 with conservative assumptions. The realistic value  
18 would be much lower?

19 MR. DAIBER: That's correct.

20 CHAIRMAN WALLIS: Because if this were  
21 realistic value, we'd be really interested in the  
22 uncertainties.

23 MR. DAIBER: Yes.

24 CHAIRMAN WALLIS: It may be the uncertainty  
25 of five psig would be significant.

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1 MR. DAIBER: Yes. Yes, definitely. When  
2 we developed those inputs, we developed a set of  
3 inputs that we thought would be very conservative and  
4 very bounding. So the peak pressures that we are  
5 calculating are considered very conservative.

6 CHAIRMAN WALLIS: If you knew they were  
7 conservative.

8 MR. DAIBER: Yes.

9 CHAIRMAN WALLIS: You knew that with good  
10 reason.

11 MR. DAIBER: Yes. We feel that, we know  
12 that they're conservative. In fact, during -

13 CHAIRMAN WALLIS: Not feeling. Feelings  
14 aren't allowed here.

15 MR. DAIBER: We know they are conservative  
16 because during the steam generator replacement  
17 process, we did try to keep it down below 54 pounds,  
18 so we did pull out some of those conservatisms to get  
19 it down to 54 pounds, and if we really had to get it  
20 down to 54 pounds, we could have gotten it down below  
21 54 pounds.

22 But based on previous experience, we were  
23 running right at 54 pounds for many years. We always  
24 were bumping up against the limit and therefore, we  
25 wanted to continue to run up against that limit. We

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1 went ahead and went over 54 and put margins in the  
2 input assumptions to go along with it.

3 With that, do you want to take a break?  
4 Or, we could turn it over to Rich.

5 CHAIRMAN WALLIS: No, I think it's a good  
6 time to take a break. You've finished almost exactly  
7 on time. Thank you very much. We will take a break  
8 until 10:30.

9 (Whereupon, the above-entitled matter went  
10 off the record.)

11 CHAIRMAN WALLIS: Ready to go? All right,  
12 now we are ready to go.

13 MR. SWANSON: My name is Rich Swanson. I'm  
14 an operations shift manager and I have a senior  
15 reactor operator license on Unit 2. I'm the officer  
16 representative on the power uprate project, and before  
17 that, I was also on the steam generator replacement  
18 team.

19 My main functions on the project were to  
20 provide operations oversight, review all the  
21 modifications and evaluations for impact on  
22 operations, and also to review the impact on emergency  
23 operating procedures.

24 Training on the uprated plant has already  
25 started. The simulator has been changed to

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1 accommodate the new updated plant. We can swap it  
2 back and forth for current cycle and future cycle to  
3 accommodate just in time training. We're providing  
4 two crew training cycles, pretty much dedicated to  
5 power uprate training, and each crew will be evaluated  
6 on the updated plant prior to outage.

7 Now I want to point out the changes we're  
8 doing for power uprate have much less impact in steam  
9 generator replacement. Controls and display changes  
10 are minimal or none. There's no physical  
11 modifications to control stations due to power uprate,  
12 and no changes to the format of the safety parameter  
13 display system. Some display ranges will be re-  
14 scaled, however, to accommodate higher flows and  
15 pressures we'll be seeing.

16 We have approximately 75 procedures to  
17 change for power uprate. It included emergency,  
18 abnormal, normal operating procedures, but there's no  
19 changes to the type and scope of procedure and we  
20 didn't write any new procedures for power uprate.

21 There's no changes in the type of nature  
22 or actions in our emergency operating procedures, and  
23 we didn't have to add any new actions to our EOPs.

24 The power ascension testing will be  
25 heavily coordinated and controlled by operations.

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1 We're involved in development and implementation of  
2 all the tests. We had test teams designated to  
3 perform the testing. During our outage, we'll have  
4 two crews working outage and we'll have a team on each  
5 crew, and these are experienced operators. The leads  
6 on each team were also involved in the testing for the  
7 steam generator replacement.

8 The power ascension testing will be  
9 basically normal testing until we get up to 90 percent  
10 of the new rating, which is approximately 98 percent  
11 of our current power. From there, we'll step up in  
12 2.5 percent increments with about a 24 to 48-hour hold  
13 at each increment of power, and we'll be doing walk  
14 downs, control system checks and verifying all the  
15 parameters we're seeing against our design parameters,  
16 and any issue that comes up will be resolved prior to  
17 going to the next power level.

18 MEMBER POWERS: What are you going to be  
19 looking for in the walk downs?

20 MR. SWANSON: We're walking down for  
21 vibrations mostly and systems. We'll have engineers  
22 out actually taking and measuring vibrations, and  
23 we'll have the operators out there looking at the  
24 systems and making sure it looks right to the  
25 operators, because the operators can see things the

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1 engineers can't.

2 MEMBER POWERS: So it's actually more than  
3 walk downs. You're actually doing the monitoring for  
4 vibrations?

5 MR. SWANSON: Yes. Here's a power  
6 ascension profile that testing, what we're going to be  
7 doing coming up out of our next outage. Basically up  
8 to 90 percent in CR standard turbine over speed trip  
9 testing, we have three power holds for physics  
10 testing, and then after we get to 90 percent, you show  
11 going up in two percent increments, up to 100 percent.

12 MEMBER POWERS: How do you decide whether  
13 it's 24 or 48 hours?

14 MR. SWANSON: However long it takes for  
15 engineers to collect their data and for engineering  
16 and operations to be comfortable with the plant and  
17 that what we're seeing is actually what power we're  
18 making.

19 MEMBER POWERS: So you're not looking for  
20 something that's time dependent. It's just  
21 operational time?

22 MR. SWANSON: That's correct. There's no  
23 time limit. There's no actual limit on that, but it  
24 will take at least 24 hours to collect the data and  
25 analyze it.

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1                   And in conclusion, impact and power uprate  
2                   on operations training procedures and response time  
3                   has been evaluated and it's found to be acceptable.

4                   CHAIRMAN WALLIS: There's some response to  
5                   that since it's changed significantly?

6                   MR. SWANSON: As far as emergency operating  
7                   procedures, no. We do have, for instance, on a main  
8                   peak pump trip, we would have to respond faster to  
9                   keep the plant from tripping. But it's faster than it  
10                  is this cycle, but it's not faster than it has been in  
11                  previous cycles. We gained extra time. We replaced  
12                  steam generators to respond to main peak trip.

13                  CHAIRMAN WALLIS: Right.

14                  MR. SWANSON: And that with power uprating,  
15                  it basically goes back to about where it was. And if  
16                  there's no further questions, I'll turn it over to  
17                  Dale James. He can talk about Alloy 600.

18                  MR. JAMES: Thank you, Rich. Good morning.  
19                  My name is Dale James. I'm the manager of engineering  
20                  programs and components at Arkansas Nuclear One, and  
21                  my group has responsibility for the steam generator  
22                  integrity, fact program and the Alloy 600 program.

23                  I'd first like to talk about Alloy 600 and  
24                  the impact that we see associated with power uprate.  
25                  As has been mentioned, we will be increasing the Thot

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1 from it's current condition of just a little over 604  
2 to about the 609 range. Of course, we had a history  
3 of That changes ANO. We began at somewhere around 607  
4 during the early operations.

5 We reduced that temperature back in the  
6 mid '90s to preserve the steam generators down to the  
7 600 level. It's slightly increased, and then with the  
8 steam generator in place, we went up to the 604 area,  
9 and now with power uprate, we'll be going to 609. So  
10 we have a history of changes in That at ANO.

11 MEMBER POWERS: I'm puzzled by the line on  
12 your slide. It says power uprate results in only a  
13 slight change of That, but a slight change of That was  
14 presumably a significant change of That in the past to  
15 preserve steam generators. Why is this one not  
16 significant in the other direction?

17 MR. JAMES: We felt like when we reduced  
18 That on steam generators that we were doing the right  
19 thing. We could continue to generate the power levels  
20 that the plant was designed to, while preserving for  
21 it adding margin. The exact impact of that reduction  
22 in temperature is really not known. Obviously -

23 CHAIRMAN WALLIS: Then are you doing the  
24 wrong thing, increasing the That?

25 MR. JAMES: We will be decreasing margins.

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1 The extent of that decrease is not known. What I will  
2 present to you is how our programs will or will not  
3 change as a result of that increase with respect to  
4 Alloy 600.

5 POWERS: That is a good representation of  
6 your head temperature?

7 MR. JAMES: Actually not. Actually on the  
8 ANO Plant and several other combustion plants, I'm not  
9 sure about some other Westinghouse plants, but we do  
10 have a bypass flow into the head region from the cold  
11 leg, and get mixing in that area such that the head  
12 temperature is about 14.5 degrees cooler than the  
13 actual That.

14 MR. JAMES: So with respect to the power  
15 uprate and its implications as far as increasing hot  
16 leg temperatures, what we're going to be looking at  
17 its effect on the reactor vessel head penetrations.  
18 That would include the control on the dried mechanisms  
19 as well as our in coil instrument nozzles, and we have  
20 one head vent.

21 Just for references, 81 control on that  
22 dried mechanism nozzle, 8 ICI nozzles and one vent on  
23 the head.

24 MEMBER SHACK: Now presumably there's an  
25 Alloy one maybe two weld on each of these nozzles,

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1 right that would be focused on Alloy 600? This is a  
2 CE plant, so there's no Alloy 182 butters between  
3 carbon, steel and stainless anywhere in the system?

4 MR. JAMES: Dan, can you help me out on the  
5 specific design of the welds.

6 MR. SPOND: Yes. My name is Dan Spond.  
7 I'm an energy engineer. We have butter welds, but  
8 they're not at the CE DM location. The CE DMs, well  
9 they are welded to a butter joint at the J-groove weld  
10 on the erector head. Yes, with 182, and that's really  
11 the same weld metal that the rest of the industry  
12 uses.

13 MEMBER SHACK: Right. Now do you have a  
14 stainless fluridic steel butter anywhere that you've  
15 got a way to weld, aside from these 600 compounds? Do  
16 you have a stainless 182 fluridic? You know, like  
17 Westinghouse has their -

18 MR. SPOND: No, we do not, not on say the  
19 hot legs of the RCS piping.

20 MEMBER SHACK: No, you wouldn't have it on  
21 the hot leg, but there's nothing in the presurizer, no  
22 stainless butter?

23 MR. SPOND: The pressure on the surge line  
24 is stainless steel, so we do have it coming off of the  
25 hot leg, I guess. And that is part of the ISI

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1 program. So we do inspect those welds.

2 MR. HASLINGER: Karl Haslinger,  
3 Westinghouse. There are a few locations which have  
4 the 82 182 weld in all the C plants. Typically, there  
5 would be, with the exception of two plants. One has  
6 stainless steel made in coiled loop piping. The other  
7 plant, well - most of the plants have 82 182 weld at  
8 the nozzle to the tributary piping weld locations at  
9 the safe ends, and those are being evaluated currently  
10 on the MRP project.

11 The other location is on the pressurizer,  
12 such as the surge line nozzle, on both ends as well as  
13 the spray nozzles and the relief valve nozzles. So  
14 there are a variety of locations in C plants that have  
15 this problem, which is sort of a result from the VC  
16 Summers evaluations, and those are being looked at  
17 right now from a stress corrosion point of view.

18 MR. JAMES: Okay, so as far as other nozzle  
19 locations by Alloy 600 material, we also have cold leg  
20 nozzles. We're not going to talk about those, because  
21 actually cold leg temperature has decreased from our  
22 original design down to 551. It's increasing from  
23 this previous cycle to the current cycle, from 553 to  
24 - excuse me, 529 to 551. Thank you Bryan.

25 That's fairly far from the activation

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1 cooling for Alloy 600, so really we anticipate minimal  
2 impact on the cold legs. Also the pressurizer  
3 conditions are not changing as a result of power  
4 uprate, so those nozzles in the pressurizer should not  
5 be impacted as the result of power uprate conditions.

6 MEMBER POWERS: Can you explain to me what  
7 you mean by the activation point?

8 MR. JAMES: Well, I think the industry  
9 indicates that somewhere close to 600 degrees is a  
10 point where the Alloy 600 material becomes impacted as  
11 a result of temperatures. That's what we're using as  
12 far as our evaluations on the head with respect to  
13 evaluating it against the conditions that were  
14 evaluated at Oconee, and I'll talk about that in just  
15 a little bit.

16 MEMBER POWERS: I guess I'm still  
17 perplexed. We're talking about a chemical process,  
18 and you're saying it has a threshold temperature to  
19 it?

20 MR. JAMES: I think that is a common belief  
21 that there is a threshold somewhere close to 600  
22 degrees, yes.

23 MEMBER POWERS: Unremarkable.

24 MEMBER SHACK: Yes, I would think a lot of  
25 people would disagree with that. I mean it is

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1 probably true that the rates go down as the  
2 temperature goes down. There would be very little  
3 disagreement about that. But an actual threshold.

4 MEMBER POWERS: Unusual in chemistry to  
5 find, except phase transitions.

6 MR. JAMES: Okay, Dennis, let's go to the  
7 next slide. We're going to add our small bore  
8 nozzles. By small bore, I'd be referring here to the  
9 hot leg nozzle. I'm going to cover the head nozzles  
10 in my discussion in the next slide.

11 We have a program currently underway to  
12 evaluate or to assess damage to these nozzles as the  
13 result of their being exposed to elevated  
14 temperatures, and that basically what we do to address  
15 that is we form inspections. The first inspections  
16 that we perform are generic letter 8005. Those are  
17 the basically boric acid walk down whenever we go hot  
18 shed down, looking for indications of any leakage from  
19 those nozzles.

20 In addition to that evaluation though,  
21 each refueling outage, we do a bare metal examination  
22 of those hot leg nozzles, as well as the nozzles on  
23 the pressurizers to determine if there is any  
24 indications of leakage from those nozzles.

25 That's how we're addressing it. That's

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1 how we will continue to address the Alloy 600 issues,  
2 associated with these nozzles. But in addition to  
3 that, as we identify leakage and have performed  
4 preventative change outs, we are changing that  
5 material out to a 690 material that has been  
6 determined to be much less susceptible to primary  
7 water stress corrosion cracking.

8 We have done that on nine of the 19 hot  
9 leg nozzles. All the nozzles below the mid loop level  
10 on the hot legs have been repaired with 690 material  
11 already.

12 MEMBER POWERS: I'm puzzled by your first  
13 sentence. It says that you have a higher  
14 susceptibility to failure, but no change in safety  
15 significance. That means you've evaluated something  
16 like the risk reduction or risk achievement and the  
17 number doesn't change?

18 MR. JAMES: What I mean by that is the  
19 failure mechanisms that the industry is saying,  
20 regardless of the temperatures that the small bore  
21 nozzles have been exposed to, have typically been the  
22 traditional axial flaws in the base metal material,  
23 and we have not seen anything that would indicate  
24 there would be any changes in that as a result of the  
25 power uprate for the small bore nozzles that we would

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1 continue to see.

2 When they do demonstrate indications of  
3 damage, it would be an axial flaw that would not  
4 represent a safety concern with respect to significant  
5 leaky bore ejection. Okay, let's go to the next  
6 slide. We're talking about the upper vessel. We're  
7 talking about the head penetrations. Again, we are  
8 dealing here with the control and dry mechanism  
9 nozzles, as well as the ICI nozzles and the vent  
10 nozzle on the reactor vessel head.

11 Basically these nozzles have been  
12 evaluated by the industry in accordance with generic  
13 letter - or bulletin, excuse me, 2001 01. Industry  
14 response was repaired by that, by the materials  
15 reliability program group, a subcommittee of EPRI, and  
16 their results were documented in the NPR report 48.

17 And basically what that report did was  
18 perform a ranking of the facility based on the number  
19 of EFPY of operation required for that unit. In this  
20 case, ANO 2, to reach the same number of EFPY as  
21 Aconee Three, normalized for the difference in head  
22 temperature, and using 600 degrees as the starting  
23 point for initiation, that's how they normalize this.

24 And what we found out when we did that  
25 evaluation originally under the power uprated

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1 condition that we had essentially 17.1 effective full  
2 power years before we would reach a condition similar  
3 to that that Aconee had experienced on March 1<sup>st</sup> with  
4 Tzero being March 1, 2001.

5 We then performed an evaluation with the  
6 uprated temperature of the erector vessel head,  
7 associated with the power uprate, and that number  
8 reduced down from 17.1 to 14.2. What that resulted  
9 is, the NRC asked - or the industry and NRC agreed to  
10 a categorization with respect to the response of the  
11 utilities as a result of that evaluation back to  
12 Aconee.

13 ANO 2 originally hit the 17.1 and even at  
14 the 14.2 fell into the moderate category of the third  
15 category. Those are plants that were five to 30 EFPY  
16 away from Aconee conditions. So the response  
17 essentially is unchanged. That response is that we  
18 would perform a visual. It required us to provide an  
19 effective visual examination of the head, which is  
20 basically if you were capable of performing a 100  
21 percent visual examination of the head, you could use  
22 that to determine any risk significance associated  
23 with primary stress and cracking.

24 Unfortunately for us, the insulation  
25 materials on the Unit 1 head follow the contour and do

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1 not allow for visual examination. So we will be  
2 performing a 100 percent NDE examination during our  
3 upcoming refueling outage to monitor for any type of  
4 damage to those nozzles.

5 MEMBER SHACK: So that means UT?

6 MR. JAMES: That is the plan, UT from below  
7 the head.

8 MR. DAIBER: Excuse me. That's using  
9 Westinghouse Robotics system from underneath the head  
10 during the inspection.

11 MR. JAMES: Exactly what the long-term  
12 plans will be is going to be dictated based upon what  
13 the industry sees as the result of these early  
14 examinations and further evaluation of that to predict  
15 what to project, what additional scope of inspections  
16 will be in the future.

17 So in summary, the vessel had penetrator  
18 susceptibility as characterized being in this moderate  
19 category. Even under the power uprated conditions,  
20 essentially our activities or plans to address that  
21 will remain the same. That will be 100 percent UT  
22 examination of those head penetrations. The  
23 programmatic reviews and our continued review of the  
24 industry data will dictate to us, you know, what we'll  
25 be doing going forward to insure that these small bore

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1 nozzles, as well as the head penetrations do not  
2 represent any safety issues associated with in canal  
3 cracking.

4 So we believe that the plant can safely be  
5 operated considering the Alloy 600 concerns, even in  
6 the power uprated condition.

7 Let's go onto flow accelerated corrosion.  
8 Of course, flow accelerated corrosion or FAC as I'll  
9 refer to it as, it affects carbon steel components in  
10 the steam cycle where a processed temperature is above  
11 200 degrees, and there's many factors that go into the  
12 degradation rate. Probably one the significant is the  
13 material composition of the piping itself.

14 What we've seen is piping with even  
15 minimal contents of chrome are significantly less  
16 susceptible to FAC damage than normal carbon steel.  
17 Also geometry plays a part. Steam quality  
18 temperature, oxygen, the flow of velocities, and Ph of  
19 the liquid itself.

20 What power uprate is going to do to us  
21 primarily is going to result in increased flow rates.  
22 We also evaluated the impacts on temperature and  
23 pressure changes and industry changes. Chemistry  
24 essentially remaining unchanged under the power  
25 uprating condition.

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1 MEMBER SHACK: Now when you took out all  
2 the copper, did you up your ph and your feedwater?

3 MR. JAMES: We're running above 9.5 ph  
4 right now.

5 MR. DAIBER: Yes, we did.

6 MR. JAMES: Which is good for FAC. What we  
7 did to evaluate the impacts of these changing  
8 conditions on the power uprate is basically use the  
9 industry Checkworks program. Of course, that's a  
10 program that's been developed by EPRI. That is a  
11 standard program for all the utilities used to do FAC  
12 evaluations.

13 We plugged these increased parameters, or  
14 these changing parameters into our Checkworks program  
15 to determine what increased conditions, or what  
16 additional susceptibility we may have with the main  
17 stem, main water, reheat steam, high pressure  
18 extraction, low pressure vents and drains, high  
19 pressure vents and drains, all those systems that  
20 could be impacted.

21 MEMBER KRESS: Had you used Checkworks on  
22 the previous level?

23 MR. JAMES: Yes.

24 MEMBER KRESS: So you had already done the  
25 uprates?

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1 MR. JAMES: Yes, sir. In fact we went back  
2 based upon our most recent inspection, or Checkworks  
3 program prior to performing this evaluation and going  
4 forward with it. But Checkworks has been used at ANO,  
5 as well as many other plants, most of the other plants  
6 in the industry for many years now.

7 CHAIRMAN WALLIS: What sort of rates do you  
8 measure? What are the highest rates you've been  
9 measuring?

10 MR. JAMES: It depends on the system, and  
11 basically what we have seen as a result of the most  
12 susceptible system, we're looking a like a five mil  
13 increase in the wear rate per year. It just depends  
14 on the system as to -

15 CHAIRMAN WALLIS: What was it before then?  
16 Because 5 mils the increase. What was it before?

17 MR. JAMES: There's a range from zero to  
18 20, 30 mils, and most of the higher wear rate systems  
19 have been replaced with higher alloy chrome.  
20 Geometries have been rearranged to minimize the  
21 conditions associated with geometry, so a lot of those  
22 higher wear rate systems, they've already been  
23 addressed, and been replaced building margin into the  
24 system as a whole.

25 To do our evaluation that we did, used

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1 worst case conditions, used maximum steaming rates due  
2 to the turbine valves wide open, and basically the  
3 result of the evaluation using the Checkworks program  
4 indicated that we would see no more impact as a result  
5 of the power uprated condition.

6 Those results are consistent to what other  
7 licensees have predicted, utilizing Checkworks program  
8 associated with power uprates. Also it's consistent  
9 with actual measured values following our power  
10 uprated conditions. So we feel good about that.

11 Of course, we will continue to monitor our  
12 piping systems as part of our FAC program. We'll be  
13 looking at those piping systems that we believe are  
14 most susceptible as a result of the power uprate  
15 during the next outage, and a part of that process  
16 will be feeding back any deviations from what were  
17 predicted into the checkworks program for future  
18 projections.

19 So, in conclusion, the evaluations that we  
20 performed indicated that FAC wear rate should be  
21 minimally impacted by the power uprated condition and  
22 we will continue to monitor those components that are  
23 affected, to assure that those predictions are, in  
24 fact, accurate and we'll factor in any deviations into  
25 future projections.

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1           Finally, I'd like to talk about steam  
2 generator integrity, and I think first and foremost  
3 with respect to this part of the presentation is that  
4 the steam generator replacements, which we've already  
5 talked about back in the fall of 2000, the steam  
6 generators that we replaced, our original steam  
7 generators were specifically designed and analyzed for  
8 the uprated power conditions.

9           There are many significant design  
10 enhancements that were implemented as a result of the  
11 steam generator replacement that were not part of our  
12 original steam generator design, and I could go into  
13 all of these that you'd like. We're very proud of our  
14 new steam generators, and I'm sure Westinghouse would  
15 be glad to do the same for you.

16           But I think most important is the change  
17 of the tubing material to the 690 thermally treated  
18 material. Also, the increase in the heat transfer  
19 area from a little over 69,000 square feet to a little  
20 over 108.7 thousand square feet. That increase in  
21 heat transfer area, not only allowed us to accommodate  
22 power uprate, but it allowed us to accommodate any  
23 plugging margin, as well as kept the Thot increase to  
24 a fairly minor increase by pushing that much heat  
25 transfer area into the generators.

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1 MEMBER SHACK: Who manufactured these  
2 generators?

3 MR. JAMES: These replacement steam  
4 generators were manufactured by Westinghouse, and the  
5 design also is typical of a replacement design. These  
6 generators have the most recent enhancements, but  
7 generally speaking the Unit 2 steam generators are  
8 very similar to most of the Westinghouse newly-  
9 designed generators, and these flow rates that we'll  
10 be experienced in the power uprate conditions are  
11 typical of the new generator design.

12 We did perform an evaluation for the  
13 repair criteria in accordance with the NRC Regulatory  
14 Guide 1.121. That evaluation considered the  
15 structural integrity margins and leakage margins  
16 required. We dried a 40 percent through-wall plugging  
17 criteria for the new steam generators, which is  
18 consistent with the original steam generator design,  
19 even though we're using smaller tubing with thinner  
20 walls. Included in that evaluation was a wear rate in  
21 the upper bundle.

22 MEMBER SHACK: What is the actual tube  
23 diameter? Everybody keeps saying smaller.

24 MR. JAMES: We went from a 3/4 inch tubing  
25 to a 11/16.

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1 (Off mike conversation.)

2 MR. JAMES: Included in that evaluation was  
3 a wear rate calculation for the upper bundle, where  
4 most of the wearing will occur at the anti vibration  
5 bars. Their anticipated maximum wear rate is around  
6 0.34 percent per year, so that was evaluated and was  
7 included in this repair criteria as far as growth  
8 rate. We didn't anticipate on any flaws.

9 We will have 400 percent baseline  
10 inspection before the generators are actually  
11 installed, and will be performing another 100 percent  
12 examination during this first refueling outage to  
13 validate the projections associated with the new steam  
14 generators in accordance with EFRI guidelines.

15 So, in conclusion, the replacement of  
16 steam generators specifically analyzed and designed  
17 for the power uprated condition, incorporating many  
18 enhancements over the original steam generator design.  
19 Inspections of those generators will be performed to  
20 insure the integrity of the tubing under this uprated  
21 condition. Thank you very much.

22 CHAIRMAN WALLIS: Thank you.

23 MR. JAMES: By the way, let me introduce  
24 Jamie GoBell. Jamie's out of our design engineering  
25 group and will be discussing our piping analysis.

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1 MR. GoBELL: Good morning. The scope of  
2 the analysis that was performed can be defined  
3 basically on the changes that we did that caused us to  
4 reanalyze the piping and the physical boundaries of  
5 where the piping was.

6 The changes in the replacement steam  
7 generator and the power uprate, and we have piping  
8 inside containment and piping outside containment, and  
9 those are physically structured separated from  
10 analysis perspective.

11 Most of this analysis was done for the  
12 replacement steam generator effort. It was done at  
13 power uprate conditions. But I'm going to go ahead  
14 and talk about what was done for replacement steam  
15 generator just for completeness, even though the  
16 impact from power uprate was minimal.

17 Inside containment, we started out by  
18 validating the original design basis and verifying we  
19 knew what the margins were and what was contained in  
20 that. For most of the piping inside there, we  
21 performed rigorous re-analysis at power uprated  
22 conditions. Because the replacement steam generators  
23 were heavier, we had to analyze for new seismic and  
24 dead weight loadings. Because the containment  
25 pressure went up, we had to look at the piping of

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1 vessels inside containment to make sure they were  
2 qualified for that external pressure both for the  
3 design and the structural integrity test pressure.

4 As part of our re-analysis of a lot of  
5 that piping, we implemented leak for break analysis,  
6 or technology, where we switched from the main coolant  
7 line breaks to the branch line breaks and the  
8 tributary lines, and we also included asymmetric  
9 compartment pressurization loads on the vessels and  
10 the pumps.

11 We looked at our design transience and  
12 revised those to reflect the operating -

13 MEMBER SHACK: When you did the leak before  
14 break, what did that let you do?

15 MR. GoBELL: The original analysis used  
16 breaks of the main coolant line piping, and we were  
17 able to eliminate the dynamic effects of that so the  
18 loads that we had to impose on the piping and the  
19 vessels we were able to reduce significantly because  
20 now we only consider breaks at the tributary line  
21 connections.

22 MEMBER SHACK: But did you make any  
23 physical changes in the plant? Did you get rid of any  
24 snubbers?

25 MR. GoBELL: No.

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1 MEMBER SHACK: No, nothing.

2 MR. GOBELL: No changes because of that  
3 analysis. On the transients, we updated those to  
4 reflect any impact from replacement steam generator  
5 and power uprate and to reflect any operating history  
6 of the plant, the number of cycles we've seen.

7 We also, in anticipation of a license  
8 renewal, we went ahead and increased the cycles. We  
9 did the analysis to a 60-year life to qualify at  
10 license renewal effort. We maintained and improved  
11 the original code of record, and the analytical  
12 techniques that we used in the design basis, and the  
13 goal of course was to satisfy the code stress and  
14 fatigue usage requirements on that piping.

15 MEMBER SIEBER: What is the code of record  
16 that you used?

17 MR. GOBELL: It's very - that depends on  
18 what you're talking about. The different piping  
19 systems and the different components are designed to  
20 different codes of record. Examples would be the  
21 coolant pumps I believe for 1965 through '67 addenda.  
22 A lot of the piping was 1971 vintage for the code of  
23 record.

24 MEMBER SIEBER: And this is B-31 at one  
25 point?

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1 MR. GoBELL: On the secondary side, yes it  
2 is out on the secondary side. I can classify it on  
3 the primary side and Class 1 and 2 was ASME, Class 1,  
4 2 and 3, 1971 typically.

5 MEMBER SIEBER: All right.

6 MR. GoBELL: And onto the piping outside  
7 containment. The main changes there were changes in  
8 pressure and temperature of the process fluids. We  
9 evaluated those systems against the analysis of  
10 record. Usually if the change in pressure or  
11 temperature, we developed a scaling factor, which we  
12 multiplied the highest stress in that system or nozzle  
13 load, support load type thing, against a scaling  
14 factor that was basically a ratio of the increase, and  
15 showed qualification of the system based on that.

16 We also did, looked at the dynamic  
17 loading, specifically on the main steam line because  
18 the mass flow rate had increased and the pressure has  
19 increased. We developed new reinforcing functions for  
20 the stop valve, fast closure transient, and qualified  
21 the piping associated with that to those new loads.

22 MEMBER SHACK: It says that the mass flow  
23 rate increases, the steam velocity of kinetic energy  
24 dropped.

25 MR. GoBELL: From the Cycle 14, was the

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1 last cycle we had the degraded old steam generators  
2 in.

3 MEMBER SHACK: Everything's in comparison  
4 to Cycle 14. If I went back and looked at Cycle 12,  
5 I'd find what I expect to find.

6 MR. GoBELL: Yes.

7 MEMBER SHACK: Yes.

8 MR. GoBELL: Yes, we are going to be higher  
9 than original design which would be Cycle 12, but  
10 lower than what we were experiencing in Cycle 14.

11 MEMBER SHACK: In 14.

12 MR. GoBELL: That's just a function of the  
13 main steam pressure we reduced to degrade the steam  
14 generators.

15 We also looked at the changes that the  
16 pressure and temperature could have on the downstream  
17 effects, things like line break, missile hazards,  
18 corrosion, minimum wall thickness required for FAC  
19 evaluations, thermal movement of the piping situations  
20 FAR evaluations that may have been performed in the  
21 past that could be affected by those changes and the  
22 effect on the expansion joints and piping.

23 And in conclusion, we only had a couple  
24 modifications that were directly related to the  
25 piping. We changed the setting on a couple spring

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1 cans just to reduce the nozzle loads on dry turbines,  
2 and we have a modification that's going to be  
3 implemented in the upcoming outage. It's really  
4 resulting from a heightened awareness of vibration.  
5 We're going to go in and harden a lot of the small  
6 bore dents and drains and branch lines off the main  
7 steam feedwater. We have a section we're going to  
8 reduce mass, try to increase natural frequency and  
9 just make it more resistant to vibration.

10 We performed comprehensive review and  
11 analysis of all the systems involved and all the  
12 changes that we're looking at and the conclusion was  
13 the piping remains qualified for all those changes.

14 MEMBER SHACK: Do you have a plant history  
15 of failures in small diameter lines due to vibrations?

16 MR. GOBELL: That is typically where you  
17 see your vibration failures, usually in the socketweld  
18 of the small branch vent or drain. We haven't seen  
19 that in large - oh yes. We've been addressing that  
20 and have become a lot more sensitive to it over the  
21 last five to seven years. We've got a lot of  
22 operators calling us saying, hey this is shaking.  
23 Come look at it, and maintenance, that sort of thing.  
24 So we've done quite a bit of work.

25 MEMBER SIEBER: Have you ever gone through

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1 the reactor cooling system when you were hot on the  
2 power and measured the vibration on the branch lines  
3 to try to predict which one's going to fail first, or  
4 which ones?

5 MR. GOBELL: We have gone in and gotten  
6 handheld vibration data at different locations where  
7 we found leaks in the past. We've looked at a lot of  
8 the systems, especially around the reactor coolant  
9 pumps. We had the 100 Hertz driving frequency and  
10 that sort of thing and gotten a lot of data there with  
11 actual operating conditions.

12 MEMBER SIEBER: One of the problems is that  
13 when a lot of these plants were constructed, they  
14 would take the vents and drains and make them pretty  
15 long and then put a heavy valve at the top, which it  
16 would do a real job on the socket weld.

17 MR. GOBELL: Well that concludes the piping  
18 analysis. I'd like to turn it back over to Bryan to  
19 talk about the next agenda item, the ECCS.

20 CHAIRMAN WALLIS: Thank you.

21 MR. DAIBER: Before I start into the ECCS,  
22 I'd like to go back and try to cover a few items. I  
23 want to make one clarification. I want to make sure  
24 that there's no confusion. There's several topical,  
25 a GE topical and a Westinghouse topical that we

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1 referenced. We're not a GE plant, obviously, or  
2 Westinghouse plant, so we didn't use the methodologies  
3 defining those topical. We used CE methodologies  
4 when we did all of our analysis work from field design  
5 LOCA to non-LOCA considerations.

6 Those methodologies were really just  
7 utilized as a guideline to give us an insight into  
8 what kind of information we needed to provide in our  
9 submittal and what we need to look at to do power  
10 uprate efforts.

11 MEMBER SCHROCK: But you cited proprietary  
12 reports. My question was how you arranged to have  
13 access to a proprietary report.

14 MR. DAIBER: Entergy does have a lot of  
15 power plants. Some of them are GE boilers. With  
16 respect to the fuel design codes and considerations,  
17 those thermal hydraulic codes that are used and the  
18 FACS code and the ROCS codes for flux considerations,  
19 those are really looked at from an ongoing basis.

20 The ROCS codes, we look at the core flux  
21 designs and we benchmark. Each CPC plant updates  
22 their verifications on their flux with predicted  
23 values, and those codes have been proven to be very  
24 reliable in predicting the fluxes in past cycles, and  
25 so we continue to believe that they're going to do a

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1 good job on the future design code considerations.

2 Also from the core design and thermal  
3 hydraulics standpoint, where we expect to go with the  
4 Unit 2 uprated core design, we don't believe we're  
5 moving into a region that hasn't already been operated  
6 at by other CE plants with higher power ratings, given  
7 all the input considerations with respect to peaking  
8 factors, RCS flows and the cold hot considerations.

9 So I wanted to clarify that. With respect  
10 to the ECCS analysis, again we used, if it's all right  
11 I'm going to call it CE methods. We used the CE  
12 methods for performing the large break LOCA, the small  
13 break LOCA and Boric acid precipitation considerations  
14 when we did the power uprate efforts. And real  
15 briefly, I'm going to go through the methodologies,  
16 assumptions, acceptance criteria and results for each  
17 of these various areas, starting with the large break  
18 LOCA.

19 The large break LOCA, as I discussed  
20 earlier, we changed methodologies for large break  
21 LOCA. We did use an approved methodology. It's the  
22 latest approved methodology. It's what's referred to  
23 as the 1999 EM. It's the latest approved methodology  
24 that CE has and we applied that methodology to ANO 2  
25 for under the operating conditions. It's documented

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1 in CENPD-132.

2 MEMBER SCHROCK: Can you give us a summary  
3 of what's new about it?

4 MR. GoBELL: Joe Cleary's here from  
5 Westinghouse Combustion. He can discuss those  
6 methodology changes and the topical report much better  
7 than I can.

8 MR. CLEARY: My name is Joe Cleary from  
9 Westinghouse. There were three major types of changes  
10 made to the 1999 EM. The version of EM that it  
11 replaced, by the way, is the 1985 EM and they're both  
12 Appendix K evaluation models. The three types of  
13 changes, number one were process changes basically, to  
14 allow us to run the code in a more unified way, less  
15 analyst intervention, transferring data between the  
16 codes.

17 The second modification was the removal of  
18 Dougall-Rohsanow as required by 5046 in Appendix K for  
19 changes that are within Appendix K.

20 The third set is number of improvements.  
21 There were roughly five or six minor changes, the low  
22 hanging fruit, so to speak, changes that we were able  
23 to make with very little regulatory risk. In sum  
24 total, they may have produced a reduction in peak clad  
25 temperature in the ballpark of 150 degree, peak

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1 cladding temperature.

2 The type of changes in particular, I'll  
3 give you a few examples. There was a change to the  
4 reflood methodology to decrease the steam venting  
5 resistance during reflood. We incorporated a steam  
6 generator heat transfer model that removed some of the  
7 energy from the steam so it was less super heated.

8 The previous version of the model just had  
9 a constant temperature, or constant specific volume  
10 really for the steam. We improved the model that  
11 represents the interaction of steam and water with  
12 nitrogen, during the nitrogen discharge phase of the  
13 safe ejection tanks.

14 We made a small change to our Flec base  
15 reflood heat transfer coefficient correlation to make  
16 use of some FLECHTSEASET data that was not used as the  
17 basis for our earlier model. We improved the one  
18 aspect of the blow down hydraulics code to introduce  
19 a variable gap pressure during the blow down  
20 transient.

21 Those are probably the most significant  
22 changes that we've made to the model. In sum total,  
23 like I said, none of them presented a significant  
24 change by themselves, the peak cladding temperature,  
25 but in total approximately 150 degrees in the sample

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1 calculation we showed in the topical.

2 MEMBER SCHROCK: You have a peak clad  
3 temperature prediction in large break LOCAs, as I  
4 understood it, of 2166, and that results from analysis  
5 which reduced that prediction by 150 degrees roughly  
6 compared to older predictions by the Appendix K  
7 method?

8 MR. CLEARY: Yes, the methodology results  
9 in approximately a 150 degree decrease.

10 CHAIRMAN WALLIS: So I'm not quite sure  
11 what you're saying. If you'd have gone by your method,  
12 would you have a higher temperature?

13 MR. CLEARY: Yes.

14 CHAIRMAN WALLIS: 2300 and something.

15 MR. CLEARY: If we had used the older - in  
16 addition to changing the methodology and the power  
17 uprate, there were a few other changes to the  
18 analysis. All other changes - all other things being  
19 equal, we would have calculated temperature  
20 approximately 150 degrees higher with the new  
21 methodology versus the old.

22 MEMBER SCHROCK: Have you - the conclusion  
23 for a position as to whether 7.5 percent is the limit  
24 of uprate that could be achieved using Appendix K, and  
25 did you have any interest in pursuing the best

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1 estimate approach, rather than Appendix K?

2 MR. DAIBER: At this point in time, with  
3 the current 7.5 percent uprate and even considering  
4 the potential for an ECCS uprate, we feel it's more  
5 than adequate margin in the methodologies we're  
6 currently using, the 1999 EM. So, under -

7 MEMBER SCHROCK: I don't understand that  
8 statement. The residual 36 degrees you characterize  
9 as more than adequate.

10 MR. DAIBER: Again -

11 MEMBER SCHROCK: Is that what I've heard?

12 MR. DAIBER: Yes. Well, there's also  
13 margin in the input assumptions. Again, when we did  
14 this process, we made sure that we developed input  
15 assumptions that were very conservative and very  
16 bounding for where we expected to operate the plant.

17 So the input assumptions along with the  
18 methodology itself, provide conservatisms that are  
19 there. So although there's only a 36 degree margin to  
20 the limit, the assumptions we used are very  
21 conservative and very bounding for where we anticipate  
22 to operate the plant.

23 MEMBER SCHROCK: But with regard to the  
24 other question, have you considered would it be to  
25 advantage to use best estimate, and would best

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1 estimate be needed if you were going to go for a  
2 higher uprate?

3 MR. DAIBER: Yes. If we went to a  
4 substantially higher power rating than the 7.5 percent  
5 that we've considered, then definitely we'd look at a  
6 combination of best estimate, large break LOCA and I  
7 believe CE Westinghouse are comparing their methods  
8 now that they're one, and I believe they're showing  
9 some benefits with just the Westinghouse approach or  
10 with CE approach.

11 MR. CLEARY: CE does not have best estimate  
12 methodology. Westinghouse has a best estimate large  
13 break model, as I'm sure you're well aware. We've  
14 done a little bit of comparison and we've concluded  
15 that the Westinghouse Appendix K model calculates  
16 lower peak cladding temperatures than our Appendix K  
17 model, and their large break, best estimate model  
18 obviously produces lower peak cladding temperatures  
19 than either of the Appendix K models.

20 At this point in time, we don't have any  
21 commercial drivers to warrant submitting the  
22 Westinghouse best estimate model to NRC review for  
23 application to CE design and SSSs. If that changes in  
24 the future, if we need it for support of any of our  
25 uprates, then that's a path we are prepared to go

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1 down.

2 CHAIRMAN WALLIS: So this new methodology  
3 is 1999. That's something that was carefully looked  
4 up by the staff and they've approved all those changes  
5 that you made?

6 MR. CLEARY: Yes. It's an approved  
7 valuation model in compliance with Appendix K.

8 CHAIRMAN WALLIS: You seem to have gained  
9 a lot, 170 degrees?

10 MR. CLEARY: 150 degrees, yes.

11 CHAIRMAN WALLIS: Is it the reflood heat  
12 transfer coefficient that's the main actor there?

13 MR. CLEARY: It's the reflood related, yes.  
14 Both the improvement to the flood correlation and the  
15 hydraulic aspect of decreasing the steam venting  
16 resistance, and therefore getting higher reflood rate,  
17 particularly the less than one inch per second reflood  
18 rate that drives the flood correlation.

19 MR. DAIBER: As Joe alluded to, when we  
20 applied the 99 EM, we obviously accounted for power  
21 up. Next slide, Dennis. We obviously accounted for  
22 the increase in the power rating, but we also changed  
23 some of the other input parameters. Linear heat rate  
24 was increased from 13.5 to 13.7, and the range of SIT  
25 Tank pressures and inventories was also increased in

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1 the analysis arean.

2 So the analysis incorporated very  
3 conservative boundary assumptions with respect to the  
4 SIT tank conditions, although the current tech specs  
5 and operating conditions don't exercise that broad a  
6 range currently.

7 The results of the large break LOCA  
8 analysis, the spectrum was revisited. The limiting  
9 peak clad temperature was 2154 for the .4 double ended  
10 guillotine pump discharge break, which is slightly  
11 different than the .6 break size currently is our  
12 limiting break size, using the 1985 evaluation model.

13 So, we also compared the results fro Cycle  
14 15 to Cycle 16, realizing the methodologies here are  
15 different than some of those parameters I just  
16 mentioned have just changes. For Cycle 15, when we  
17 looked at the new RSGs, the peak clad temperature  
18 there was 2029, and for Cycle 16 we're now at 2154, as  
19 I just mentioned.

20 With respect to the maximum oxidation,  
21 core wide oxidation, we also verified acceptable  
22 results there, making sure within 10 CFR 5046  
23 compliance on those criteria.

24 CHAIRMAN WALLIS: To get back to the  
25 previous slide, is there something in the regulations

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1 that says you should evaluate these particular break  
2 sizes? I'm going back to my colleague's earlier  
3 question. If you had looked and it's 8.5, it doesn't  
4 mean that wouldn't have been above 2200.

5 MR. CLEARY: The regulations specifically  
6 address looking at the three discharge coefficients of  
7 1.0.8 and .6. We start out our analysis looking at  
8 those three and if we find that the .6 is of more  
9 limit, the most limiting of those three, we go down  
10 using the same increment, i.e. to .4 guillotine.

11 This is our first analysis where the .4  
12 was shown to be limiting. So we continue to decrease  
13 the break size to get a break that showed a local  
14 peak, and we decided to drop by a tenth of a fraction  
15 rather than two-tenths in that case, because now the  
16 absolute values of those numbers are getting lower.

17 CHAIRMAN WALLIS: It's a funny shaped  
18 curve, because everything is between 2200, except for  
19 that 2154. So it looks as if it's above peak. It's  
20 more or less a plateau. It's a bit odd. Why is that.  
21 Do you have any idea?

22 MR. CLEARY: There is one hydraulic  
23 difference between the four biggest breaks there that  
24 I think is the major contributor to that dissimilarity  
25 and that is the tying of the reflood rate drop below

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1 one inch per second. It was earlier for the .4  
2 guillotine comparatively speaking looking at the  
3 trends, than for the breaks. Consequently, there is  
4 a somewhat larger period of time, I'm talking maybe 15  
5 to 20 seconds during reflood that the temperature is  
6 using the lower one inch per second reflood rates for  
7 that break size compared to the others.

8 CHAIRMAN WALLIS: So is this a step in the  
9 calculation method or something when you go to these  
10 lower?

11 MR. CLEARY: Yes, it is required by  
12 Appendix K. One can not use the flood heat transfer  
13 coefficients below where reflood rate is.

14 CHAIRMAN WALLIS: It's a step in the  
15 calculation procedure to do this sort of step in the  
16 results. So it's a peculiarity of the sort of non-  
17 smoothness of the Appendix K method.

18 MR. CLEARY: That's right. Discontinuity  
19 in two ways, one for any break size, there's a  
20 dramatic change in the reflood heat transfer  
21 coefficients once the reflood rate falls below one  
22 inch per second.

23 CHAIRMAN WALLIS: Physically incorrect.

24 MR. CLEARY: That's correct.

25 CHAIRMAN WALLIS: It's a requirement.

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1 MR. CLEARY: That's right. Substantive  
2 research since '74 has shown that there really is no  
3 change in phenomena for the reflood rates as they step  
4 below one inch per second. The other similarity is  
5 now between the .4 and the others in that the  
6 hydraulic analysis calculated a little bit earlier  
7 time for that. So the discontinuity occurred somewhat  
8 earlier for that one break.

9 MEMBER SCHROCK: It seems that if you look  
10 at the big picture here it was far more important for  
11 you to change your Appendix K model than it was to  
12 attempt to do any peak shaving or flux flattening in  
13 the fuel design. Is that correct? You just wouldn't  
14 have been able to ask for an uprate.

15 MR. DAIBER: Yes, it was necessary for us  
16 to move to the 1999 EM. In fact, we did request that  
17 the review schedule of that be consistent with our  
18 need for power uprate. So the 1999 EM was approved in  
19 relation to the need for ANO 2 as a part of the uprate  
20 effort, yes.

21 CHAIRMAN WALLIS: Did the ACRS ever see  
22 this '99 valuation model? I don't think they did.

23 MR. CLEARY: No, it was not discussed with  
24 ACRS.

25 CHAIRMAN WALLIS: But this is a key aspect

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1 of the uprate.

2 MR. DAIBER: Move onto the small break  
3 LOCA. The methodology for small break LOCA, we used  
4 the same current analysis methodology of record for  
5 Cycle 16 uprated conditions, referred to as the S2M  
6 document in CENPD-137, Supplement 2-P-A. This  
7 methodology was the same, which will help in  
8 comparison in later slides with Cycle 15 analyses.

9 Some of the assumption changes with  
10 respect to small break LOCA, obviously again the power  
11 uprate was considered, linear heat rate was also  
12 accounted for. That broader range of SIT tank  
13 pressures was also accommodated in the small break  
14 LOCA and I note here the high pressure safety  
15 injection flows were kept the same in Cycle 15 and  
16 Cycle 16. That's a critical parameter there.

17 The results of the small break LOCA  
18 analysis indicated that the .4 square foot pump  
19 discharge break, which is our current limiting break  
20 remained the same. The peak clad temperature is now  
21 2066, with a little footnote that it's actually 2090.  
22 There was a code there identified after we ran our  
23 analyses and the limiting breaks was rerun correcting  
24 that and the official -

25 CHAIRMAN WALLIS: Did you miss slide 78?

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1 I was going to ask about the core wide oxidation.

2 MR. DAIBER: Sure.

3 CHAIRMAN WALLIS: I wasn't sure that that  
4 was something that could be predicted. And then  
5 you've got a .99 versus a criterion of 1.

6 MR. DAIBER: The methodology there --

7 CHAIRMAN WALLIS: In all cases?

8 MR. DAIBER: Yes, the methodology there is  
9 very conservative. I believe it's based on the peak  
10 pin through the whole core.

11 MR. CLEARY: In small break. In this  
12 case, we a number of years ago started reporting the  
13 core wide oxidation result as less than 0.99. In  
14 actuality, the actual calculated numbers for that  
15 break spectrum is in the ballpark of about .4 for the  
16 corewide oxidation.

17 CHAIRMAN WALLIS: Why didn't you report  
18 4.4. That would give me a much better feeling.

19 (Laughter.)

20 MR. CLEARY: I guess the answer is to  
21 avoid having to make cycle to cycle variations to that  
22 number by -- in the reload safety valuation reports.  
23 If we continue to show less than .99 --

24 MR. BOEHNERT: Oh, so that should less  
25 than .99?

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1 MR. CLEARY: Yes, that is correct.

2 MR. BOEHNERT: That's the problem.

3 CHAIRMAN WALLIS: This is oxidation from  
4 the outside in?

5 MR. CLEARY: Yes, and also in our  
6 methodology we assume that the entire core ruptures at  
7 the same elevation that we predict rupture for the hot  
8 rod and the inside of the cladding, after ruptured  
9 node oxidizes as well and contributes to the corewide.

10 MEMBER SCHROCK: What is your accuracy  
11 level for that prediction?

12 MR. CLEARY: I'm not sure if I can address  
13 accuracy. It's a very conservative model based on  
14 Baker-Just oxidation model. I guess, could you  
15 explain what you mean by accuracy in this case?

16 MEMBER SCHROCK: Yes, compare it with some  
17 data and so what kind of predictive capability do you  
18 really have as compared to some real experimental  
19 data?

20 MR. CLEARY: The basic --

21 MEMBER SCHROCK: Dr. Wallis' comment about  
22 the .99, for example, do you believe you can predict  
23 it within 1/10th of 1 percent, 1/100th of 1 percent,  
24 whatever?

25 MR. CLEARY: Well, from my perspective

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1 we're not trying to predict reality with an Appendix  
2 K model. We have conservative component models, in  
3 particular in this case, Baker-Just driving the  
4 calculation. So to the extent that the Baker-Just  
5 model predicts reality, or predicts an oxidation we  
6 report that as the -- using very conservative pin  
7 sensors for representing the power in all the rods in  
8 the core and other conservatisms in the methodology.

9 So I would say --

10 MEMBER SCHROCK: Essentially, being  
11 Appendix K evaluation means that there is no  
12 consideration of repeal of the ability of the  
13 predictive method? That's not a consideration. It's  
14 only a question of whether the method was approved.

15 MR. CLEARY: I think the sensor rod here,  
16 the point you're making, that's correct. The actual  
17 calculated number of about .4 probably is very  
18 conservative relative to a realistic calculation of  
19 corewide oxidation.

20 CHAIRMAN WALLIS: This is .4 for cycle 16  
21 with the new upgrade?

22 MR. CLEARY: It's .4 for a bounding  
23 calculation that is expected to apply for cycle 16 and  
24 going forward as long as the plant configuration --

25 CHAIRMAN WALLIS: What is it for cycle 15

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1 if it wasn't .99?

2 MR. CLEARY: I didn't review those numbers  
3 before this meeting. I believe they would have been  
4 a little bit higher than the .4 that we calculated  
5 using 1999 EM, primarily because the 1999 EM with the  
6 automated code system does a more precise application  
7 of our methodology.

8 Previously, when we did it by hand, the  
9 analysts took conservative measures to do the analysis  
10 one time and not have to repeat the somewhat  
11 cumbersome calculation, so adding in those  
12 discretionary conservatisms generally resulted in  
13 numbers that were higher than .4, but less than .99.

14 CHAIRMAN WALLIS: This must be 40 or 50  
15 years old.

16 MEMBER SCHROCK: Not very good either.

17 MEMBER POWERS: It depends on how much you  
18 believe in breakaway oxidation. If you believe in  
19 breakaway oxidation, the ability under dynamic events,  
20 Baker-Just is not all that bad.

21 MR. DAIBER: Moving to slide 81 on small  
22 break LOCA results, compares -- looking at the results  
23 here, again the limiting break size stayed the same at  
24 .04 with a peak clad temperature of 2090.

25 In the next slide we compare the results

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1 to the acceptance criteria, but we also compare it to  
2 cycle 15 results. Here, the methodology stayed the  
3 same and the input assumptions relatively stayed the  
4 same except for core power and the peak clad  
5 temperature went up from 1905 in cycle 15 to 2066 in  
6 cycle 16. That comparison is based on the same  
7 version of the code.

8 The results for cycle 16 all indicated  
9 acceptable results with respect to 5046 acceptance  
10 criteria.

11 MEMBER SCHROCK: Did you skip over some  
12 slides?

13 MR. DAIBER: We jumped back. Moving on to  
14 the boric acid precipitation analysis. For boric  
15 acid precipitation analysis, we did switch methodology  
16 in cycle 16. We utilized again an approved  
17 methodology. It's the CE approved methodology for  
18 boric acid precipitation. This methodology that we  
19 applied we know is more conservative than the methods  
20 that we were currently, originally licensed to.

21 We did account for the power uprate and  
22 the original analysis of record from cycle 1 had been  
23 maintained over the last 15 cycles so there were  
24 various other miscellaneous input parameters that we  
25 updated when we did the analysis.

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1           The results of that analysis indicated  
2           that assuming a hot leg injection started at 5 hours,  
3           the maximum boric acid concentration attained a weight  
4           percent of 23.3. This is less than the acceptance  
5           criteria of 27.6 weight percent. And verifying that  
6           our current DOP guidance that we've used over the  
7           years of initiation of hot leg injection between 2 to  
8           4 hours still remains valid under the power uprated  
9           conditions.

10           CHAIRMAN WALLIS: Is this where we get to  
11           the mixing part?

12           MR. DAIBER: Yes, this is the mixing  
13           issue. There was an issue raised by the staff with  
14           respect to the volume assumed in our analysis in  
15           implementing this new methodology. The volume we used  
16           includes the core region and the region of the lower  
17           plenum below the core for that mixing. That's  
18           consistent with what we had used in our original  
19           methodology and we consistently use that same volume  
20           when we apply --

21           CHAIRMAN WALLIS: It's not easy for me to  
22           see why they should be well mixed together. The core  
23           is up here with all kinds of stuff in it and the lower  
24           plenum is down here. It's not clear to me why they  
25           should mix.

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1 MR. DAIBER: There possibly are some valid  
2 considerations with respect to the mixing concerns.  
3 And taken as an individual issue, it's one thing, but  
4 taken with respect to the overall conservatisms  
5 embedded in the methodology, we believe that the  
6 overall methodology utilized to determine long-term  
7 core cooling is a very conservative methodology.

8 CHAIRMAN WALLIS: You said something about  
9 a recriticality or something. What's the concern?  
10 Why worry about this?

11 MR. DAIBER: Flow blockage, boric acid  
12 precipitating out and causing flow blockage  
13 consideration.

14 CHAIRMAN WALLIS: Flow blockage,  
15 coolability of the core. Nothing to do with nuclear  
16 behavior?

17 MR. DAIBER: That's correct.

18 CHAIRMAN WALLIS: Is this something that's  
19 well understood, this precipitation of boron?

20 MR. DAIBER: The time at which or the rate  
21 concentration at which it precipitates out has been  
22 looked at and there's some data available with respect  
23 to what point and what weight percent versus  
24 temperature at which the precipitation would occur.  
25 The phenomena here is dealing with a cold leg break

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1 situation where the excess ECCS fluid is spilling off  
2 the side and you're only really getting boil off in  
3 the core and steaming since leaving behind the boric  
4 acid consideration. So it's a very conservative  
5 assumption and modeling consideration.

6 CHAIRMAN WALLIS: So you're boiling and  
7 it's getting richer and richer in boric acid?

8 MR. DAIBER: Right, that's the  
9 conservative modeling assumption that's utilized to  
10 develop this time --

11 CHAIRMAN WALLIS: It precipitates, it  
12 sticks. It doesn't fall out or --

13 MR. DAIBER: That's right, right. It's  
14 assuming that once it reached that weight percent, it  
15 does --

16 CHAIRMAN WALLIS: Is there an experimental  
17 basis for all of this? People have actually done  
18 realistic experiments to figure out what the  
19 precipitation is and how tough it is and what its  
20 shape is and all kinds of things, issues that I can  
21 think of. I just wonder what the basis is for  
22 understanding it.

23 MR. CLEARY: I think by calculating a  
24 concentration using conservative methodology that a  
25 maximum concentration that's below the solubility

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1 limit it avoids having to address all those issues  
2 which you bring up.

3 CHAIRMAN WALLIS: It assumes it's mixed.  
4 There aren't regions where, for some reason or other,  
5 it's got more concentration?

6 MR. CLEARY: That's correct, within a  
7 mixing volume and there was, as you pointed out,  
8 difference of opinion as to what constitutes an  
9 acceptable mixing volume. But within the mixing  
10 volume, yes, there is uniform concentration.

11 CHAIRMAN WALLIS: Do you agree with the  
12 staff eventually?

13 MR. CLEARY: We came to a resolution, an  
14 agreement that the Arkansas analysis is appropriately  
15 conservative. I believe the staff may be -- will be  
16 dealing with the CE methodology on a generic basis  
17 going forward in the future.

18 MR. DAIBER: From a conservative  
19 standpoint, we believe the methodology is  
20 conservative, eventually in the long term what we do  
21 is we initiate hot leg injection. Once hot let  
22 injection is there, then there's adequate -- we  
23 definitely know at that point there's going to be  
24 adequate mixing and adequate flow coming out of the  
25 top of the core and spillage and covering it. So it's

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1 really just a matter of time at which you actuate  
2 that.

3 We also know that the methodology that CE  
4 Westinghouse uses here is very conservative. In fact,  
5 one of the most -- one of the conservative assumptions  
6 in the methodology is that all the charging flow which  
7 comes from the BAM tanks goes directly to the core.  
8 In reality, that doesn't happen. It mixes with LPSI  
9 flow at several thousand GPM. The charging flow is  
10 coming in at about 138 GPM. The LPSI flow is coming  
11 in at about 3,000 or 4,000 and LPSI-HPSI combination  
12 is well over 4,000 GPM and it truly mixes and most of  
13 that would actually fall on the floor and not go to  
14 the core.

15 However, here, we assume everything in  
16 that tank goes directly to the core, concentrating it  
17 very quickly, so the methodology in and of itself does  
18 embed some very conservative assumptions all with  
19 respect to the volume that's used and the spillage  
20 that's considered. We believe that the methodology in  
21 and of itself is very inherently conservative.

22 With respect to the ECCS analysis we  
23 reviewed the 5046 acceptance criteria and verified, as  
24 we indicated for small/large break LOCA and boron  
25 precipitation that we met the design criteria and

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1 under operating conditions, power upgraded conditions,  
2 we believe that ANO-2 is acceptable.

3 With that I'd like to move on to the  
4 resolution of open items on the agenda.

5 There are no current open items with  
6 respect to the ANO-2 power uprate submittal. Due to  
7 the timing at which the draft SER went out and the  
8 resolution of several questions that were still open,  
9 there were in the draft SER several open items still  
10 identified. Since that time we have worked with the  
11 staff and provided them additional information to  
12 respond to those questions and at this time there are  
13 no current open items.

14 However, what I'll do now is -- there were  
15 three items there. We'll go through each of those  
16 items and address the issue and the resolution of  
17 those items, dealing with seam generator tube  
18 ruptures, radiological consequences, the MHA  
19 radiological consequences which is a mixing issue and  
20 the control and doses.

21 First, we'll go over the steam generator  
22 tube rupture dose considerations. During the original  
23 submittal to the NRC, we were using 30 minutes  
24 operator response time to generate our doses for tube  
25 rupture. Subsequent to that time we changed that to

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1 60 minutes to give our operators more than adequate  
2 margin to address this particular event. Those  
3 calculations were submitted at a later time. They  
4 have now had the chance to review that and accept the  
5 results that we have presented for a steam generator  
6 tube rupture.

7 With respect to the LOCA, there were some  
8 issues with respect to the spray versus unsprayed  
9 region, the mixing that occurred and accredited in our  
10 off-site release calculations, also our limiting event  
11 for controlling dose considerations.

12 We do credit two interchanges between the  
13 sprayed and unsprayed regions per hour in our off-site  
14 release calculations and control room dose  
15 calculations.

16 In resolution of this issue with the  
17 staff, what we did was we went and we looked at where  
18 containment fans are located because at two  
19 interchanges per hour an assumption is based on the  
20 air flow coming from our containment cooling fans. We  
21 looked at the location of those fans where the intake  
22 was, where the discharge was and compared that  
23 relative to what we considered sprayed and unsprayed  
24 regions and we did an extensive review and  
25 verification of where those regions were and provided

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1 quite a bit of information with the staff with respect  
2 to where the intake is and where the discharges are  
3 and we were able to demonstrate that the two  
4 interchanges per hour is a very conservative  
5 assumption.

6 CHAIRMAN WALLIS: Now is that based on  
7 just discursive arguments or is it some analysis?

8 MR. DAIBER: It's based on the geometry  
9 and the airflows with respect to where those volumes  
10 are. Most of the containment is sprayed, about 78  
11 percent of it is sprayed and about 22 percent of it is  
12 unsprayed. The fans are located, themselves, under a  
13 roof per se. There's a concrete floor above them.  
14 But it's a very small volume at which they intake air.

15 CHAIRMAN WALLIS: So you look at the flow  
16 rates with the fans and the volume you have to clear  
17 and you figure out how long it takes to do that?

18 MR. DAIBER: Yes, the fan itself is  
19 drawing in what would be called an unsprayed region,  
20 but the volume that it draws in from is so small that  
21 it's effectively interchanging that volume.

22 CHAIRMAN WALLIS: So you're going to claim  
23 -- in reality it's more like 10 interchanges per hour  
24 or something, so you need credit for two? There is  
25 some sort of analysis behind it that says what it

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1 really is is thus and so and therefore conservative  
2 assumption is reasonable?

3 MR. DAIBER: Yes. It's based on a  
4 qualitative argument based on the geometries and the  
5 intake in the sprayed regions --

6 CHAIRMAN WALLIS: Is this written down,  
7 this qualitative argument?

8 MR. DAIBER: Yes, it is, quite extensively  
9 written down.

10 CHAIRMAN WALLIS: Do you have it so we can  
11 read it over lunch or something?

12 MR. DAIBER: Yes, yes. In response to the  
13 NRC questions it's written down. And it's fairly  
14 extensive with pictures, all sorts of graphs.

15 The control room dose issue, as we  
16 discussed earlier our control room dose calculations  
17 were performed based on 10 CFM and leakage  
18 considerations. In November of last year we did a  
19 control room envelope in leakage test and the results  
20 of that test indicated a natural in leakage value of  
21 134 SCFM.

22 MR. BOEHNERT: What kind of in leakage  
23 tests did you do?

24 MR. DAIBER: A tracer gas.

25 MR. BOEHNERT: Tracer gas.

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1 MR. DAIBER: The 134 SCFM includes 10 CFM  
2 for operating ingress and egress.

3 CHAIRMAN WALLIS: 10 SCFM is very, very  
4 difficult to achieve.

5 MR. DAIBER: I'm sorry?

6 CHAIRMAN WALLIS: 10 SCFM leakage is very  
7 difficult to achieve.

8 MR. DAIBER: Yes, and the basis for that  
9 really goes back to just ingress and egress from the  
10 operators. So what we've done to resolve this  
11 particular issue is we've submitted to the staff a  
12 dose calculation associated with the MHA which is our  
13 limiting event for LOCA considerations, using 61 SCFM  
14 as the new bounding allowable in leakage and that  
15 value is actually back-calculated as the maximum  
16 allowable in leakage that we can have and still meet  
17 the GDC 19 control room operating dose considerations.

18 To further get our in leakage values down  
19 to verify that we're below 61 SCFM, we've also  
20 committed to replace the seals on VSF-9 which is one  
21 of the control room emergency ventilation filter fan  
22 housing units. That seal during the in leakage test  
23 was attributed to about 45 SCFM in leakage so we're  
24 replacing the seal on that to essentially eliminate  
25 that in leakage. The other area of in leakage was

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1 related to the pressurization of the north wall of the  
2 back of the control room. We're also making  
3 commitments to ensure that that room would not  
4 pressurize. The pressurization comes from 2VEF-56  
5 operating. So we've also made commitments to make  
6 sure that that room will not be pressurized to reduce  
7 the in leakage there by another 49 SCFM in leakage.  
8 Therefore, we're effectively giving our in leakage  
9 values down well below the 61 SCFM.

10 CHAIRMAN WALLIS: Are you doing to do some  
11 periodic testing?

12 MR. DAIBER: I'm sorry?

13 CHAIRMAN WALLIS: Are you going to do some  
14 periodic testing and checking of what the actual  
15 leakage is?

16 MR. DAIBER: At this point in time we are  
17 not committing to any periodic testing associated with  
18 that.

19 CHAIRMAN WALLIS: I remember this issue  
20 came before the Committee and we had all kinds of  
21 evidence about what really happens in these things.  
22 The main problem is that somebody leaves something  
23 open. Someone repairs something and leaves something  
24 open and then your leakage is 400 CFM or something and  
25 until someone realizes they've left something open

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1 which may be days, your leakage is way beyond what you  
2 should be.

3 MR. JAMES: Bryan, this is Dale James. We  
4 are implementing a control room boundary program to  
5 address those very issues. There is some industry  
6 guidance, NUMARC guidance, NEI guidance, excuse me,  
7 out on control room boundary control programs which we  
8 will be implementing.

9 CHAIRMAN WALLIS: So you are going to  
10 monitor, not perhaps measure, but you're going to  
11 check all the things which contribute to linkage on a  
12 regular basis?

13 MR. JAMES: I'm not positive, but I think  
14 there is some criteria in there about periodic  
15 testing, depending upon the quality of the program.

16 MR. BOEHNERT: Yes, the staff has under  
17 consideration and I guess a generic letter and a set  
18 of Reg. Guides which we're going to hear about a  
19 little bit later this year.

20 MEMBER POWERS: Graham, the question I  
21 would worry about is you tested this thing, you've  
22 gotten this huge leakage from a couple of major  
23 sources. You fix those major sources. Are they  
24 hiding? Are those major leaks hiding, minor leaks, so  
25 if you went back and tested, instead of reducing to 94

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1 CFM, you reduced it by 25, 30? I mean that seems to  
2 me to be the question that comes immediately to my  
3 mind.

4 The second question that comes up is you  
5 tested it for some set of conditions that you could  
6 reproduce conveniently and you're applying this to a  
7 different of conditions for an accident. It's not  
8 obvious to me how that changes your leakage.

9 MR. DAIBER: Dan, can you address some of  
10 this? I know when they did the testing on this, they  
11 did look at the action and condition configurations  
12 and I think Dan can address that better.

13 MR. FOUTS: Yes. I'm Dan Fouts. I'm  
14 supervisor of Safety Analysis. We actually did four  
15 tests. The first one was with 2 VSF 9, as we call it  
16 and we got 27 CFM leakage and we were able to account  
17 for all of that in leakage being upstream of the  
18 filter unit, so we knew where it was coming from and  
19 basically we were able to confirm we have an intact  
20 control room at that point.

21 The second test was at VSF 9 and I believe  
22 it was around 89 SCFM in leakage. We then turned on  
23 the 56 fans and noticed the pressurization caused us  
24 to go to the 134 which was the maximum that we got.  
25 So at that point we knew that the delta between having

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1 the 56s on or not on, we knew the delta between the  
2 VSF 9 and the 2 FSF 9 fans and so we knew that if we  
3 took care of the leakage on the VSF 9, that we could  
4 reduce by the 45 and take care of the 56s being on,  
5 we'd reduce by the additional amount and get us down  
6 to where we are.

7 CHAIRMAN WALLIS: It's a whole system.  
8 And this VSF 56 is somewhere else.

9 MR. FOUTS: 2 VSF 56 --

10 CHAIRMAN WALLIS: The environmental  
11 pressure around the, on the north wall.

12 MR. FOUTS: The 2 VSF 56s suck out of the  
13 emergency switch gear rooms and they discharge into  
14 our controlled access area which is a wall just on the  
15 other side of the control room and pressurize that and  
16 we did make pressure sweeps of the whole area, so we  
17 knew what the delta pressures were between the  
18 different areas. When we did the testing we simulated  
19 accident conditions as best we could, so we turned off  
20 fans that weren't -- that may or may not be lost  
21 during the accident. We turned on the ones that could  
22 possibly come on, post-accident.

23 MR. DAIBER: Now in conclusion, as I had  
24 mentioned earlier, there are no current open items  
25 with the ANO-2 power uprate issues.

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1           MEMBER KRESS: On this in leakage question  
2 again, you had that in leakage whether you have a  
3 power uprate or not and the power uprate doesn't  
4 really -- you got to deal with that whether you've  
5 have a power uprate?

6           MR. DAIBER: That's correct. The power  
7 uprate is only an incremental impact.

8           MEMBER KRESS: It gives you a little more  
9 dose?

10          MR. DAIBER: That's correct.

11          CHAIRMAN WALLIS: Are we going to make it  
12 to lunch?

13          MR. BOEHNERT: Yes. I think --

14          MR. DAIBER: This is the last topic. It's  
15 the risk impact.

16          CHAIRMAN WALLIS: Good topic to lose an  
17 appetite.

18          MEMBER POWERS: Think how fortunate you  
19 are not to have the chairman here and having to read  
20 the words qualitative risk.

21          CHAIRMAN WALLIS: Oh, I don't believe in  
22 qualitative risk.

23          MEMBER POWERS: Yes, but you don't get  
24 histrionic over it like the chairman does.

25          CHAIRMAN WALLIS: Do you want me to do an

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1 impersonation?

2 (Laughter.)

3 MEMBER POWERS: Oh please.

4 MR. DAIBER: ANO-2 did address the risk  
5 impacts associated with power uprate. Our submittal  
6 is now the risk-informed submittal. However, a risk  
7 analysis was done in consideration of the power uprate  
8 efforts for ANO-2.

9 We did this in several forms. With  
10 respect to the level 1 and level 2 CDF core damage  
11 frequency, large early release fractions and fire  
12 vulnerability considerations, we did a quantitative  
13 assessment of those particular considerations.

14 A qualitative impact was performed at  
15 power uprate for the impacts with respect to the  
16 seismic vulnerabilities, external events and we also  
17 did a qualitative impact with respect to shutdown risk  
18 and I'll go into each of those.

19 MEMBER KRESS: Has your PRA gone through  
20 the industry peer review process certification for  
21 this?

22 MR. DAIBER: The model that we utilized  
23 for this particular effort has not or did not go  
24 through that certification. The revision 3 model  
25 which is our current model is going under that

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1 certification review as we speak right now. The  
2 results from that model have reduced our CDF values  
3 lower than what I'll be talking about here.

4 When we started off this effort, we  
5 started with what we had available to us which was a  
6 1997 plant model. We have updated the IPEEE model  
7 over the years to make sure the Level 1 internal event  
8 model most, as best we can represents the plant. With  
9 respect to the LERF considerations that model is  
10 effectively the same as that associated with the IPEEE  
11 submittal.

12 With respect to external events and fire  
13 considerations, we utilized for the fire the latest  
14 model available which had some updated initiating  
15 event frequencies associated with it. However, the P2  
16 values conversion values from frequencies to core  
17 damage considerations, those were effectively the same  
18 as the original IPEEE considerations. And with  
19 respect to the seismic and the external events again  
20 we started with the latest available IPEEE models that  
21 were available at the time.

22 I'm now going to go over the internal  
23 event considerations on core damage frequency and  
24 we'll address the following areas: initiating events,  
25 frequencies, success criteria, component failure

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1 rates, system fault tree analyses and operator  
2 responses.

3 The initiating events and frequencies, we  
4 first looked at those and made sure that there were no  
5 new initiates identified and no new increase in  
6 initiated frequency. There was one modification that  
7 we made. It was that CSAS actuation. That was very  
8 similar to an already modeled MSIS actuation which  
9 secures main feed and loss condenser. However, due to  
10 the fact that we've already modeled the MSIS to CSAS  
11 actuation signal wasn't a new initiator and the  
12 frequency of the MSIS was determined to be  
13 conservative with respect to the bounding issue of the  
14 new addition. And the reason for that was when we  
15 installed the CSAS actuation we installed it, keeping  
16 in mind trip hardening facets and we went back and we  
17 also trip hardened the MSIS actuation signals, so it's  
18 a frequency of an inverted MSIS which was actually  
19 reduced, even though we added the new signal.

20 As a result of that, there were no changes  
21 required to the current model for up rated conditions  
22 with respect to initiating event frequencies.

23 The success criteria was also reviewed as  
24 a result of the power up rate considerations and along  
25 the lines of success criteria, there was one change

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1 that was noted to be necessary to update the success  
2 criteria and that was associated with large break  
3 LOCA, the amount of HPSI flow required at time of  
4 recirculation. The current evaluation model, the  
5 current power considerations uses two of four HPSI  
6 valves per pump as the acceptance criteria,  
7 recognizing the increase in decay heat associated with  
8 power uprate, we increased that requirement from 2 to  
9 4 to 3 to 4 valves on the uprated conditions.

10 The other criteria associated with some of  
11 the transient event considerations, we went back and  
12 verified the success criteria there and the method of  
13 verification was the use of the code CENTS. CENTS is  
14 the CE Westinghouse methodology effectively used for  
15 doing the Chapter 15 events. We applied it in the  
16 best estimate fashion here to verify that the success  
17 criteria, the other success criterias remain value  
18 under uprated conditions.

19 So the only fault tree topologic change  
20 necessary for power uprate was the success criteria  
21 with respect to large break LOCA considerations at  
22 recirculation.

23 We also went through and looked at the  
24 component failure rates and the eventual impact of  
25 power uprate on component failure rates. And as we

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1 discussed earlier this morning, all the plant systems  
2 and components were reviewed for verification that  
3 they could operate within the uprated conditions and  
4 still meet their design requirements. And appropriate  
5 modifications and/or set points were made to ensure  
6 that those components would still operate within the  
7 design considerations.

8 Based on that and the fact that we do have  
9 on-going monitored programs and look at the components  
10 themselves and trend components considerations, we  
11 determined that there was no adverse effects on the  
12 component failure rates associated with extended power  
13 uprate for Unit 2.

14 MEMBER POWERS: I guess -- explain to me  
15 again. Existing monitoring programs will account for  
16 additional wear. That means you'll know when it's  
17 occurring?

18 MR. DAIBER: Yes and/or --

19 MEMBER POWERS: Surely, the fact that it  
20 has occurred must increase failure rates?

21 MR. DAIBER: It will -- if there is -- if  
22 there is a result of that, we will pick that up as  
23 part of the monitoring programs and ultimately update  
24 the data base as necessary. But also, it allows us to  
25 watch the components and make sure we're performing

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1 predictive maintenance on a more appropriate schedule  
2 as necessary.

3 MEMBER POWERS: But you've got to reflect  
4 the fact that the additional wear is occurring in your  
5 component failure rates that you use the PRA model.  
6 Surely, you can't say you're going to go fix something  
7 that's going bad on you, does not mean that you didn't  
8 experience a period of risk while it was bad.

9 MR. DAIBER: From the component design  
10 standpoint, we made sure that all the components were  
11 operating within the design criteria and upgraded the  
12 components --

13 MEMBER POWERS: That doesn't have anything  
14 to do with how you set your component failure rates.

15 MR. DAIBER: To actually try to predict  
16 some of that is very challenging. If the components,  
17 the pumps operating at a higher speed and the wear  
18 rate expected under the higher speed or conditions  
19 causes it to fail more frequently than if it were not,  
20 that data is not really available on a generic basis.  
21 We do take into account actual plant operating  
22 conditions to accommodate failure rates associated  
23 with components and based on that experience we do on  
24 a regular basis update component, the failure rate.  
25 So to the exact science of getting that data and

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1 predicting that data, it's very difficult. However,  
2 from a long term perspective, the component failure  
3 rates for a specific components will be rolled into  
4 the model as we gain experience under the operating  
5 conditions.

6 MEMBER SCHROCK: Could you give an example  
7 of what that first bullet means and equipment verified  
8 to operate within design limits?

9 MR. DAIBER: With respect to components,  
10 design requirements, their ratings, their pressures,  
11 their flow rate requirements, they were all verified  
12 to be -- that the components actually were within what  
13 the vendor would recommend for the design of those  
14 components.

15 MEMBER SCHROCK: What does that say about  
16 failure rates?

17 MR. DAIBER: It gives us a good level of  
18 comfort that we're operating within where the vendor  
19 would recommend and that there would be no substantive  
20 change in the failure rates that we would expect for  
21 that component over what we've seen in the past.

22 CHAIRMAN WALLIS: So your failure rates  
23 are based on your experience of failure rates?

24 MR. DAIBER: A combination of generic  
25 plant data and review of our plant specific data with

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1 respect to components.

2 CHAIRMAN WALLIS: It is based on  
3 experience of either your plant or a group of plants?  
4 It's not based on guesswork from what some  
5 manufacturer says?

6 MR. DAIBER: No. That's right. It's  
7 based on actual operating experience.

8 MEMBER KRESS: That's standard PRA  
9 procedure. There doesn't seem to be any other --  
10 there doesn't seem to be any other way to do it.

11 MEMBER POWERS: No, it's not standard PRA  
12 procedure is to take into effect zero. You know it  
13 exists. I mean you're having to put things in here.

14 MEMBER KRESS: Yes, but you don't have any  
15 way to --

16 MEMBER POWERS: Yes, you do. Run a  
17 sensitivity analysis and say suppose my component  
18 failure rates change by the ratio of frequencies of  
19 repair.

20 MEMBER KRESS: You can do the sensitivity  
21 analysis.

22 MEMBER POWERS: Sure.

23 MEMBER KRESS: You don't know the ratio of  
24 frequency of repair just yet though. You will over  
25 time.

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1 MEMBER POWERS: I will bet that the  
2 rotating equipment you can take number of revolutions.

3 MEMBER KRESS: That would be one process  
4 to do it, but the fact is there's just no way to  
5 estimate what a power uprate will do --

6 MEMBER POWERS: The worst way to do it is  
7 to ignore it.

8 CHAIRMAN WALLIS: That seems  
9 nonconservative anyway.

10 MR. DAIBER: We will have to -- I will  
11 point out that from the safety-related equipment  
12 that's typically required to operate post event, all  
13 that equipment was verified to essentially operate  
14 within the current design requirements. There were no  
15 additional design requirements identified associated  
16 with any of the safety-related equipment needed to  
17 mitigate these events most of the considerations with  
18 respect to where we'd come with normal operating  
19 equipment.

20 MEMBER POWERS: Which is the initiating  
21 events. There are two parts to the equation.

22 MR. DAIBER: Right.

23 MEMBER POWERS: There's the initiators and  
24 the mitigators. The mitigators are okay does not mean  
25 that the initiators are okay.

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1                   MEMBER SCHROCK: Failure rates, it seems  
2 to me, depend on the way the thing is operated, a wide  
3 range of things, the exposure to transients that may  
4 be damaging any number of things in the operation, but  
5 also to variations in the manufacturing process, what  
6 the thing was initially. Rotating machinery, surely  
7 related to maintenance factors. There's so many  
8 things that go together to do it, but what puzzles me  
9 is how any correlation is developed between design  
10 operation within design limits and the failure rate.

11                   MR. DAIBER: The only --

12                   MEMBER SCHROCK: Surely, if you operate  
13 outside design limits you would subject the thing to  
14 a higher failure rate, but how is that used in fixing  
15 failure rates that you're going to plug into your PRA.

16                   MR. DAIBER: The real assurance that you  
17 get is the fact that you don't see any substantive  
18 changes in the component failure rates. Obviously,  
19 we're operating within what the design manufacturer  
20 recommends and although there may be small changes as  
21 a result, there are no substantive changes expected as  
22 a result of the failure, component failure rates.

23                   MEMBER KRESS: It's just that PRAs are not  
24 sensitive to the level of a 7 percent power increase  
25 in terms of inputting failure rates and initiating

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1 frequencies. You just can't distinguish those things  
2 at that level for a specific plant in a PRA and that's  
3 why one of the nice things to do with PRAs is to have  
4 a good uncertainty analysis. And I'm sure the  
5 uncertainty element would far and away swamp the  
6 change in 7.5 percent, but of course we don't get  
7 uncertainties when we get PRAs very often, but if we  
8 had them, I'm sure it would swamp anything 7.5 percent  
9 would do to those things.

10 MR. DAIBER: That's a good point and the  
11 other thing is as we'll get into later here, operator  
12 actions and response times were identified as one of  
13 the more critical areas and any sensitivities you  
14 would see as a result of component failure rates would  
15 be overwhelmed by the sensitivities we did see as a  
16 result of operator action considerations.

17 MEMBER POWERS: As far as I can tell it's  
18 all due to rampant speculation. I don't think you can  
19 substantiate your statements about uncertainty and I  
20 don't think you can substantiate statements about the  
21 relevant importance of operator actions and component  
22 failure rates. I mean it's just speculation. You  
23 just don't have the numbers.

24 MEMBER KRESS: I think you're right. If  
25 you don't have the numbers, it is speculation. Those

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1 are tough numbers to come by.

2 I can do the uncertainty, probably, pretty  
3 well because there is enough data to incorporate  
4 uncertainties. I just can't do the other half and  
5 that's what the 7.5 percent of power uprate will do to  
6 that uncertainty distribution, I don't have that data.

7 MR. FOUTS: This is Dan Fouts. I would  
8 like to point out one other item here. We do use a  
9 substantial amount of generic data and the equipment  
10 components and so forth that we have in the plant that  
11 we're going to operate it at uprated conditions or  
12 current conditions is not seeing anything unlike what  
13 these components see all over the country as it is.  
14 So this generic data already includes to some extent  
15 whatever uprates we may be using.

16 MEMBER POWERS: I mean it's all bearing on  
17 unbelief here. I'm going to change things. I know  
18 clearly I am making it worse. Maybe it's incremental  
19 worse, I'm making it worse, but I leave things the  
20 same because I can't estimate the increment. I can  
21 estimate the increment, change the component failure  
22 rates by 10 percent and see if it makes any  
23 difference. I mean this is -- it doesn't strike me as  
24 even a typical thing to do. Change them by 50  
25 percent, see if it makes any difference. If it

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1 doesn't make any difference, then the point is  
2 substantiated.

3 MEMBER KRESS: I've got to tell you, it  
4 would make some difference if you changed it by 50  
5 percent.

6 (Laughter.)

7 MEMBER POWERS: And if it did, then we  
8 would get down into a discussion of whether it was 10  
9 percent or 50 percent is the appropriate thing.

10 CHAIRMAN WALLIS: Are you going to show us  
11 later on the operator actions dominate so you could be  
12 off by say a factor of two and component failure rates  
13 wouldn't make any difference?

14 MR. DAIBER: With respect to operator  
15 actions, the dominant effect in change in core damage  
16 frequency was on the order of 16 percent increase as  
17 a result of the reduced time available to operator  
18 action.

19 CHAIRMAN WALLIS: Are you going to argue  
20 if you had -- maybe you didn't do this, you didn't  
21 double your component failure rates and see the  
22 effect?

23 MR. DAIBER: No, we did not do a  
24 sensitivity analysis when we did this.

25 Again, we expected all the components to

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1 be operated within current design parameters which is  
2 what generic data is based on and we may see a more  
3 rapid degradation in certain areas when we do our  
4 inspections, but that just means we would take  
5 correction action sooner, whether it's predictive  
6 maintenance or fact program or whatever. If there's  
7 an impact from power uprate on that, we would take  
8 action before we would ever get to the point that we  
9 would see a failure. And if we happen to miss all of  
10 that, then we'll pick it up in our periodic reviews of  
11 component failures and the other maintenance rule,  
12 updating the model for initiating event frequencies,  
13 whatever or a period of time. We're just not  
14 anticipating it based on our review of all the data  
15 that we've seen before.

16 Are you using generic data for that?  
17 Again, the safety related components, there were no  
18 significantly new challenge from the design--

19 MEMBER POWERS: I want to make sure that  
20 everybody understands. When you say you're using a  
21 generic data you mean you're using an applicable data?

22 MR. DAIBER: Applicable data --

23 MEMBER POWERS: Inapplicable data. When  
24 you say the word generic, you're admitting you don't  
25 have data for the existing thing. You're using the

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1 best you have available and unfortunately, that's just  
2 not directly applicable.

3 CHAIRMAN WALLIS: So there's a lot of  
4 uncertainty associated with that.

5 MR. FOUTS: Well, we use generic data  
6 because we haven't had any failures on our plants so  
7 that's the best we've got available.

8 CHAIRMAN WALLIS: Can we move on now?

9 MR. DAIBER: Sure.

10 MEMBER POWERS: We may come back to this  
11 in the full committee.

12 MR. DAIBER: With respect to the system  
13 fault tree considerations, again we reviewed the plant  
14 modifications that were proposed for power uprate  
15 considerations and verified the impacts or lack of  
16 impact upon the system fault tree models. The only  
17 real modification that impacted the system fault tree  
18 models again was the CSAS actuation component. That  
19 CSAS actuation was sent to the main steam and main  
20 feed isolation valves. We did upgrade the system  
21 fault trees to accommodate that modification.

22 We did review operator actions associated  
23 with the PRA model. We looked at both current  
24 operating conditions and uprated conditions and to  
25 quantify the effect on associated operator actions, we

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1 used a thermal hydroscope CENTS again in this  
2 situation and we ensured that the -- we quantified the  
3 actual change and available operator response times  
4 for a range of sequence of events in the uprated  
5 model. And we did that in a comparison basis both  
6 between current power and uprated conditions. We then  
7 were able to incorporate these new times in to the HRA  
8 models and quantify new HRA times and we did that, we  
9 went back and both quantified it, the CENTS is a new  
10 methodology that was not used originally for the  
11 original quantification for HRA, so we went back and  
12 we requantified the HRA at current power rate of  
13 conditions and to uprate it to make sure we had a good  
14 apples to apples comparison for the effect of HRA.

15 MEMBER POWERS: And for your human  
16 reliability analysis what were you using?

17 MR. DAIBER: The methodology?

18 MEMBER POWERS: Uh-huh.

19 MR. DAIBER: We used EPRI methods for the  
20 post-proceduralized operator action considerations and  
21 we used a combination of the most conservative of the  
22 cause based and cognizant reliability methods. So we  
23 looked at both of them, EPRI -- both of them based on  
24 EPRI methodologies and we take the conservative of the  
25 two, so we believe that our assumptions with respect

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1 to HRA are very conservative and the implications of  
2 power uprate impacts are somewhat amplified due to  
3 that conservative approach that we take.

4 So we developed effectively two PRA  
5 models, what we'll refer to as the 2A, the pre-uprate  
6 model and then a 2B model essentially incorporated the  
7 changes in success criteria that we discussed, the  
8 changes in HRA considerations, where it rolled up into  
9 the 2B model. We quantified both of these cases and  
10 then did the comparison to get a change in CDF as a  
11 result of these impacts for power uprate  
12 considerations.

13 The change in CDF that we quantified on  
14 this was  $2.7 \text{ E}^{-6}$  which is essentially a 16 percent  
15 increase in CDF. This change in CDF falls within  
16 Region II, a small change per the guidance of Reg.  
17 Guide 1.174.

18 Then for the LERF considerations we  
19 reviewed the current IPE binning criteria that was  
20 established and verified that the power uprate  
21 considerations did not have any change or effect on  
22 those plant damage state considerations, in  
23 particular, those plant damage states related to the  
24 large early relief frequency considerations.

25 We then rolled in the Level 1 results that

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1 we just discussed on top of those plant damage state  
2 fractions to come up with a change in the large early  
3 release fraction. The delta LERF then was calculated  
4 to be  $9.3E^{-8}$  which effectively resulted in a 24  
5 increase, 24 percent increase in the large early  
6 release fraction considerations. This now falls  
7 within Region III which is considered the very small  
8 changes with respect to Reg. Guide 1.174 criteria.

9 CHAIRMAN WALLIS: It's very interesting.  
10 There's nothing about the benefit achieved from these  
11 small changes in risk. It's an interesting way to  
12 regulate. Benefit is not part of the equation.

13 MR. DAIBER: The additional megawatts  
14 electric, ratio to megawatts electric, yes.

15 MEMBER POWERS: I'm perplexed.

16 CHAIRMAN WALLIS: You are what? You are  
17 perplexed?

18 MEMBER POWERS: I spend my life perplexed.

19 (Laughter.)

20 CHAIRMAN WALLIS: I think from the public  
21 point of view they're getting a benefit and they're  
22 getting an increased risk. All that the Agency  
23 measures is the increased risk and so it's okay.  
24 There's no risk benefit balance. In reality, that's  
25 what's going on.

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1 MEMBER KRESS: If one had did the safety  
2 goals correctly, one would have factored the benefit  
3 to risk.

4 CHAIRMAN WALLIS: Yes, you have to do  
5 that.

6 MEMBER KRESS: So that would have been in  
7 the criteria in the first place.

8 CHAIRMAN WALLIS: I understand.

9 MEMBER POWERS: I'm willing to infer that  
10 they did do that.

11 MEMBER KRESS: They did account for it.

12 MEMBER POWERS: And they accounted to the  
13 benefit. What we, of course, don't have in these  
14 numbers is any quantification of the impacts of  
15 external events or shutdown risk.

16 CHAIRMAN WALLIS: Like some of the events  
17 that are coming up later on, I think.

18 MEMBER POWERS: We won't get any  
19 additional numbers.

20 CHAIRMAN WALLIS: Well, we're going to get  
21 something before 110 or something like that.

22 (Laughter.)

23 MR. DAIBER: There won't be numbers  
24 though.

25 CHAIRMAN WALLIS: This is well within the

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1 regions and Reg. Guides, it's not near the boundaries?

2 MEMBER POWERS: I mean if you leave out  
3 half the effects, you get small numbers and everybody  
4 is happy with this myth.

5 MR. DAIBER: The internal fire analysis,  
6 we also looked at external events, including fire  
7 considerations. We reviewed their frequencies with  
8 respect to fire, the loading considerations and on the  
9 uprated conditions there were no effects on the  
10 combustible loading requirements, hence no change in  
11 the frequencies and the current frequencies used in  
12 the ANO-2 model are very conservative.

13 MEMBER POWERS: What is your prior IPEEE  
14 fire?

15 MR. DAIBER: We use EPRI 5 methodology for  
16 that.

17 MEMBER POWERS: And what did you come up  
18 with? There's a number there.

19 MR. DAIBER: The EPRI 5 methodology is a  
20 screening methodology.

21 MEMBER POWERS: Right.

22 MR. DAIBER: So it's utilized to screen  
23 zones. We don't do a thorough quantification of the  
24 actual risk associated with fire for using that  
25 methodology. It's used essentially to determine

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1 insights and vulnerabilities and those places where  
2 enhanced operator guidances necessary is implemented  
3 as appropriate.

4 But as far as determining an explicit  
5 value we don't quantify that with respect to--

6 MEMBER POWERS: Is there a reported value?

7 MR. DAIBER: We report values based on the  
8 screening criteria, that is correct. For particular  
9 zones, we do calculate values and what we do when we  
10 do the screening though is we look at a particular  
11 zone. We assume everything in the zone is failed as  
12 a result of the fire, conservatively assume that it  
13 fails and see if it still falls below a screening  
14 criteria of  $1E^{-6}$ . If it falls below that, we're done.  
15 If it stays above that we may look at a little more  
16 detail. Or if it still falls within acceptance  
17 criteria at that point with appropriate operator  
18 action, we consider ourselves done with that point  
19 too. We don't necessarily look at it and truly say  
20 okay in this zone, in this particular region, this  
21 fire would only affect these particular components and  
22 only these particular components and look at it from  
23 that perspective. It's more of a graded approach and  
24 to point out vulnerabilities and show that we have  
25 adequate procedures in place to accommodate the risk

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1 associated with fires in certain regions.

2 MEMBER KRESS: How many zones do you look  
3 at usually?

4 MR. DAIBER: I believe we have -- I don't  
5 know the total number that was used with respect to  
6 the unscreened, there were 15 unscreened zones. The  
7 rest of the zones screened out.

8 MEMBER POWERS: Somehow Dr. Shack reminded  
9 me that somewhere on this documentation I read 9.5 x  
10  $10^{-5\text{th}}$ .

11 MR. DAIBER: Yes, if you add up the values  
12 that we presented, I don't think I have a slide on  
13 that.

14 CHAIRMAN WALLIS: Are we going to get  
15 some?

16 MR. DAIBER: Yes, I do have a slide, a  
17 back-up slide.

18 CHAIRMAN WALLIS: It doesn't seem to be on  
19 your slide.

20 MR. DAIBER: No, I have a backup slide.

21 MEMBER KRESS: If you take the 15 and  
22 multiply it 1.5 times --

23 MR. DAIBER: 134, 135.

24 MEMBER KRESS: Probably where it came  
25 from.

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1 MEMBER POWERS: My recollection of --

2 MR. DAIBER: 134, 135.

3 MEMBER POWERS: Insights document is this  
4 plant has a fire risk reported. It's adequately  
5 characterized in the nature of accurately  
6 characterized the nature of that number. I would be  
7 effusive in my abuse of the reliability of that number  
8 because it's as conservative as he says.

9 But I mean it does put in perspective the  
10 distinction between the normal operating events and  
11 fire as an initiator and yet we focus all of our  
12 attentions on the normal operating events.

13 MEMBER KRESS: Yes, the normal operating  
14 was something like CDF of  $10^{-6}$ . The normal operating  
15 events was something like  $10^{-6}$ .

16 CHAIRMAN WALLIS: Fire is an order of  
17 magnitude greater.

18 MEMBER KRESS: Yes, it is an order of  
19 magnitude greater.

20 CHAIRMAN WALLIS: Do you have the bottom  
21 line here?

22 MR. DAIBER: I don't have these added up.

23 CHAIRMAN WALLIS: You get to  $1E^{-4}$ .

24 MR. DAIBER: Right.

25 CHAIRMAN WALLIS: Which is above--

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1 MR. DAIBER: That is correct. If you  
2 would add these numbers up, it comes up more than 1E<sup>-</sup>  
3 <sup>4</sup>.

4 CHAIRMAN WALLIS: So it looks as if fire  
5 is really a significant event for these plants.

6 MR. DAIBER: No, we don't believe that to  
7 be the case at all. We believe that if we truly went  
8 in and applied the same level of rigor to these  
9 numbers as we do to the IPE level of rigor to these  
10 numbers and to these events, we would get that number  
11 much lower. But that's not the methodology we  
12 utilized when we submitted our IPEEE results. The  
13 accepted methodology, the EPRI methodology that we did  
14 utilize did not require that to be done. So if one  
15 truly wanted to come up with a core damage frequency  
16 associated with fire, we would apply much greater  
17 rigor and reviewing what components truly would fail  
18 in a room as a result of the fire, what available  
19 operator actions are available, what backup equipment  
20 is truly available and apply all that additional  
21 recovery considerations to the CDF values.

22 So what we see here are very, very  
23 conservative numbers.

24 MEMBER POWERS: Let's also hasten to point  
25 out that the requirements for the fire equipment do

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1 not approach the requirements they have for the  
2 recovery and mitigation systems in normal operating  
3 events. And so inherently you have something that is  
4 less reliable. You're not, for instance, required to  
5 meet the single failure criterion for fire protection  
6 equipment. So yes, you'd probably get some reduction,  
7 but I don't expect that it's going to be enormous  
8 reductions.

9 Then you run into a fundamental problem in  
10 the reliability of equipment, without redundancy, is  
11 limited. It's tough to get  $10^{-6}$ .

12 CHAIRMAN WALLIS: Do we need to look at  
13 the other accidental events or external events?

14 MR. DAIBER: The other external events are

15 --

16 CHAIRMAN WALLIS: It seems to be no impact  
17 to other external events.

18 MR. DAIBER: Right, with respect to other  
19 external events, the power uprate effects are really  
20 considered negligible. There is no real impact as a  
21 result of power uprates associated with all the other  
22 external event considerations.

23 You want to go back to --

24 MR. BOYD: I'm trying.

25 MR. DAIBER: So am I.

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1 (Pause.)

2 MR. DAIBER: Seismic margins--

3 CHAIRMAN WALLIS: Maybe we won't need to  
4 go through all of this. There's nothing that --

5 MEMBER POWERS: I mean what you did is one  
6 assurance, the shutdown risk is not evaluated, but  
7 what you know is that operator times are a little bit  
8 shortened here and there, especially in mode 4 and  
9 that it's acceptable.

10 That's about all I expect out of human  
11 reliability analysis anyway, so it's not such a bad  
12 statement.

13 MEMBER SIEBER: So directly to Slide 111.

14 CHAIRMAN WALLIS: I'm suggesting we go to  
15 --

16 MR. LANE: I think that's my cue. Is  
17 there anything else you want to say relative to --

18 MR. DAIBER: No. I guess if that's --  
19 real quick with respect to shutdown risks, we do look  
20 at shutdown risks. We look at the safe shutdown  
21 considerations of the plant. We do monitor that  
22 power uprate from the perspective of anything else  
23 that goes on during the outage is really within the  
24 range of what is considered during an outage and the  
25 risk associated that is managed by the plant

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1 procedures and the automated ORAM code for  
2 consideration of all these risks.

3 That concludes our presentation and with  
4 great pleasure I now turn this over to Rick Lane.

5 MR. LANE: Thank you, Bryan. I'll go  
6 ahead and make my concluding remarks from here because  
7 I know we're getting close -- into the lunch period  
8 here, so we'll make it short. I would like to thank  
9 the ACRS subcommittee today. I really appreciate the  
10 interaction and also I would like to change the NRC  
11 staff. We've gone through a very thorough review  
12 here. We have worked hard to achieve, as Bryan  
13 mentioned earlier, the actions at this point in time  
14 with the staff and do appreciate the rigorous effort  
15 that this review has taken.

16 We feel that we have met the key  
17 objectives and goals that I identified in my  
18 introduction and that is first and foremost to safely  
19 uprate this unit by performing the rigorous analysis  
20 and modifications and the appropriate testing to make  
21 sure that we appropriately achieve and safely achieve  
22 the 7.5 percent uprate.

23 We also, very important to us, is to  
24 maintain adequate operating and design margins. We  
25 believe that the plant and the plant staff are ready

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1 for this uprate and I thank you today for the  
2 interaction and that concludes my remarks.

3 CHAIRMAN WALLIS: Thank you.

4 MR. LANE: Thank you.

5 CHAIRMAN WALLIS: I think that concludes  
6 this morning's session and then we're going to hear  
7 from the staff on all of these matters this afternoon.

8 After that we have yet another topic to go  
9 into so we have a busy set of activities this  
10 afternoon.

11 In light of that, I'm wondering if we  
12 could have at least a somewhat shorter lunch break.  
13 Can we meet here at 12:15? Is that acceptable? 1:15,  
14 thank you very much.

15 Colleagues, please?

16 MEMBER KRESS: Yes.

17 CHAIRMAN WALLIS: Can we meet here at  
18 1:15, is that acceptable?

19 MEMBER KRESS: Yes.

20 CHAIRMAN WALLIS: We don't need an hour  
21 for lunch, so we will recess until 1:15. Thank you  
22 very much for your presentations.

23 (Whereupon, at 12:29 a.m., the meeting was  
24 recessed, to reconvene at 1:15 p.m.)

25

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(1:18 p.m.)

CHAIRMAN WALLIS: We come back into session. We are now going to hear from the staff on the application of Arkansas Nuclear One, Unit 2, for extended power uprate, and I believe that Tad Marsh of the NRC staff will get us going.

MR. MARSH: I do thank you. Good afternoon. My name is Tad Marsh, and I am the Deputy Director of the Division of Licensing Project Management at NRR.

The staff is here to present to you this afternoon two extended power uprate reviews. The first is going to be the seven and a half percent uprate for Arkansas Unit Two.

Just by background, this is the largest extended power uprate for a PWR that we have seen to date. Based on discussions with Westinghouse during the July 2001 meeting, the staff expects submittals for extended power uprates for PWRs in the range of 10-20 percent. So this is the first, the beginning.

Following our presentation for Arkansas, we will present the 20 percent power uprate for the Clinton plant. The Clinton power uprate is similar to Duane Arnold, Dresden and Quad Cities which you have

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1 seen as late last year.

2 Clinton's application deviates from the  
3 ELTR-1 and 2 for the GD-BWR extended power uprates in  
4 four areas. These areas are transient analysis, LOCA  
5 analysis, stability and large transient testing.

6 We will discuss our review of these first  
7 three deviations with you, and we will also be  
8 discussing some of the background associated with the  
9 large transient testing.

10 Before we start our presentations, I'd  
11 like to touch on the feedback that we have received  
12 from the ACRS on Duane Arnold, Dresden and Quad Cities  
13 and our response to the ACRS in our letter of February  
14 1st.

15 I'd like to start by emphasizing that our  
16 reviews of extended power uprate, we believe to be  
17 thorough and in depth. I believe that the issues  
18 raised in your letters are related to documentation of  
19 the review, not the review itself and, as we outlined  
20 in our letter, we received somewhat similar responses  
21 regarding documentation from the Office of the  
22 Inspector General on another issue.

23 In addition, our own self-assessment has  
24 identified documentation weaknesses which we will  
25 address. In order to improve the documentation of our

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1 reviews, we are committed to a broad review of agency  
2 documentation practices. This effort is broader than  
3 NRR, and we are working with other offices.

4 In addition, at NRR we have included an  
5 issue of documentation in the NRR integrated quality  
6 plan to ensure that this issue receives the proper  
7 attention. We expect our documentation to continue to  
8 improve. I have seen significant improvements  
9 between our draft safety evaluations forwarded to the  
10 ACRS and our final safety evaluation reports. We will  
11 continue to strive for improvements in documentation.

12 We are attempting to ensure that our  
13 drafts meet the guidance contained in our NRR office  
14 letter LIC 101 and other guidance documents and  
15 management directives and the template safety  
16 evaluations for power uprates.

17 NRR management is committed to ensuring  
18 that our safety evaluations will continue to improve.  
19 We believe that the ongoing efforts related to  
20 documentation will more fully address the issues  
21 raised in your letters for further applications.

22 With regard to your recommendation for the  
23 staff to develop a standard review plan for power  
24 uprates, the staff has been tasked by the Commission  
25 to evaluate the merits of developing such an SRP, and

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1 we have committed to complete such an evaluation by  
2 May 1, 2002.

3 Our evaluation will address -- and this is  
4 described in the letter -- the merits of developing an  
5 SRP section specifically for extended power uprates  
6 for the utilization of SE templates, building on  
7 safety evaluations already that are done, and any key  
8 improvements stemming from the integrated quality  
9 plan. We will keep you informed, of course, in this  
10 evaluation.

11 A key change to the review in BWRs is  
12 anticipated to occur on the approval of the GE topic  
13 report for CPPU. That's the constant pressure power  
14 uprate.

15 I would like to also say that in the arena  
16 briefing that we had with the Commission last week,  
17 there was a lot of discussion about power uprates, and  
18 the SRM coming from the Commission asks us to look at  
19 ways to improve the efficiency and effectiveness of  
20 the power uprate reviews.

21 We will get back to the Commission on a  
22 plan by June 26th, and there is a Commission meeting  
23 on license renewal and on power uprates on July 10th.  
24 There was a great deal of discussion with the  
25 Commission regarding the need for an SRP, quality of

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1 safety evaluations, the number of plants that we see  
2 coming with their applications for power uprates. So  
3 this is an item of interest not just to the staff but  
4 to the Commission.

5 Moving on to the Arkansas and Clinton  
6 reviews, I would like to emphasize that we have  
7 conducted thorough reviews of these applications in  
8 all areas potentially affected by the power uprates,  
9 but the focus on the review is being on safety.

10 We have conducted our reviews consistent  
11 with the existing practices, including the lessons  
12 learned from the Maine Yankee experience. All the  
13 areas that are affected by power uprates have been  
14 reviewed and evaluated.

15 The staff has critically examined the  
16 methodologies and their application for these power  
17 uprate requests, and we have concluded that all of  
18 analytical codes and methodologies that have been used  
19 for licensing analysis are acceptable for these  
20 applications.

21 Although we reviewed information in many  
22 areas, we intend to focus our presentations today on  
23 areas which we believe to be the most important for  
24 power uprates. We also have NRR staff here to address  
25 any questions which you may like to be discussed.

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1           Now I'd like to turn the presentation over  
2 to Tom Alexion, the NRR Project Manager for Arkansas.  
3 Tom will give an overview of the review process used  
4 for Arkansas application and the order of the  
5 presentations.

6           Before I do that, can I answer any  
7 questions you may have? Thank you.

8           CHAIRMAN WALLIS: Thanks very much.

9           MR. ALEXION: Good afternoon. My name is  
10 Tom Alexion, and I am the NRC Project Manager assigned  
11 to Arkansas.

12           By way of background, the seven and a half  
13 percent power uprate application by entity represents  
14 the largest PWR upgrade to date. The highest PWR  
15 power uprate previously approved by the NRC is five  
16 percent.

17           As you heard this morning, ANO-2 is a CE  
18 designed PWR. The architect/engineer and constructor  
19 were Bechtel. The full power license was issued on  
20 September 1, 1978. The current license maximum  
21 reactor power level is 2815 megawatts thermal, and the  
22 current net maximum dependable capacity is 850  
23 megawatts electric. The ANO-2 has a large dry  
24 containment.

25           Also as you heard this morning, the steam

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1 generators were replaced at ANO-2 in the fall of 2000.  
2 Some differences between the old and the replacement  
3 steam generators are listed on this slide.

4 The licensee has designed the replacement  
5 steam generators to accommodate the increase in power.  
6 I would also like to note that, when reviewing the  
7 power uprate application, the NRR staff relied upon  
8 analysis previously done at the uprated power level  
9 and supported license amendments that were issued to  
10 support steam generator replacement in the fall of  
11 2000.

12 The NRR staff used the Farley five percent  
13 power uprate as a guide for the scope and depth of its  
14 review. For further review guidance in specific  
15 technical areas, the Standard Review Plan was  
16 utilized.

17 MEMBER SCHROCK: Excuse me. Was the  
18 Farley uprate reviewed by the ACRS?

19 MR. ALEXION: No, because it was a five  
20 percent.

21 MEMBER POWERS: We did, however, have one  
22 of our senior fellows go through the Farley uprate  
23 and provided us a brief assessment for it. Virgil, if  
24 you don't have a copy of that, we should get you one.

25 MEMBER SCHROCK: Thanks.

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1 MEMBER POWERS: You are aware of that,  
2 paul?

3 MR. BOEHNERT: Yes. No, in fact, I think  
4 he has a copy. I think I sent it to him.

5 MEMBER SCHROCK: You think I have?

6 MR. BOEHNERT: Yes.

7 MEMBER SCHROCK: Probably.

8 MR. ALEXION: The staff reviewed the  
9 licensee's application of acceptable codes and  
10 methodologies to see that they are used within the  
11 appropriate restrictions and limitations and to ensure  
12 that they are applicable to the power uprate  
13 condition.

14 MEMBER POWERS: Can I bring you back to  
15 the -- Use the Standard Review Plan -- that's a  
16 massive document. It's on CD-ROM. So it's not too  
17 difficult to get around in it.

18 When you say they used the standard the  
19 Standard Review Plan, that was left to the discretion  
20 of each of the reviewers to pick and choose what they  
21 used out of that?

22 MR. ALEXION: That's correct.

23 MEMBER POWERS: Were they -- and of  
24 course, the presentation indicated to us what  
25 particular sections they used?

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1 MR. ALEXION: I believe some of them do.  
2 I'm not for sure if all of them do, but I know, like  
3 for BOP, a very extensive list of SRP sections.

4 During the course of its review, the staff  
5 also issued many requests for additional information,  
6 and the licensee has responded to all of them. The  
7 staff also audited the licensee's risk evaluation for  
8 power upgrades, performed independent calculations  
9 with the dose assessments for those postulated  
10 accidents that result in increased dose consequences,  
11 and had a contractor perform independent calculations  
12 of the peak containment pressures and temperature  
13 following a postulated LOCA and main steamline break.

14 The principal areas of review are the NSSS  
15 and accident analysis, evaluations of systems  
16 structures and components, BOP systems, human factors,  
17 radiological analyses, and the risk assessment for  
18 power uprate.

19 MEMBER POWERS: Will you -- Did you look  
20 at a rod ejection accident?

21 MR. ALEXION: I think Reactor Systems did,  
22 yes.

23 MEMBER POWERS: And then when you come to  
24 the ability to fuel the sustained -- the powered  
25 input, what do you do there?

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1 MR. ATTARD: I'm Tony Attard from Reactor  
2 Systems. That's one of the Chapter 15 events. So  
3 that's where we -- you know, when we did the review to  
4 make sure that that was done in accordance with the  
5 criteria specified in that section.

6 MEMBER POWERS: But we knew that the fuel  
7 at modern burnups can't sustain 225 calories per gram  
8 power inputs or even 100 calories per gram power  
9 inputs. What do you do?

10 MR. ATTARD: Well, I believe those kind of  
11 calories were for particularly high burnup fuel. So  
12 we made sure or see that they still meet the 280, you  
13 know, for new fuel like they specify.

14 MEMBER POWERS: Okay. So you essentially  
15 go in and say did the rod ejection accident produce  
16 280 calories per gram. Answer is no. Therefore,  
17 everything is okay.

18 MR. ATTARD: Well, if they meet the  
19 criterion and they used approved methodologies, we  
20 accept it.

21 MEMBER POWERS: I understand.

22 MR. ALEXION: The order of presentation is  
23 as shown. The only open items in the draft safety  
24 evaluation were the radiological assessment area. All  
25 of the open items have since been closed, and the

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1 closure of these items will be discussed in the  
2 radiological assessment presentation.

3 CHAIRMAN WALLIS: How many of these  
4 reviews contained confirmatory analyses by the staff -  
5 - by any staff?

6 MR. ALEXION: I think we just had the ones  
7 I mentioned.

8 CHAIRMAN WALLIS: You did something on the  
9 containment, I understand, didn't you?

10 MR. ALEXION: Yes, we had somebody --  
11 Pressures and temperatures, we had those consequences.  
12 You said independent calculations was your question?  
13 I believe those were the two. Staff can correct me if  
14 I'm wrong.

15 MR. RICHARDS: Why don't we just ask the  
16 presenters to make sure they touch on that, if they  
17 did do some of those.

18 MR. ALEXION: As was previous discussed,  
19 the NRR staff has no open items. That concludes my  
20 opening remarks. With that, we'll go to the Reactor  
21 Systems presentation.

22 MR. LIANG: My name is Chu Liang. I'm a  
23 Reactor Systems Branch reviewer to review this ANO  
24 Unit 2 power uprate. There are a few other staff of  
25 the branch also participated in this review in

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1 specific areas. Next slide.

2 (Slide change)

3 This slide identified the major review  
4 areas that we performed in Reactor Systems Branch.  
5 The first is the reactor cooling systems, ECCS and  
6 shutdown cooling systems. These safety reactor  
7 systems are reviewed and verified that there are no  
8 system modifications required to perform their design  
9 safety function under power operated conditions.

10 The second item, we reviewed the fuel  
11 performance. We verified that all fuel design  
12 requirements and limits are met under power operated  
13 conditions -- operating conditions.

14 We also reviewed --

15 CHAIRMAN WALLIS: You say you verified.  
16 You mean you had a statement from the licensee that  
17 they had made these calculations?

18 MR. LIANG: The licensee provided some  
19 analysis per our request, and verified a few things,  
20 that there were a few the review has some concern, and  
21 we review them, and we confirm that all the design  
22 requirements are met.

23 CHAIRMAN WALLIS: And you are convinced  
24 that they have done them correctly, because of, what,  
25 a history of doing them using approved methods, or

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1 what? How do you assure yourself that these  
2 calculations are okay?

3 MR. ASTELUWICZ: This is Frank Asteluwicz,  
4 the Reactor Systems Section Chief. The answer to your  
5 question is some yes and some no. We do rely on the  
6 fact that the methods have been approved in the past,  
7 and we did look at the limitations imposed on those  
8 methods as part of our review, and confirmed that, in  
9 fact, the licensee satisfied whatever limitations were  
10 imposed on the application of those particular codes.

11 In most cases, we did not do an  
12 independent analysis that stuck numbers into the codes  
13 to confirm that the numbers calculated are, in fact,  
14 the numbers that the licensee generated. That's part  
15 of the way we do our analysis these days.

16 We rely heavily on the fact that the codes  
17 have been examined carefully or the processes are  
18 determined carefully, and then rely on the licensees  
19 to -- Basically, we audit the calculations and rely on  
20 the licensees to do them correctly.

21 MEMBER KRESS: Consider, for example, the  
22 ECCS code for Appendix K. Do you go back and review  
23 the validation basis for that to see if it --  
24 including the kind of power profiles that you get with  
25 the upgrade or were they done with a different power

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1 profile?

2 MR. ASTELUWICZ: The only thing I could  
3 answer -- The only way I could answer that question is  
4 that, if there were no limitations put on the use of  
5 that particular application at the time the staff  
6 looked at it, we would not generally go back to look  
7 at that. If we had some knowledge that there may be  
8 some issue in dispute, then we would go back and look  
9 to make sure that the range of applicability still  
10 occurred, but absent some unique knowledge, we would  
11 not do that.

12 CHAIRMAN WALLIS: So it sounds as if you  
13 are not raising new questions. You are going back to  
14 see that the old questions were suitably answered in  
15 sort of the historical record, but you don't come up  
16 with new questions to ask.

17 MR. ASTELUWICZ: Well, no, we do ask new  
18 questions. I'm not sure how to answer that question.  
19 We don't go back and challenge the foundation of the  
20 codes once they were approved, and I'm not sure that  
21 that's the question that you are asking. I mean, if  
22 you are asking are --

23 CHAIRMAN WALLIS: If somebody put  
24 limitations on the codes, it's not clear that they  
25 anticipated the kind of use that they are being put to

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1 today when they put those limitations on. That's the  
2 thing I'm concerned about.

3 MR. ASTELUWICZ: I understand. We do  
4 question whether or not the codes are applicable in  
5 the range that they are being used, but we don't go  
6 back and resurrect the data and confirm for ourselves  
7 that that's true. I mean, we do ask questions about  
8 that.

9 MR. MARSH: Mr. Chairman, just with  
10 respect to the confirmatory analyses, the questions  
11 that you have been asking about that, whatever you  
12 would prefer doing in terms of answering that  
13 question, we can come back to the full committee at  
14 the full committee time and give you a complete and  
15 thorough list; because not all of the staff's reviews  
16 are here today, if you would like to have that type of  
17 a list.

18 In terms of confirmation of codes, in the  
19 Duane Arnold, Dresden, Quad Cities reviews in terms of  
20 the transient testing, recall that G.E. had said to  
21 us, and we had agreed with that, that the performance  
22 of the plant on which they were basing their transient  
23 testing hypothesis behaved very well with respect to  
24 the modeling. So there was a confirmation using  
25 empirical data of the models that were used for that

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1 plant compared to how it actually behaved.

2 So there is some confirmation. I'm ont  
3 sure here with respect to the transients of the  
4 reactor coolant system or ECCS, but there is some at  
5 least in that context.

6 MR. LIANG: We reviewed steam supply  
7 system design transients. The licensee redefined  
8 them, and as modified slightly. Those design  
9 transients are used for design of the steam supply  
10 system to assure the system design as designed, were  
11 not -- during operation were not exceeding its stress  
12 limit, and other limitations, and we verify to assure  
13 that number of occurrences of any given transient  
14 selected for design purpose were exceeding the  
15 expected number over lifetime of the plant, and was a  
16 slightly change in the loss of feedwater transient.  
17 Change increased the number due to past experience,  
18 and changed the hydrotest requirement to less frequent  
19 due to ASME code changes.

20 We reviewed the LOCA and the Non-LOCA  
21 accident analyses to see there are some change in the  
22 code used, and the results of analysis meeting  
23 acceptance criteria. Next slide, please.

24 (Slide change)

25 MR. LIANG: The Reactor Systems Branch

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1 review process: The first bullet is reviewed  
2 application to current licensing basis. We were just  
3 review the effect of the increased power to the  
4 current design.

5 Next we verify plant modifications meeting  
6 SRP acceptance criteria.

7 Many transients and accidents previously  
8 reviewed at the uprated power levels in previous  
9 Amendment submitted for steam generator replacement we  
10 already reviewed and accepted during that review.

11 The transient and accident analyses  
12 submitted in this submittal we reviewed against assure  
13 approved codes and the methodologies are used and the  
14 methodology codes are applicable to ANO Unit 2 to  
15 support power uprate. And we verified the results to  
16 assure the acceptance criteria for each event  
17 specified in the SRP are met. Next slide.

18 (Slide change)

19 MR. LIANG: Reactor System Branch review  
20 results for transient and accident analyses are  
21 meeting the acceptance criteria for each event  
22 specified in the SRP.

23 All transient and accident analyses were  
24 analyzed using staff approved codes and methodologies  
25 with all limitations and restrictions specified for

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1 each code applicable conformed and is applicable to  
2 ANO power uprate application.

3 All transient and accident analyses inputs  
4 are conservative and consistent with tech specs limit.

5 MEMBER POWERS: In the presentation made  
6 by the applicant for one of his LOCA analyses, he  
7 indicated that a code error had been found. Could you  
8 tell us what that code error was?

9 MR. LIANG: Somebody help.

10 MR. ASTELUWICZ: We don't have that  
11 available to us right now. If you want to, we'll get  
12 back to you on that.

13 MR. LIANG: We also concluded the fuel  
14 design meets all design requirements and limits. That  
15 concludes our presentation.

16 MEMBER POWERS: Have the design  
17 requirement limits on fuel with Erbium poison in place  
18 of Gadolinium poisons been examined? Has there been  
19 any change?

20 MR. WU: This is Shu Lang Wu. Yes, we  
21 approved gadolinium and Erbium fuel for combustion  
22 engineering.

23 MR. POWER: So you've examined the  
24 peculiarities there. Now could you tell me how  
25 replacing gadolinium with Erbium changes the oxygen

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1 potential of the fuel?

2 MR. WU: Oxygen?

3 MEMBER POWERS: Oxygen potential of the  
4 fuel

5 MR. WU: I don't know about the answer.

6 MEMBER POWERS: It must change it, putting  
7 in basically a trivalent element in place of a  
8 tetravalent element. So you have to induce some  
9 vacancies. It must change it.

10 MR. WU: You're talking about the number  
11 of rod or what? I don't --

12 MEMBER POWERS: No. I'm talking about the  
13 oxygen potential in the fuel itself. Propensity to  
14 oxidize the inside of the clad is what I'm most  
15 worried about.

16 MR. WU: Well, I'm sorry. I don't work  
17 with that.

18 CHAIRMAN WALLIS: There's no acceptance  
19 criterion for this?

20 MEMBER POWERS: I think there is not. I  
21 mean, there may be -- It may come in a round and about  
22 fashion because of total oxidation that you have to  
23 worry about, but it's a round-about.

24 CHAIRMAN WALLIS: So they are from the  
25 outside in, not inside out.

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1           MEMBER KRESS: Yes, but it has to do with  
2 the failure of the clad.

3           MEMBER POWERS: You worry about the  
4 failure of clad. You also probably worry a little bit  
5 about the gap inventory changing as a result of it.  
6 I myself don't have any preconceived notions on this  
7 except --

8           MR. WU: Yes. We will get back to you.

9           CHAIRMAN WALLIS: Well, this is a summary  
10 slide that says everything is fine. Were there any  
11 particular transient analyses that you had to go back  
12 and carefully examine or anything in particular that  
13 caught your eye as requiring extra work on your part  
14 to check over or anything like that?

15           MR. LIANG: Yes. We asked a lot of  
16 questions, and the utility answered them, and we  
17 reviewed the assumptions, the input data to the  
18 transient and accident analysis of interest, and we  
19 also asked the code and the computed code and the  
20 methodology applicability to the ANO application, and  
21 we questioned these assumptions and got back the  
22 response to questions. We reviewed them, and we find  
23 that we satisfied some of them.

24           We asked questions, we have problem,  
25 because deviate from SRP a little bit, but we

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1 confirmed that those assumptions are consistent with  
2 the current licensing basis. So we accepted them  
3 based on the current licensing basis be honored, and  
4 finally we conclude all the analysis meeting  
5 acceptance criteria and the analyses were  
6 conservative.

7 MEMBER KRESS: What code was used for the  
8 Appendix K LOCA analyses?

9 MR. ASTELUWICZ: I'm not sure. Your  
10 specific question is it was an approved topical. The  
11 number was on the licensee slide, CEN-199, whatever  
12 that number was. I don't recall off the top of my  
13 head.

14 MEMBER KRESS: No. What computer code did  
15 the licensee use to calculate the figures of merit for  
16 the Appendix K LOCA analyses? They used some sort of  
17 approved code.

18 MR. ASTELUWICZ: Yes. I'm not sure. I  
19 think Westinghouse, they used BASH and BART. Is that  
20 what you are asking? I'm not sure I understand the  
21 question.

22 MEMBER KRESS: Yes, that's what I want to  
23 know, the name of the code. I'd also be interested to  
24 know when it was reviewed and approved by the staff.

25 MR. LIANG: Yes. All the code -- In

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1 response to staff's request, the licensee provided a  
2 big submittal of this proprietary information and  
3 identified each event, what code and methodology was  
4 applied, and the staff review SER, identified the  
5 restrictions and limitations and how they conformed  
6 them.

7 MEMBER KRESS: When were these  
8 restrictions and limitations placed on the use of the  
9 code?

10 MR. LIANG: This part is proprietary, and  
11 will be made available.

12 MEMBER KRESS: The when wouldn't be  
13 proprietary.

14 MR. LIANG: Yeah, yeah. The code, when  
15 approved, those limitations specified in staff's SER,  
16 topical reports.

17 MEMBER KRESS: Which was when?

18 MR. ALEXION: Each one has a different  
19 date.

20 MR. LIANG: Yeah, each one have different  
21 date. Start from 1975 and until recent, and different  
22 because we involve about 30 codes.

23 MEMBER KRESS: But these codes were  
24 vintage of like '75, that time frame?

25 MR. LIANG: Seventy-five to recent, and

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1 the LOCA codes about 14 of them, and the non-LOCA  
2 transients using another 15.

3 MEMBER KRESS: They used 14 different  
4 codes?

5 MR. LIANG: Involved, you know, in this --  
6 to support this application. In total, it's about --  
7 a lot involved to support this power uprate.

8 CHAIRMAN WALLIS: Well, now I asked you  
9 about -- This is a very summary slide. So it doesn't  
10 give a story of something you worried about, and then  
11 you told me that when you did have concerns, you went  
12 back and had these RAIs and around and around and  
13 around and around.

14 MR. LIANG: Yeah, yeah. We tried to --

15 CHAIRMAN WALLIS: Is there some example  
16 you can give me of some concern you had that maybe you  
17 didn't bring it, but it would help a lot if we could  
18 sort of see your modus operandi. So if you could sort  
19 of convince us that the way that you went about things  
20 was thorough, then you got -- It would be nice if you  
21 had an example of thoroughness which we could look at  
22 and say, gee whiz, those guys were really thorough.  
23 Is there some example you can give us like that?

24 MR. LIANG: Examples, like --

25 CHAIRMAN WALLIS: Some example of where

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1 you had to be thorough.

2 MR. LIANG: We've taken a look at their  
3 assumptions, and --

4 MR. ASTELUWICZ: Chu, let me interrupt.  
5 Let me try. This is Frank Asteluwicz again.

6 A specific example: One of the areas that  
7 we looked at carefully was the issue of long term  
8 cooling, the boron precipitation question, because we  
9 had concerns in that area.

10 Another area that we looked at were some  
11 of the control rod withdrawal events where in the  
12 course of a review at a sister plant, we uncovered the  
13 case where a potential tech spec was being violated,  
14 and we proceeded to probe that area on Arkansas and  
15 have them reassess it, and they are in the process of  
16 changing their tech specs to account for that  
17 particular concern.

18 Can I give you anymore specifics?  
19 Probably not off the top of my head.

20 CHAIRMAN WALLIS: That's the sort of  
21 thing, I think, would help, because otherwise it's  
22 just so general.

23 MR. ASTELUWICZ: I understand.

24 CHAIRMAN WALLIS: And if we are trying to  
25 evaluate -- I don't want to use the word credibility,

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1 but something like that. I mean, I'd like to sort of  
2 get the good feeling that you've done a thorough job.  
3 How do I get that? I have to sort of see examples of  
4 a thorough job, which means digging in in some depth  
5 on some issue which is of concern.

6 MR. ASTELUWICZ: Right.

7 CHAIRMAN WALLIS: I don't know how we can  
8 get that.

9 MR. ASTELUWICZ: There will be other  
10 examples forthcoming in some of the other areas. The  
11 other -- I forgot which one I wanted to bring up, but  
12 -- I forgot. I'm sorry. But we did -- ATWS is  
13 another area we had a lot of questions, and you heard  
14 the discussions early this morning about how they have  
15 the DSS, and that was sufficient to meet the rule. We  
16 asked them, you know, to go back and make sure that  
17 the design of that particular facility -- or the  
18 design of that system would meet the intent of its  
19 function for ATWS.

20 CHAIRMAN WALLIS: This is the ATWS?

21 MR. ASTELUWICZ: Yes.

22 CHAIRMAN WALLIS: So to me, this is an  
23 unusual way of satisfying at ATWS criterion. Is this  
24 an unusual way of doing it?

25 MR. ASTELUWICZ: The rule in this area is

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1 pretty specific. When the staff went back to  
2 rulemaking, the two specific reactor vendor types, the  
3 CE design and the B&W design, were viewed to have such  
4 a high frequency for ATWS events that the Commission  
5 felt it was appropriate to impose a modification at  
6 that time.

7 The Westinghouse units do not have that.  
8 So the variation between the Westinghouse designs and  
9 the B&W and CE designs are a little bit different, and  
10 we asked a different set of questions for Westinghouse  
11 units than we do for the B&W and CE types.

12 MR. BOEHNERT: Well, Westinghouse also had  
13 additional relieving capacity. So it had lower  
14 pressures.

15 MR. ASTELUWICZ: That's correct. It was  
16 a combination of everything.

17 MR. ALEXION: Go ahead.

18 CHAIRMAN WALLIS: So there's going to be -  
19 - What we are going to hear later on is going to come  
20 a little closer to what I was asking for with my last  
21 question?

22 MR. MARSH: Mr. Chairman, we produced some  
23 details we can give you in the containment analysis as  
24 well to demonstrate some in depth types of analyses,  
25 but I also want to point out that this review was done

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1 in concert with the steam generator replacement  
2 review, too. So there's thoroughness that went on in  
3 that review, which you are probably not hearing right  
4 now as well.

5 CHAIRMAN WALLIS: I guess we didn't have  
6 the benefit of that here?

7 MR. MARSH: That's right. I think many  
8 of the analyses that were done associated with the  
9 power uprate were done in the context of the steam  
10 generator replacement. Okay, Tom, want to move on?

11 MR. ALEXION: Let's move on to the Plant  
12 Systems Branch review.

13 MR. CULLISON: Good afternoon. I am Dave  
14 Cullison from the Plant Systems Branch. With me is  
15 Rich O'Dell sitting over there. He performed the  
16 reviews -- the containment reviews for the steam  
17 generator replacement, and he can answer any of the  
18 questions about those reviews.

19 (Slide change)

20 MR. CULLISON: I'll start off with the  
21 next two slides are the list of the SRP sections I  
22 used as guidance for conducting my review.

23 MEMBER POWERS: Let me just ask, when  
24 should we ask about the steam generator reviews?

25 MR. CULLISON: I'll get to those a little

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1 bit later.

2 MEMBER POWERS: Okay.

3 MR. CULLISON: I also used the Farley  
4 safety evaluation as a guide in performing my reviews.

5 (Slide change)

6 MR. CULLISON: Based on the review,  
7 essentially we found no significant impact on any of  
8 the these systems. We -- In other words, we didn't  
9 find anything that was unacceptable.

10 The areas I have marked with an asterisk  
11 are the ones that were reviewed for the steam  
12 generator replacement, and Rich can speak to those in  
13 a minute.

14 MR. ALEXION: Two slides over?

15 MR. CULLISON: Yes, two slides over.

16 (Slide change)

17 CHAIRMAN WALLIS: Are you going to say  
18 anything more about spent fuel pool coolant?

19 MR. CULLISON: Yes, I am.

20 CHAIRMAN WALLIS: All right.

21 MR. CULLISON: I had three areas which I  
22 focused on, basically because there wasn't -- I  
23 didn't think there was sufficient information in the  
24 submittal to draw a conclusion. So I asked questions  
25 of the licensee to provide that information.

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1           Those were the fuel pool system, service  
2 water system and the emergency feedwater system. On  
3 the fuel pool system, they are a little bit different  
4 than probably most plants. They don't do a bounding  
5 calculation. They do a cyclic calculation, but their  
6 backup system is boiling, boiling from fill.

7           So we had discussions to make sure that  
8 they had -- We, really using administrative controls,  
9 we obtained their licensee basis of keeping the pool  
10 below 150 degrees, regardless of the heat load from  
11 the --

12           CHAIRMAN WALLIS: It depends on the  
13 temperature of the water they are putting in, doesn't  
14 it?

15           MR. CULLISON: Right. They do a  
16 combination of monitoring the reservoir water  
17 temperature and the decay time on the spent fuel, and  
18 they developed a graph so they could go to it,  
19 depending -- based on one pump, two pump.

20           CHAIRMAN WALLIS: So if the reservoir gets  
21 too warm, they just increase the flow rate. Is that  
22 what they do?

23           MR. CULLISON: Well, they can do that, and  
24 they also can let the fuel decay a little bit longer,  
25 do a calculation.

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1 CHAIRMAN WALLIS: It may overheat while  
2 you're waiting for it to decay.

3 MR. CULLISON: Well, no, this is before  
4 they remove it for --

5 CHAIRMAN WALLIS: Oh, before it goes in?

6 MR. CULLISON: Before it goes into the  
7 pool.

8 CHAIRMAN WALLIS: Where is it then? It's  
9 in the reactor?

10 MR. CULLISON: It's in the reactor.

11 CHAIRMAN WALLIS: It's still decaying?  
12 Oh, you shut the reactor down --

13 MR. CULLISON: This is after they shut  
14 down, before they --

15 MEMBER SIEBER: Three days maybe.

16 MEMBER POWERS: I mean, in the past there  
17 have been some fairly heroic times. The thrust  
18 nowadays is to continuously shorten that time. I  
19 mean, it is the great fallacy that Mode 4 is such a  
20 low risk event. It's becoming higher risk all the  
21 time.

22 MR. CULLISON: The licensee's -- what they  
23 told me is that what they try to do is match the  
24 additional heat load from the spent fuel with the  
25 capacity of the cooling system. So they never really

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1 increase the temperature of the pool. I found that to  
2 be acceptable.

3 On the service water system, I verified  
4 that the safety related service water system had the  
5 capacity to meet any heat loads -- any increased heat  
6 loads from the power uprate.

7 (Slide change)

8 MR. CULLISON: On the emergency feedwater,  
9 at the time I was doing my review there was a  
10 nonrelated license amendment to change the way they  
11 calculated the necessary amount of water in the  
12 condensate storage tanks. The idea was to go to a 30-  
13 minute supply, which would give them time to bring  
14 service water online to provide water to the emergency  
15 feedwater system.

16 That part of that amendment request was  
17 eventually withdrawn, and I had to go with the  
18 question to verify that they had adequate amount of  
19 water in the CSTs to meet the demands for the power  
20 uprate. They came back with the answer, and it was  
21 acceptable.

22 That's what I have. I have back-up slides  
23 on the continuing response analyses, and if you would  
24 like to see those or any --

25 MEMBER POWERS: Any areas that you listed

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1 but didn't go into are interestingly labeled control  
2 room uninhabitability.

3 MR. CULLISON: That's a little -- I hadn't  
4 seen that before.

5 MEMBER POWERS: That's okay.

6 MR. CULLISON: But what that is is the --  
7 if they have to evacuate the control room in the case  
8 of any event other than an Appendix R, that they have  
9 the ability to safely shut down the reactor. Based on  
10 my review of the information they provided, it's  
11 acceptable.

12 MEMBER POWERS: Okay. So this does not  
13 have to do with the dosage in the control room?

14 MR. CULLISON: No, it's different.

15 CHAIRMAN WALLIS: Are you going to talk  
16 about containment or is someone else going to talk  
17 about it?

18 MR. CULLISON: Rich O'Dell. I've got  
19 back-up slides. At the time I developed this  
20 presentation, I didn't know how much interest there  
21 would have been in the --

22 MEMBER SIEBER: I wouldn't mind having you  
23 go through that portion that you have as back-up.

24 MR. CULLISON: Okay, I'll go through the  
25 slides, and Rich can answer any of the questions.

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1 (Slide change)

2 CHAIRMAN WALLIS: I think all you have in  
3 detail that illustrates thoroughness, the better off  
4 we'll all be.

5 MR. CULLISON: Okay.

6 CHAIRMAN WALLIS: As long as it doesn't  
7 take forever. I guess if it takes forever, we'll  
8 wait.

9 MR. CULLISON: One of the issues for the  
10 steam generator replacement was containment cooling.  
11 The licensee brought that up this morning. Based on  
12 their evaluations, they had to do equipment  
13 modification to the fan blades -- this is for the  
14 safety related portion of the system -- and --

15 CHAIRMAN WALLIS: Do you understand that  
16 business of the fan blades?

17 MR. CULLISON: They had to change the  
18 pitch.

19 CHAIRMAN WALLIS: Yes, but it did  
20 something odd, and I couldn't quite understand it. It  
21 changed the flow rate, and it changed the  
22 temperatures. I couldn't follow that.

23 MR. CULLISON: The changed capacity of  
24 each cooler minimized the capacity of each cooler.

25 CHAIRMAN WALLIS: It reduced the flow

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1 rate.

2 MR. CULLISON: Reduced the flow rate.

3 CHAIRMAN WALLIS: Why would you reduce the  
4 flow rate if you want more cooling?

5 MEMBER SIEBER: Well, the issue is you  
6 burn out the motor on the fan.

7 CHAIRMAN WALLIS: Yes, that's right. So  
8 you protect the motor on the fan. So it's a  
9 restriction. So it reduces your ability to cool.

10 MR. CULLISON: Right. But to have enough  
11 capacity, they changed the tech spec to have both  
12 trains operable. They used to have -- required to  
13 have one train operable. Now they have both trains  
14 operable.

15 CHAIRMAN WALLIS: So now both trains are  
16 operable. Then does this involve also their analysis  
17 of mixing in the containment or they assume it's well  
18 mixed.

19 MR. CULLISON: I think it's well mixed.  
20 Go ahead, Rich.

21 MR. O'DELL: No. Containment mixing  
22 doesn't figure into this analysis. It's just heat  
23 removal capability.

24 CHAIRMAN WALLIS: But it goes back to the  
25 one node containment mode?

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1 MR. O'DELL: It's a one node containment  
2 mode.

3 CHAIRMAN WALLIS: Are you satisfied with  
4 the one node containment model?

5 MR. O'DELL: The one node containment  
6 model?

7 CHAIRMAN WALLIS: Enough for this purpose?

8 MR. O'DELL: This is Richard O'Dell from  
9 Plant Systems Branch. The one node containment model  
10 is the standard model that most licensees use.

11 CHAIRMAN WALLIS: -- the paperwork.

12 MR. O'DELL: And the feeling is --

13 CHAIRMAN WALLIS: So they were concerned  
14 about mixing because of the spray for the thing, the  
15 spray in the unsprayed region. That's why you get  
16 involved with a more than one node idea.

17 MR. RICHARDS: Tom, correct me if I'm  
18 wrong, but I think that's addressed by a different  
19 tech branch later on in the presentation.

20 MR. ALEXION: Yes, that's in the dose  
21 analysis.

22 CHAIRMAN WALLIS: So at least there, there  
23 are about two different regions in the containment.

24 MR. RICHARDS: WE have a discussion about  
25 that coming up. It's just a little later in the

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1 presentation.

2 CHAIRMAN WALLIS: So if there's a concern  
3 about containment cooling, then it might be worthwhile  
4 to revisit the assumption of adequate mixing in the  
5 containment. That's something I might do if I were a  
6 reviewer.

7 MR. O'DELL: The conventional wisdom is  
8 that a one node model is actually conservative, that  
9 if you have a one node model, you are mixing the steam  
10 with the air, and it reduces the heat transfer over  
11 the case where you've had stratification and you would  
12 have the steam at the top condensing rapidly, and the  
13 air forced down to the bottom.

14 So you have a part of the containment that  
15 has very good heat transfer and part that doesn't. As  
16 you know from another briefing, two licensees are  
17 planning to come in any day now with a map containment  
18 model that's a multi-node model, and the staff will  
19 have a chance to review that.

20 CHAIRMAN WALLIS: Are they going to come  
21 in with that before we get to approve the model  
22 itself? We had some questions about the model itself.  
23 We're getting a bit away from this, but I would hope  
24 that we get to thoroughly look at the basis for the  
25 model itself before these licensees come in and ask us

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1 to accept the use of it.

2 MR. O'DELL: Well, it's pretty much at the  
3 same time, but yes, that will definitely be part of  
4 the review.

5 CHAIRMAN WALLIS: It's another one of  
6 these express trains we are standing in front of.

7 MR. O'DELL: We got a year, and then the  
8 train is at our intersection.

9 MEMBER SIEBER: I'd like to go back to the  
10 question of the fan coolers. What steps did you take  
11 after they decided they needed to change the blade  
12 pitch to assure that the motors would not burn out or  
13 fail during a DBA with full containment pressure?

14 MR. O'DELL: Is that an environmental  
15 containment issue? Is that an environmental  
16 qualification question you are asking?

17 MEMBER SIEBER: No. It isn't. It's a  
18 load question. You've got a very dense atmosphere in  
19 containment when you've got 60 pounds of pressure in  
20 there, and the motors have to drive the fans. They  
21 continue to run through the action. Is that not  
22 correct?

23 MR. O'DELL: I don't think -- Tom, correct  
24 me if I'm wrong. I don't think we looked at that.  
25 There are things like that when a licensee comes in

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1 and says that they are making a change, an engineering  
2 change like that, and it appears to us, just from  
3 making the change, that they've thought through what  
4 needed to be done. That area wasn't looked at. The  
5 assumption is the licensee's engineering people can  
6 assess that.

7 MEMBER SIEBER: Know how to engineer it.  
8 Right. On the other hand, those fans do provide a  
9 function during an accident. Right? And are a part  
10 of the protection of containment to assure that  
11 containment will, in fact, function. Is that not  
12 correct?

13 MR. O'DELL: Yes, they are. They are, and  
14 your question is a legitimate question. It just  
15 wasn't addressed in this review. There's always more  
16 questions you can ask and, like I say, your question  
17 is legitimate. It's certainly a question we could  
18 have, maybe should have, asked. But we didn't.

19 MR. MARSH: This is Tad Marsh on the  
20 staff. Plant changes of that sort are conducted  
21 through a 5059 process which, as you know, has you do  
22 evaluations, and then they are audited by the staff as  
23 part of the inspection process or as part of the  
24 normal follow-up review.

25 It sounds like this type of change was not

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1 part of the licensing process. This was another type  
2 of evaluation that they had done.

3 MEMBER SIEBER: Yes. On the other hand,  
4 it's a modification that you are making to accommodate  
5 a power uprate. So it's a -- To my mind, it's a  
6 condition that the power upgrade caused in the plant,  
7 and I'm curious as to whether you looked at it.

8 In an earlier life, I paid to have motors  
9 rewound. So there's reason for me to ask this  
10 question.

11 MR. O'DELL: This may be a good time to  
12 answer a previous question about specific areas that  
13 were looked at in the review that we spent some time  
14 on, and the fan coolers was an area where we had  
15 several telephone calls with the licensee and got some  
16 significant clarification from what was in the first  
17 submittal.

18 The licensee wasn't hiding anything. They  
19 made a statement in the original submittal that --  
20 along the lines that they had done some analysis with  
21 the GOTHIC code concerning possible boiling in the  
22 service water, and we spent a lot of time with that  
23 and asking for the details of how the calculation was  
24 done, and they provided a lot of information that  
25 satisfied us that the boiling was a condition that was

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1 temporary and would only be a problem at a pressure  
2 below the pressure -- the normal pressure of the  
3 service water system.

4 I also asked a couple of times about the  
5 technical specification requiring all four fan cooler  
6 units, because we had just -- I had just gotten done  
7 a little while before with an emergency tech spec  
8 amendment for another Entergy plant where they had a  
9 tech spec that required all four fan coolers to be  
10 operable, and one of them wasn't operable anymore, and  
11 it put them in a bad situation.

12 I questioned whether they really wanted to  
13 put themselves in the same situation. But at the  
14 time, there wasn't anything in the near term that  
15 could be done. So we approved the amendment as it  
16 was.

17 So that's an example, for what it's worth,  
18 of an area where there was discussion and a lot more  
19 information was asked for, and clarification, and  
20 results of analyses.

21 CHAIRMAN WALLIS: If you get boiling in a  
22 fan cooler, what happens? Does it come out into the  
23 piping? Do the voids come out into the piping or they  
24 stay in the fan cooler?

25 MR. O'DELL; It just limits the cooling.

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1 CHAIRMAN WALLIS: Just a very local thing?

2 MR. O'DELL: Yes.

3 MR. MARSH: This was looked at in the  
4 context of Generic Letter -- help me. I believe it  
5 was 96-06 where we looked at the transient performance  
6 of fan coolers because of momentary heating because of  
7 temporary loss of flow. Licensees had to evaluate the  
8 performance of piping systems with the re-initiation  
9 of service water to ensure there wasn't any water  
10 hammer and loss of function of the fan coolers.

11 CHAIRMAN WALLIS: Been that route, too.  
12 Yes. But it's not the same thing. It's not the same  
13 problem, is it?

14 MR. MARSH: Well, if there's boiling in  
15 the coils of the fan cooler.

16 CHAIRMAN WALLIS: Unless the voids are  
17 transferred to the service water mains, it doesn't  
18 matter, does it?

19 MR. O'DELL: It just limits the heat  
20 transfer that you are expecting from the engineered  
21 safety feature.

22 CHAIRMAN WALLIS: Okay.

23 MR. MARSH: Okay.

24 MR. ALEXION: Want the next slide?

25 MR. CULLISON: Yes, go ahead with the next

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1 slide.

2 (Slide change)

3 CHAIRMAN WALLIS: What is the ultimate  
4 heat sink for this?

5 MR. CULLISON: It's an emergency cooling  
6 pond which is a large pond that -- They actually have  
7 two. They have their reservoir and the pond, and the  
8 true ultimate heat sink is the pond, just in case the  
9 reservoir goes away.

10 In containment response analysis, this is  
11 an area where the staff did --

12 CHAIRMAN WALLIS: You're off this slide.  
13 There's a new one?

14 MR. CULLISON: Right. This is the one I'm  
15 on. And the containment response analysis -- this is  
16 also done as part of the steam generator replacement,  
17 and this is an example where a confirmatory  
18 calculation was performed.

19 CHAIRMAN WALLIS: Using a different code?

20 MR. O'DELL; We asked Los Alamos to do a  
21 calculation for us. They were comfortable with the  
22 MELCOR code. So they used the MELCOR code to do the  
23 analysis as a design basis analysis. It didn't  
24 include all the fission product and other types of  
25 models that MELCOR can handle and melting of fuel and

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1 that kind of thing. It was just a design basis  
2 analysis of the containment. But they used the MELCOR  
3 code.

4 They looked at LOCA in a main steamline  
5 break, and it wasn't -- It wasn't a great example of  
6 a confirmatory analysis. There were problems. The  
7 contractor had an error it took a while to recognize  
8 and fix, and the licensee identified some changes they  
9 wanted to make to the input after a lot of our  
10 analysis is done. But the contractor did a lot of  
11 sensitivity studies, looking for what things were most  
12 important, and went back and adjusted the input and  
13 redid some of the calculations.

14 CHAIRMAN WALLIS: What numbers did they  
15 come up with?

16 MR. O'DELL: I believe the pressures were  
17 within a psi or so of each other.

18 CHAIRMAN WALLIS: A 57.6 or whatever?

19 MR. O'DELL: It was like 55 and 57, that  
20 kind of number.

21 CHAIRMAN WALLIS: That's after they  
22 adjusted some things?

23 MR. O'DELL: But I would rather not put  
24 too much stress on the final answers, because it  
25 wasn't that pretty of an analysis.

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1 CHAIRMAN WALLIS: It is reassuring that at  
2 least some time in their confirmatory calculation is  
3 made.

4 MR. O'DELL: In the case of the steamline  
5 break, there was a very large difference between the  
6 licensee and the contractor's calculations, and we  
7 talked with the licensee, and the licensee identified  
8 to us that they used a very conservative value for the  
9 efficiency of the containment spray.

10 We went back and did a sensitivity study  
11 based on that, and got answers that were very close to  
12 the licensee's values. The licensee was much more  
13 conservative than the contractor's calculation.

14 CHAIRMAN WALLIS: These sorts of things  
15 are helpful to me, these kinds of details. Thank you.

16 MR. MARSH: Mr. Chairman, we were unaware  
17 that you wanted that level of detail for this  
18 presentation today.

19 CHAIRMAN WALLIS: We ask for whatever  
20 level of detail we think is appropriate.

21 MR. MARSH: We thought we were to give an  
22 overview.

23 CHAIRMAN WALLIS: Yes, but that's been the  
24 problem all along, I think. If you read between the  
25 lines of our letters, we say, yes, the overview looks

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1 fine, but the real work is in the detail. So where's  
2 our assurance that the real work was good? That's the  
3 question we've been asking all along in these reviews.

4 MR. MARSH: Right. For today's  
5 presentation we were asked to come for an hour and a  
6 half to give you an overview.

7 CHAIRMAN WALLIS: I know.

8 MR. MARSH: Okay? And that's sort of  
9 where we are.

10 CHAIRMAN WALLIS: We don't have enough  
11 time.

12 MR. MARSH: Right.

13 CHAIRMAN WALLIS: But I think you  
14 understand why we are going to dig deeper.

15 MR. MARSH: And we would have come  
16 prepared differently.

17 CHAIRMAN WALLIS: That's okay. I mean,  
18 you're not prepared. Sometimes that's better.

19 MR. MARSH: Depends on your viewpoint.

20 MEMBER POWERS: I would just comment here  
21 that, as we progress through this, when we want a  
22 little more detail, that may want to color what we do  
23 in a final presentation on some of this stuff.  
24 Sometimes the oral expression is enough.

25 MR. O'DELL: Could I just add that the

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1 calculations, the Los Alamos calculations, are in  
2 Adams. So they are available to the public, and --

3 MEMBER SIEBER: Well.

4 MR. O'DELL: Well, we all know where that  
5 stands. But they are available to the public, and the  
6 accession numbers referenced in the SER.

7 MEMBER POWERS: I'll just remind people  
8 that Los Alamos is north of Sandia.

9 MEMBER SIEBER: Well, getting back to this  
10 question, I think it's important that in some areas  
11 you give us some detail, as Dr. Wallis has said, so  
12 that we have a feeling as to what depth you went to to  
13 confirm the licensee's application; because otherwise  
14 it's -- you know, the acceptance criteria were met,  
15 and page after page after page of that, which doesn't  
16 help us.

17 So that's why I asked for this. I think  
18 we can go on and finish this up here.

19 MR. ALEXION: Okay. We'll go on to the  
20 next presenter then. The next presentation will be  
21 Mechanical Engineering Branch.

22 CHAIRMAN WALLIS: I think that's  
23 important. We know that you are going to say the  
24 acceptance criteria were all met, and we want to know  
25 what's behind it. That's the real question.

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1 MEMBER POWERS: You know, they wouldn't  
2 even be here if the acceptance hadn't been met.

3 CHAIRMAN WALLIS: That's right. So we  
4 know that. That's a given.

5 MR. MANOLY: Good afternoon. My name is  
6 Kamal Manoly. I'm the Section Chief in the Mechanical  
7 Engineering Branch where the bulk of the review was  
8 done.

9 (Slide change)

10 MR. MANOLY: Just up front, I would like  
11 to let you know that the review in the mechanical area  
12 is pretty much the same in the -- for the pressurized  
13 as was in the boiler.

14 Just some components changed, like the  
15 steam generator and the moisture separators in the  
16 boilers, but the piping and the balance of plant  
17 piping essentially all the same. We look at fatigue  
18 usage in terms of compliance with ASME code they  
19 committed to.

20 So essentially, we're doing the same  
21 review we've done before. The components that we  
22 looked at are the reactor vessel, internals, nozzles  
23 CRDMs, the same. The steam generator is the only  
24 measured difference here, and the reactor coolant  
25 pumps, pressurizer and nozzles, and the NSSS and BOP

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1 piping the same, and the safety related valves. That's  
2 similar.

3 (Slide change)

4 MR. MANOLY: Scope of review, still the  
5 same. We look at the methodology and the loads  
6 specified, stresses in the piping and components, and  
7 the usage factors for thermal fatigue, and also look  
8 at the acceptance criteria and the codes they  
9 committed to, and functionality of the valves,  
10 specifically in regard to Generic Letters 89-10 for  
11 MOVs and 95-07 for the pressure locking and thermal  
12 binding, and 96-06 for pressurization of isolated  
13 piping containment.

14 MEMBER POWERS: When you looked at  
15 fatigue, you were looking at cyclic mechanical  
16 loadings only?

17 MR. MANOLY: When I say COF is thermal  
18 fatigue.

19 MEMBER POWERS: Thermal fatigue? Okay.

20 MR. MANOLY: The cyclic for the flow  
21 induced, that's for the steam generator, and that's  
22 the next slide.

23 MEMBER POWERS: When you just mentioned  
24 that the scope was similar to the BWR, somehow --

25 MR. MANOLY: Yes, except for the steam

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1 generator. That's all.

2 MEMBER POWERS: Well, obviously, the steam  
3 generator. There seemed to be more concern about flow  
4 induced vibration here and, in fact, I mean, the  
5 licensee made the comment that --

6 MR. MANOLY: Yes.

7 MEMBER POWERS: Is there more concern with  
8 flow induced vibration in these systems for some  
9 reason?

10 MR. MANOLY: You are on the last slide.

11 (Slide change)

12 MR. MANOLY: Okay, for the steam generator  
13 replacement, we looked at the finite element analysis  
14 done by the licensee. The used the ANSYS code which  
15 is one of the two mostly used codes in the country.

16 We looked at the CUF for fatigue and also  
17 for the allowables on the components and supports.  
18 The flow induced vibration for the steam generator,  
19 they maintained a stability ratio of .75, less than  
20 the limit of 1.0. So that was the limit imposed by  
21 the licensee on their tubes.

22 (Slide change)

23 MEMBER POWERS: Now is this, again, a  
24 piping analysis or is this a more full blown detailed  
25 stress analysis?

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1                   MR. MANOLY:        The steam generator  
2 replacement, that is a piping -- components, just  
3 typical piping analysis, you know.

4                   MEMBER POWERS: Even though they are using  
5 ANSYS?

6                   MR. MANOLY: ANSYS, yes.    The next one is  
7 pretty much identical to the boiler, NSSS and BOP  
8 piping.    They used Bechtel ME101 which is used  
9 industrywide, and again you compare the limits -- the  
10 stresses to the limits in the ASME code, depending on  
11 the class of piping being evaluated.

12                   They also calculated the CUFs for the  
13 Class 1 piping based on 60 years.

14                   (Slide change)

15                   MR. MANOLY: And the last slide that you  
16 were interested in was about the flow induced  
17 vibration in the main steam piping.    The main steam  
18 piping was the most sensitive system to the flow  
19 induced vibration issue.

20                   There's a study done by SWRI that the  
21 kinetic energy is basically driving force behind the  
22 flow induced vibration.

23                   CHAIRMAN WALLIS:        Doesn't seem  
24 dimensionally correct somehow.

25                   MR. MANOLY: Excuse me? I didn't get the

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1 point.

2 MEMBER POWERS: Take a derivative.

3 CHAIRMAN WALLIS: I think you mean a  
4 momentum flux or something like that.

5 MR. MANOLY: No. The kinetic energy --

6 CHAIRMAN WALLIS: No, I think you mean a  
7 momentum flux.

8 MR. MANOLY: As presented by the  $\rho V^2$ ?

9 CHAIRMAN WALLIS: Yes, something.

10 MR. MANOLY: Okay. That's what's  
11 proportional.

12 CHAIRMAN WALLIS: I think you mean a  
13 momentum flux. That's okay.

14 MR. MANOLY: It's flow induced vibration.

15 CHAIRMAN WALLIS: These always -- This  
16 always bothers me a bit, this assumption that all  
17 forces are proportionate to the  $\rho V^2$ ; therefore,  
18 flow induced vibration is; because flow induced  
19 vibration is a kind of coupling between mechanical and  
20 fluid, and sometimes you can get odd resonances or  
21 things happening --

22 MR. MANOLY: That's true.

23 CHAIRMAN WALLIS: -- that are not  
24 reflected just in the momentum flux.

25 MR. MANOLY: That's true, but also the

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1 clear change in numbers and the values, like the cycle  
2 pressure was 769.

3 CHAIRMAN WALLIS: As long as you are away  
4 from resonance, it's fine. When you get near  
5 resonance, everything is quite different.

6 MR. MANOLY: Very true. But the fact is  
7 that the flow vibration issue is better with the  
8 replacement generators and the part operates regime.  
9 Despite that, they are going to be doing monitoring  
10 during start-up using the procedure in OM-3, using  
11 hand held devices which is acceptable.

12 CHAIRMAN WALLIS: What's a hand held  
13 devices? Hold it up to the pipe and see how much it's  
14 shaking?

15 MR. MANOLY: Yes. That's basically what  
16 we can prepare to address.

17 CHAIRMAN WALLIS: It's an accelerarometer  
18 or something or is it something you just feel?

19 MR. MANOLY: No, no. It is right against  
20 the pipe.

21 CHAIRMAN WALLIS: It's an accelerarometer,  
22 though, isn't it?

23 MR. MANOLY: Yes.

24 MEMBER SIEBER: It's the differential  
25 between how much the pipes are shaking and how much

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1 the engineer is shaking.

2 MR. MANOLY: Are there any questions you  
3 might have?

4 CHAIRMAN WALLIS: What sort of frequencies  
5 does it vibrate at, range?

6 MR. MANOLY: I don't have the numbers.  
7 Maybe, Dr. Wu, do you have the numbers for the  
8 frequencies?

9 CHAIRMAN WALLIS: Order of magnitude?

10 MR. ALEXION: Low frequency.

11 MR. MANOLY: We can get it to you. We  
12 don't have it right now.

13 CHAIRMAN WALLIS: Well, is it hertz or  
14 kilohertz or --

15 MEMBER SIEBER: It may be hertz.

16 CHAIRMAN WALLIS: I'm just trying to see  
17 if they scaled it right.

18 MR. MANOLY: But I just didn't have the  
19 magnitude itself.

20 CHAIRMAN WALLIS: Is it sub-hertz?

21 MR. WU: This is a low frequency fatigue.  
22 So low frequency.

23 CHAIRMAN WALLIS: Less than a hertz, isn't  
24 it? Less than a hertz?

25 MR. WU: Well, it could be -- Should be

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1 greater than one hertz.

2 CHAIRMAN WALLIS: Should be greater than  
3 one hertz?

4 MR. WU: One hertz, yes.

5 MEMBER SIEBER: Five to ten.

6 MR. MARSH: Five to ten.

7 MR. MANOLY: Any other questions? Okay,  
8 thank you.

9 CHAIRMAN WALLIS: Thank you.

10 MR. MARSH: Next we'll hear from the  
11 Materials and Chemical Engineering Branch.

12 CHAIRMAN WALLIS: Well, I'm just curious  
13 here. What sort of amplitude do you get? When do you  
14 get an amplitude that concerns you? Are you looking  
15 at amplitudes of a millimeter or a meter or what?

16 MEMBER SIEBER: That would be in the lower  
17 frequency.

18 MR. WU: Yes, lower amplitudes. They are  
19 measured by the micro-inch, very small, yes, very  
20 small.

21 MEMBER SHACK: The piece above the  
22 threshold for high frequency fatigue, he's got a  
23 problem.

24 CHAIRMAN WALLIS: Right.

25 MEMBER POWERS: What you want to do it

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1 talk to Jit and have this -- when they go through this  
2 power ramping up, you can visit the plant and help the  
3 engineers do the hand held.

4 CHAIRMAN WALLIS: Well, when you go to oil  
5 refineries, you do get motions of several centimeters.

6 MEMBER SIEBER: Yes, and you do in power  
7 plants, too.

8 MEMBER POWERS: Not for a great deal of  
9 time, though.

10 MEMBER SIEBER: They don't necessarily  
11 occur at full power either.

12 CHAIRMAN WALLIS: No.

13 MEMBER SIEBER: You know, it could be at  
14 any power level. It depends on the tuning of the  
15 system.

16 MR. MARSH: Depends whether it's in a  
17 resonance region or whether you are far from resonance  
18 or not.

19 CHAIRMAN WALLIS: That's the whole  
20 question. That's why just  $\rho V^2$  doesn't really  
21 answer that.

22 MR. MARSH: Right. Sometimes they measure  
23 acceleration as well as velocities and displacements,  
24 because acceleration is a more meaningful parameter  
25 for some of these systems.

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1 CHAIRMAN WALLIS: Okay, thank you.

2 MR. ELLIOT: Hi. I'm Barry Elliot from  
3 Materials and Chemical Engineering Branch. Next  
4 slide.

5 (Slide change)

6 MR. ELLIOT: We review -- In the Branch,  
7 we review nine systems components and analyses. They  
8 are listed up on the slide. We review the fuel pool  
9 capability to remove decay heat and fission products  
10 from the following power uprate.

11 I want to explain how I am going to do  
12 this presentation. The first six items I'm going to  
13 run through rather quickly, and the last three items  
14 I'm going to go through in a little more detail.

15 So I'm just going to say for the first six  
16 items what we review -- basically what we review. We  
17 determined if they were adequate.

18 The second item is we review the clean-up  
19 and shutdown capability of the CBCS following power  
20 uprate. We review containment spray systems' ability  
21 to remove iodine following LOCA for power uprate  
22 conditions.

23 MEMBER POWERS: Say that again. You look  
24 at the containment spray system for what?

25 MR. ELLIOT: Ability to remove iodine

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1 following LOCA for power uprate conditions.

2 MEMBER POWERS: And find it's poorer all  
3 the time.

4 CHAIRMAN WALLIS: That's the only stuff it  
5 removes?

6 MR. POWER: That's the only thing they  
7 give credit in PWRs for. BWRs, on the other hand --  
8 water is different in the two.

9 MR. ELLIOT: We review the impact of power  
10 uprate on the previous review leak before break  
11 analyses. We review the impact of increases in  
12 primary system temperature and secondary flow rate on  
13 the water chemistry program, and we review the impact  
14 of power uprate conditions on flow assisted corrosion  
15 program. Next.

16 MEMBER POWERS: Now you have elected to go  
17 quickly through the FAC analysis, but that strikes me  
18 as very important, and I'm concerned about the  
19 licensee's analysis here. I mean, he can't be very  
20 familiar with the code. He doesn't even spell the  
21 name of it correctly in his Vu-Graph.

22 So did you look -- I mean, what did you do  
23 to look at his analyses?

24 MR. ELLIOT: We know that there is a small  
25 increase in the corrosion rate temperature, and what

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1 we just look at to see is if the code is capable of --  
2 We were depending on our CHECKWORKS code to predict  
3 the locations that are susceptible and, therefore,  
4 need inspection.

5 That code still can be used for the power  
6 uprate. We determined that, and so we are relying on  
7 that code to predict where to look and inspect for the  
8 flow assisted corrosion.

9 MEMBER POWERS: And none of those  
10 vulnerable locations were found to change, I think.

11 MR. ELLIOT: I don't know if they're found  
12 to change or not. Chris, do you know if they found a  
13 change?

14 MR. BARCHEVSKY: I didn't hear that  
15 question.

16 MR. ELLIOT: The question is, did any  
17 locations change, critical locations change?

18 MR. BOEHNERT: Identify yourself, please.

19 MR. BARCHEVSKY: Yes, there was some --  
20 Chris Barchevsky. There were some changes in the code  
21 which have to be modified. So the code was slightly  
22 modified to predict, you know, erosion/corrosion.

23 MEMBER POWERS: The question is: In the  
24 piping system that they have in the plant now, they  
25 have certain areas that they monitor closely for flow

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1 assisted corrosion. Did any new areas appear that --

2 MR. BARCHEVSKY: No.

3 MEMBER POWERS: No? Just all the same  
4 places?

5 MR. BARCHEVSKY: The same places.

6 MEMBER POWERS: And you are content with  
7 that, I take it?

8 MR. MANOLY: Yes.

9 MEMBER SHACK: Now what changes were  
10 necessary in the code?

11 MR. BARCHEVSKY: Of changes? Well --

12 MEMBER POWERS: Changes in parameters or  
13 changes in the code?

14 MR. BARCHEVSKY: Yes. The changes were  
15 mainly velocity. The velocity is different. The  
16 velocity parameter had to be modified, hanged.

17 MEMBER SHACK: Okay. I mean, so we're  
18 talking about input changes.

19 MR. BARCHEVSKY: That's right, inputs in  
20 parameter.

21 CHAIRMAN WALLIS: Is this a rho V<sup>2</sup> effect,  
22 too?

23 MEMBER SIEBER: Everything is.

24 MEMBER POWERS: Well, you could certainly  
25 cast it as a rho v<sup>2</sup>. We usually don't, but to

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1 accommodate you, I think we could.

2 MR. ELLIOT: Next we are going to talk  
3 about the Alloy 600 program.

4 (Slide change)

5 MR. ELLIOT: The concern here is primary  
6 water stress corrosion cracking of piping that is  
7 connected to the RCS, the pressurizer and the vessel  
8 head penetration. Cracking in the vessel head  
9 penetrations were subject of an NRC bulletin, Bulletin  
10 2001-01.

11 In this part of this program, PWRs were  
12 ranked by the MRP according to the operating time and  
13 effective full power years required for the plant to  
14 reach an effective time and temperature equivalent to  
15 Oconee Unit 3 at the time that circumferential  
16 cracking was identified in that unit.

17 The licensee has performed that type of  
18 calculation. It turned out that the uprate increases  
19 at  $T_{hot}$  from 604 to 609. The impact on the head was to  
20 increase the ranking to, I think, 14.5 EFPYs -- or  
21 decreased -- It would increase susceptibility and,  
22 therefore, its ranking was 14.5 EFPYs.

23 Also there is the increase in  $T_{hot}$  would  
24 not substantially increase the primary water stress  
25 corrosion cracking initiation in growth rate.

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1 CHAIRMAN WALLIS: When you read these, it  
2 sounds as if you are the licensee. What makes it  
3 different when it's a presentation by you and the  
4 staff?

5 MR. ELLIOT: In this case here, we do  
6 check. We confirm the susceptibility ranking  
7 ourselves. Using the inputs from the temperatures, we  
8 confirm their ranking, and that's one of the things  
9 that we do for the staff.

10 CHAIRMAN WALLIS: How do you -- What  
11 process do you go through to confirm their rankings?

12 MR. ELLIOT: Well, we talk to them about  
13 what temperature the head is, what temperatures the  
14 nozzles are at, and we know how long they operate for.  
15 They give us that, and then we put the time and  
16 temperature into the equations --

17 CHAIRMAN WALLIS: Pretty simple.

18 MR. ELLIOT: -- and determine the  
19 effective full power years to reach equivalent to  
20 Ocone.

21 MEMBER POWERS: I guess I'm a little  
22 perplexed -- as I say, I spend a lot of time being  
23 perplexed -- that the numbers you quote up here for  
24 temperatures are not the temperatures of the head.

25 MR. ELLIOT: No, they are not. The

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1 temperature at head is 14.5 degrees below those  
2 temperatures.

3 MEMBER SIEBER: It's a cold head.

4 MEMBER POWERS: See, when I try back of an  
5 envelope calculation here, and based on the changes in  
6 time, I come back, and say that you are using an  
7 activation energy for stress corrosion cracking, must  
8 be around 40 kilocalories. Is that roughly correct?

9 MR. ELLIOT: Alan, you want to tell them  
10 how we do this in more detail?

11 MR. HIZER: This is Alan Hizer of NRR.  
12 Actually, I think it was on the order of 32.

13 MEMBER POWERS: Thirty-two? Does that  
14 strike you as a little low for stress corrosion  
15 cracking? Not a bad guess, by the way, to get 40.

16 MEMBER SHACK: Actually, the growth rates  
17 are typically around 32. Initiation is typically more  
18 like 40 to 45. I think they actually use a slightly  
19 higher number for initiation. I thought it was like  
20 40.

21 MR. HIZER: For the susceptibility  
22 rankings, since a lot of that was thought to be growth  
23 driven --

24 MEMBER SHACK: Growth driven, you use the  
25 crack growth initiation. Okay.

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1 MR. POWERS; Okay. My numbers are roughly  
2 correct. Not a bad guess.

3 MEMBER SIEBER: On the other hand, the  
4 relationship between susceptibility and temperature is  
5 not linear. Right?

6 MEMBER POWERS: No, no.

7 MEMBER SIEBER: Okay. And the reason why  
8 this plant comes in okay is because it's a cold head  
9 plant. Is that true?

10 MR. ELLIOT: Right. We have plants that  
11 operate at higher temperatures than this.

12 MEMBER SIEBER: If the head were operating  
13 at 609, would you be concerned?

14 MR. ELLIOT: At what?

15 MEMBER SIEBER: Would you be concerned?

16 MR. ELLIOT: We would be a lot more  
17 concerned. We are only talking about five degrees  
18 here. You're talking about increases by 14. That's  
19 a lot.

20 MEMBER SIEBER: Yes, and it's nonlinear,  
21 too. Right?

22 MR. ELLIOT: Right.

23 MR. HIZER: Just as a reference point,  
24 before the power uprate conditions they had a  
25 susceptibility ranking of a little over 17 EFPY. So

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1 just the five degrees dropped them by a little over 2  
2 EFPY. So that's -- But it kept them within the same  
3 bin, if you will, from the Bulletin, the moderate  
4 susceptibility bin.

5 MR. ELLIOT: A higher temperature like  
6 you're talking about could put them in a higher bin.  
7 Just means they have to do a different inspection, but  
8 what they talked about this morning was they're  
9 planning on doing an ultrasonic inspection. So even  
10 if they were in the higher bin, they would still do --  
11 they are coming out doing what would be necessary for  
12 a more susceptible plant.

13 MEMBER SIEBER: But when you look at  
14 susceptibility, regardless of whether it's a hot head  
15 or a cold head, you look at the hotleg safe ends.  
16 That should be an issue and an area that would gather  
17 more of your attention. Could you describe to us what  
18 you did related to the safe end welds?

19 MR. ELLIOT: -- two welds on this plant  
20 are piping connected to the reactor coolant pumps, and  
21 the --

22 MEMBER SIEBER: And the vessel.

23 MR. ELLIOT: No, the vessel is -- This  
24 piping is ferritic.

25 MEMBER SIEBER: Oh, okay.

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1 MR. ELLIOT: So it doesn't have -- Then  
2 you have the surge line that has connections -- and  
3 then there's instrument lines that go into --

4 MEMBER SIEBER: Small bore, right.

5 MR. ELLIOT: Yes, that have that. So they  
6 are part of the Bulletin 2001-01 susceptibility  
7 ranking. For those, we are relying on the Generic  
8 Letter 88--5, walkdowns and the in-service inspection  
9 program. And the small increase in temperature really  
10 has no impact on the ability of those programs to do  
11 an effective job. They will still do their effective  
12 job on those types of plants that are not part of the  
13 head.

14 MEMBER SIEBER: And other than saying it's  
15 a small change, no other work was done. Right? This  
16 is more of a judgment call?

17 MR. ELLIOT: The key area here is that  
18 there is a change in the growth rate. It initiates  
19 sooner, but we have plants that operate higher than  
20 609. They have operated many years higher than 609.  
21 Maybe it's a hotleg temperature, and so our experience  
22 with those are very good.

23 The programs that -- The walkdown programs  
24 and the inspection programs are adequate. So they  
25 should be adequate for this plant, because they aren't

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1 increasing it that much temperature.

2 MEMBER SIEBER: Okay.

3 MR. ELLIOT: The rest of this slide is  
4 self-explanatory.

5 The next issue is really dear to my heart,  
6 neutron fluence and reactor vessel integrity.  
7 Appendix D, 10 C.F.R. establishes Scharpey upper shelf  
8 screening criteria, and 10 C.F.R. 50.61 establishes  
9 RT<sup>PTS</sup> screening criteria for pressurized thermal shock.

10 Appendix G, 10 C.F.R. Part 50 established  
11 fracture toughness criteria for pressure temperature  
12 limits, and are also used for low temperature  
13 overpressure protection setpoints for operation of the  
14 reactor pressure vessel during heat-up, cooldown, and  
15 hydrostatic test conditions.

16 Now the upper shelf energy and RT<sup>PTS</sup> values  
17 have -- are screening criteria. The pressure  
18 temperature limits are not screening criteria. They  
19 just updated based upon the fracture toughness of the  
20 vessel.

21 CHAIRMAN WALLIS: Does the fluence go up  
22 or down at this?

23 MR. ELLIOT: The fluence goes up here with  
24 the powerup.

25 CHAIRMAN WALLIS: Does it go up

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